A Study of Web Services Strategy in the Financial Services Industry

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ABSTRACT

Web Services continues to be an important area of adoption by business firms. This study analyzes the critical factors that contribute to an effective Web Services strategy. Focused on an analysis of key firms in the financial services sector, the study examines in a best practices survey, confirmatory detailed case studies and statistical interpretation the significance of technological, methodological and business factors that have enabled success in the initial strategies of these firms. The findings impute that firms in the financial sector which lead e-Business Web Services projects with a focus on business factors have higher success in strategy than firms in this sector that lead with technological functionality. This study contributes new insight into the effective implementation of Web Services strategy and is appropriate as a beginning framework for financial service and other business firms exploring further investment in Web Services in order to integrate their core systems

KEYWORDS: business process management, BPM, critical success factors, financial services industry, integration, service-oriented architecture, SOA, service-oriented development, SOD, simple object access protocol, SOAP, extensible mark-up language, XML, web services description language, WSDL, universal description discovery and integration, UDDI

1. BACKGROUND

Web Services is an authentic architectural innovation in the integration of business applications. Benefits of component-based integration that emphasize open Internet and Web standards, such as Extensible Mark-up Language (XML), are considered to be better connectivity, internal efficiency, flexibility, immediacy of information, interoperability of disparate systems, and lower cost of systems development. These benefits allow faster and improved service to customers (Hall, 2003 and Reed, 2003). Cost savings and productivity in applications associated with Web Services (Knorr, 2004, Lohr, 2003 and Adams, 2002), which include e-Commerce, customer relationship management (CRM), financial, human resource and knowledge management functionality (Hall), have contributed to increased adoption by firms investing in this technology (Gralla, 2003). Practitioner literature indicates that, in a period of slowly increasing information technology budgets, which include investment in non-proprietary service technology (Alter, 2004), and which are forecasted to be increasing to 2006 (Auchard, 2003), Web Services, in contrast to traditional middleware, contributes financial savings by such an order of magnitude that this technology is currently evaluated as high to moderate in priority (Den Haan, 2003) and in promise (Brandel, 2004, Brown, 2004, Massaro, 2004, Betts, 2003, Keefe, 2003

and Violino, 2003) in information systems plans of firms. Web Services is frequently evolving in conservative and risk averse firms as a critical formative technology (Andrews and Hotle, 2003).

The deployment of the ecosystem of Web Services as an integration methodology is an amorphous strategy. Despite practitioner studies that allude to the competitive benefits of automated process technology, the benefits are essentially from experimental "low hanging fruit" internal application projects, not from announced external invasive process projects (Brown, 2003 and Stone, 2003), nor from heterogeneous high-throughput, low-latency systems (Vijayan, 2003). Web Services as an interdependent business ecosystem (Iansiti and Levien, 2004) is an intricate domain involving diverse platform technologies. Examples of current services consist of the following: narrow, non-complex, controlled client and non-invasive application integration, encapsulation of customized legacy systems, and information and process sharing of request and reply Simple Object Access Protocol (SOAP) systems within the firewalls of firms. Few of these examples are delivering significant benefits from integration of core systems (Vogels, 2003), due to issues in broader adoption of Web Services technology, that preclude full coherence of information semantics, process management, security, maturity of standards, tools and training, and reliability of transactions (Weiss, 2004 and Langdon, 2003). These issues limit the practitioner-cited benefits of Web Services as a current tactical technology (Andrews, 2003).

This stage of Web Services is analogous to earlier eras of innovation in software technologies (Coffee, 2002), which advance in distinct stages of initiation, adoption and implementation. Studies in academia indicate initiation as a change or information gathering stage culminating in the adoption stage, adoption or deployment as a commitment and decision stage, and demand and development of the innovation as the installation or implementation stage (Dembla, Palvia, Brooks and Krishnan, 2003). Web Services as a prototyping and XML application integration technology, improving upon Distributed Component Object Model (DCOM) and Common Object Request Broker Architecture (CORBA), and also Electronic Data Interchange (EDI) and the Enterprise Resource Planning System (ERP), are in an adoption stage in leading edge firms (Alter, 2003). The benefits of new technologies are achieved in a tactical dimension in the adoption stage and in a return-on-investment (ROI) strategic dimension in the full implementation stage. The challenge of Web Services as a competitive differential is introduced in this study not in the simple application adoption stage, but in a future path to a complex process implementation stage.

The path of Web Services technology is in an evolution, from simple Web pages, programmatic Web requests, point-to-point or system-to-system XML services, standard SOAP XML Hypertext Transport Protocol (HTTP), File Transfer Protocol (FTP) and Simple Mail Transfer Protocol (SMTP) services, Universal Description, Discovery and Integration (UDDI) and Web Services Description Language (WSDL), to the complex but dynamic and spontaneous (Milenkovic, Robinson, Knauerhase, Barkai, Garg, Tewari, Anderson and Bowman, 2003) standard Service-Oriented Architecture (SOA) services, formerly Distributed Objects Architecture. The frequent adoption of firms is in application XML services (Knox, 2003 and Greenemeier, 2002). Internal large legacy monolithic applications may, however, be redesigned in components integrated by SOAP invocation and XML information interchange. These applications deployed and implemented may facilitate a foundation for applications in a SOA architectural paradigm (Valdes, 2002), or sub-architecture of the enterprise architecture (Barry, 2003), that furnishes a portfolio of services that contribute to better business benefit to firms. XML is considered merely a simple and tactical dimension of current application Web Services, while SOA is the strategic technology-agnostic dimension of future process and reusable system services. SOA is more important to the eventual business success of Web Services.

Firms considering the feasibility of a technological strategy, that continues sustained superior performance of their businesses (Anupindi, Chopra, Deshmukh, Van Mieghem and Zemel, 1999), are currently challenged technically and managerially (Thomke, 2001) in the dominant hype of technology firms introducing advanced but uncontrolled and diverse platform and specialty technologies. These technologies allow for adoption of services estimated to become a $21 billion market by 2007 (Nowak, 2003). IBM WebSphere, Microsoft .NET Framework, Sun Microsystems Java 2 Platform, Enterprise Edition (J2EE) and Open Network Environment (ONE), and the technologies of other firms that include BEA Java WebLogic and Oracle, compete for industry adoption (McKendrick,

2003), though none effect a full solution strategy (Altman, 2003). Standards continue to be debated by contesting technology firms and by ostensibly independent organizations that include the following: Liberty Alliance, the Organization for the Advancement of Structured Information Standards (OASIS), the Uniform Code Council – RosettaNet (UCC), Web Services Interoperability Organization (WS-I) and the World Wide Web Consortium (W3C). Studies indicate the business importance of Web Services management (Babcock, 2003 and Strassmann, 2003) concurrent with meticulous cost and risk management (Carr, 2003). The contention of this study is that the management of Web Services, sometimes considered as invisible stealth technology (Sutor, 2003), is subject to the criticality of business, and that an enterprise deployment strategy of success in services is imputed to subordinate technological dynamics to the business imperatives of firms investing in this technology.

2. INTRODUCTION

The adoption of Web Services is characteristic of the beginning of an emergent or intended strategy, that consists of a consensus of cumulative experiences or practices that eventually form a deliberate or realized strategy (Mintzberg and Walters, 1985). Adoption however still challenges firms in the introduction of a clear enterprise management strategy (Knox, Earley, Furlonger, Harris, Free and De Lotto, 2003). To assist firms, studies in the practitioner literature have increasingly indicated the importance of considering business benefits in operational effectiveness separate from sole technological functionality (Porter, 1996). Further, the literature indicates the importance of broad firm and managerial change (Hagel III and Brown, 2001). Also indicated is the need for services methodology, in Business Process Management (BPM), customer centric and foundational SOA infrastructure models of non-silo systems, in contrast to application, product centric and XML integration models, in order to effect differentiated and holistic benefits for customer interaction (Kalakota and Robinson, 2003). Integration of BPM, component-based customer centric and SOA infrastructure models, allowing for inconsistency in standards and leveraging emerging technologies without interruption of key services, is the intent of a management strategy. Lack of methodological and business strategy in firms adopting Web Services hinders the competitive benefits of this technology.

The financial industry is one sector adept in innovation that is beginning to advantageously adopt Web Services in the context of the criticality of having a defined strategy (Adrian, 2003 and Earley, 2003). This industry is affected by atypical complexity of changing business models and operations, customer demand for one-stop access to expanded and multiple services, merger and reorganization impact, global partnership and governmental regulation (Sforza, 2004 and Earley, Adrian, Free, Harris, Knox, Kun and Litan, 2003). The industry is additionally confronted with problems of inherited legacy technologies. Firms in this industry are considered Type A aggressive business exploiters of services, beyond Type B mainstream and Type C conservative integrators of technologies (Knox, 2003). The large-sized firms in this industry are considered driving the next stage of innovation in Web Services (Bruce, 2004), despite an effort focused frequently in internal XML application adoption, and in legacy system transformation (Mearian, 2004), not external SOA implementation of infrastructure. The technology of Web Services affords benefits across myriad channels for these firms. These benefits include cost efficiencies that improve business-to-consumer (B2C) and business-to-business (B2B) customer functions and portals, for an online potential of 18 million customers in 2006 (Guglielmo, 2001), through gradual integration of disparate offerings of products (Lublinsky and Farrell, 2003) and the streamlining of processes (Violino, 2004). The technology additionally improves business-to-employee (B2E) interactions. Technology firms continue to enable this effort by furnishing perceived service solutions that facilitate faster client adoption, contributing to potential expanded functionality of Web Services for firms in the financial industry.

Though innovation in technology is frequently considered faster in financial firms than in other sectors, these firms frequently lack the formal governance (Abrams, 2003) of a Web Services strategy. Such a strategy is focused on complex internal and external operations, critical to partner and customer interactions of the firms, instead of on simple internal applications that they have currently. Formulation of a BPM process and SOA infrastructure in a Service-Oriented Development of Applications (SODA) model that contributes to ROI, and that enables transformation of process providing superior benefits to customers (Slack and Lewis, 2003 and Stalk, Evans and Schulman,

1992), is the ideal in the financial services industry and in other industry sectors. Studies in the practitioner literature however indicate the difficulty of formulation of a plan for future implementation of incremental and systematic service-oriented SOA infrastructure from the base of the current XML application and transaction adoption. Transformation is hindered not only by immature and inconsistent standards and technologies, but also in general by limited investment in strategic technological initiatives (Alter). The significance of congruent technological, methodological and business features that have contributed discernibly to an initial successful strategy towards SOA in financial service firms is limited in the scholarly literature and is often limited to technological factors in the trade publications. The utopian future of Web Services in this sector is flawed and in need of a solution in a lack of features of a formal strategy.

3. FACTORS IN WEB SERVICES STRATEGY

The literature of the practitioner studies abounds in technological definitions of Web Services. This study defines services in the financial services industry in the below:

> "Web Services are [discrete network-based application] software components that employ one or more of the following [industry interface languages and uniform communications protocols and] technologies - Simple Object Access Protocol (SOAP) [XML], Web Services Description Language (WSDL) and Universal Description, Discovery and Integration (UDDI) - to perform distributed [and interoperable] computing [over programming and technological platforms]. Use of any of the basic technologies – SOAP [XML], WSDL or UDDI – constitutes a Web Service. Use of all of [these technologies] is not required (Knox, Andrews and Abrams, 2003)."

The descriptive conditions or factors of criticality in a Web service strategy are introduced in the study as not only technological, but also as methodological and business, as defined in the below categorical framework:

3.1 Business Factors in Web Services Strategy -

- *business benefit driver*, extent to which anticipated benefits to the business of the firm drive the Web Services project;
- *business client contribution*, extent to which business departments of the firm consent and contribute tangibly throughout the duration of the services project;
- *competitive differential*, extent to which competitive and first mover edge to the business of the firm drives the project;
- *customer demand,* extent to which specific customer demand for improved interaction drives the project;
- *executive sponsorship*, extent to which executive managers of the firm articulate and evangelize the importance of Web Services and fund the initial projects;
- *focus on process integration*, extent to which business process integration, not only application choreography, is the focus of the services project; and
- *financial rate of return (ROI)*, extent to which increased revenue and / or decreased expense in the firm is a result of the project.

3.2 Methodological Factors in Web Services Strategy -

- *best practices model*, extent to which interoperability maturity and practices profile in reusability of the internal technology department of the firm contribute to the Web Services project;
- *consultant contribution*, extent to which integrator services consultants of technology firms contribute throughout the project;
- *culture of innovation*, extent to which practices of developmental innovation of the internal technology department contribute to the services project;
- *enterprise framework*, extent to which a formal enterprise architectural framework, such as the Zachman Framework for Enterprise Architecture, contributes to the project;
- *life cycle project management*, extent to which flexible innovation in project methodology

and scenario service testing contribute to the project;

- *metric scorecard*, extent to which efficiency dashboards or scorecards monitor business expectation and facilitate future justification for investment in service projects;
- *standards gap management*, extent to which inconsistency in cross domain interoperability of multiple technological installations are managed by the services project manager; and
- *standards organization membership*, extent to which the internal technology department contributes tangibly to industry policies and service standards introduced by technology standards organizations, such as W3C, and by other diverse organizations, such as the Association for Cooperative Operations Research and Development (ACORD), the Financial Services Technology Consortium, the Interactive Financial Exchange (IFX), the Java Community Process (JCP), and the Web Services Interoperability Organization.

3.3 Technological Factors in Web Services Strategy -

- *architectural basic foundation*, extent to which the existing enterprise infrastructure and platform of the firm is included in the Web Services project;
- *architectural process orientation layer*, extent to which the process and synchronization layer of the infrastructure is included in the services project;
- *reliability layer*, extent to which the reliability layer of the infrastructure is included in the project;
- *security layer*, extent to which the security layer of the infrastructure is included and managed in the services project;
- *transaction management layer*, extent to which the transaction management layer of the infrastructure is included in the project;
- *executive technology leadership*, extent to which the chief information officer (CIO) or the chief technology officer (CTO) evangelizes the importance of Web Services as a strategy;
- *competency and education*, extent to which the enterprise architect, service developer and operations project staff in the internal technology department of the firm is skilled in component Web Services;
- *internal application domain of service*, extent to which the Web Services project is implemented in a simple internal application of the firm;
- *internal process domain*, extent to which the services project is implemented in a complex and extendable internal private Internet process of the firm;
- *internal SOA domain*, extent to which the project is implemented in a loosely coupled and standards defined internal private Internet infrastructure of the firm;
- *external process domain*, extent to which the Web Services project is implemented in a complex, security sensitive and extendable external and public Internet trusted partner firm process;
- *external SOA domain*, extent to which the services project is implemented in a standards defined external and public Internet trusted partner infrastructure;
- *platform technology from technology firm*, extent to which the infrastructure platform of the technology firm is included in the Web Services project;
- *platform specialty tools from platform technology firm*, extent to which services specialty tools of the platform technology firm are included in the projects;
- *best of class tools*, extent to which platform facilitating specialty tools of Enterprise Application Integration (EAI) firms and third party pure play tool firms, such as Actional, Cape Clear and Confluent, SeeBeyond, Tibco and Vitria, and, also WebMethods, are included in the projects;
- *proprietary technologies*, extent to which proprietary technologies and / or tools of the internal technology department of the financial services firm are included in the services projects;
- *XML standard*, extent to which the Web Services project is implemented in XML standards;

- *SOAP standard*, extent to which the services project is implemented in SOAP communication standards;
- *WSDL standard*, extent to which the project is implemented in WSDL description standards;
- *UDDI standard*, extent to which the project is implemented in UDDI protocol registry standards; and
- *other proprietary standards*, extent to which the services project is implemented in proprietary procedures or original systems standards of the internal technology department of the financial services firm.

These diverse factors are imputed in this study to be important in adopting a Web service SOA strategy. Few studies in the practitioner or academic literature include this diversity in analyzing Web Services in the financial services industry.

4. FOCUS OF STUDY

The focus of the study is to analyze in financial service firms the significance of critical success factors perceived as contributing to effective implementation of an initial Web Services strategy. Though investment in this technology continues in generic industry, closer examination of the current momentum in aggressive large-sized firms having perceived industry presence and financial resources, in the specific industry of financial services, enables fresh insight into factors of anticipated success generally applicable as a framework throughout business industries. The analysis expands the findings of an academic study by Dembla, Palvia, Brooks and Krishnan (Dembla, Palvia, Brooks and Krishnan, 2003), that focused on success factors of an application of services. Inclusion in the broader analysis of this new study of not only technological, but also methodological and business factors of Web Services, is helpful to managers in large-sized firms considering extended investment in SOA processes and technologies, may be helpful to those in small-sized firms opportunistically taking advantage of the simpler tools, and is a timely contribution to the field. This study defines in essence a framework for increasing the likelihood of a substantive and successful Web Services strategy.

The analysis sample of the financial industry study is summarized in Table 1. (All tables appear in the Appendix.)

5. RESEARCH METHODOLOGY

The research methodology of the study employed a population of large-sized financial service businesses, consisting of banks, brokerages, financing, insurance and investment firms headquartered in the United States, and having assets of $500 million or higher and / or $1 billion or higher under management, in *two iterative stages of analysis*.

(The analysis originated in a feasibility project of a new Independent Study Program in *Web Services: Processes and Technologies* at Pace University, in New York City, in March - May 2003, that involved a preliminary analysis of financial service businesses on Wall Street.)

In *stage 1* a sample of fourteen businesses were identified by the authors based on the reputation of the financial firms as aggressive in their e-Business implementation of Web Services. The businesses were selected from twenty-three firms in the 2004 and 2003 literature of consulting studies of Gartner, Inc. and of studies of the leading technology service firms of IBM, Microsoft and Sun Microsystems, from which the authors excluded nine firms due to biased marketing information. Available information from other industry literature sources on diverse but key Web Services projects of the fourteen businesses was surveyed and analyzed in the June – December 2003 period by one academic author of the study. The projects perceived to be highly indicative of successful deployment of services at the fourteen businesses were then analyzed for their conformance to business, methodological and technological constructs of Web Services, from a defined checklist instrument of thirty-six explained factors of importance, indicated in the prior section of this study. To the factors were applied a six-point rating scale of 5 - very high importance, 4 - high importance, 3 – intermediate importance, 2 - low importance, 1 - very low importance, and 0 - no importance in project success, based on author perception of the projects in the literature, and this data was then summarized by the authors.

In *stage 2* projects of a sample of four additional financial businesses were selected from the literature for further analysis by the authors based on their distinguishing features in simple, moderate and advanced sophistication of Web Services, perceived to be illustrative of successful implementation of services at large-sized businesses in the financial industry. The projects of these four businesses were analyzed independently and individu-

ally in detailed Case Studies in the January –May 2004 period by one other academic author and three technology agnostic industry authors of this study, the latter of whom were experienced in integration processes in financial firms, averaged twenty-seven years in the practice of service technologies, and were supervised by the principal author. The projects were analyzed for their conformance to constructs of Web Services in stage 1, applying from the checklist instrument of explained factors a similar six-point scale of very high importance to no importance, to the success of the projects, based on author perception of the projects. Though the projects were also analyzed from other available literature not included in stage 1, the analysis integrated approximately 110 hours of on-site semi-structured interviewing of six technology and eight business managers of the projects of the four firms on factor importance, during the five month period of this stage. The findings of the interviewing further enabled author perception. The goal of this stage was to confirm or not confirm the analysis in stage 1, and the data in contrast to that in stage 1 was then interpreted and summarized by the authors.

In both stages of the study, and in the summary, the data on the large-sized businesses from stages 2 and 1 were interpreted statistically in SPSS 11.5 by the academic authors for subsequent implications to financial service management.

The research methodology of the study is summarized in Figure 1.

6. ANALYSIS OF FINANCIAL SERVICE FIRMS – 14 FIRMS

The descriptive analysis of the fourteen financial service firms from stage 1 disclosed *higher importance in business and methodological categorical factors* (m = 4.23 and 3.89) *than in technological factors* (2.37), in the Web Services projects of the firms, as indicated in Table 3. The data for the business and the methodological construct factors was distributed from *business benefit driver* (5.00) to *financial rate of return* (3.43), and from *culture of innovation* (4.79) to *standards organization membership* (2.43), while the technological factors were distributed from *executive technology leadership* (4.00) to *proprietary technologies* (0.07) and *proprietary standards* (0.07). This data is indicated in Table 4. The means of the fourteen firms were distributed from Firm 6 (3.67) to Firm 13 (2.56), as indicated in Table 2. Further statistical analysis in AVOVA disclosed favorable levels of significance at $p<0.005$, $p<0.001$ and $p<0.001$ for the independent variables of the firms, categories and factors on the dependent perception importance rating variable, as indicated in Tables 5, 6 and 7.

7. FINANCIAL SERVICE CASE STUDIES – FIRMS 1, 2, 3 AND 4

The businesses in the Case Studies are confidentially defined as Firms 1, 2, 3 and 4, actual and successful firms in financial services and cited as first mover innovators in Web Services by dependable consulting and industry sources. Throughout the January – May 2004 period, key Web Services projects of these firms, that also implemented diverse platform technologies, were analyzed extensively by the authors of the study, for conformance to the business, methodological and technological construct factors analyzed in the study of the original fourteen financial firms. The intent of the Case Studies in stage 2 was to test the results of the academic researcher survey in stage 1. The authors applied an instrument of a questionnaire similar to the instrument of the researcher author in stage 1, but enhanced the analysis to include interviewing of project managers when available at the four firms, in order to fully test the results of the initial survey. The Case Studies of the businesses concurrently integrated secondary sources similar to the survey.

Descriptions of the Case Study Firms are summarized in Tables 8, 9, 10 and 11, and the analyses of the Firms are summarized in Tables 12, 13 and 14.

The key project in Firm 1 was an *internal application domain of service*, simple in Web Services sophistication. The business of this firm is group and individual disability income insurance, but was hindered in a diversity of twelve functions and error impacted manual procedures for fulfilling the needs of new insurance policies. Information was processed redundantly by employees and the applications. The immediate intent of this services project was to install an integrated Web centric data application to manage new policies from initial offering to the enrollment of the customer. The future intent is to move this pilot application and other similar applications to a B2C Microsoft .Net infrastructure.

The most important conditions for the success of this services project in Firm 1 were determined to be articulated business factors of *business benefit*,

business client contribution and *financial rate of return* and methodological factors of *consultant contribution*, *life cycle project management* and *metric scorecard*. The firm clearly identified business and financial benefits to be afforded by integrating procedures for opening new insurance policies, and included business clients in the project in a defined methodological approach introduced by a consulting organization. Non-executive business management in the firm initiated a metric scorecard that justified investment in the project. Other than *executive technology leadership*, technological conditions that contributed to the project were confined to the existing in-house Microsoft platform, but other platforms could have contributed equal success. Though the key project in services in Firm 1 was an internal application domain, the productivity benefits of the project have allowed continued investment in further B2C applications that approach moderate process sophistication.

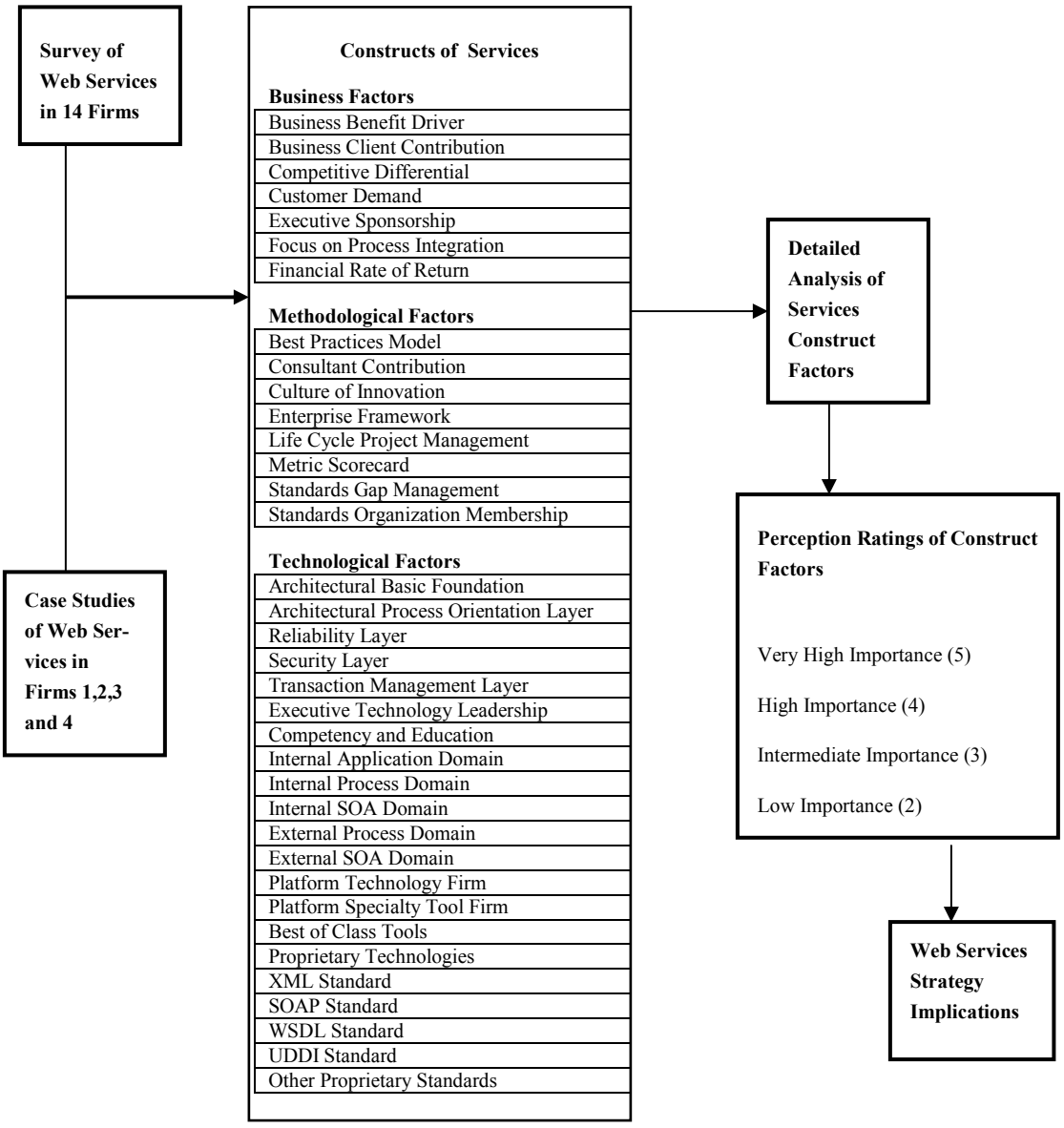

FIG. 1: Research Methodology of Financial Services Study

In Firm 2 the key projects were effectively in *internal process domain*, moderate to advanced in Web Services sophistication. The business of the firm is automotive financing for customers and dealers, including issue of non-government debt to investors, that is furnished in multilingual online payment and planning services on its Web site. To compete faster in its financial marketplace, Firm 2 originally implemented a closed IBM mainframe OS/2 proprietary environment, which was now obsolete and unresponsive. The intent of the projects was to "exceed the pace of technology" (project technology manager 1 – Firm 2) by installing a Sun Java open infrastructure to "revolutionize" and service on-demand and scalable applications for the employees, dealers and customers. Future intent is to transfer this infrastructure from the proprietary environment to a J2EE independent SOA service driven structure.

The most important constructs in the success of the projects in Firm 2 were discerned by the authors of this study to be business and methodological factors of *business benefit*, *business client contribution*, *competitive differential*, *focus on process integration*, *financial return*, *consultant contribution*, *culture of innovation* and *metric scorecard*. These factors were enhanced by advantageous technological constructs of *platform technology from technology firm*, *platform specialty tools from platform technology firm*, *best of class tools*, *competency and education*, *reliability* and *transaction management layers*, and *executive technology leadership*, not fully identified in Firm 1 nor the fourteen firms of the survey. Firm 2 was driven by a competitive client "imperative" (business manager 1 – Firm 2) to enable faster service to B2C customers and B2B dealers, employed methodological and technological Sun SunTone consultants experienced in process projects to ensure metric results in the service, and was highly focused in implementing and innovating in its initiatives in service. Further than in Firm 1 and the fourteen firms, strong technology management and trained technology staff were key in effecting an internal SOAP process domain, facilitated by a fully reliable and transactional infrastructure, that later led to a less risky internal SOA domain and a foundation to link to external process and SOA infrastructures. Interoperability of the Sun Open Net Environment platform technology, Java and iPlanet portal tools and Solaris utilities was important and timely in transitioning Firm 2 to an advanced e-Business sophistication in Web Services.

The key project in Firm 3 was *an internal SOA domain*, advanced in Web Services sophistication. The business of this firm is brokerage, financial advisory and independent investment service, in customer offline and online channels, which were impacted adversely by competitive discount brokerage firms on the Web. Firm 3 was hindered in furnishing a differentiated B2C experience for customers, and faster time to market product options, due to older processes, systems and utilities, as in Firm 1, that were not integrated to enable a "360 interface in a [new] 15 second standard from an [old] 8 minute standard" (project technology manager 1 – Firm 3). The intent of the services project in Firm 3 was to enable an improved, seamless and timely experience for the customers when they interfaced with the firm, in Web and non-Web channels, by simplifying and standardizing the infrastructure of the systems. The eventual intent of this Web Services project is to position the initial SOA infrastructure as a foundation to further integrate external and internal systems in an external SOA structure, as in Firm 2.

The factors important in the success in the SOA project of Firm 3 were determined by the authors to be inherently more business and methodological than in Firms 2 and 1, and included *business benefit*, *client contribution*, *competitive differential*, *customer demand*, *executive sponsorship*, *focus on integration*, *financial return*, *best practices model*, *enterprise framework*, *project management* and *metric scorecards*, though *executive technology management*, *technology and specialty tools from platform technology firm* and *architectural process orientation layer* were equivalently instrumental in this success. The technology and business departments of this firm were definitely informed in the importance of B2C competitive and customer drivers of their project and in the need to innovate in Web Services. Though consulting help was only tangential in importance, the *culture of innovation* of Firm 3 was an important factor in the faster evolution of internal XML, SOAP and WSDL application and process project domains to internal SOA project domains. The project was managed in a flexible but disciplined end to end Unified Modeling Language (UML) value chain strategy. Throughout the highlighted project studied by the authors, the solidity of the IBM WebSphere platform technology, coupled with Java tools, that incrementally replaced the older technologies of the firm, was crucial in enabling success. The SOA initiative is now positioning Firm

3 as a "trusted global adviser" (business manager 1 – Firm 3) to respond sooner to the requirements of its marketplace, and its success is rationalizing further investment in the technology of Web Services.

The project of Firm 4 was an *external process domain*, the most advanced in Web Services sophistication among the Case Study firms analyzed by the authors. The business of this domestic firm is banking, brokerage, capital management, corporate and investment banking, and wealth management, that was created due to its acquisition and merger of other financial institutions since 2001. The immediate issue in Firm 4 was to integrate disparate internal Web Services process and application projects and diverse Microsoft and IBM technologies of the merged institutions. These tasks were more intricate than in Firms 3, 2 or 1. The intent in Firm 4 was a coherent external process initiative, in order to compete effectively in the marketplace. The intent of the integration project was to service external B2C consumer and corporate customers, B2B financial institutions and B2B and B2C internal on-line sales staff with 360 real time information and relationship support. The future intent of the new Firm 4 is to be a dominant international institution that supports its external and internal clients by taking advantage of flexible external process and SOA domain technologies.

Firm 4 was considered by the authors in their interviews with the technology and business managers to be notably distinct in its *business benefit*, *business client contribution* and *sponsorship* factors, as the firm indicated services technology as a business and *competitive differential* imperative in its B2C and B2B future. Its *culture of innovation* and *focus on* incremental *financial return* and *integration* factors were also indicated as important and a "inducement" (business manager 1 – Firm 4) to continue the project, as the return on investment was estimated from "eighteen months to three years" (business manager 2 – Firm 4) from a budget larger than in Firms 2 and 1. The firm initiated experimentation in XML-based Business Process Execution Language (BPEL), due to interoperability that was more advanced than in Firms 3, 2 or 1. the firm was fortunate to integrate *infrastructure layers* of its larger acquired institution, which was important in initial success, though further than anticipated focus was needed to integrate the external B2B process *security layer* through a labor intensive but limited proprietary method not introduced in Firms 3, 2 or 1. Firm 4 was helped in having IBM as its leading *platform technology firm*, which was observed to be more important to its success than in the fourteen firms, and which integrated the technological platforms of the smallest institutions in limited time, with the support of Web and legacy technologically skilled staff in these institutions. Though Firm 4 was fortunate in existent and inherited factors of importance that facilitated its initial external process domain, and that helped in the positioning of the SOA domain, the strategy was fully focused on the intent of the firm to be successful in its marketplace through Web Services. Satisfaction surveys of customers and partners by the firm indicate growing improvement in this intent.

7.1 Financial Service Case Studies - Summary

An aggregate analysis of the constructs of the Web Services projects of Firms 1, 2, 3 and 4 indicates the higher importance of business factors, continuing the findings in the fourteen firms of the survey. Of the factors analyzed, *business benefit*, *client contribution* and *competitive differential* were cited by the interviewees as the drivers of the projects in the firms, though competitive differential was intermediate in Firm 1 due to its lower application domain investment. *Financial rate of return* and *focus on process integration* were also determined to be important drivers in the four firms. *Executive sponsorship* was discerned to be important in the higher process and SOA project investments of Firms 2, 3 and 4, which were driven to higher investment in Web Services due frequently to increasing *customer demand* for improved and new online services. The Case Studies of Firms 1, 2, 3 and 4 clearly highlight the consistency of business factors as important in the initiatives of the projects.

The Case Studies indicated the importance of methodological factors in the Web Services projects of the four firms, but slightly less than the technological factors. Flexibility in *life cycle project management* was considered generally important by the firms, in driving the new technological investment, though lower in Firm 1. *Metric scorecards* of qualitative and quantitative benefits were discovered in the interviews to be especially important in continuing investment in the projects. Despite the identification of *culture of innovation* as important in Firms 2 and 3, these firms, and Firms 1 and 4, indicated Web Services *consultant*

contribution as a more important factor in ensuring success of their projects. *Models* of Web Services *practices* and solutions in the financial services industry were discovered by the authors to be generally of moderate importance, due to a perceived bias of published studies by technology firms and reluctance of financial firms to intimately share their practices. Though *standards gap management* and *standards organization membership* were indicated to be non-existent in the strategies of the firms, due to internal parochial prioritization of their projects, the Case Studies indicated the importance of the other methodological factors, but less than the technological factors.

Technological factors were noted in the firms to be somewhat higher drivers of success than the methodological factors, and higher than in the fourteen firms of the survey, but not higher in importance than the business factors, in the Web Services projects. *Executive technology management* and *staff training* were considered important to very important by the authors and the interviewed managers, and were motivators in the technology department transformation to services. The technology and business managers noted *platform technology, tool and product vendor* and their relationship management of the vendor as exceptionally very important in expanding application, process and SOA releases, *XML*, *SOAP*, *WSDL* and *UDDI standards* were noted as high in importance in the further implementations in Firms 3 and 4. P*roprietary technologies and standards* were noted as generally unimportant, if not negative factors in the implementations. Except for Firm 1, that limited its investment, the *architectural basic foundation* and the *process*, *reliability* and *transaction management layers* enabling process transition to the Web were moderate in the firms, though the *security layer* was limited and in the main not emphasized due to the mostly internal domains of the projects. These studies indicate importance in the collateral and incremental benefits of the existing or introduced technological factors in the projects, that facilitated the business factors of success in Web Services, but the business factors are indicated to be more important to the actual success, as analyzed in the following section.

7.2 Analysis of Financial Service Case Studies – Case Study Firms 1, 2, 3 and 4

The descriptive analysis of the four financial service Case Study firms in stage 2 of the study disclosed *higher importance in business categorical factors* (m = 4.39) *than in methodological and technological factors* (3.19 and 3.31), in the Web Services projects of these firms, as indicated in Table 13. The data for the business construct factors in Table 14 was distributed from *business benefit driver* and *financial rate of return* (5.00) to *customer demand* (3.25), while the methodological and technological factors were distributed from *metric scorecard* (4.50) to *standards gap management and organization membership* (1.25), and from *platform technology firm* (5.00) to *external SOA domain* (1.50) and *other proprietary standards* (1.50). These findings, in the specific analysis of stage 2, indicated closer management of the services projects in a technological and business context, divulged in interviews with the managers of the four firms, and illustrated in *platform technology firm* (5.00) and *financial rate of return* (5.00), in contrast to the findings introduced in the generic literature analysis of stage 1 of the fourteen firms. The means of the four firms were distributed from Case Study Firm 1 (3.92) to Case Study Firm 2 (1.92), as indicated in Table 12. Further statistical analysis of the Case Studies was not done in ANOVA, due to the limited number of firms in the Case Study sample.

The Case Studies of the key projects in Web Services of Firms 1, 2, 3 and 4 by the different authors confirm with confidence the results of the initial survey in the *importance of business factors, in contrast to technological factors, in a services strategy*.

7.3 Summary Analysis of Financial Service Firms - 18 Firms

The descriptive analysis of the eighteen financial service firms from stages 1 and 2 of the consolidated study disclosed the *higher importance in business and methodological* categorical *factors* (m = 4.26 and 3.74) *than in technological factors* (2.52) *in a Web Services strategy*, as indicated in Table 15. The data for the business and the methodological factors were distributed from *business benefit driver* (5.00) to *financial rate of return* (3.76), and *from culture of innovation* (4.44) to *standards organization membership* (2.17), while the technological construct factors were distributed from *executive technology leadership* (4.17) to *proprietary technologies* and *other proprietary standards* (0.39), as indicated in Table 16. The higher means and the lower standard deviations in

Table 16 are favorable results. The means of the construct factors in the four firms of the Case Studies (Table 14) are knowingly different from the factors in the fourteen firms (Table 4). Nevertheless, the means of the categorical factors in the eighteen firms (Table 15) justify at minimum the definitely higher importance in the business factors than in technological factors. The methodological factors however may not be as definite in future Case Study research. Final statistical analysis in AVOVA, of all data sets of the study, disclosed continued favorable levels of significance at $p<0.005$ for the firm, category and factor independent variables on the perceived rating of importance dependent variable. This analysis indicates that the different firms, categories and construct factors have significantly different results on the importance rating variable, as shown as a formal summary in Tables 17, 18 and 19.

8. IMPLICATIONS OF FULL STUDY

"Organizations have to be in a position to adapt to technological innovation. In order to be in a position to adapt, management must have knowledge of the kind of technological innovation that will come ... [and] the firm must have a strategy ..." (Cyret and Kumar, 1994)

The criticality of technological strategy congruent with business strategy in the adoption, deployment and implementation of Web Services is an important implication of this study. Though the financial firms analyzed in the study are habitual innovators and optimists in new technologies, the drivers of their projects were frequently competitive differentiation and business benefit, defined by their business departments, which had budgets to fund the projects. Key managers of the business organizations focused relentlessly on the business importance of infrastructure and on the priority of sponsored Web Services technology and were helped by the leading technology managers. Studies in the literature indicate the importance of committed generalist non-technical managers taking leadership in complex technological initiatives (Watson, 2004), not for the benefit of the technology organization but for the business firm (Richardson and Ives, 2004), and strategizing faster than other firms (Heineke, 2003). The subsequent synergy with the technology organizations of the firms studied was crucial in the overall operability and success of Web Services in these businesses, from initial applications to external process SOA systems.

The emphasis on business domain complemented by customer centricity in a process oriented services strategy is another important implication of the study. Customer expectation for consistent, efficient, faster, friendly and improved 360 interaction and relationship on B2C channels of business delivery was a subtle driver analyzed in the platforms and projects of the financial businesses. Studies indicate the growing importance of defining commodity businesses, such as financial firms, in the context of the customer, not the firm (Sawhney, Balasubramanian and Krishnan, 2004), in customer relationship management (CRM) initiatives. Consideration for the impact of the application projects to the process projects on influencing front-end marketing, sales and service outcomes to B2C high net income customers, and additionally trusted B2B partners, was an exhibited factor in the business strategies of the firms. The essence of Web Services as a customer solution strategy was critical in enabling the success of the systems introduced in the firms.

Implications include the importance of change capability (Kaplan and Norton, 2004) in a culture of continuous entrepreneurial improvement (Hamel and Valikangas, 2004) in Web Services. Given current limitations in optimizing service platforms and technologies from a business dimension, firms integrating Web Services in a larger middleware methodology have to be flexible in their process and SOA implementation projects. Newness of partnerships (Thibodeau, 2004) and service technologies, however, afford excitement and experimentation as a tactical proposition. This was evident in the abstracted and normalized application and process strategies in a SOA design by dedicated technologists, which were frequently helped by procedures of data reusability and the process skills of the technologists. Studies indicate the importance of this innovation in methodology in adaptive firms (Meyer, 2003) that consider SOA as infrastructure style (Carlson and Tyomkin, 2004). The firms in this study were cognizant of Web Services as an evolutionary and realistic strategic proposition, which was a cultural factor important in the success of the technology.

The importance of a flexible but disciplined project methodology in an evolutionary and continuous cycle of development, testing and production of the Web services strategy is a further implication of the study. To learn Web Services in the SOA framework, and to optimize business benefits in the incremental implementation of their pro-

jects, the technology organizations had highly effective partnerships with platform technology firms. The technology firms in turn were knowledgeable in the business processes of the financial firms and were most standardized in their service technologies. Initial B2C beta applications of low benefits migrated in most of the firms to advanced B2C internal multi-layered process projects of multiple systems of high business benefits. This focused enterprise initiative justified increased investment in internal and external SOA "in flux" frameworks (McKendrick, 2004), as an operational innovation strategy (Hammer, 2004). Though requirements were not fully defined for the SOA framework by the business organizations, and security and standards of external B2B systems deterred the technology organizations, these issues did not forestall the internal B2C interoperability projects. Throughout the study the firms were indicated to be non-contributors to the formulation of service standards of industry organizations, but the strategies were not constrained by formal methodology rules on investment in immature technologies, such as Web Services. This flexibility was important to the prompt and successful penetration of this innovation.

The final implication of this study is in the clear indication that Web Services is a feasibly strong proposition for firms in the financial services industry. Studies in the literature forecast mainstream deployment in services increasing dramatically in this decade (Earley, 2003), driven by successful implementation (Hagel and Brown, 2004). Firms hesitant in increasing initiatives in Web Services due to cost considerations and historical limitations in return on technology investments (Hagel, 2002) may be hindered in having technologically constrained business processes. This hesistancy may preclude a faster and stronger proposition of service to their customers and trusted partners. Hesitancy in investment may stifle innovation (Andrews and Hotle, 2003) in forthcoming on demand computing and synthesized (Eisenberg, 2004) Service Oriented Architecture Implementation Framework (SOAIF) and Open Grid Services Architecture (OGSA) solutions (Saini, 2004). The importance of the proposition of Web Services as a strategy is that this technology is indicated in the study to be not an option but a competitive requirement.

9. LIMITATIONS AND OPPORTUNITIES IN RESEARCH

The study furnishes a framework for further researching critical factors in a Web Services strategy, as the implications of this study of one specific industry cannot be generalized and have to be filtered and interpreted cautiously. Not only larger financial firms but also smaller ones innovating in services have to be considered for both internal and external SOA process projects, as to the research suitability of the factor framework of this study. Firms in other domestic and international industries having distinct competitive, business and strategic landscapes have to be similarly and comparatively reviewed in a future study. Though reviews of failure factors may continue to be limited in the literature, due to firms frequently hesitant in divulging perceived competitive information, a total study of strategy has to include this intelligence. Web Services is an evolving field ripe for research studies, where future findings will be helpful and informative to both industrial and academic fields attempting to comprehend the issues of this strategic technology.

10. CONCLUSION

This study of Web Services is meaningful and insightful into the business, methodological and technological factors of strategy in financial services firms. *Technological factors are imputed to be comparatively less important than business factors in initiating a successful strategy*. Though initiatives are often flawed by immaturity of services standards and technologies, evangelistic firms in this specific industry that innovate in e-Business Web Services in focused incremental integration projects are introducing benefits of competitive differentiation indicative of a successful strategy. Further research in factors of a successful strategy is needed in firms of other industries. The study of services strategy and transformation in the financial industry furnishes a framework for further research and is therefore timely.

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Appendix: Tables

TABLE 1: Analysis Sample of Financial Services Industry

Firm Type	Survey	Case Study	Total Study
Banking	4	1	5
Brokerage	3	1	4
Financing	4	1	5
Insurance	3	1	4
Total	**14**	**4**	**18**

TABLE 2: Analysis of 14 Financial Service Firms

Survey Firms	Mean	Standard Deviation
1	3.17	1.298
2	3.08	1.251
3	3.44	1.229
4	3.19	1.305
5	3.53	1.207
6	3.67	1.287
7	3.53	1.320
8	3.17	1.558
9	2.92	1.442
10	2.69	1.564
11	2.69	1.636
12	2.78	1.533
13	2.56	1.629
14	2.58	2.156
Total	**3.07**	**1.504**

n = 504 (14 Firms x 36 Factors of Importance)

TABLE 3: Analysis of Categorical Factors of 14 Firms

Categorical Factors	Mean	n	Standard Deviation
Business	4.23	97	.685
Methodological	3.89	113	.958
Technological	2.37	294	1.479
Total	**3.07**	**504**	**1.504**

TABLE 4: Analysis of Construct Factors of 14 Firms

Constructs	Mean	Standard Deviation
Business Factors		
Business Benefit Driver	5.00	0.000
Business Client Contribution	4.07	0.475
Competitive Differential	4.21	0.699
Customer Demand	4.57	0.514
Executive Sponsorship	4.21	0.426
Focus on Process Integration	4.14	0.663
Financial Rate of Return	3.43	0.646
Methodological Factors		
Best Practices Model	3.29	0.726
Consultant Contribution	4.36	0.497
Culture of Innovation	4.79	0.579
Enterprise Framework	4.36	0.497
Life Cycle Project Management	4.07	0.829
Metric Scorecard	4.29	0.726
Standards Gap Management	3.50	0.519
Standards Organization Membership	2.43	0.756
Technological Factors		
Architectural Basic Foundation	3.00	1.038
Architectural Process Orientation Layer	2.93	0.997
Reliability Layer	3.00	0.961
Security Layer	2.57	0.852
Transaction Management Layer	2.86	0.949
Executive Technology Leadership	4.00	0.961
Competency and Education	3.21	0.893
Internal Application Domain	3.00	0.961
Internal Process Domain	3.07	1.072
Internal SOA Domain	2.14	1.231
External Process Domain	1.21	1.251
External SOA Domain	1.14	1.406
Platform Technology Firm	3.21	1.251
Platform Specialty Tool Firm	3.14	1.167
Best of Class Tools	2.79	1.369
Proprietary Technologies	0.07	0.267
XML Standard	3.07	1.072
SOAP Standard	2.36	1.336
WSDL Standard	2.00	1.301
UDDI Standard	1.00	1.177
Other Proprietary Standards	0.07	0.267
Total	**3.07**	**1.504**

n= 504

TABLE 5: ANOVA Analysis of 14 Firms vs. Perception Importance Ratings

	Sum of Squares	df	Mean Square	F	Significance
Between Groups	66.317	13	5.101	2.334	.005
Within Groups	1071.112	490	2.186		
Total	**1137.429**	**503***			

*504 Cases – 1 Case Excluded =503

TABLE 6: ANOVA Analysis of Categorical Factors of 14 Firms vs. Perception Importance Ratings

	Sum of Squares	df	Mean Square	F	Significance
Between Groups	348.849	2	174.425	110.815	.000
Within Groups	788.580	501	1.574		
Total	**1137.429**	**503**			

TABLE 7: ANOVA Analysis of Construct Factors of 14 Firms vs. Perception Importance Ratings

	Sum of Squares	df	Mean Square	F	Significance
Between Groups	749.286	35	21.408	25.813	.000
Within Groups	388.143	468	.829		
Total	**1137.429**	**503**			

TABLE 8: Descriptive Summary of Case Study Firm 1

Case Study Firm 1	
Business	Insurance
Headquarters	Northeast US
Offices	30+
Revenue*	$10 Billion
Income*	$710 Million
Customer Assets under Management*	$50 Billion
Customers	25 Million
Employees (Technology Staff)	13,000+ (600+)
Services Technology	Microsoft
Services Project	Internal Application

*2003

TABLE 9: Descriptive Summary of Case Study Firm 2

Case Study Firm 2	
Business	Financing
Headquarters	Midwest US
Offices	200+
Revenue*	$90 Billion
Income*	$2 Billion
Customer Assets under Management*	$30 Billion
Customers	10 Million
Employees (Technology Staff)	20,000+ (1,500+)
Services Technology	Sun
Services Project	Internal Process

*2003

TABLE 10: Descriptive Summary of Case Study Firm 3

Case Study Firm 3	
Business	Brokerage and Investment Advisory
Headquarters	West US
Offices	400+
Revenue*	$4 Billion
Income*	$470 Million
Customer Assets under Management*	$970 Billion
Customers	8 Million
Employees (Technology Staff)	15,000+ (700+)
Services Technology	IBM
Services Project	Internal SOA

*2003

TABLE 11: Descriptive Summary of Case Study Firm 4

Case Study Firm 4	
Business	Consumer and Corporate Investment Banking
Headquarters	Southeast US
Offices	3,300+
Revenue*	$24 Billion
Income*	$4 Billion
Customer Assets under Management*	$480 Billion
Customers	18 Million
Employees (Technology Staff)	87,000+ (3,900+)
Services Technology	IBM and Microsoft
Services Project	External Process

*2003

TABLE 12: Analysis of 4 Financial Services Case Study Firms

Firms	**Mean**	**Standard Deviation**
Case Study 1	3.92	1.131
Case Study 2	1.92	2.048
Case Study 3	3.67	1.707
Case Study 4	3.78	1.742

n= 144 (4 Firms x 36 Factors of Importance)

TABLE 13: Analysis of Categorical Factors of 4 Case Study Firms

Categorical Factors	**Mean**	**n**	**Standard Deviation**
Business	4.39	28	1.066
Methodological	3.19	32	1.925
Technological	3.31	84	1.923
Total	**3.32**	**144**	**1.861**

TABLE 14: Analysis of Construct Factors of 4Case Study Firms

Constructs	Mean	Standard Deviation
Business Factors		
Business Benefit Driver	5.00	.000
Business Client Contribution	4.75	.500
Competitive Differential	4.25	.957
Customer Demand	3.25	1.708
Executive Sponsorship	3.75	1.500
Focus on Process Integration	4.75	.500
Financial Rate of Return	5.00	.000
Methodological Factors		
Best Practices Model	3.50	1.000
Consultant Contribution	4.25	.957
Culture of Innovation	3.25	2.062
Enterprise Framework	3.50	1.732
Life Cycle Project Management	4.00	.816
Metric Scorecard	4.50	1.000
Standards Gap Management	1.25	2.500
Standards Organization Membership	1.25	2.500
Technological Factors		
Architectural Basic Foundation	1.75	1.500
Architectural Process Orientation Layer	3.50	2.380
Reliability Layer	3.50	2.380
Security Layer	2.00	2.000
Transaction Management Layer	3.50	2.380
Executive Technology Leadership	4.75	.500
Competency and Education	4.00	.676
Internal Application Domain	2.75	2.062
Internal Process Domain	3.75	.957
Internal SOA Domain	4.00	1.155
External Process Domain	2.50	1.915
External SOA Domain	1.50	2.380
Platform Technology Firm	5.00	.000
Platform Specialty Tool Firm	3.75	2.900
Best of Class Tools	2.75	2.217
Proprietary Technologies	1.50	1.915
XML Standard	3.25	2.363
SOAP Standard	3.00	2.000
WSDL Standard	2.75	2.062
UDDI Standard	2.25	1.500
Other Proprietary Standards	1.50	1.915
Total	**3.32**	**1.861**

n=144

TABLE 15: Analysis of Categorical Factors of 18 Financial Service Firms

Categorical Factors	Mean	n	Standard Dev
Business	4.26	125	.784
Methodological	3.74	145	1.264
Technological	2.52	378	1.606
Total	**3.13**	**648**	**1.592**

TABLE 16: Analysis of Construct Factors of 18 Firms

Constructs	Mean	Standard Deviation
Business Factors		
Business Benefit Driver	5.00	.000
Business Client Contribution	4.22	.548
Competitive Differential	4.22	.732
Customer Demand	4.28	1.018
Executive Sponsorship	4.11	.755
Focus on Process Integration	4.28	.669
Financial Rate of Return	3.78	.676
Methodological Factors		
Best Practices Model	3.33	.767
Consultant Contribution	4.33	.594
Culture of Innovation	4.44	1.199
Enterprise Framework	4.17	.924
Life Cycle Project Management	4.06	.802
Metric Scorecard	4.33	.767
Standards Gap Management	3.00	1.495
Standards Organization Membership	2.17	1.339
Technological Factors		
Architectural Basic Foundation	2.72	1.227
Architectural Process Orientation Layer	3.06	1.349
Reliability Layer	3.11	1.323
Security Layer	2.44	1.149
Transaction Management Layer	3.00	1.328
Executive Technology Leadership	4.17	.924
Competency and Education	3.39	.916
Internal Application Domain	2.94	1.211
Internal Process Domain	3.22	1.060
Internal SOA Domain	2.56	1.423
External Process Domain	1.50	1.465
External SOA Domain	1.22	1.592
Platform Technology Firm	3.61	1.335
Platform Specialty Tool Firm	3.25	1.487
Best of Class Tools	2.78	1.517
Proprietary Technologies	0.39	1.037
XML Standard	3.11	1.367
SOAP Standard	2.50	1.465
WSDL Standard	2.17	1.465
UDDI Standard	1.28	1.320
Other Proprietary Standards	0.39	1.997
Total	**3.13**	**1.592**

n= 648 (18 Firms x 36 Factors of Importance)

TABLE 17: ANOVA Analysis of 18 Firms vs. Perception Importance Ratings

	Sum of Squares	df	Mean Square	F	Significance
Between Groups	168.790	17	3.323	4.253	.000
Within Groups	1470.833	630	2.335		
Total	1639.623	647			

TABLE 18: ANOVA Analysis of Categorical Factors of 18 Firms vs. Perception Importance Ratings

	Sum of Squares	df	Mean Square	F	Significance
Between Groups	356.889	2	178.445	89.728	.000
Within Groups	1282.734	645	1.989		
Total	1639.623	647			

TABLE 19: ANOVA Analysis of Construct Factors of 18 Firms vs. Perception Importance Ratings

	Sum of Squares	df	Mean Square	F	Significance
Between Groups	829.290	35	23.694	17.895	.000
Within Groups	810.333	612	1.324		
Total	1639.623	647			