



# **Organization-Specific Enterprise Architecture Analysis of a Major Financial Services Sector Systems Provider**

**By Robert Wood**



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## Executive Summary

ABC Systems (ABC), a system provider to the financial services sector since 1968, has embarked on significant organizational change in recent years as market conditions have changed and new corporate strategies have been articulated.

While ABC has started the process of change in a number of areas, adherence to Enterprise Architecture (EA) principles can help the organization to achieve its goals more efficiently and cost-effectively. Acquisitions, involvement in new industries and new lines of business, and the challenges of maximizing current investments will keep ABC busy for the foreseeable future.

This paper endeavors to define the environment in which ABC operates, identify specific architectural challenges presented to the company, and provide recommendations for effectively and efficiently overcoming those architectural challenges.

Specifically, this paper looks at ABC in the context of the TOGAF framework and specific solutions are recommended from an organization-specific perspective. While many important architectural elements are available to ABC, the ultimate success of its articulated corporate strategies ties closely to the success of its EA efforts to address and remediate identified architectural issues.

## General Background of Project Topic

ABC is a major system provider to transfer agents in the financial services sector. Their core offering is a system that is used for shareholder accounting by many Fortune 100 mutual fund companies. ABC has been in business since 1968 and profitable for most of that time. However, recent trends in account management, due to the success of large brokerage houses like Charles Schwab, have significantly reduced revenues from their core offering. ABC's response to this market shift has been to enact a corporate strategy that includes the addition of several lines-of-business, optimizing IT resources, and reducing costs where possible.

ABC has made a number of acquisitions over the last few years. These acquisitions have resulted in a complex landscape with varied stakeholders. This structure is detailed in the stakeholder map matrix in Appendix C.



In addition to providing the shareholder accounting system for several Fortune 100 mutual fund companies, ABC now also provides software solutions for mutual fund compliance testing and oversight as well as

printing services for mutual fund transfer agents. Mutual fund servicing functions now offered include fund accounting, transfer agency, legal, compliance, and sales in the open-end, closed-end and ETF markets. Adding to the complexity and thanks to recent acquisitions, ABC now provides system solutions to the healthcare industry.

Over the years, ABC has made significant investments in IT infrastructure to support its flagship product offering. Two world-class data centers are in operation and managed by ABC and used to provide IT services and recovery capabilities to the parent company and subsidiaries.

Acquisitions made in recent years have created significant challenges in terms of integration and optimization of IT resources. Several of the acquired companies had contracts with third party data center providers and owned significant amounts of hardware that differed from the ABC corporate standard. Where possible, services provided by acquired companies to employees were relocated to existing ABC platforms in ABC data centers and acquired hardware was retired or redeployed. Where this was not possible, acquired hardware was relocated to ABC data centers and maintained there through its useful life. Also, most of the newly acquired business units were given access to centralized SAN resources for storage therefore allowing them to leverage existing data replication processes for disaster recovery purposes.

Because ABC endeavors to provide world-class IT infrastructure resources to its associates, acquired business units have been given access to resources via redundant data lines. These redundant lines are provided by multiple telecommunications providers. Providing business units with robust access to the corporate data centers is meant to keep hardware needs at remote offices to a minimum.

ABC's centralized resources are intended to address the final strategic item; cost reduction. With IT resources centralized, remote offices should require minimal personnel for desktop support and have limited power and cooling needs. The result should be that people and technology costs are kept to a minimum.



Because these strategic goals should feed the bottom-line when realized, the TOGAF framework and related ADM tools should be leveraged to make them achievable. The goal of this paper is to identify the specific architectural issues that must be addressed and provide recommendations for solving them.



## Major Architecture Issues

- *Organizational* – As the sources of data have increased over time, seamless access to that data is required for both internal and external stakeholders.
- *Data* – Internal stakeholders need access to multiple pools of data on multiple platforms for multiple lines of business while external stakeholders need access to more limited amounts of data but also across multiple lines of business.
- *Information and Knowledge* – Centralized data, especially data about clients, is needed by multiple groups to facilitate new business and service existing clients.
- *Information Technology* – Central, replicated SAN resources are required by business units to ensure uninterrupted access to corporate data.
- *Business Process* – Digitization of business processes is needed and access to related documentation is required across the organization, including clarification of the relationships between key groups.
- *Controls/Metrics* – Proper controls and related metrics are vital to understanding the health of the IT operation and planning for actionable improvements.

## Analysis of Project Topic and Major Architectural Issues

The following section details the major architectural issues that need to be addressed by ABC. These issues are considered in the context of the TOGAF framework, and specifically from an organization-specific architecture viewpoint, with a goal of recommending appropriate solutions. “Focusing strongly on the to-be situation...” (Rik Bos, 2012) and planning solutions accordingly will help ABC to achieve its strategic goals.



## Organizational Architecture

Organizational architecture is a key consideration at ABC. Providing seamless access to data for both internal and external stakeholders has been identified as a critical need and it is important that ABC understand the related issues and potential solutions.

Internal users have the most substantial need for data access. The data needed by this group can be categorized into three data pools. The first is that data needed by all associates across the enterprise. The second is that data needed by operational personnel. The third is that data needed by non-operational personnel including those working in sales and client relationship management functions.

External stakeholders have more limited data access needs. However, appropriate client access is a priority because data must be properly sanitized, secured, and logically presented. There is little tolerance for disrupted or incomplete data access from this group.

Associates across the enterprise need access to data from core internal systems including human resources systems and corporate accounting systems. PeopleSoft's HR module is used at ABC to provide access to human resources data including benefits information, paid-time-off information, and employee management information. Corporate accounting data, including expense reporting detail, is provided by PeopleSoft's Financials module. Both systems need to be more easily accessible. Existing interfaces to this data require third party software to function and a significant number of help desk tickets are generated in their support.

Operational personnel need access to internal line-of-business applications for processing as well as related internal web-reporting systems. While many of the web-reporting systems can easily be made available internally over HTTP, many of the line-of-business applications require thick clients that cannot easily be delivered remotely from the data center as currently deployed. This is an area that should be addressed to achieve the desired centralization of IT resources and related cost savings.



Non-operational associates need access to internal data for multiple purposes. Sales associates need a centrally-available data repository for tracking sales prospects. Client relationship management associates need a similar repository that can be used to track communications with existing clients.

External stakeholders have broader but more straightforward data access requirements. Because ABC provides a variety of services to various clients, external users need a secure, readily accessible interface by which they can obtain all data relevant to them. For many external users this interface will need to interact with two or more pools of data that live in operationally distinct and non-integrated systems.

Because "...simplicity...promises clarity, speed and flexibility..." (Nash, 2012), this "single pane of glass" view should provide clients with an optimized experience and leave them with a comfort-level that their data is securely stored and managed in a single location. Further, creating a solution that presents data from "...the viewpoint of the customer..." (Mamaghani, Madani, & Sharifi, 2012) will provide ABC a higher level of technological credibility with clients.

## **Data Architecture**

Data architecture issues are also present at ABC. Internal stakeholders need access to multiple pools of data on multiple platforms for multiple lines of business. External stakeholders need access to more limited amounts of data but also across multiple lines of business.

Much of the data architecture challenge relates to standardizing and streamlining access to critical systems. Much of the needs of internal users relate to operational tasks. Many of those tasks are themselves related such that "...change in one particular function or rule can result in various modifications on other rules that fall under the same category or set". (Thirumaran, 2012) The result is that a great deal of data in the enterprise can be consolidated if the underlying systems are made to act on central pools of data.

A good example of the inter-relationship of data comes from the mutual fund processing world. Every day that the stock market trades, transfer agency personnel process trades for individual shareholders. Fund accounting personnel, who need access to this shareholder data, must also pull in data





from third party pricing vendors and fund administration expense systems to calculate the net asset value for the underlying mutual funds. Once this has been completed, Compliance personnel must review NAV calculations and determine both if calculations are correct and if fund groups have traded in accordance with SEC and IRS rules. Fund administration personnel must then compile the data from all groups and provide periodic expense reports and financial statements to the legal group. The legal group then reviews the associated data and provides approval for its publication. Finally, the marketing group takes the data and sends it to external stakeholders in print or electronic format.

As currently implemented, data lives in multiple locations. Further, existing levels of integration between systems is not sufficient resulting in duplication of data. In extreme cases, manual re-entry of already reviewed data is required. ABC needs to find a way to achieve a "...convergence between computer and communication technologies..." (Zuppo, 2012) so that data flows efficiently through the operation.

### **Information and Knowledge Architecture**

Information and knowledge architecture issues also exist at ABC. Centralized data, especially data about clients, is needed by the sales and client relationship management functions.

Because no formal CRM system has been implemented, too much time is spent by sales staff tracking leads and determining next steps in the sales process. Many sales associates track leads using spreadsheets. Some have built small databases using Microsoft Access, but there is currently no central repository for sales data. Further complicating the issue is that several of the business units are pursuing the same clients for slightly different purposes. Lack of a CRM system leads to the occasional embarrassment of two different business units reaching out to the same sales leads.

Client relationship management has been identified by senior management of ABC as a critical function. However, lack of a formal system to address this has led to angst with some clients. The simple perception that business units within ABC are not communicating can lead to client dissatisfaction and ultimately client attrition. Unfortunately for ABC, some clients have provided feedback to this effect.

### **Information Technology Architecture**



Information technology architecture is another important architectural issue at ABC. Central storage and the related benefits of data replication between data centers have been identified as a critical goal.

ABC has spent a great deal of resources getting redundant, world-class data centers up and running. An important component of the established configuration is that a storage area network (SAN) has been established such that all data in the primary data center is replicated at 15 minute intervals to the secondary data center. Also, investments have been made in so-called "Big Data" platforms including an enterprise-wide offering that provides centralized access to disparate data for market research purposes.

The challenge that ABC now faces relates largely to the number and variety of businesses acquired over the last few years. To fully leverage investments in SAN technologies at the data centers as well as big data capabilities, the majority of stored data must reside in the corporate data centers. ABC has stated that it wishes to achieve data integration between business units and in the process "...solve the issues of bulk data movement, replication, synchronization, transformation, data quality and data services..." (Hansen, 2012) While important strategically, tactically completing data migrations and providing the appropriate connections for big data is challenging. The result is that many acquired systems still live in remote offices.

## **Business Process Architecture**

ABC must also address business process architecture issues to realize its strategic goals. Digitization of business processes is needed and access to related documentation is required across the enterprise. Graphical documentation tools should play a part in capturing this information and providing visual aids for those who own business processes at all levels.

The breadth of business processes at ABC is significant, especially given recent acquisitions. As such it is important that the company fully understand internal processes such as HR and corporate accounting that spread across the enterprise, internal operational processes that are specific to the various lines of business, and business processes that involve interaction with clients. Appendix A provides a graphical view of ABC's core system diagram and attempts to depict the complex relationships at play within the company.

Documenting internal processes that span the enterprise is important and will help ensure that employees are serviced efficiently thereby reducing the risks associated with unhappy employees. ABC must understand and clearly



communicate how it will interact with its employees, the ways in which employee activities will be monitored, and proper methods of handling exceptions to stated policies. From a corporate standpoint ABC must understand how expenses are tracked and controlled, the ways in which corporate data is compiled and communicated to corporate stakeholders, and the controls in place to ensure compliance with regulations and reduce associated regulatory risk. The documentation in this area needs to be addressed and is a recognized shortcoming for ABC.

Proper documentation and digitization of internal operational processes at the business unit level will increase the efficiency of operations, reduce the risk of operational errors, and provide clients assurance that their data is being properly handled and secured. For ABC, unfortunately, this documentation and digitization is lagging resulting in error rates higher than are acceptable to senior management.

Because business is ultimately about the clients, proper documentation and digitization of business processes related to clients is imperative. Not only

will this standardize interactions with clients and therefore improve client satisfaction, it will also improve the security posture of the organization related to the client data that it handles and stores. "External electronic integration allows firms to connect with business partners". (Nazir & Pinsonneault, 2012) As with other documentation, ABC needs to improve this area of documentation and solidify and digitize the related business processes.

## **Controls and Metrics Architecture**

Controls and metrics architecture is a final area that must be addressed by ABC. Due to the fact that ABC operates in both the financial services and healthcare industries, proper controls and tracking of metrics is critical. It is also important that ABC quantify the value of its IT operation using metrics since "...like any investment there is a need to justify IT expenditure through demonstrating value." (Wilkin, 2012) Regulations including HIPA, GLBA, SOX, and PCI-DSS are also daily concerns and it is important that ABC have the appropriate controls and metrics to allow them to stay in compliance with these regulations. As such, incident handling and response procedures, metrics related to IT operations, and audit procedures as related to regulatory agencies must be clearly defined.



Incidents are a fact of doing business. Properly responding to those incidents can be the difference between a minor issue and one that threatens the ongoing health of the company. As such, business processes for handling standard incidents must be spelled out and communicated regularly. ABC systems needs to improve in this area to both reduce risk to the organization and to provide greater assurance to clients that ABC can handle situations as they arise.

Metrics allow IT managers to gauge the health of operations. Understanding the frequency and duration of downtime in the IT operation, tracking error rates and trends, and capturing feedback from stakeholders are good ways of understanding the current state and making improvements for the future state. This is especially important because "...poor strategies in managing one or more [IT] factors can lead to a failure [emphasizing that] IT and business models have become virtually inseparable." (Wilkin, 2012) As with other areas, ABC needs to establish more formal metrics and manage them effectively ongoing.

Audits both allow businesses to validate that they are doing what they need to be doing and to provide clients a mechanism by which they can verify that their vendors are doing things the right way. Effectively navigating audits is critical to businesses as missteps in the audit process can lead to client angst and regulatory penalty. Ultimately, ABC needs to ensure that "...corporate IT systems [comply] with predefined policies, procedures, standards, guidelines, specifications, or legislation". (Rik Bos, 2012) Though ABC regularly undergoes audits from various agencies, a better-documented audit process is needed.

## **Framework Considerations**

TOGAF's ADM provides a useful structure for planning architectural solutions. Defining the overall architectural vision and documenting the business architecture and related information systems and technology architectures establishes a clear picture of the organizational landscape. Considering the enterprise through this framework enables effective planning as opportunities and solutions are identified, governance established, and change management processes socialized. Further, TOGAF's ADM framework provides access to a rich collection of artifacts and buildings blocks that can be used to memorialize the current state and plan for the future state.

This section outlined the major architectural issues that need to be addressed by ABC. Considered from an organization-specific architecture



viewpoint, the goal has been to make clear the issues and provide context for the recommendations that will be made in the following section of this paper.

## **Recommended Solutions and High-Level Road Map**

Regarding organizational architecture, there are several ways that ABC can address identified issues. Solutions need to be designed to address the needs of both internal and external stakeholders. Further, tools from the TOGAF ADM framework should be incorporated to enforce recommended architectural changes.

As identified previously, all internal users need seamless access to HR and corporate accounting systems. The ERP system currently in place to provide that access is PeopleSoft. On the HR side the solution is PeopleSoft HR and on the corporate accounting side the solution is PeopleSoft Financials. While both products can be delivered via web interface, the current iteration requires an out-dated version of a third-party browser plug-in, Java, which is both insecure and often unstable.

Because ABC is such a large client for PeopleSoft, the recommendation here is to work with PeopleSoft to either remove the Java requirement for this

application or, at a minimum, upgrade it to use the latest Java version. Doing so will greatly reduce the burden caused by supporting an older version of Java and reduce the inherent risks of leveraging a vulnerable plug-in in the production environment. While ABC could look to switch to a different ERP vendor to work around this issue, such a move would be costly and take significant time to complete.

Regarding line-of-business applications, much of the current challenge relates to the lack of standardization in providing access to these systems. Some applications are hosted in the data center and accessed remotely using Terminal Services, some are accessed remotely using Citrix, and others are hosted locally at business unit locations. This causes headaches for support staff and increases cost because of the additional support required.

The recommendation here is that the company mandate that all line-of-business applications be hosted at the central data center and that business units leverage Citrix to access the applications. While this will take some



effort up front, the long-term benefit will be greater security and recoverability for the systems, reduced support costs to the business units, and better reliability of the systems for end users. An alternative, selecting line-of-business applications that are offered in a SaaS model, is not practical given the current investments in existing solutions.

Regarding the needs of non-operational associates, the recommendation is to license Salesforce.com. This cloud solution will address the needs of both the sales and client relationship management groups by providing a central repository for both sales lead and client data. IT support costs will be eliminated and security of data can be ensured contractually. Service can also be guaranteed contractually with service-level agreements. This solution is more practical than attempting to implement a CRM system internally as it can be achieved more quickly and with less up-front cost.

As for external system users, the recommendation is to create an optimized portal that can provide users a sanitized view into all of their pools of data provided by ABC. The portal should be Internet-facing, leverage SSL encryption for data-in-motion security, and be monitored continuously for security. While this data could also be delivered using methods such as SFTP, a web portal provides ABC an opportunity to display its technological capabilities and improve client satisfaction.

Identified data architecture issues can be addressed by buying or building appropriate interfaces for line-of-business systems. As such, the recommendation for ABC is that they evaluate interactions between systems and identify areas of integration. This will allow them to determine the most cost-effective solution. Further, because so much operational data is passed between business units, reducing manual processing and eliminating duplication of operational data must be a priority for ABC. While manual processes could be maintained and optimized to some degree, eliminating data redundancy and digitizing data moves will reduce errors and the costs related to those errors.

SalesForce.com is the recommended solution to address identified information and knowledge architecture issues. This system not only makes the data easily accessible for end users, it can also serve as a central repository for both sales leads data and data on existing clients. Because this is a cloud solution, staff members from all business units can easily retrieve and update data. Further, data duplication is reduced as users access it centrally. While it is feasible to license and support a system in the



ABC data center to provide CRM functionality to the sales department and client relationship management group, Salesforce.com is easily implemented, industry-tested, and secure.

Information technology architecture issues can be addressed by fully leveraging the corporate investments in SAN technologies. Because the ABC SAN networks have been configured to replicate from the primary data center to the backup data center, all data stored in the SAN environment is protected and secure. ABC should prioritize the migration of business unit data to data center SAN devices and work to achieve as high a level of standardization as possible. While workarounds could be implemented that would allow for operational data to be housed outside of the central data centers, the costs of maintaining a separate recovery strategy for exception situations are impractical.

Technologies needed to address identified business process architecture issues are largely in place. The recommendation for ABC is for it to leverage Microsoft SharePoint to capture and manage business process documentation across the board. This product will allow users to establish the interfaces that they find most conducive to maintaining and communicating business process information. Further, this data can be made available to clients if SharePoint is deployed to support external access. While this data could be stored in network file shares, SharePoint provides structure and gives users the ability to customize the ways in which data is presented to stakeholders.

Controls and metrics architecture issues can be addressed incrementally. A good first step for ABC is to document and socialize a formal incident response process. This should include step-by-step procedures for handling multiple incident scenarios. Microsoft SharePoint can be the repository for this information and access provided accordingly. ABC also needs to identify and publish useful IT operational metrics. These should include metrics detailing the levels of confidentiality, availability, and integrity of data housed in ABC's systems. Further, this data should be made available in dashboard format to upper management. Once again, Microsoft SharePoint will work nicely for this effort. A final recommendation for ABC relates to audit planning and documentation. ABC should leverage Microsoft Visio to memorialize audit processes. This documentation should be stored in SharePoint and made available to both internal and external stakeholders as needed.





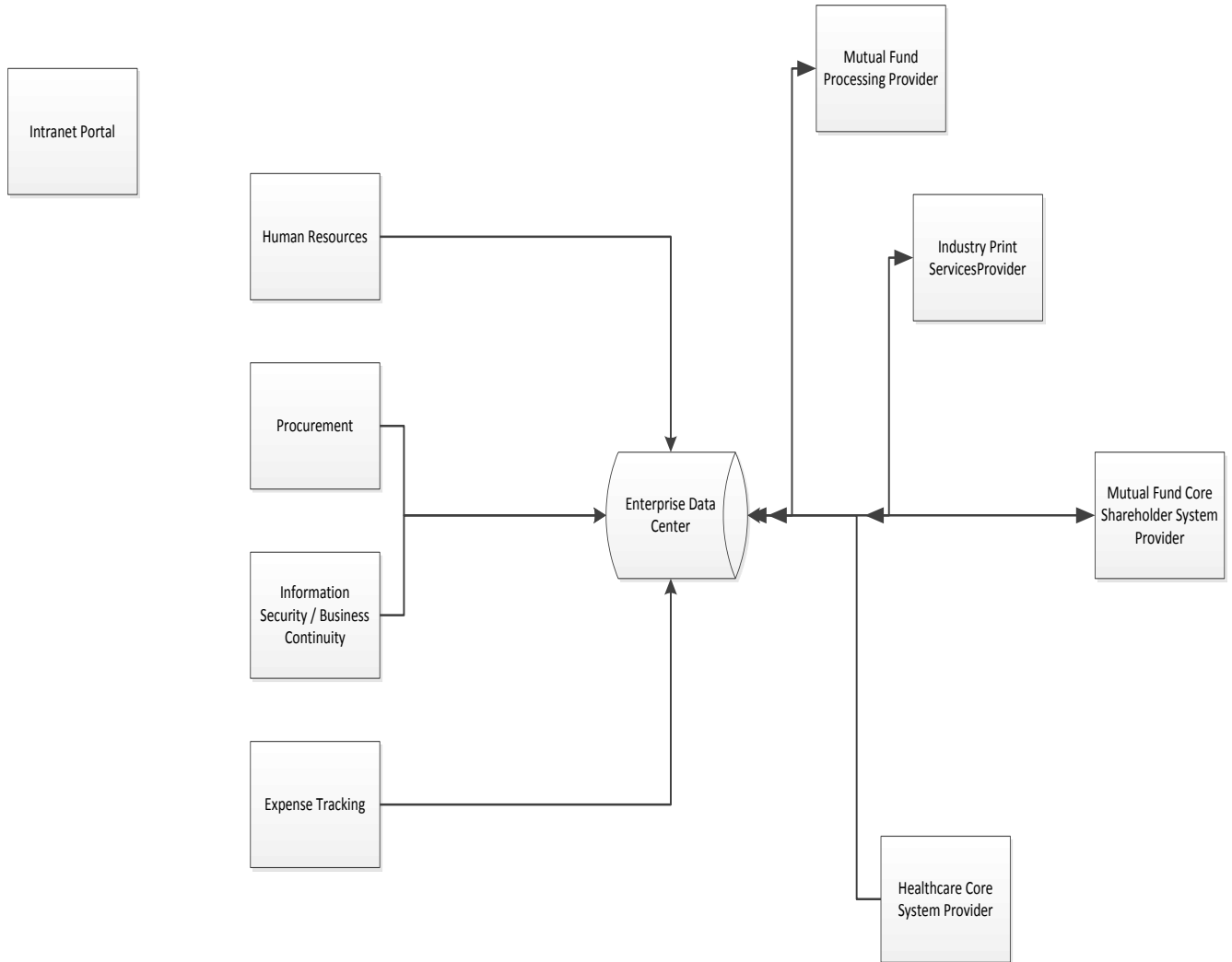


## Road Map – Priority of Items

Architectural Issue	Recommended Solution	Priority
Organizational Architecture / Data Architecture / Information and Knowledge Architecture	Implement Salesforce.com.	1
Organizational Architecture	Work with PeopleSoft to remove Java requirement.	2
Organizational Architecture	Mandate the use of Citrix for line-of-business applications.	3
Organizational Architecture	Build an Internet-facing, web-based client portal.	4
Data Architecture	Identify data interface gaps and build appropriate interfaces.	5
Information Technology Architecture	Enforce use of SAN for all business units.	6
Business Process Architecture / Controls and Metrics Architecture	Deploy Microsoft SharePoint in conjunction with Microsoft Visio.	7
Controls and Metrics Architecture	Established IT Operational metrics.	8
Controls and Metrics Architecture	Formalize Incident Response Procedures.	9

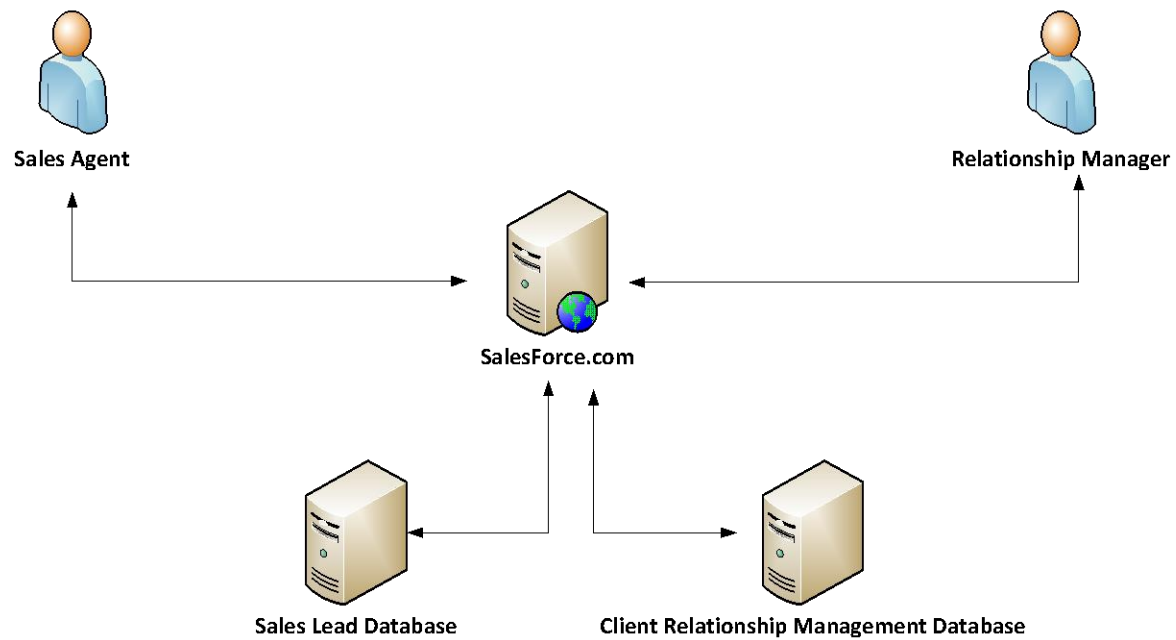


## Appendix A – ABC Systems Core Diagram





## Appendix B – Salesforce.com Use Case Diagram

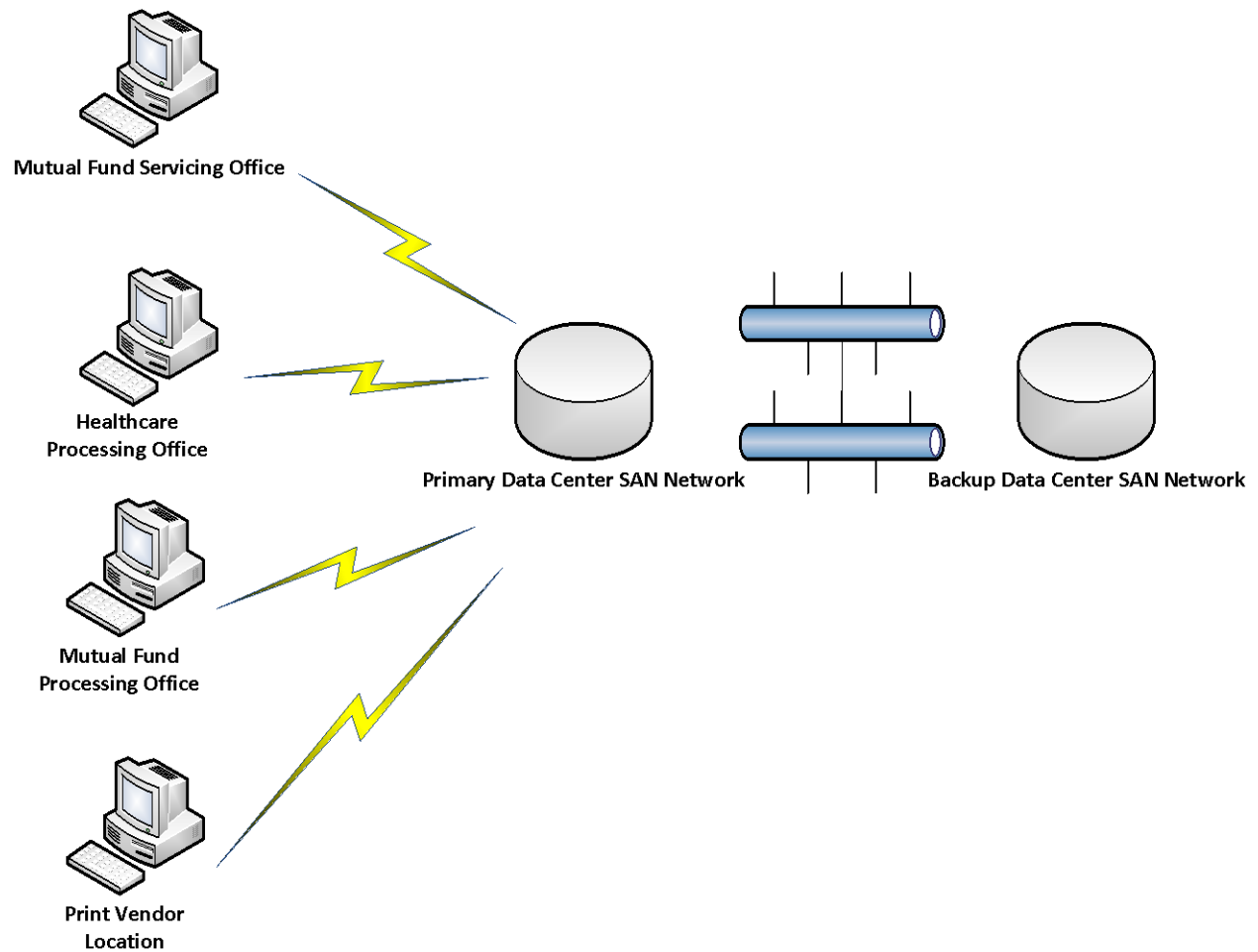




## Appendix C – Shareholder Map Matrix

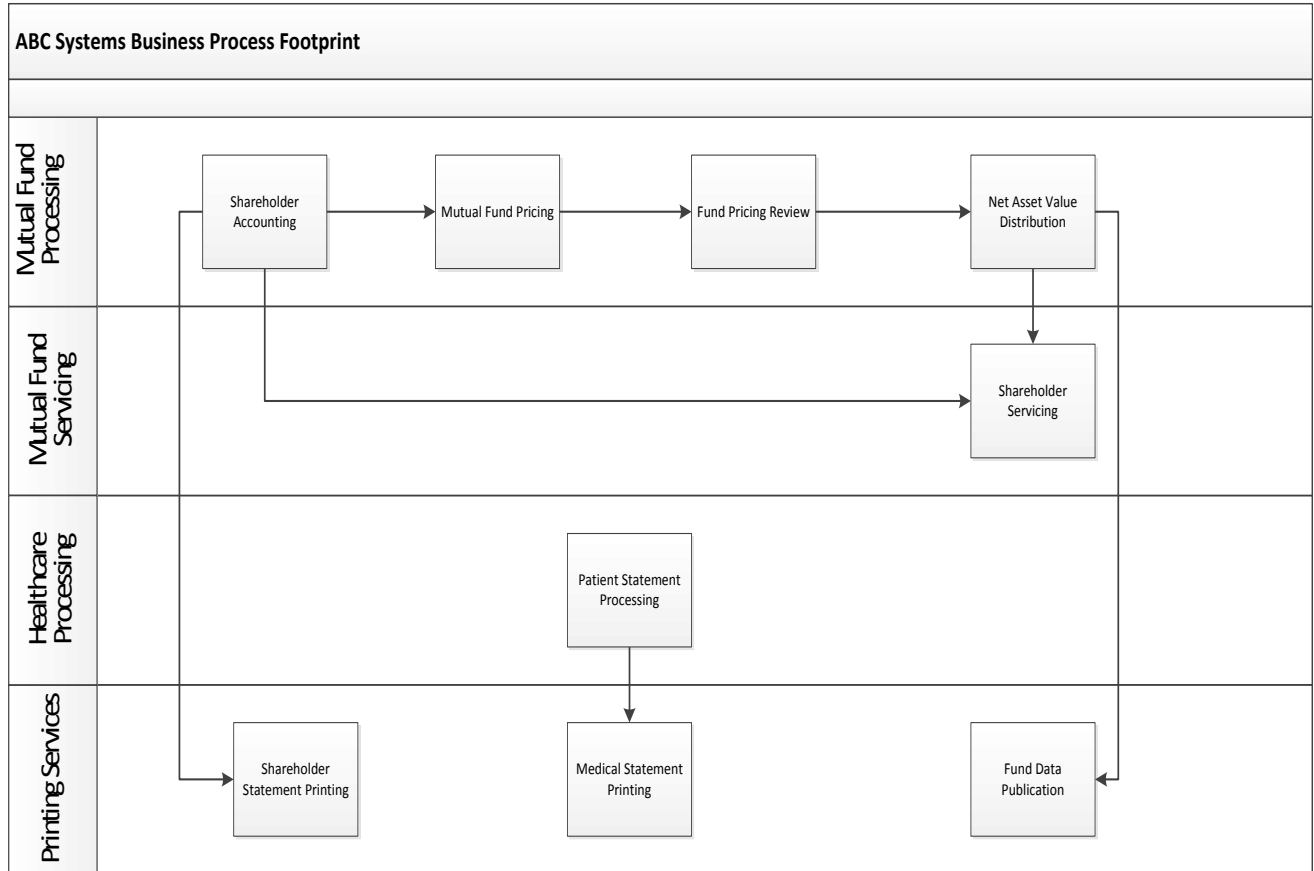
Stakeholder	Involvement	Class	Relevant Artifacts
Executive	This group is most interested in tracking the health of the organization. They set the goals and objectives for the organization and closely monitor the relationship between IT and the business.	Keep informed.	Dashboard-level reports.
Internal Systems Users	Employees across the enterprise use PeopleSoft HR for HR functions.	Keep satisfied.	Reports and notifications.
Line of Business Application Users	This is the operational staff responsible for daily processing across a range of complex applications.	Keep satisfied.	Reports and web interfaces.
Corporate Accounting System Users	This group leverages PeopleSoft Financials for expense tracking and reporting.	Keep satisfied.	System documentation.
Client	Clients are primarily interested in accessing their data via secure, external-facing web applications.	Keep satisfied.	Reports.

## Appendix D –SAN Network Diagram





## Appendix E – Business Footprint Diagram





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## AUTHOR'S BIO

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Robert Wood is currently completing a MAS degree in Information Security from the University of Denver. He is a Certified Public Accountant in the state of Colorado, received a MIS degree from the University of Colorado at Denver and a BS degree in Accounting from the University of Northern Colorado, and holds CISSP, CISM and PMP certifications. Robert has more than 15 years of experience in Information Technology managing developers, operations professionals and security professionals during that time.