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Project Zenith: A Case Study of Electronic Data Interchange

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ABSTRACT

This paper utilizes a case study approach to analyze the key decisions, stakeholders, and lessons learned from a project to develop an Electronic Data Interchange (EDI) application conceived and developed by a consulting firm. Several individuals within the firm viewed this EDI service as an opportunity for generating new revenue. However, the new system was not embraced fully by several sales and account representatives who did not view this potential product as a service that could make an adequate profit margin and translate into larger commissions. In addition, the consulting firm's president supported the project to the extent that it must be completed and generate revenue within three months. As a result, the project manager and team had to overcome a number of obstacles and issues. Several key decisions and lessons learned are discussed and should be of interest to both information system practitioners and researchers.

INTRODUCTION

Electronic Data Interchange (EDI) provides a standardized framework for organizations to exchange various form or document-type data using an electronic format (Malaga, 2005). This exchange may include invoices, purchase orders, packing slips, inventory queries, and other documents that support the various transactions taking place between firms. For example, an insurance provider may receive an electronic claim, and an EDI system would then convert the data into a readable format that could then be imported into the insurance company's existing claims system. In fact, any standardized business form exchanged between two parties can be made through an EDI system if both parties agree to specific standards or mapping. This improvement in efficiency, speed, and accuracy has increasingly made the electronic transfer of documents a condition for doing business with many larger firms and in many industries.

One of the most important business decisions for an organization is determining how the data will be sent and received. For instance, a Value Added Network (VAN) is a third party service that acts as an electronic post office that stores and transmits the transactional data. The EDI document contains address information that allows the document to be routed to the appropriate recipient. More recently, there has been a movement towards EDI over the Web instead of using a VAN (Scheier, 2004; Sliwa, 2004). However, this requires the customer or supplier to make sure that the proper organization is notified when a purchase order or invoice does not go though – a process generally handled by the VAN. In addition, security can become an issue unless the data is properly encrypted or if specific Internet Protocol (IP) address must be configured or reconfigured with a firewall (Scheier, 2004). Regardless, the cost savings can be significant since a traditional paper purchase order is estimated to cost about $120 to be created, processed, and routed through a typical purchasing system, while an electronic version is estimated to cost about $35 through a VAN or even less through the Internet (Cassidy, 2000).

Although EDI provides many opportunities for improving organizational efficiency and effectiveness, the introduction of such a system can be viewed as planned organizational change. This change, if not management effectively, can create a situation where the change may not occur or where only a portion of the change is accepted (Connor, 1995). In either case, the full benefits of the project will never be realized or only realized after a great deal of time and resources have been expended.

This study provides a case study of a consulting firm that undertook the development of an EDI project to expand their product and service line. In general, a case study provides an appropriate research strategy when "how" or "why" questions are of primary interest, when the researcher does not have significant control over events, or when the phenomenon of interest takes place within some real-life context (Yin, 1994). Moreover, descriptive or qualitative research may be undertaken when description and explanation are of greater interest than prediction (Merriam, 1988). The names of the firm and system have been changed to maintain confidentiality.

This paper has been organized into several sections. The next section provides a background of the firm and its industry. The following section provides an overview of the project and its inception and the opportunity facing the firm. A stakeholder analysis and force field analysis in the next section then provide a mechanism for understanding the driving and resisting forces that surrounded the project. In the last section, several lessons learned and conclusions will be discussed.

This study should be of interest to both practitioners and information systems researchers. For practitioners, the background and lessons learned should be of value for organizations interested in EDI as well as the issues that surround the planned organizational change when implementing a new system. For academics, this study provides an interesting view that comprises not only EDI, but the impact a new system may have on the various stakeholders in an organization. This study builds upon previous research in this area and provides a catalyst for future research.

BACKGROUND

THE COMPANY – MIDWESTERN CONSULTING

Midwestern Consulting[1] was founded in the early 1980's by two entrepreneurs with the philosophy that technology must be adapted to the situation at hand and must evolve along with changing business models and demands of increasing marketplace competition. This privately-held consulting firm is located in the Midwestern United States and currently employs about sixty professionals with consulting expertise in areas such as e-business, security and infrastructure.

Figure 1 provides an overview of the organization's management structure. The firm follows a functional organization structure to manage various resources to support specialized tasks or activities. Projects within the firm are typically coordinated through specific channels and housed within a particular function. For example, the Zenith EDI project was housed in the XML/ EDI integration division of the company, and the project was managed by the EDI Managed Services Manager.
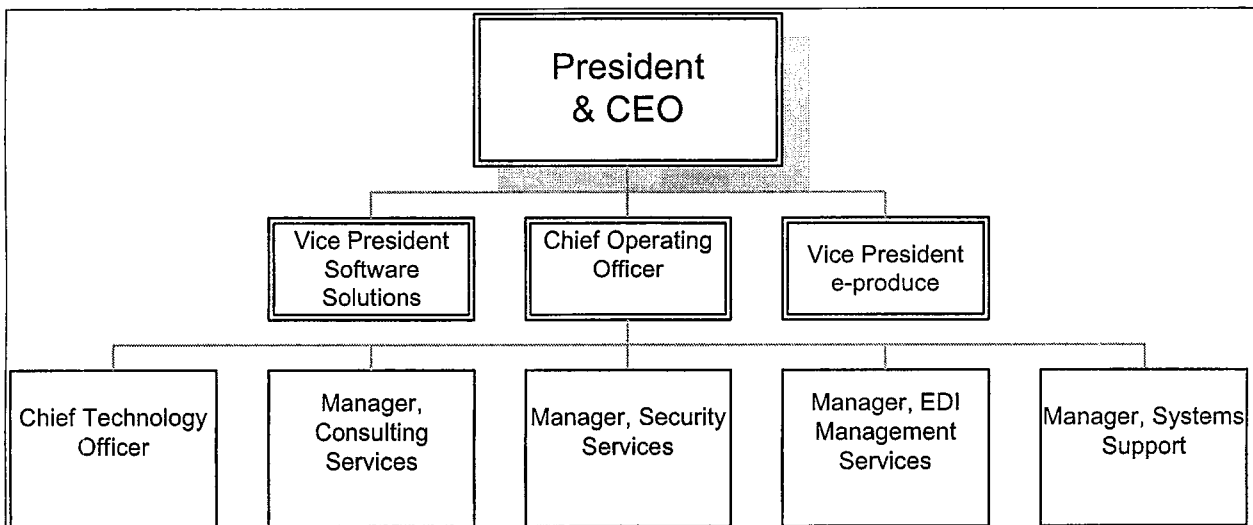

Figure 1: Midwestern Consulting Organizational Chart

PROJECT ZENITH

In the late 1980's, Midwestern Consulting developed a vertical market software package to meet the needs of businesses that deal with fresh produce. The system supported the management of financial information, as well stream-lining order entry, shipping, receiving, warehousing, and inventory operations. This solution became known as "e-Produce."

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1 The names of the organization and project have been changed to maintain confidentiality.

The success of e-Produce was viewed by several individuals within the consulting firm as a catalyst of opportunity for developing and selling customized software solutions. According to the Zenith project manager, the concept of EDI during the development of e-Produce was not practiced in the fresh produce industry due to unique industry packing requirements and also due to a lack of accepted standard identification techniques of products (e.g., UPC codes). In addition, the produce industry was viewed as "cash oriented" and relied on verbal and paper-based ordering systems.

However, larger organizations such as Kroger and Wal-Mart began to mandate that their produce ordering systems become completely paperless. The result was an increased need to utilize EDI, and Midwestern Consulting began to receive more and more EDI project proposals that would allow their customers to be compliant with the mandates of their larger account holders.

The components required for EDI conversion were custom-developed by Midwestern Consulting for each client. To be EDI compliant, customers had to contract with a Value Added Network (VAN) that acted as a collection hub for EDI documents. These VAN's only accepted X.12 as their standardized record layout and format. Therefore each component that converted these files into their respected appropriate formats for receipt and delivery had to be written from scratch by Midwestern Consulting. According to the Zenith project manager, "Contracting with a VAN generally incurred a monthly charge of $50 to $100 per month plus 20 cents per kilocharacter. BizTalk (www.biztalk.net) is one example of a VAN provider and was viewed as a major competitor to Zenith. In addition to the cost of this software and service, there was an additional charge for installation and maintenance work performed. These projects were extremely expensive and the Midwestern Consulting envisioned that there would be an increased demand for compliance to these standard conversions."

It was at this point that the project manager approached the vice president with the awareness that all these packages did was convert flat files. At this time, FTP was emerging as a technology, so the project manager recommended that they write a translator and host it at the headquarters of Midwestern Consulting. If a client had a batch of invoices that they wanted to send to a partner, such as Wal-Mart, they could FTP the files to the Midwestern Consulting's server. A translator would then convert the EDI transfers into the appropriate format and ensure that they went to the correct business partner. From the standpoint of purchase orders, they wrote the translator so that it could take a flat file of purchase orders, and convert them to any flat file format that was needed. According to the Zenith project manager, the key behind their reasoning was "Why should the customer pay for their own translator when Midwestern Consulting could translate them here and use it to provide a service to customers, all the while costing less than if the customers had bought the translators individually."

THE INCEPTION OF PROJECT ZENITH

The vice president of Midwestern Consulting coined the term "Managed Service" that became a function within the organization responsible for the alleviation of customers having to pay for third party EDI translation software. At this time, the developers of this project examined the available technologies of the time. They were interested in finding languages that were object-

oriented, gaining popularity (i.e., progressive), and worked well in a client-server environment. They also examined protocols that were gaining popularity for the purposes of transferring data.

The result of their research led them to choose Java for the client-server software and XML as the appropriate technology for communication between the client-server programs and data transfers since all data in the X.12 format would be converted into XML. Subsequently, XML could be used as a data vehicle for all Managed Service customers, particularly those who did not use a specific standard or layout for data file formats. The project team began by developing an XML program that could import and export XML data to legacy system databases. "Once this was written," according to the project manager, "we had a captive audience of all customers that were running the e-Produce package." In addition, the project manager added, "The original mission statement for Zenith was to provide the same capability that the VAN's provide. This meant taking a file from a trading partner and making it available to a customer, and vice versa."

Zenith promised its EDI customers a reduction in costs from approximately $20,000 per installation site to a one-time charge of $4,000 followed by $1,500 dollars per trading partner from then on. This service was "Guaranteed Approved Live," meaning that Midwestern Consulting guaranteed that a client would be doing EDI with a trading partner of their choice and to each party's satisfaction. This system shortened the installment time, on average, from five person-days to less than four hours. As a result, there had been a noticeable increase in business for Midwestern Consulting. Within a year of making Zenith available, clients have reported an increase of six trading partners on average. As the project manager noted, "If you take a paper order, and step it through the process, from hand entry to a manual invoice, and include all the time of the people working on it, and so forth, it is five dollars per invoice. EDI allows invoices to come out for fifty cents per invoice. This is a fantastic thing for the customers. This is why customers like it"

PROJECT SCHEDULE AND BUDGET

When asked about the schedule and budget, the project manager responded by saying "The company president gave the project three months to generate revenue. If it didn't generate revenue, it would be killed on the third month. He did not ask for any input with regards to the schedule." Additionally, the project manager stated "Consulting firms generally do not want to start service bureaus. There is a perception by consulting firms that there is more money to be made in the consulting disciplines rather than by data services."

In this case, a top-down approach was used to estimate the project since upper management mandated the project schedule due to a reaction to the business environment. Moreover, it appears that the president was not eager to commit to a great deal of time or money in order to enter the data service business. In this situation the schedule as handed down from upper management and project team had very little input into the estimates of the project.

With respect to the project budget, the project manager stated, "We were given all the resources we needed. The major problem was the time element. Our budget was time." The constraints of a budget were eliminated, and, as a result, there was no need for a formal budget. But in its place was a non-extendable deadline, as decided by management."

KEY STAKEHOLDER ANALYSIS

To understand the background of the project more fully, the roles and responsibilities of several key project stakeholders are provided. This analysis was conducted based upon an interview with the project manager.

President of Midwestern Consulting (Project Sponsor)

In the project manager's opinion, the biggest challenge to the success of Zenith project was a lack of support from upper management. The primary champions for this project were the vice president and the project manager who created the original plan for the EDI service. A key issue was that from its inception in 1980, Midwestern Consulting's core competency was providing consulting services. Therefore, the president did not view the company as being in the business of providing IT, data, or EDI services. Subsequently, he did not view Zenith as a project that would align with the primary goals, strategy, or intended purpose of the company as a whole.

According to the project manager, "The division and product was developed by a consulting firm. The conflict existed where the question remained 'Couldn't we make more money billing customers while putting EDI systems in the old way, versus providing a server? Why expend the money for this in order to bill a customer $5,000 plus 20 cents a line, when we could hit them up front for a $20,000 or $30,000 a project?' The crux of the problem was that the project manager and developer for the Zenith project had been fully billable on other EDI projects to the tune of $14,000 per month. Herein lays the risk, foresight, and intangibility of the effort."

From the initial proposal submitted by the project manager, the president of the firm was unconvinced of the merits of the project, and therefore provided project resources for only three months. Additionally, the president set forth the ultimatum that the product absolutely had to generate revenue immediately after being implemented. Moreover, the project manager added, "This is to say nothing of making a profit, which was not done until the next year." The project manager felt an intense need to prove the worth of the project to a critical president who was conditionally willing to sponsor such an undertaking.

The president was supportive only to the extent Zenith/EDI services would lead to additional consulting revenue for Midwestern Consulting. This assumption did prove to be true, but unfortunately not until two years after Zenith went live. As explained by the project manager, "He (the president) felt that whether the service bureau made money or not was immaterial if it led to new consulting projects. Unfortunately, when the head of sales went out and pitched Zenith to Java users groups, etc, to establish our name in the field, it soon became evident that there wasn't much consulting revenue generated from Zenith/EDI installations." Zenith was installed as a result of the pressure applied by a trading partner to be EDI compliant in a short period of time, and therefore the initial sale didn't insinuate that there was consulting needed in addition to the EDI solution."

Vice President of Midwestern Consulting

The vice president of the company was interested in forwarding a Java-based project. Up until this point, the company had been focused primarily on third generation languages such as COBOL. This project was an opportunity to use new, cutting-edge technologies. According to the project manager, "The vice president was a champion of Java and this allowed me to focus 100 percent of my time on the project until the revenue stream was established."

Technical Expert – Manager of Application Development Consulting at Midwestern Consulting

This individual managed Java projects and established the programming standards to be followed. He was responsible for selecting the source control system for the programming software, and to ensure compliance with the various standards.

Technical Expert – Chief Technology Officer at Midwestern Consulting

This person was in charge of setting up the servers, firewalls, routers, and other security for the project. He was also responsible for the compiler versions and development kits, as well as backup.

Project Team - Account Reps

The account representatives are Midwestern Consulting employees who are assigned to a specific customer. They needed to be consulted with and guided in terms of the standards to be followed when the client piece has to be interfaced with the legacy system.

Project Team – Corporate Accountant

The corporate accountant aids in the establishment of the general ledger journals for recording revenue for Zenith, as well as the creation of procedures for taking the billing logs and invoicing customers for Zenith services.

Project Team – Java Programmer 1

This person was responsible for creating the client server shell program. This consisted of a server segment, as well as a client segment of software that took data in, exported it, and then translated it in an outbound fashion only. This section of the project established proof of concept and verified the communication between the client and the server.

Project Team – Java Programmer 2

This person took the shell and enhanced it to accommodate inbound delivery from trading partners. Additionally, this person's code allowed "to and from" activity from the client to the customer, but also added the capability to get data from external trading partners. This programmer also added multi-threading, delivery verification, logging, error-checking, and

billing interface functionality to the software. Finally, both Java programmers performed database work in addition to their programming duties.

Sales Staff

According to the project manager, "The sales staff didn't want to take the time to sell Zenith because it was too technical. In addition, it was too cheap. There wasn't enough room in the pricing to give them a good commission. The margin was too narrow because the developers wanted to establish it first. Because the product cost was kept low to establish it in the market for competitive reasons, the markup wasn't attractive to them. All of the sales staff had to be convinced that this product could be sold and make money."

Account Representatives

Similar to the sales staff, some account representatives had to be convinced Zenith would provide more revenue than writing custom EDI solutions for each customer. According to the project manager, "Pressure had to be brought to bear from the top to the account reps in order to get them to utilize Zenith versus writing a custom solution."

External (Outside) Consultants

According to the project manager, "The greatest allies turned out to be the outside consultants for Midwestern Consulting's clients. They embraced the XML solution that allowed them to import and export into their legacy systems. Once these external consultants came about as great supporters, the internal allies came about as they saw the external consultants use Zenith. These people were great allies largely because Zenith and Midwestern Consulting provided free consulting advice on how to implement the EDI solutions.

Sales Department Head

Another major champion of the project was the vice president of the Sales department. Because the software was written in Java and XML, he believed that this would establish Midwestern Consulting in these state-of-the-art languages. The original product was presented in front of Java and XML user groups and written up in "Sun" and various technical publications as a very forward thinking application. These events provided additional credibility and industry acceptance of Midwestern Consulting as an industry leader. The vice president of sales supported Zenith because Midwestern Consulting is a 30 year old company that needed to establish itself in the new and more modern technologies such as object-oriented solutions. Up until this point, the company had based most of its development on third generation languages.

Heads of e-Produce

The vice presidents of e-Produce were viewed as allies for Zenith. For example, Zenith gave them a timely and effective solution for their customers that provided an opportunity to minimize the amount time for support calls. One concern was that there has to be a support function built into the package. There was also a need for custom programs to be added to the e-Produce

product package to fit a unique customer needs because e-Produce employees were required to know their customers' needs and provide efficient and effective solutions.

Zenith was also viewed as being able to fill a growing need for EDI services that e-Produce customers wanted and needed. They were able to appear to their customers as knowledgeable in this area. It also provided them with an additional module or feature that they could sell with their main product package. Finally, the e-Produce package is subscription-oriented, and the addition of Zenith to their product allowed them to generate additional yearly subscription fees.

The formal organization provides a published structure that defines the official lines of authority, responsibilities, and reporting relationships. While the formal organization tells us how individuals or groups within an organization should relate to one another, it does not tell us how they actually relate (Nicholas, 1990). Although we often think of stakeholders as only individuals or groups having an interest in the successful outcome of a project, there are often many who can gain from a project's failure.

Therefore, Table 1 provides a summary of a stakeholder analysis conducted to better understand each stakeholder's role, interest, and degree of influence on the project. First, the project manager was asked to provide his perception concerning each stakeholder's interest in the project where a +1 implies a positive interest in the successful implementation of Zenith, 0 or neutral interest, and a -1 implies negative interest in the successful implementation of Zenith. Next, the project manager was asked to provide his perception concerning the amount of influence each stakeholder had over the project. A scale of 0 to 5 was used, where 0 implies no influence and 5 implies extremely high influence (i.e., this stakeholder could terminate the project). In the next step, the project manager was asked to use a metaphor to define a role for each stakeholder. This was used to provide a clear picture or meaning for each stakeholder. The project manager was also asked to provide an objective for each stakeholder in terms of how each stakeholder could help the project. For example, some stakeholders may provide resources, expertise, or guidance navigating through political waters. Lastly, the project manager was asked to provide a strategy that he used for achieving each objective.

Stakeholder	Interest	Influence	Role	Objective	Strategy
President	+1	5	Sponsor	Maximize revenue and profit, and maintain the organization's strategic focus.	Improve relationship through results and confidence
Vice President	+1	4	Champion, Decision Maker	Major champion for this project. He has the president's ear, and owns 49% of the company. He is the single most important ally. He hopes the project will bring the company new revenue through new technology.	Maintain Relationship and confirm his hopes
Java Programmer 1	0	1	Implementer	Provide the services needed as the technical foundation of the project.	Maintain
Java Programmer 2	0	1	Implementer	Provide the services needed as the technical foundation of the project.	Maintain
Manager of Application Development Consulting	0	2	Advisor	Provides the project with the technology and coding standards so as to ensure it is completely properly and according to the specifications set up by the organization.	Maintain
Chief Technology Officer	0	2	Advisor	Ensured that the security and connectivity of the project was in place.	Maintain
Account Representatives	-1	0	Rival	Need to be consulted and guided as to the standards to follow when interfacing the client side to the legacy system.	Convince them that the system is easy to put in and is a preferred way of doing EDI.
Corporate Accountant	0	1	Advisor	Consulted for the creation of the automatic bulling logs and invoices that are sent to Zenith customers.	Maintain

Sales staff	-1	0	Foe	Aimed to prove that Zenith was not something that they could sell and make a profit on too. They felt the margin was too narrow.	Improve relationship by showing the demand for the product.
External Consultants	+1	0	Ally, Advocate	Advocated the potential of the project to the management of the company.	Maintain
Vice-President of Sales	+1	2.5	Advocate, Champion	Advocated the project to management due to its potential for new sales avenues through new technology.	Maintain
Vice-President of Produce Pro	+1	1	Ally, Advocate	Uses his ability as the head of a company close to Midwestern Consulting to advocate the values added by Zenith.	Maintain

Table 1: Stakeholder Analysis Summary

FORCE FIELD ANALYSIS

Figure 2 summarizes a force field analysis to facilitate our understanding of the driving and resisting forces that surrounded the Zenith project. Force field analysis was developed by Kurt Lewin (1951) and has become a widely used tool for understanding and managing organizational change. In addition, force field analysis can be a useful tool for providing new insights into the evaluation and implementation of organizational and manufacturing strategy (Maslen & Platts, 1994; Thomas, 1985).

A force field analysis is a technique for developing a big picture that involves all of the forces in favor or against a particular change. Forces that are viewed as facilitating the change are viewed as driving forces, while the forces that act as barriers or that work against the change are viewed as resisting forces. By understanding the forces that act as aids or barriers to the change, one may enact strategies or decisions to enact the desired change or to understand why a particular change was not implemented.

Lewin's basic model includes the concepts of unfreezing, changing, and refreezing. The present state represents an equilibrium or status quo. To change from the current state, there must be driving forces both to initiate and motivate the change. Unfreezing, or moving from the current state, requires an altering of the peoples' current habits, perceptions, and stability. Therefore, viewing change from Lewin's model suggests that beginning a change starts with an ending of the present state. Transition through the transition starts means a loss of equilibrium until an individual or organization moves to the desired state. Once there, it is important that the

attitudes, behaviors, and perceptions be refrozen so that the desired state becomes the new status quo and equilibrium for the individuals involved.
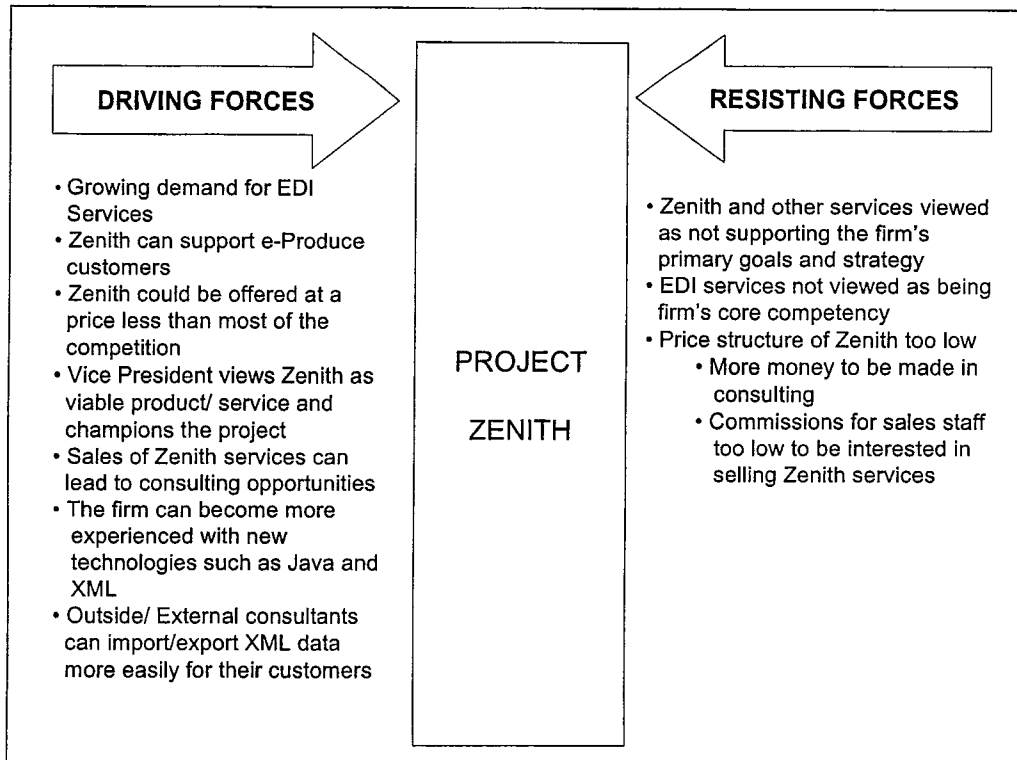

Figure 2: Force Field Analysis

From the stakeholder analysis, one can uncover a number of driving and resisting forces surrounding project Zenith. The main drivers for the project appear to be a growing demand for EDI services, support for e-Produce customers, and the potential for new consulting opportunities. To a lesser extent, gaining experience with state-of-the-art technologies and support from outside or external consultants play a role. No doubt that the project could have been cancelled by the president if the vice presidents champion the project.

On the other hand, although Midwestern Consulting viewed the low cost of the Zenith service as a driving force, it appears to have been a double-edged sword. More specifically, the low cost of the EDI service suggests a competitive advantage; however this low pricing would result in lower commissions for the sales staff. The culture change required to expand beyond traditional consulting services certainly was important issue for the president who mandated a tight deadline for the project to be completed and profitable within few months.

ACTIONS TAKEN AND DECISIONS MADE

It was believed that Zenith would provide value to customers who needed to outsource their X.12 to XML translations. Moreover, Zenith's value would not only be created by its strategic timing, but also by the perceived obtuse pricing model used by the competing system, BizTalk. However, the schedule for producing a working, revenue-generating system was extremely tight. The following decisions were made by the project manager in response to the specific challenges and problems that were presented to him.

Due to the limited schedule to design, build, test, implement, and become a revenue-generating product within three months, the project manager chose to develop the system using various Rapid Application Development (RAD) approaches. Using RAD, the project manager was able to utilize different development approaches, tools and techniques that could be mixed and matched based on the project. For example, prototyping allowed the developers and users to work closely together to develop a fully functional system within the shortest possible time. According to the project manager, "By using the prototypes we were able to spend months in volume testing across various servers. We were able to throw big files at it, and probe the weaknesses until we had an environment that we felt could handle the largest files we would encounter. We had several people volunteer to be beta sites. The features that are currently used now were developed for the beta sites at the beginning. Those beta sites were generally the people that were most eager to use the new system." The prototype of the Zenith system was fully usable and eventually became the production system after it had gone through a number of refinements. The prototyping approach was useful in this situation because of the capabilities of the technologies used since Java and XML were not particularly well known or understood by the development team. The Zenith project was the first project at Midwestern Consulting that dealt with this technology, which was still a relatively young technology for the industry as a whole.

In addition to prototyping, the Zenith project manager employed Extreme Programming (XP). When dealing with XP, a system is released to users through the use of a series of versions. As the project manager pointed out, "As a result of the three month limit that was handed down by the president, the version we brought up basically transferred documents. We did not enhance the product to include web based enquiries, and a lot of the other features that would be included in the future. We also didn't include automatic emails of daily transactions, because of the time limit. If someone questioned whether or not they were missing a document, they would call us. We would call them and say 'yes, we have it.' We had logs, but no inquiry capability available to the customer. In retrospect, most customers don't really even want it!" This statement by the project manager is an example of how the iterative approach allowed the developers to learn from the users by being closely involved with them, and integrating the customer and user feedback into future versions or releases. New versions of Zenith are still being released. He also added, "The next version will include data warehouses, which will allow for an increased ability to analyze the information transfers in new ways."

An important action taken by the project manager was to work with the account representatives, who dealt with the clients. They needed to be taught to sell the Zenith service as an introductory

type of system. According to the project manager, "This didn't happen right away. The president is now a very enthusiastic supporter of Zenith, due to the fact that he now sees the financials and revenues that are being created by the Zenith products, both in e-Produce and Midwestern Consulting divisions. In retrospect, since 2002, more account representatives have embraced Zenith as a solution to be used at their client sites and the account reps have indeed used Zenith as an initial project at new customer sites, and that effort has lead to additional consulting revenues, which are as high as were originally hoped for, yet arrived a little later than hoped for."

CONCLUSIONS AND LESSONS LEARNED

This case study provides an interesting view of the people, processes, and technology issues surrounding the development of an EDI system; however, many of these lessons can be applied to most information systems projects.

In terms of people, this project underscores the importance of a project champion. In this case, Midwestern Consulting's vice president was largely responsible for shielding the project. Given the president's reluctance to fully embrace the project, the project most likely would have failed. This reluctance to support the project fully may have contributed to the sales staff's and account representative's lack of support as well. Clear and express support of the project from a united upper management might have signaled to everyone within the organization that the project was integral to the vision and mission of the organization. Consequently, resistance by the sales and account representatives may have been mitigated.

In addition, the project manager' ability to communicate and deal with people was also a key to the project's success. This is evidenced by the project manager's ability to create and sustain relationships and act as a peacemaker when dealing with an unenthusiastic upper management. In addition, the project manager was able to create and effectively manager a project team that required the right mix of technology skills and communication skills to define and prototype a set of user requirements under extreme schedule constraints. Moreover, business and organizational skills were required not only by the project manager, but also the other team members, particularly those dealing with other functional areas and with individuals outside of the organization.

The need to work effectively in a team environment was essential. No one worked by themselves, and each person relied on another for a certain aspect of the work to get done. The project manager relied on the Java coders to create the software shell. The account representatives relied on the project manager to provide them with the technological background knowledge to properly implement this solution at the client sites.

In terms of processes, the choice to follow a RAD and prototyping approach to systems development allowed the users and developers to work closely, communicate effectively, and develop a fully functional system within schedule constraint set by the firm's president. This approach allowed for a "proof-of-concept" to be developed quickly. A more structured approach, such as the waterfall method, may have been effective if the schedule constraint was not

imposed, but would have made evaluation and the subsequent decision to support project Zenith more difficult.

It appears that technology plays a lesser role in this project. Although the use of Java/XML allowed Midwestern Consulting to expand it current technology knowledge base and comfort zone, the real lessons come from the people and processes associated with this project. Technology is only an enabler. People, most noticeably reflected by the culture of the organization, provided not only the capability to complete the project, but also created a base of resistance. All information systems projects are planned organizational change. While technology enables this change, it is the people and processes that tend to have the greatest contribution to the overall project's success or failure.

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