

Determinants of Successful Intranet Implementation: A Comparative Case Study

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Abstract

Innovative Information Technology (IT) is vital to organizations because it can produce tremendous financial benefits and create a competitive advantage in the marketplace. The goal of this paper is to identify importance factors that influence the implementation of one current innovative IT, organizational intranets.

A literature review of innovation and implementation was conducted to identify possible determinants and case studies were used to research organizations in the process of intranet implementation. Two organizations, the Naval Postgraduate School, just beginning an intranet implementation, and Sandia National Laboratories, nationally recognized for its recent successful implementation, were selected as comparative sites. Onsite surveys and interviews were conducted and analyzed. Results of the case studies suggest four critical determinants for successful intranet implementation: a reliable internal network, an open information culture, organizational support and an identifiable champion.

A model that predicates the expected level of successful intranet implementation based on the interaction of these critical factors is presented for future research.

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1. Introduction

What is an intranet? Why is it important? What are the factors that determine its successful implementation? This paper will conduct a literature review to identify potential determinants, chose a methodology to test these factors, analyze the results and determine which factors influence organizational implementation of an intranet.

Information Technology (IT) is a broad discipline that includes the management, creation and distribution of information. System design, creation of applications and the technology required to deliver the information are important components. Innovative IT promises financial savings, increased productivity, and a competitive advantage in the marketplace. However, change is sometimes difficult to achieve. Bringing innovative IT into an organization can be a complex process that often ends in failure. This paper will analyze the introduction of intranets into two organizations. It is hoped that the analysis will provide some suggestions on how any IT can be successfully implemented.

An intranet is an organization's internal computer network. It is normally protected from the Internet by a firewall. The design is based on the client-server architecture, with a Hypertext Transport Protocol (HTTP) server and a web-browser client. The HTTP server delivers static or dynamic web pages. Dynamic web pages allow manipulation of information contained in a Data Base Management System (DBMS.) Web-browsers are platform and operating system independent and are capable of accessing any web-server in the organization.

There are several reasons why intranets are important. The GartnerGroup writes that numerous companies have reported Return on Investment (ROI) of over 1000 percent when implementing an enterprise-wide intranet. Increased accessibility to current information, ability to work off-site, prestige, competitive advantage, reduced maintenance expenses and employee satisfaction are just a few of the other benefits cited. The real value is more than the sum of these things; an intranet leads to a paradigm shift in the way organizational data is viewed; data is recognized as an organizational asset that should be available to all authorized personnel. Through the web-based model, a universal interface is available for all types of organizational computers. For this paper, the definition of a successful intranet is one where any authorized user with a web-browser on an organization's internal network can access and modify enterprise-wide information.

The next section of this paper conducts a literature review of the theory used to analyze innovation and implementation. Section three describes the methodology adopted to gather information. An analysis of the collected data will be discussed in section four, which will result in the identification of the critical determinants. Finally, in section five, a model that depicts the interaction of the critical factors is introduced to stimulate future research.

2. Theoretical Background and Literature Review

Abundant research has been conducted on innovation in organizations. This section reviews some prominent theories and presents a hypothesis of the potential determinants that may affect the acceptance of new technology.

Innovation is a new way of doing things. It is more likely to be successful when the social environment to which an organization belongs has norms that favor change (Mohr 1969.) Personality, attributes, interests and training of top and middle management play an important role in determining the speed that a firm introduces innovation (Kelly 1975.) According to March (1965), innovation may cause changes in structure, changes in actors, and changes in performance or definition of tasks. Hage (1967) states that the organizational structure itself may be a cause of innovation. Time may be an influence (Pettigrew 1989.) Size, profitability of investment and management techniques may be determinants of innovation. Mohr (1982) writes that “Innovation = Motivation times Resources.” He says that an organization must possess and be willing to commit the resources needed to implement a new technology for it to be successful.

Implementation of innovative ideas is an organizational change process (Hoffer et al. 1996) and should be handled like other organizational changes. The culture of the organization should be considered before making any changes because Bergquist (1993) suggests that the character and structure of an organization is determined at its origin and is very difficult to change in any substantial manner. Lewin (1951) created a three-step sequential model for the change process. It involves “unfreezing” the present behavior, “changing” or developing a new behavior and then “refreezing” or reinforcing the new behavior. His force-field diagram suggests that there are multiple forces for change and multiple forces for maintaining the status quo (Stoner & Freeman 1989.) Some forces for change are:

- new technology
- better raw materials
- competition from other groups
- supervisor pressures

Forces that inhibit change are:

- group performance norms
- fear of change
- member complacency
- well-learned skills.

Shein (1987) writes that motivation and readiness to change are essential to unfreezing and that organizational members also need to identify with a champion who is spearheading the change. After these things have been accomplished, new processes can be introduced. Once the new processes are in place, they can be frozen into place as the new accepted way of doing things. Ginzberg (1981b) writes that past implementation literature provides consistent evidence of two important generic factors for implementation success: management support and user involvement. His research produced three additional factors that were important: commitment to the project, commitment to change, and extent of project definition and planning (Ginzberg 1981a.)

Figure 1 provides an initial hypothesis of the important determinants that influence successful implementation of an intranet based on the these writings.

Initial Hypothesis - Determinants of Successful Intranet Implementation

Factors	Author
1. Organizational norms that favor change.	Mohr
2. Personality, attributes, interests, and training of top and middle management.	Kelly
3. Organizational Structure.	Hage
4. Time.	Pettigrew
5. Size, profitability of investment, and management techniques.	Pettigrew
6. Motivation and Resources.	Mohr
7. Character and structure of the organization.	Berquist
8. Motivation and readiness to change.	Shein
9. An identifiable Champion.	Shein
10. Management support and user involvement.	Ginzberg
11. Commitment to the project, commitment to change, and extent of project definition and planning.	Ginzberg
12. For change – New technology, better raw materials, competition from other groups and supervisor pressures.	Lewin
13. Inhibit change – Group performance norms, fear of change, member complacency and well-learned skills.	Lewin

Figure 1

Although a large body of literature on information systems strategy in organizations exists, almost all of this literature is concerned with prescriptive methods and frameworks aimed at aiding management in the formulation of strategy. A much smaller body of work [Kling and Iancono 1984; Orlikowski 1992] concerns how the process of Information Systems (IS) strategy links to implementation (Walsham 1994.) More research dealing with implementation of new technology in organizations is needed.

Previous research has identified several potential factors that influence the implementation of innovation. Examples of these factors include organizational culture, available resources and the motivation to change. These factors provide a good list to start with and will help determine the approach used to conduct the research.

3. Methodology

The initial hypothesis listed in Figure 1 must be tested to discover which of the potential determinates are important, add any new factors that can be identified, and measure the level of intranet implementation achieved with them.

Mohr (1982) writes that if you want to quantify the final result, or show a high degree of correlation between determinants and the result, you are dealing with variance theory.

Variance theory seems a good fit if we can quantify the dependent variable, successful intranet implementation. With successful innovation as the dependent variable, we must develop a model consisting of independent variables that are true efficient causes (Mohr 1982.)

Although intranets are relatively new, there has been a plethora of articles written about them. Since few have been scientifically rigorous, there is little scientific data available for creating theory. I chose to use case studies to research intranet implementation because they provide: the ability to discover new independent variables, the opportunity to test the list of potential factors, and an paradigm to measure intranet implementation success. Case studies typically combine data collection methods such as archives, interviews, questionnaires and observations (Eisenhardt 1989.) Atwell and Rule (1989) suggest that several methods of data collection should be used to adequately address the impact of Information Technology. Pettigrew (1989) recommends going for polar types to exploit “planned opportunism.” This approach produces interesting research as well as an excellent opportunity for comparisons. I chose two sites for the cases studies, one just beginning an intranet implementation and one with a highly successful intranet in place. Observation, archival documentation retrieval, questionnaires and interviews were used for both case studies.

Site Selection and Background

The U.S. Navy’s research university, the Naval Postgraduate School (NPS) <http://www.nps.navy.mil> was chosen to study because it is at the beginning of an intranet implementation. Approximately 1400 masters and Ph.D. students are enrolled in various technical degree-granting programs. Students come from all branches of the United States Military, the Department of Defense, and numerous foreign countries. Additional students participate in courses conducted in international affairs, acquisition programs and aviation safety. There are 1500 full-time staff and faculty. Three thousand computers are connected to the campus computer network.

NPS began its campus network with a mainframe hierarchical DBMS connected to department dumb terminals. As personal computers and workstations proliferated, individual departments created internal networks with different network operating systems. These internal networks connected PCs and workstations with numerous incompatible operating systems and platforms. Because of the ease of data manipulation on PCs, separate databases were created in many departments. This resulted in systems of independent and incompatible databases throughout the campus. Email became a campus-wide asset when departmental networks were connected through an integrated NPS backbone.

In 1995, a major effort was completed to provide TCP/IP to all workstations and PCs connected to the campus network. With TCP/IP, personal computers and workstations were able to connect with the mainframe DBMS through dumb terminal emulation. Incompatible departmental databases still proliferated because of the disparity between information on the departments’ databases and the mainframe DBMS. With TCP/IP, web-browsers became ubiquitous on network-connected PCs and workstations. Computer system administrators began setting up web-servers to provide departmental

information in the form of static web pages first for their own department then for the campus.

Numerous types of web-servers and client databases (i.e. Paradox and Access) came into use. A grassroots effort was initiated to provide general guidance for the authoring and conformity of appearance of these pages. In 1996, tools to provide dynamic web pages were introduced to the campus. Individual departments with motivated system administrators created a few dynamic pages that queried departmental databases. One project, a campus electronic telephone directory that the author helped develop provided an example of dynamic web-based access to enterprise-wide data. No effort has been made to create an interface between the campus mainframe DBMS and the internal network. There is one dedicated programmer for the mainframe DBMS. There is one NPS webmaster responsible for maintaining the NPS Internet homepage, but there is no dedicated internal web page. At present, there are no personnel assigned to intranet implementation. End-user interest in utilizing intranet technology is becoming stronger especially from the students. At present, a major effort is underway to improve the reliability and bandwidth of the internal network.

Sandia National Laboratories (<http://www.sandia.gov>) was chosen as the site for the second case study because it was named as one of the nation's top six intranet sites for its excellence in execution, innovative use of technologies and demonstrated intranet benefits. Sandia is a multi-program national security laboratory operated by Sandia Corporation for the U.S. Department of Energy. It works in partnership with universities and industry to enhance the security, prosperity, and well being of the nation while employing approximately 6,600 technical and administrative employees. Sandia has approximately three times as many clients connected to its network as NPS.

Sandia National Laboratories' internal network had a similar beginning to NPS; it started with a mainframe database that was only accessible through dumb terminals. As technology advanced, a patchwork of networks was created for Macs, PCs, and UNIX workstations. Eventually the individual networks were tied together and TCP/IP connectivity was provided. Web technology was initially introduced to Sandia through individual programmers. Grassroots support for the technology developed, as web-browsers became ubiquitous. Several intranet champions surfaced. The organization decided that a web-based intranet was the most efficient way to proceed with their information needs. An executive level decision was made to provide adequate resources for a full-scale intranet. An on-line organizational electronic telephone book and weekly bulletin were published, departments were encouraged to develop their own web pages and a relational DBMS that acts as a data warehouse was connected to the intranet. A dedicated intranet team of ten members was organized and trained to connect dynamic web pages to the centralized relational DBMS. Currently, a web-walker captures information from every web page in the organization and stores it in the data warehouse. The intranet team maintains the top two levels of the intranet web-page hierarchy. It is estimated that paper savings alone have saved Sandia hundred of thousands of dollars.

Refined List of Potential Determinants

I used Mohr's formula ($I = MXR$) to categorize Figure one's list of possible factors into groups aligned with motivation or resources. The initial list was combined

and reduced by personal observation of the NPS executive board and computing staff, review of archival data from NPS and Sandia (King 1996), and interviews at NPS.

The resulting resource factors were: network capability, IT training, network personnel expertise, executive board expertise, staff expertise, enterprise DBMS, enterprise information sharing, and adequate resources available for the implementation.

The resultant motivational factors were: number of processes that could be improved, ROI of improved processes, grassroots support, departmental support, executive support, identifiable champion, external forces, crisis situation, and a clear implementation strategy.

Data Collection

The list of resource and motivational factors were used to create questionnaires (Appendix A & B) and interview questions (Appendix C & D) used in both organizations. The questionnaires provided quantitative data on each of the remaining factors. The interviews provided individuals an opportunity to expand their opinions from the questionnaires.

NPS questionnaires were completed first and then individual interviews were conducted. The questionnaires and interviews were conducted over a one-month period and were completed in the participant's office. One month after the interviews were completed at NPS, Sandia National Laboratories was visited. Sandia's questionnaires were sent via email prior to the on-site visit and reviewed prior to the interviews. Sandia participants were asked to give their answers in two parts: one before the intranet implementation began and one at the time of the on-site visit. After the individual interviews were completed, a demonstration of Sandia's Intranet was conducted.

Thirteen members of the Naval Postgraduate School and thirteen members from Sandia National Laboratories provided information from the questionnaires and interviews. Naval Postgraduate School members who had knowledge of the network and/or who were decision-makers for network policies were selected for interviews and questionnaires. Network personnel and decision-makers were also targeted for interviews at Sandia.

Measurements

A modified Lictor scale with a range of 1 to 4 was used to measure the quantitative responses. The scaling was defined as 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. NPS members were asked 41 questions about themselves, their individual technical expertise, the network's capability, information sharing, grassroots and executive support, and implementation policies, etc. (Appendix A.) Sandia personnel were given 63 similar questions created to produce longitudinal information about their intranet implementation (Appendix B.)

The following additional scale was created to provide a quantitative measure of the participant's evaluation of the dependent variable, successful intranet implementation:

0 = No Intranet

1 = Departmental Information available via Static Web Pages

- 2 = Enterprise Information available via Static Web Pages
- 3 = Departmental Information available via Dynamic Web Pages
- 4 = Limited Enterprise Information available via Dynamic web pages
- 5 = Enterprise Information available via an Enterprise maintained relational DBMS

Level 0 is an intranet where external access to organizational static information is unrestricted. Level 1 restricts access to the web-servers that provide static departmental information. Level 2 is achieved when web-servers provide static information of interest to more than one department. Level 3 is a more complex design where the web-server provides authorized users a web application interface that is capable of accessing and modifying departmental database information. Level 4 provides users the capability to modify or retrieve limited instances of organizational level data. Level 5 is the most complex situation: enterprise-wide data is identified and defined, web-servers provide users the capability to access and modify data from a centralized or distributed DBMS. Authorized users who own the information update one official copy of the data. Organizational processes can be re-engineered using the accessible enterprise data. Overall, the capability and complexity of an intranet increases when information processing moves from low end processes such as static retrieval to high end processing such as transactional processing.

The SPSS computer statistical package was used to create mean, chi-square and “p” values for the cumulative responses to each question. Chi-square tests compared results with those to be expected on the basis of chance. Higher chi-squared numbers showed greater deviation from chance frequencies. The “p” value (level of statistical significance) was used to determine the degree of chance that the results could have occurred randomly. A “p” value of .005 to .01 is most often considered to be statistically significant. Since there were four possible responses to the questions, the degree of freedom was three.

Reliability and Validity

Questionnaires and interviews were targeted at two organizations that were far apart in their intranet implementation in an effort to increase the validity of the findings. Questionnaires were used to determine each organization’s level of implementation and to identify possible dependent variables. Interviews were conducted to provide an in-depth perspective of the intranet implementation and discover the factors that supported or inhibited its implementation. Random selection of the sample population was not used; individuals were chosen who possessed technical knowledge of the network and were involved at different levels of network decision-making. This sample selection method may have introduced some bias but individuals were selected from different departments and authority levels in an attempt to reduce this effect. Both quantitative and qualitative data was gathered to enhance the reliability of the findings. Multi-year observation and archival information was used to longitudinally compare the two organizations.

In summary - the Naval Postgraduate School and Sandia National Laboratories were used to identify potential determinants for intranet implementation. Participants from both sites were very cooperative. Questionnaires and interviews produced

substantial information needed to evaluate the legitimacy of the potential factors. An analysis of the data collected will be conducted next.

4. Analysis of the Results

Quantitative Results

Quantitative data was collected through questionnaires. Appendix E & F give detailed statistics for each question asked at NPS and Sandia. The questionnaires were broken down into sections that graded the intranet, rated organizational characteristics and gathered general background information about the participants.

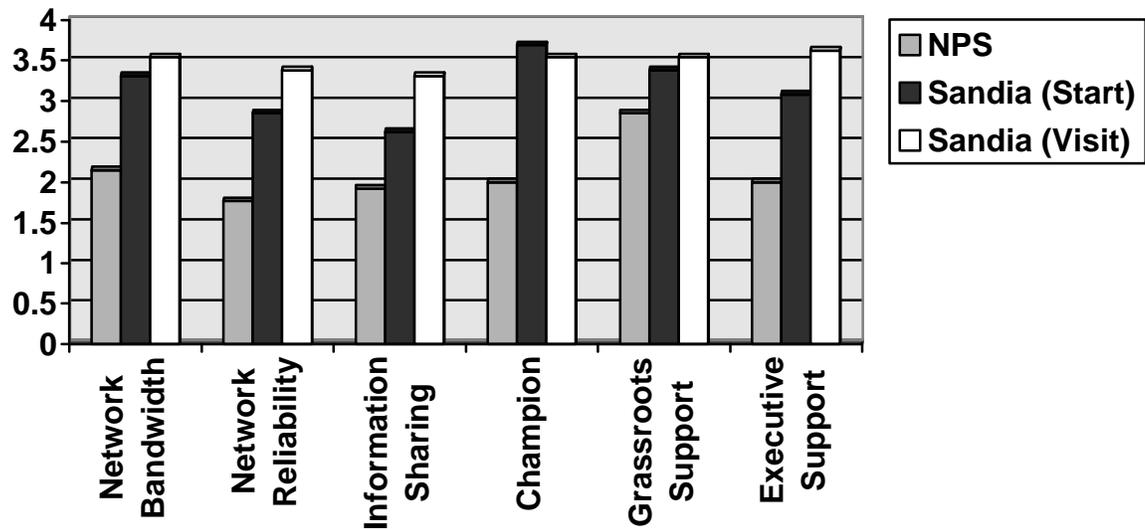
The first section measured the technical expertise of the participants using a Lictor scale of one to four. Both groups scored well, with NPS higher in database knowledge and Sandia higher in web technology.

Intranet implementation levels were then measured. NPS personnel rated their intranet at the departmental and enterprise static web page level (Mean = 1.73, chi-squared = 22.182, $p = .000$) with a few instances of level 4 web page database connections. Most users answered that only static web page information was available from their internal network. This was approximately the same level that Sandia had achieved when they began their organized implementation. At the time of the site visit, Sandia's personnel rated their intranet implementation level very high, at the enterprise relational DBMS level (Mean = 4.92, chi-squared = 42.769, $p = .000$) providing web access to enterprise information to any authorized users.

The next section asked twenty-two questions about the organization. Sandia answered these questions twice, once describing the situation when the intranet implementation began and a second time evaluating the situation during the on-site visit. There were several similarities between NPS' present situation and when Sandia began its implementation. NPS respondents did not believe that adequate resources were allocated for intranet implementation (Mean = 1.69, chi-squared = 16.846, $p = .001$) nor that there was a clear implementation strategy in place (Mean = 1.38, chi-squared = 14.385, $p = .002$.) Sandia reported the same problems at the beginning of implementation but not as negatively. Both groups believe that many enterprise processes can be improved using intranet technology and there are many processes that can return a large ROI. Intranet training and intranet technical expertise were reported as inadequate at both sites. Neither site reported a crisis situation that would cause a change to occur. Significantly, both groups believed that their departments did not adequately share information with other departments. Several of these values have dramatically improved at Sandia.

A graphical comparison of the factors that were markedly different at Sandia and NPS is shown below. The Y-axis values (based on the Lictor scale of 1 to 4) represent the mean score of the user's responses.

User's Evaluation – Is the Factor Adequate?



1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree

Figure 2

Users felt that the NPS network was not adequate, receiving a low bandwidth capability score (2.15) and a very low reliability rating (mean = 1.77, chi-squared = 7.000, $p = .072$.) Sandia's network which was upgraded just prior to the beginning of their intranet implementation had satisfactory bandwidth and reliability scores with the bandwidth receiving a very high rating (mean = 3.31, chi-squared = 10.777, $p = .018$.) The network bandwidth and reliability at Sandia have increased to higher levels. Information sharing between departments was initially low at both sites with Sandia's mean score of 2.62 and NPS's mean score at 1.92 ($p = .034$.) Sandia's departmental information sharing has increased substantially (mean = 3.31, $p = .072$.) Identification of a champion for the intranet implementation was very different. NPS participants stated that there was not an identifiable champions (mean = 2.0, chi-squared = 6.091, $p = .107$), while Sandia replied strongly that there was one with a mean of 3.54 (chi-squared = 11.923, $p = .008$.) Grassroots support was initially fairly good at both sites. Sandia had the higher mean score 3.38 ($p = .018$) while NPS was 2.85. Executive support was perceived to be much higher at Sandia (mean = 3.08) than NPS (mean = 2.0.) and has increased substantially at Sandia to a mean of 3.62.

Qualitative Results

Naval Postgraduate School

Qualitative results were collected through interviews. Interviewees at the Naval Postgraduate School wanted an intranet and identified several important factors needed for its implementation.

First, the internal computer network needed to be upgraded to increase bandwidth and reliability. The participants felt that a capable network was a basic requirement for any application enterprise development; without it, intranet applications would be quickly discarded. Training was needed to educate the users on the benefits that could be achieved with the new technology and would also generate support from the grassroots level. A transition to a climate where departmental data was shared and viewed as an enterprise-wide asset was needed because the departments' different academic missions has led to cultures supporting islands of information.

Identification of an NPS Intranet champion was considered pivotal. No individual stood out as the leader of the transition who would spearhead the effort and secure the necessary resources. There was strong grassroots support for an intranet but the departmental system administrators didn't feel executive level support was high enough to provide the needed resources. Creation of a web-enabled organizational relational DBMS was mentioned often as a needed improvement. The present mainframe DBMS is hierarchical and difficult to interface with the web. Most participants said the organization did not have an environment that fostered change and therefore it would be difficult to actually make the paradigm shift.

There was wide agreement that an intranet could provide great benefits for the organizations at all levels. One interviewee suggested first implementing an intranet at the level of enterprise static web pages where enterprise-wide instructions and information could be authored on web pages, providing some quick savings. High ROI could be achieved without requiring enterprise-wide dynamic data access. This would create a two-step strategy where the first step would be to realize substantial organizational savings with static web pages. Savings would generate increased executive support that could produce the resources needed to advance to the enterprise-wide sharing of information level.

All types of users asked for more enterprise information. Staff personnel requested intranet technology to increase their efficiency and provide access to enterprise information. Students want to learn how to construct and maintain an intranet so that they can build them in their future organizations as well as remain competitive in the field of Information Technology. Professors wanted access to class schedule and student information.

Sandia National Laboratories

Sandia's interviews were very successful, clearly illuminating the chronology of events that led to their highly successful intranet. The satisfaction level for their intranet was high and there was a well-deserved pride evident in those who have taken part in its implementation.

The participants stated that an internal network capable of adequately and reliably transferring data between client and server was the foundation for any intranet implementation. Without this foundation, intranet applications would be unusable.

Another important area that was identified was a culture where information was shared between departments. Because of Sandia's classified mission, there is a built-in requirement that some information be compartmentalized. In the past, this situation contributed to a culture of closed information and one where change was not the norm.

The information culture has changed considerably. Two things happened simultaneously to begin the process: Sandia upgraded the reliability and bandwidth of their computer network and web-browsers became available. A small group of visionaries saw the web's promise. Two information specialists convinced an engineering department to support their research. They dubbed themselves the Engineering Viewing Environment (E.V.E.) team. They developed a few static web pages and then set out to gain grassroots support for web technology. They held training seminars and spoke to whoever would listen. Soon information specialists and users in many departments were champions and started developing departmental static web pages. During this period, the emphasis was on creating a structured, integrated enterprise intranet consisting of static web pages. The E.V.E. team didn't stop there. Next, they worked hard to develop executive level support. With the help of departmental information specialists, they educated executives. They not only explained the concepts, but also demonstrated static and newly invented dynamic web pages. They made their case for an intranet based on increased performance and efficiency, not on ROI.

At this point, another pivotal event occurred. All information and computer specialists, 400 in total, and their budgets from all departments were put under the operational control of a Chief Information Officer (CIO.) The E.V.E. team immediately presented their concept for an intranet to the CIO. He liked the idea and responded with funding and management support.

The CIO also chose to initiate development of an application for time card submission using the classic client/server architecture. The existing mainframe DBMS, IBM's DB2, did not have the client/server capabilities needed, so Sybase, a relational DBMS, was purchased to work as the server. Powerbuilder was used to develop the client applications. With a 100-client test group, the Sybase/Powerbuilder combination worked. However, it proved to be too difficult to deploy and maintain throughout the entire organization because of multiple operating systems and platforms. The CIO then chose to support intranet technology with web-based browsers.

With grassroots support and CIO support in place, a new expanded, 10 member E.V.E (2) team, renamed itself the Enterprise Viewing Environment. The E.V.E. (2) team used Sybase as a data warehouse, retrieving information from the mainframe DBMS periodically and making it available on their Intranet. Development of an enterprise data model was considered at this point but was delayed because of its complexity.

At first, Sybase tables were used only for viewing. Transactional processing such as updating information was done through the mainframe DBMS. Then tables were created on the Sybase DBMS that could be updated from web pages. Batch processing was used to take the Sybase tables and update the mainframe DBMS, DB2. The most recent development is the use of Java scripting to create web page applications that contain organizational business rules and insert this information into the Sybase DBMS.

Future plans call for Java web pages to directly modify information in the mainframe DBMS.

Benefits

The benefits for Sandia have been many. As noted earlier, Sandia has saved hundreds of thousands of dollars in paper alone. Interviewees said organizational information is now more available and there is a much more open dialog for sharing information. Java enhanced web applications are on-line that help users manage how personnel work hours are charged for specialized projects that are often complicated and funded by several accounts. There are business rules included in the Java applications that help ensure the data is correct before it is entered into the DBMS. More applications are in development and they promise even manpower greater savings. Figure 3 graphically depicts the implementation chronology that created these benefits.

Sandia's Implementation Chronology

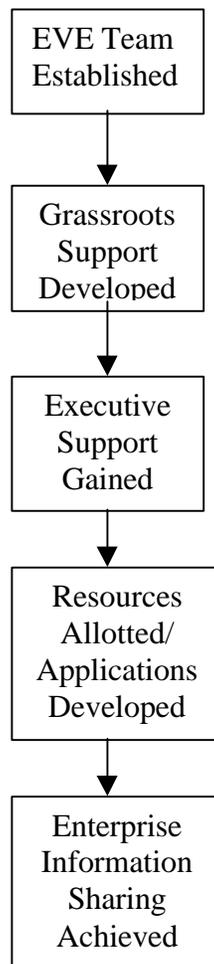


Figure 3

Executive support was needed throughout the development process at Sandia to change the culture to one where enterprise data was more freely accessible. There is still more to be done in this area. Training is conducted for anyone interested in web browser usage, static web page authoring or web page application development. More people have become avid users of their intranet, including the executive board.

The results of the quantitative and qualitative data were in general agreement, showing the same important differences in implementation factors between NPS and Sandia. Even with the small sample, some of the quantitative data collected, shown in Figure 2, proved to be statistically significant. Section fives summarize these differences.

5. Conclusions

The purpose of this paper has been to identify critical determinants that affect the successful implementation of an enterprise-wide web-based intranet. Figure 1 identifies the factors that formed the initial hypothesis. Case studies were used to test these factors at two organizations, the Naval Postgraduate School and Sandia National Laboratories, both at different points in their intranet implementation plans.

Lewin's (1951) three-step sequential model for the change process fit both organizations. According to the participants at NPS, they are frozen in the accepted information culture, waiting for something to unfreeze the present situation. Sandia's interviews pointed to their E.V.E. team as the catalyst that thawed out their organization and ultimately enabled it to move ahead to where the web-based intranet is the new standard.

Mohr's (1982) formula: "Innovation = Motivation times Resources" was used to categorize the determinants. First, the important resources were identified then the motivation factors were discussed.

Interviews at both sites produced unanimous agreement that an internal network capable of adequately and reliably transferring data between client and server is a requirement for any intranet implementation. Without a reliable network, intranet applications would be tested and then dismissed by users. Participants said that the improvements in the network at Sandia worked as a catalyst for the implementation process. In their questionnaires, NPS personnel disagreed with the premise that their network was adequate. Figure 2 clearly shows the differences between Sandia and NPS in these areas: NPS participants felt the network bandwidth and reliability were not sufficient and that information sharing was inadequate. Sandia participants felt these resources were satisfactory.

Another important resource cited in almost every interview was an organizational culture that supported information sharing. The participants felt that an open information culture must be achieved throughout the entire organization to ensure that enterprise information is available to everyone. Without it, an intranet can provide only limited information. NPS, and during the initial implementation, Sandia scored low in this area.

In concert with Ginzberg's (1981a) research factors of commitment to the project and commitment to change, several motivation factors seemed to be required to unfreeze the initial paradigm. The first important factor was implementation support. In interviews at both sites, grassroots and executive support were emphasized as vitally important.

Grassroots support came from users, departmental information specialists and staff. It is a great way to start innovation and is needed to institutionalize the change, but by itself it was not enough; executive support was also needed. Executive support ensured the required resources were made available and was also needed to open up the information architecture, define enterprise-wide information, determine who owned it, who should update it, and where it will should be stored. Figure 2 shows how the participants viewed support for the implementation. At both sites, initial executive support was low and grassroots supports was adequate. At the time of the site visit, Sandia's executive support had improved dramatically.

An identifiable champion is another important motivational factor mentioned frequently. The champion is Ginzberg's ultimate player who is identified as committed to change and specifically to their project. In Sandia's case study, the E.V.E. team was the initial champion that generated grassroots and executive support. When the team became successful in motivating grassroots and executive members, the resources were provided and the culture began to change. At Sandia, the initial champion(s) came from the grassroots level of the organization. They were on the cutting-edge of technology and were able to see the benefits of the paradigm change before the executives were even aware of the technology. At NPS, participants reported that there was no identifiable champion.

With the speed that Information Technology is changing, it is possible that in the present and future the champion may come from the technological departments where the IT is introduced and not the executive branch. This will increase the importance of user involvement in organizational change.

In summary, the determinants found be critical for successful intranet implementation were:

- (1) A reliable, high bandwidth internal network
- (2) An open information culture
- (3) Grassroots and executive support
- (4) An identifiable champion.

6. Future Research

Two case studies were conducted as part of the research for this paper. I believe they produced some interesting results that deserve further study. A model that depicts the results of the interaction between the determinants would also be beneficial.

Additional Case Study

A third case study has been initiated at Sun Microsystems. The following information provides an introductory overview.

Sun's internal network began with a different information culture than Sandia or NPS. Initially, Sun had its corporate data housed on a mainframe with Sun workstations as clients running dumb terminal (3270) emulation. All employees had workstations and access to enterprise data providing an open information culture as part of the original structure. When the client/server architecture evolved, Sun abandoned the mainframe and

used Sun servers to house relational DBMS. One server was used for each database application and Sun workstations were developed as clients maintaining the open information architecture. When the engineering and Information Resource (IR) department personnel stated using web browsers, executive level management resisted their use. A \$50 per workstation surcharge was levied on anyone using Mosaic (the original web browser) because executives felt that too much bandwidth would be used. Ultimately, engineering and IR personnel persisted and were able to gain executive level support. Now all new applications at Sun are web-based using Java technology for client applications. Sun has thousands of web servers and its implementation is rated at the enterprise-wide level by observation and initial interviews.

Initial Model

An initial hypothesis that postulates the expected level of intranet implementation based on the interaction of the identified critical determinates is described below. It is research project that could provide some interesting insights into the level of intranet capability that an organization can expect to attain.

Assumptions

For the purpose of this model, the factors identified earlier in this paper as the key determinants in the successful implementation of an intranet are used: a reliable network with adequate bandwidth, an open information culture, grassroots support, executive support, and a champion.

Hypothesis

The following hypotheses, formulated from observations and statistical data collected from NPS and Sandia, are presented for consideration:

- (1) In a closed information culture, with only grassroots support, intranet implementation will tend to stagnate at the static information level (Figure 4, cell II.)
- (2) In a closed information culture with grassroots and executive support, intranet implementation will have difficulty progressing beyond departmental dynamic information development (Figure 4, cell III.)
- (3) In an open information culture with only grassroots support, intranet implementation will provide limited access to enterprise information (Figure 4, cell I.)
- (4) In an open information culture with grassroots and executive support, intranet implementation can provide enterprise information and transactional processing to anyone on the intranet (Figure 4, cell IV.)

A graphical representation of the hypothesis and corresponding implementation levels is presented below using the previously defined implementation levels:

- 0 = No Intranet
- 1 = Departmental Information available via Static Web Pages
- 2 = Enterprise Information available via Static Web Pages
- 3 = Departmental Information available via Dynamic Web Pages
- 4 = Limited Enterprise Information available via Dynamic web pages
- 5 = Enterprise Information available via an Enterprise maintained relational DBMS

Intranet Implementation Levels

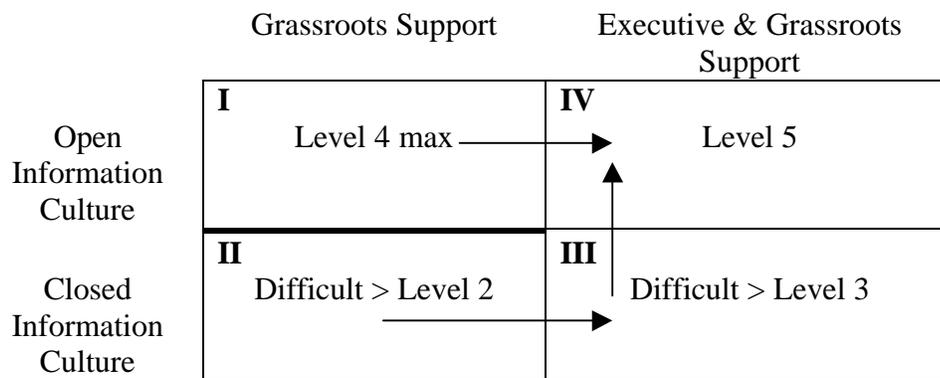


Figure 4

The dark line drawn between cells I and II indicates that a move between these cells, a shift in the information culture with only grassroots support, is difficult to achieve. In a Closed Information Culture, intranet implementation above level 3 is difficult to accomplish even with grassroots and executive support. Executive and grassroots support must be used to change the organizational culture. In an Open Information Culture, enterprise-wide implementation is possible if both grassroots and executive support are present. The history of Sandia's implementation is shown by the arrows as a progression from cell II to cell III to cell IV. Progression from cell I to cell IV is also considered a possibility. The vectors suggest speed and direction of possible implementation paths. Using Lewin's force-field model, we may be able to predict the forces that assist or inhibit the resultant strength of these vectors. Figure 5 is a simple force-field depiction with some potential determinants.

Vector Strength

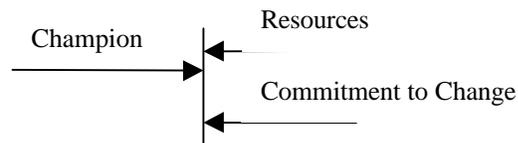


Figure 5

Because the hypothesis developed in this paper is from two case studies and a limited number of interviews, further research that includes an expanded sample base with more organizations and interviewees is needed. Path analysis of successful intranet implementation could be enlightening. A particularly interesting case study would investigate an organization with an Open Information Culture that has successfully implemented an Enterprise-Wide Intranet (i.e. Sun.) If the implementation moved from cell I to cell IV, it would support the theory that an organization with an Open Information Culture could move to an Enterprise-Wide Intranet more easily than one with a Closed Information Culture.

To conclude, I have proposed a model that can be used as a roadmap for intranet implementation. I believe it can be very useful in determining the strategy organizations should use to provide enterprise-wide information to authorized users. Further research is needed to refine the model, investigate other potential determinants, and provide additional support for this approach.

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Appendix A – NPS Questionnaire

Purpose

The questionnaire is part of a research effort to identify factors that contribute to the successful implementation of an enterprise-wide web-based intranet. It is hoped that the results of this study will lead to the formulation of a hypothesis that can be used as a guide for successful intranet implementation.

Please answer all the questions. If you wish to comment on any question or qualify an answer, you may use the margin or a separate sheet of paper. Thank you for your time and cooperation.

Part I

1. Please indicate your expertise or familiarity with the following intranet techniques by checking the response options 1, 2, 3, or 4.

- 1 = Not familiar
- 2 = Vaguely familiar (no expertise)
- 3 = Somewhat familiar (limited expertise)
- 4 = Very familiar (expert)

TECHNIQUES	EXPERTISE			
	1	2	3	4
a. Accessing client databases (i.e. Access, Paradox)				
b. Accessing server DBMS (i.e. Oracle, Sybase, Informix)				
c. Using a web browser (i.e. Netscape or Internet Explorer)				
d. Authoring Static Web pages				
e. Authoring Dynamic Web Pages (i.e. web pages linked to databases)				
f. Managing a Web server				

2. When was the intranet model introduced to NPS? _____

3. In your opinion, what is the level of intranet implementation at NPS? (Check one only)

- 0 = No Intranet ()
- 1 = Departmental Static Web Pages ()
- 2 = Enterprise-Wide Static Web Pages ()
- 3 = Departmental Dynamic Web Pages ()
- 4 = Enterprise-Wide Access to Enterprise Data ()

Part II

4. Please answer the following questions about your organization by checking the number that best describes the level you agree with the following statements.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Agree
- 4 = Strongly Agree

Organizational Characteristics	LEVEL			
	1	2	3	4
a. Network bandwidth is adequate				
b. Network reliability is adequate				
c. Network accessibility is adequate				
d. Intranet Technology Training is adequate				
e. Intranet Expertise of Network personnel is adequate				
f. There are many enterprise processes that could be improved using an enterprise-wide Intranet				
g. There are processes that could be improved using an Intranet that would provide a large ROI (Return on Investment)				
h. There is excellent grassroots Intranet technical expertise				
i. There is strong grassroots support for Intranet implementation				
j. There is strong departmental support for an Intranet				
k. There is strong executive support for Intranet Implementation				
l. There is an Intranet implementation champion				
m. The executive board has the technical expertise to make Information Technology decisions				
n. The organizational technical staff has the technical expertise to implement an Intranet				
o. Departments share information within their departments				
p. Departments share their information with other departments				
q. There is an enterprise-wide database management system in-place				
r. The enterprise-wide DBMS is Intranet capable				
s. There are external forces that are pushing the organization toward Intranet implementation				
t. There is a crisis situation that is forcing Intranet implementation				
u. There are adequate resources allocated for Intranet implementation				
v. There is a clear Intranet implementation strategy				

Part III

5. Your position/Title: _____ Organization _____

Department _____

6. What classification best describes your position?

- a. Faculty
- b. Staff
- c. Student

7. How long have you been in this organization?

- a. 0 – 2 Years
- b. 3 – 5 Years
- c. 6 – 10 Years
- d. 11 – 15 Years
- e. 16 – 20 Years
- f. 21 Years or more

8. Number of years in current position: ()

9. What is the highest degree you have obtained?

Bachelor () Master () Doctorate () Other ()

10. When you first introduced to web technology? (i.e. web browsers) _____

11. When were you first introduced to the intranet model? _____

12. Have you received any formal training in intranet technology? Yes () No ()

13. Would you like to receive (additional) intranet training? Yes () No ()

14. List any additional factors that you think may affect the implementation of an intranet.

Date Completed _____ Name _____

Appendix B – Sandia Questionnaire

Purpose

The questionnaire is part of a research effort to identify factors that contribute to the successful implementation of an enterprise-wide web-based intranet. It is hoped that the results of this study will lead to the formulation of a hypothesis that can be used as a guide for successful intranet implementation.

Please answer all the questions. If you wish to comment on any question or qualify an answer, you may use the margin or a separate sheet of paper. Thank you for your time and cooperation.

Part I

1. Please indicate your expertise or familiarity with the following intranet techniques by checking the response options 1, 2, 3, or 4.

- 1 = Not familiar
- 2 = Vaguely familiar (no expertise)
- 3 = Somewhat familiar (limited expertise)
- 4 = Very familiar (expert)

TECHNIQUES	EXPERTISE			
	1	2	3	4
a. Accessing client databases (i.e. Access, Paradox)				
b. Accessing server DBMS (i.e. Oracle, Sybase, Informix)				
c. Using a web browser (i.e. Netscape or Internet Explorer)				
d. Authoring Static Web pages				
e. Authoring Dynamic Web Pages (i.e. web pages linked to databases)				
f. Managing a Web server				

2. When was the intranet model introduced to Sandia? _____

3. When was intranet implementation begun? _____

4. In your opinion, what is the general level of intranet implementation at Sandia?
(Check one only)

- 0 = No Intranet ()
- 1 = Departmental Static Web Pages ()
- 2 = Enterprise-Wide Static Web Pages ()
- 3 = Departmental Dynamic Web Pages ()
- 4 = Limited Enterprise Info available via Dynamic Web Pages ()
- 5 = Enterprise Information available via an Enterprise relational DBMS ()

Part II

5. Please answer the following questions as of when the intranet implementation began at Sandia. Check the number that best describes the level at which you agree with the following statements.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Agree
- 4 = Strongly Agree

Organizational Characteristics	LEVEL			
	1	2	3	4
a. Network bandwidth was adequate				
b. Network reliability was adequate				
c. Network accessibility was adequate				
d. Intranet Technology Training was adequate				
e. Intranet Expertise of Network personnel was adequate				
f. There were many enterprise processes that could have been improved using an enterprise-wide Intranet				
g. There were processes that could have been improved using an Intranet that promised large ROI (Return on Investment)				
h. There was excellent grassroots Intranet technical expertise				
i. There was strong grassroots support for Intranet implementation				
j. There was strong departmental support for an Intranet				
k. There was strong executive support for Intranet Implementation				
l. There was an Intranet implementation champion				
m. The executive board had the technical expertise to make Information Technology decisions				
n. The organizational technical staff had the technical expertise to implement an Intranet				
o. Departments shared information within their departments				
p. Departments shared their information with other departments				
q. There was an enterprise-wide database management system in-place				
r. The enterprise-wide DBMS was Intranet capable				
s. There were external forces pushing the organization toward Intranet implementation				
t. There was a crisis situation forcing Intranet implementation				
u. There were adequate resources allocated for Intranet implementation				
v. There was a clear Intranet implementation strategy				

6. Please answer the following questions about the current situation at Sandia by checking the number that best describes the level you agree with the following statements.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Agree
- 4 = Strongly Agree

Organizational Characteristics	LEVEL			
	1	2	3	4
a. Network bandwidth is adequate				
b. Network reliability is adequate				
c. Network accessibility is adequate				
d. Intranet Technology Training is adequate				
e. Intranet Expertise of Network personnel is adequate				
f. There are many enterprise processes that could be improved using an enterprise-wide Intranet				
g. There are processes that could be improved using an Intranet that would provide a large ROI (Return on Investment)				
h. There is excellent grassroots Intranet technical expertise				
i. There is strong grassroots support for Intranet implementation				
j. There is strong departmental support for an Intranet				
k. There is strong executive support for Intranet Implementation				
l. There is an Intranet implementation champion				
m. The executive board has the technical expertise to make Information Technology decisions				
n. The organizational technical staff has the technical expertise to implement an Intranet				
o. Departments share information within their departments				
p. Departments share their information with other departments				
q. There is an enterprise-wide database management system in-place				
r. The enterprise-wide DBMS is Intranet capable				
s. There are external forces that are pushing the organization toward even greater Intranet implementation				
t. There is a crisis situation that is forcing even more Intranet implementation				
u. There are adequate resources allocated for Intranet maintenance				
v. There are clear Intranet standardization policies				

Part III

7. Your position/Title: _____ Department _____

8. How long have you been in this organization?

- a. 0 – 2 Years ()
- b. 3 – 5 Years ()
- c. 6 – 10 Years ()
- d. 11 – 15 Years ()
- e. 16 – 20 Years ()
- f. 21 Years or more ()

9. Number of years in current position: ()

10. When you first introduced to web technology? (i.e. web browsers) _____

11. When were you first introduced to the intranet model? _____

12. Have you received any formal training in intranet technology? Yes () No ()

13. Would you like to receive (additional) intranet training? Yes () No ()

14. List any additional factors that you think may affect the implementation of an intranet.

Date Completed _____ Name _____

Appendix C – NPS Interview Questions

The purpose of this interview is to document your opinion of the important factors required for successfully implementing an enterprise-wide web-based intranet. A paper will result that will include case studies of two sites, NPS and Sandia National Laboratories.

1. Do you think it is in the best interests of NPS to implement an enterprise-wide intranet? Why?
2. Do you think the culture at NPS is one of enterprise-wide information sharing or departmental “Islands of Information”? If Islands of Information, how could the culture be changed?
3. Should we have a centralized DBMS warehouse connected to the intranet?
4. Does NPS have the motivation and resources to implement an intranet?
5. Do you think NPS has adequate grassroots support to implement one?
6. Do you think grassroots support by itself is enough to ensure that an intranet gets built?
7. Do you think NPS has adequate executive support to implement one?
8. Do you think executive support by itself is enough to ensure that an intranet gets built?
9. Do you think NPS will develop an enterprise-wide web-based intranet? Why?
10. What are the greatest hurdles to developing an enterprise-wide web-based intranet NPS?
11. What are the biggest assets at NPS for developing an enterprise-wide web-based intranet?
12. What would your implementation strategy be?
13. Do you think we should target an intermediate level solution instead of the ultimate goal of enterprise-wide data availability?

Appendix D – Sandia Interview Questions

The purpose of this interview is to document your opinion of the important factors required for successfully implementing an enterprise-wide web-based intranet. A paper will result that will include case studies of two sites, NPS and Sandia National Laboratories.

1. Has it been in the best interests of Sandia to implement an enterprise-wide intranet? Why?
2. Do you think the culture at Sandia at the beginning of the intranet implementation was one of enterprise-wide information sharing or departmental “Islands of Information”? If Islands of Information was the culture changed?
3. Did you have a centralized DBMS when you began the intranet implementation? If you had one, was it hierarchical or relational?
4. Do you now have a centralized DBMS connected to the intranet? Does it act as a data warehouse?
5. Do you think a centralized relational DBMS is required for a successful Enterprise-wide intranet implementation?
6. Did you have adequate grassroots support during your intranet implementation?
7. Do you think grassroots support by itself is enough to ensure that an intranet gets built?
8. Did you have adequate executive support during your Intranet implementation?
9. Do you think executive support by itself is enough to ensure that an intranet gets built?
10. Did you have an intranet champion during the implementation? If so, what were the benefits?
11. What were your greatest hurdles in developing an enterprise-wide web-based intranet?
12. What were your biggest assets in developing an enterprise-wide web-based intranet?
13. Do you think targeting an intermediate level solution (i.e. enterprise static web pages) instead of the ultimate goal of enterprise-wide data availability Is a good one?
14. What do you think is an optimum intranet implementation strategy?

Appendix E – NPS Questionnaire Statistical Summary

1. Please indicate your expertise or familiarity with the following intranet techniques by checking the response options 1, 2, 3, or 4.

- 1 = Not familiar
- 2 = Vaguely familiar (no expertise)
- 3 = Somewhat familiar (limited expertise)
- 4 = Very familiar (expert)

TECHNIQUES	EXPERTISE				
	Mean	df	Chi-squared	p	N
a. Accessing client databases (i.e. Access, Paradox)	3.69	3	19.308	.000	13
b. Accessing server DBMS (i.e. Oracle, Sybase, Informix)	3.15	3	5.154	.161	13
c. Using a web browser (i.e. Netscape or Internet Explorer)	3.69	3	16.846	.001	13
d. Authoring Static Web pages	3.38	3	8.231	.041	13
e. Authoring Dynamic Web Pages (i.e. web pages linked to databases)	2.77	3	.846	.838	13
f. Managing a Web server	2.38	3	1.462	.691	13

2. In your opinion, what is the level of intranet implementation at NPS? (Check one only)

- 0 = No Intranet ()
- 1 = Departmental Static Web Pages ()
- 2 = Enterprise-Wide Static Web Pages ()
- 3 = Departmental Dynamic Web Pages ()
- 4 = Enterprise-Wide Access to Enterprise Data ()

	Mean	df	Chi-squared	p	N
Intranet Implementation Level	1.73	4	22.182	.000	11

3. Please answer the following questions about your organization by checking the number that best describes the level you agree with the following statements.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Agree
- 4 = Strongly Agree

Organizational Characteristics	Mean	df	Chi-squared	p	N
a. Network bandwidth is adequate	2.15	3	3.923	.270	13
b. Network reliability is adequate	1.77	3	7.000	.072	13
c. Network accessibility is adequate	2.33	3	3.333	.343	12
d. Intranet Technology Training is adequate	1.69	3	7.000	.073	13
e. Intranet Expertise of Network personnel is adequate	1.62	3	8.231	.041	13
f. There are many enterprise processes that could be improved using an enterprise-wide Intranet	3.77	3	20.538	.000	13
g. There are processes that could be improved using an Intranet that would provide a large ROI (Return on Investment)	3.54	3	13.154	.004	13
h. There is excellent grassroots Intranet technical expertise	2.62	3	.846	.838	13
i. There is strong grassroots support for Intranet implementation	2.85	3	3.923	.270	13
j. There is strong departmental support for an Intranet	2.77	3	6.385	.094	13
k. There is strong executive support for Intranet Implementation	2.00	3	4.538	.209	13
l. There is an Intranet implementation champion	2.00	3	6.091	.107	11
m. The executive board has the technical expertise to make Information Technology decisions	1.62	3	9.462	.024	13
n. The organizational technical staff has the technical expertise to implement an Intranet	2.23	3	6.385	.094	13
o. Departments share information within their departments	2.92	3	6.385	.094	13
p. Departments share their information with other departments	1.92	3	8.667	.034	12
q. There is an enterprise-wide database management system in-place	2.46	3	14.385	.002	13
r. The enterprise-wide DBMS is Intranet capable	2.75	3	4.667	.198	12
s. There are external forces that are pushing the organization toward Intranet implementation	3.00	3	14.385	.002	13
t. There is a crisis situation that is forcing Intranet implementation	2.15	3	25.462	.000	13
u. There are adequate resources allocated for Intranet implementation	1.69	3	16.846	.001	13
v. There is a clear Intranet implementation strategy	1.38	3	14.385	.002	13

Appendix F – Sandia Questionnaire Statistical Summary

1. Please indicate your expertise or familiarity with the following intranet techniques by checking the response options 1, 2, 3, or 4.

- 1 = Not familiar
- 2 = Vaguely familiar (no expertise)
- 3 = Somewhat familiar (limited expertise)
- 4 = Very familiar (expert)

TECHNIQUES	EXPERTISE				
	Mean	df	Chi-squared	p	N
a. Accessing client databases (i.e. Access, Paradox)	2.31	3	4.538	.209	13
b. Accessing server DBMS (i.e. Oracle, Sybase, Informix)	2.85	3	3.923	.270	13
c. Using a web browser (i.e. Netscape or Internet Explorer)	4.00	3	39.000	.000	13
d. Authoring Static Web pages	4.00	3	39.000	.000	13
e. Authoring Dynamic Web Pages (i.e. web pages linked to databases)	2.92	3	2.692	.442	13
f. Managing a Web server	2.50	3	6.667	.083	12

2. In your opinion, what is the general level of intranet implementation at Sandia?
(Check one only)

- 0 = No Intranet ()
- 1 = Departmental Static Web Pages ()
- 2 = Enterprise-Wide Static Web Pages ()
- 3 = Departmental Dynamic Web Pages ()
- 4 = Limited Enterprise Information available via Dynamic Web Pages ()
- 5 = Enterprise Information available via an Enterprise relational DBMS ()

	Mean	df	Chi-squared	p	N
Intranet Implementation Level	4.92	5	42.769	.000	13

3. Please answer the following questions as of when the intranet implementation began at Sandia. Check the number that best describes the level you agree with the following statements.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Agree
- 4 = Strongly Agree

Organizational Characteristics	Mean	df	Chi-squared	p	N
a. Network bandwidth is adequate	3.31	3	10.077	.018	13
b. Network reliability is adequate	2.85	3	2.077	.557	13
c. Network accessibility is adequate	2.62	3	14.385	.002	13
d. Intranet Technology Training is adequate	2.46	3	4.538	.209	13
e. Intranet Expertise of Network personnel is adequate	2.92	3	10.692	.014	13
f. There are many enterprise processes that could be improved using an enterprise-wide Intranet	3.62	3	15.000	.002	13
g. There are processes that could be improved using an Intranet that would provide a large ROI (Return on Investment)	3.58	3	12.667	.005	12
h. There is excellent grassroots Intranet technical expertise	3.23	3	8.23	.041	13
i. There is strong grassroots support for Intranet implementation	3.38	3	10.077	.018	13
j. There is strong departmental support for an Intranet	2.85	3	15.000	.002	13
k. There is strong executive support for Intranet Implementation	3.08	3	7.615	.055	13
l. There is an Intranet implementation champion	3.69	3	19.308	.000	13
m. The executive board has the technical expertise to make Information Technology decisions	2.15	3	8.231	.041	13
n. The organizational technical staff has the technical expertise to implement an Intranet	3.62	3	14.385	.002	13
o. Departments share information within their departments	3.15	3	15.000	.002	13
p. Departments share their information with other departments	2.62	3	7.615	.055	13
q. There is an enterprise-wide database management system in-place	3.00	3	7.615	.055	13
r. The enterprise-wide DBMS is Intranet capable	2.51	3	6.385	.094	13
s. There are external forces that are pushing the organization toward Intranet implementation	2.23	3	2.692	.442	13
t. There is a crisis situation that is forcing Intranet implementation	1.92	3	10.692	.014	13
u. There are adequate resources allocated for Intranet implementation	2.85	3	15.000	.002	13
v. There is a clear Intranet implementation strategy	2.85	3	18.692	.000	13

4. Please answer the following questions about the current situation at Sandia by checking the number that best describes the level you agree with the following statements.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Agree
- 4 = Strongly Agree

Organizational Characteristics	Mean	df	Chi-squared	p	N
a. Network bandwidth is adequate	3.54	3	13.154	.004	13
b. Network reliability is adequate	3.38	3	8.231	.041	13
c. Network accessibility is adequate	3.31	3	16.846	.001	13
d. Intranet Technology Training is adequate	3.25	3	6.000	.112	12
e. Intranet Expertise of Network personnel is adequate	3.62	3	14.385	.002	13
f. There are many enterprise processes that could be improved using an enterprise-wide Intranet	3.62	3	14.385	.002	13
g. There are processes that could be improved using an Intranet that would provide a large ROI (Return on Investment)	3.46	3	10.692	.014	13
h. There is excellent grassroots Intranet technical expertise	3.54	3	11.923	.008	13
i. There is strong grassroots support for Intranet implementation	3.77	3	20.538	.000	13
j. There is strong departmental support for an Intranet	3.54	3	13.154	.004	13
k. There is strong executive support for Intranet Implementation	3.62	3	14.385	.002	13
l. There is an Intranet implementation champion	3.54	3	11.923	.008	13
m. The executive board has the technical expertise to make Information Technology decisions	2.69	3	10.077	.018	13
n. The organizational technical staff has the technical expertise to implement an Intranet	3.69	3	16.846	.001	13
o. Departments share information within their departments	3.46	3	13.154	.004	13
p. Departments share their information with other departments	3.31	3	7.000	.072	13
q. There is an enterprise-wide database management system in-place	3.58	3	12.667	.005	12
r. The enterprise-wide DBMS is Intranet capable	3.50	3	10.000	.019	12
s. There are external forces that are pushing the organization toward Intranet implementation	3.15	3	8.231	.041	13
t. There is a crisis situation that is forcing Intranet implementation	2.23	3	6.385	.094	13
u. There are adequate resources allocated for Intranet maintenance	2.31	3	10.077	.018	13
v. There is a clear Intranet standardization policies	2.46	3	13.154	.004	13