

NAVAL POSTGRADUATE SCHOOL Monterey, California



THESIS

**COLLABORATIVE PLANNING SOLUTIONS: USING
USMC STANDARD COLLABORATION TOOLS TO
ASSIST WITH MISSION PLANNING AND EXECUTION**

by

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September 2001

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EXECUTION**


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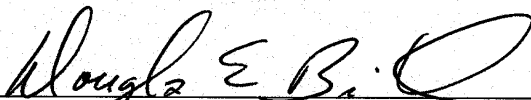
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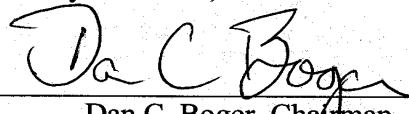
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ABSTRACT

This study provides a baseline on collaborative solutions and tools. This thesis examines the current collaborative applications used within the United States Marine Corps (USMC). It demonstrates the strengths and weaknesses inherent to the current collaborative tool set used within the USMC. Additionally, this research examines how collaborative applications can effectively enhance information sharing during mission planning and execution, as well as increase productivity. A key to efficient planning and execution today is to find a seamless application that is standard throughout the entire Marine Corps and that is easy for the users to embrace. Findings indicate that collaborative tools can be highly effective if properly applied to the correct process. Recommendations for the future include finding a Web-based, data-driven application such as Microsoft Sharepoint Portal Server 2001. It combines the ability to easily create corporate Web portals with document management, enterprise content indexing, and team collaboration features.

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EXECUTIVE SUMMARY

Collaboration tools began to emerge in the early 1990's when faster PCs, increased network and communications bandwidth, and more capable digital video components brought such capabilities into the realm of possibility and affordability. Collaboration tools come in many forms, from simple to sophisticated applications.

Collaboration technologies enable individuals and groups to communicate and work together in asynchronous and synchronous settings, ranging from formal meetings to informal interactions. These are necessary to enable distributed briefings, collaborative planning, analysis, and mission execution. When used effectively, these tools provide the ability for planners to share information in a wide variety of formats, in real-time with their counterparts on ashore or even aboard ships.

In recent years, the Marine Corps and the Department of Defense (DoD) have adapted and fielded an extensive standard set of tools useful for collaborative development. Identification of these tools and their capabilities is essential to choosing the correct tool for the job and mission at hand. The goal of developing a collaborative system is that it meets the need of the unit's planning and execution process. These robust applications offer functionality for the Marine Corps Planning Process (MCP) but are not being fully utilized since many organizations have a limited understanding of collaborative applications and the process at hand.

This thesis seeks to provide some insight into the effectiveness of collaborative applications during the planning process. Questionnaires were collected and interviews were conducted at a yearly Marine Expeditionary Force Exercise (MEFEX) to identify how the Marine Corps currently views collaborative tools and to investigate alternative applications and processes.

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I. INTRODUCTION

A. PROBLEM OVERVIEW

To be effective, a collaborative solution must be authoritative, organically maintainable, portable, meet the needs of the unit, and facilitate information retrieval at all levels. Today's collaborative solutions offer affordability and functionality, but they are not fully used within DOD because many organizations have a limited understanding of the usage and added value of collaborative applications. (MITRE, 2000)

Collaboration technologies enable individuals and groups to communicate and work together in asynchronous and synchronous settings, ranging from formal meetings to informal interactions. These are necessary to enable distributed briefings, collaborative planning, analysis, and mission execution. At their full capacity, collaborative solutions simplify the decision cycle time, which directly effects mission planning and execution. Collaborative systems that are fielded within an operation environment streamline the decision cycle time and improve decision quality, while maintaining functionality as well as increasing overall productivity. When used effectively, these tools provide the ability for planners to share information in a wide variety of formats, in real-time with their counterparts on ashore or even aboard ship.

B. OBJECTIVE

This study will provide a baseline of knowledge in collaborative solutions and tools. It will demonstrate the strengths and weaknesses inherent to the collaborative tools currently used within the United States Marine Corps (USMC). Additionally, this research will examine how collaborative applications can effectively enhance information sharing during mission planning and execution, as well as increasing productivity.

The research and surveys for this thesis were designed to collect data to address the following research questions.

- What is collaborative computing?
- What are the collaborative tools currently used within the USMC?
- Do collaborative tools enhance or interfere with the Marine Corps planning process (MCP)?
- Will users easily embrace collaborative technologies?

- What features are important within a collaborative application?
- How do the current standard collaborative tools compare to other collaborative technologies on the market?
- How can the results from this thesis be applied to the USMC planning process?

C. METHODOLOGY

The methodology used to produce this thesis included the following tasks:

- Conduct a subject matter search of books, periodicals, knowledge bases, and other library information services describing collaborative technologies and current collaborative tools.
- Conduct a review of the decision-making process and decision-cycle used with the USMC.
- Analyze collaborative tools currently used within the USMC Fleet Marine Force (FMF) and assess the effectiveness of their application.
- Analyze other competitive collaborative applications available on the market.
- Analyze the effectiveness of collaborative tools in mission planning and execution during an active Marine Corps exercise. Specifically during Marine Expeditionary Exercise (MEFEX) 2001.
- Consult with the Marine Air Ground Task Force (MAGTF) Staff Training Program (MSTP) on current collaborative developments and their current use in the Marine Corps Planning Process.

D. THESIS ORGANIZATION

This thesis is comprised of five chapters. This chapter provides the problem overview, objective, and methodology employed to conduct the research on collaborative solutions. Chapter II provides a review of how the world currently collaborates. It also defines collaboration, discusses the various twists on collaborating, and introduces some pitfalls associated with collaborative applications. Chapter III presents a background on the Marine Corps Planning Process (MCP) and the current tools used for collaboration, and also introduces a collaborative maturity model that can be helpful for collaborative computing. An USMC case study methodology is covered in Chapter IV. Chapter V reviews the findings involved with the case study. Chapter VI provides conclusions and recommendations for future collaborative work.

II. LITERATURE REVIEW: HOW DOES THE WORLD COLLABORATE?

A typical Marine Corps scenario would read as follows: You are acting as the third Marine Expeditionary Force (MEF) action officer and have a meeting with three other action officers. One officer represents Two MEF (East Coast) and the other participants from One MEF (West Coast). The topic is to discuss the planning order for an upcoming joint exercise. The operation order needed revision so everyone collaborated together on the whiteboard until there was agreement on the final operations (OP) order. Action items were assigned, and the meeting was adjourned. Sounds like an ordinary military meeting, right? Only, the action officers never left their desk; and none of the participants were in the same location. Instead, all of the action officers met in a private online virtual room using Web-based conferencing tools. In the process, the Marine Corps was able to save \$5,000 - \$10,000 in temporary active duty (TAD) expenses.

Today, many corporations, including DoD organizations are using various Web-based applications for situations as described in the above scenario. Web-based conferencing is just one of the many types of collaboration tools available in a rapidly expanding market. (Agnew, 2000)

How do we know if we are behind in collaboration technologies? Even if ones' experience with collaboration software is limited to e-mail and sharing calendars online, they are ahead of the average organization according to Marion Agnew. (2000) Collaborative Strategies Inc., a consulting company specializing in the collaboration tools market, estimates that fewer than a third of people with software such as Lotus Notes or Microsoft Outlook on their desktop, use the calendar or scheduling functions collaboratively. Options for collaboration software beyond e-mail has grown exponentially. More people are using collaborative features within their software, but many still use paper calendars. (Agnew, 2000)

Today, more than 1,000 software packages offer collaboration functions. (Agnew, 2000) This chapter will discuss what collaboration is, the movement toward

collaborative solutions, various twists on collaboration, and the pitfalls associated with collaborative applications.

A. WHAT IS COLLABORATION?

Webster's Third New International Dictionary defines collaboration as "to work jointly, especially with one or a limited number of others in a project involving composition or research to be jointly accredited."

Collaboration is about working together and sharing information with each other. (Yen, 2000) Yen believes the value of collaboration and its potential contributions include increasing productivity, reducing costs, growing profits, and improving service and product quality. A collaborative environment facilitates workgroup computing, optimizes productivity, and fosters innovation by allowing users to share ideas and applications remotely. Organizations implement collaborative computing to expedite research and development, support business decision-making, and improve competitive positioning. (White paper, 2000)

Web-based collaboration technology allows different team members to work together by using a centrally located repository for all project-related correspondence. (Burchard, 2000) Burchard explains that no matter where your team members are scattered throughout the world, they can work together using Web-based project collaboration. Keeping up with the pace of technology can be a difficult challenge. Just when you get a handle on one tool, new and improved technologies emerge, forcing us to consider whether to incorporate them into our current procedures. Another new Web-based technology may seem like an intriguing topic to file away for future reading or ignore altogether as unnecessary "bells & whistles." But the fact is we will be using the Internet to collaborate on projects whether we want to or not. More importantly, we will find that business survival will almost depend on it. (Burchard, 2000)

Today, collaboration applications come in many forms, ranging from simple Web-based instant messaging tools, to full-blown solutions that support virtual shared workspaces. (Biggs, 1999) Collaborative technologies are typically categorized along two primary dimensions:

- Whether users of the group are working together at the same time ("real-time" or "synchronous" groupware) or different times (asynchronous groupware), and
- Whether users are working together in the same place ("collocated" or "face-to-face") or in different places ("non-collocated" or "distance"). (Brink, 1998)

	Same Time "synchronous"	Different time "asynchronous"
Same place "collocated"	Voting, presentation support	Shared computer
Different Place "distance"	Videophones, chat	Email, workflow

Table 1. Collaborative Categories.

Standard collaborative computing can be categorized in the following functional components.

- Text chat
Text chat is a method by which two or more people can converse in real time by typing comments on their computers, which are connected via a network. Each person sees the comments typed by the other conversation participants. What you type is what they see. Conversations can be held between two people or up to several hundred people. The following list provides the current text chat tools available. (MITRE, 2001)

Text Chat	
<u>AOL Instant Messenger</u>	<u>MindAlign</u>
<u>Gale Messaging System</u>	<u>MSN Messenger 1.0 ICQ</u>
<u>ichat Rooms</u>	<u>Netlert</u>
<u>Jabber</u>	<u>Tribal Voice Pow Wow</u>
<u>General Dynamics Info Workspace Launch Pad</u>	<u>Volano Chat</u>
<u>Mirabilis ICQ</u>	<u>Worlds 3D Chat</u>
<u>Microsoft Chat</u>	<u>Zircon IRC Chat</u>
<u>mIRC</u>	<u>Yahoo Messenger</u>

Table 2. Text Chat Applications.

- **On-line whiteboard**
 Conference rooms usually have a whiteboard or blackboard present for use during meetings to draw diagrams or charts, list issues, or record action items. Electronic whiteboards carry this same concept to your computer screen and across the network. A picture is displayed as a backup and each participant in the session uses a uniquely colored marker to gesture, point, or type text on top of the picture. The displayed pictures can be maps, charts, imagery, still video, or briefing slides that are imported or captured from another applications and pasted or snapped into the whiteboard area. Completed whiteboards with annotations can be exported and saved for later references by any of the participants. (Duncan, 1998)
- **Audio conferencing**
 Audio conferencing has traditionally been conducted using a telephone system for performing person-to-person calls or conference calls greater than two people. Audio conferences can be performed across networks with the addition of a microphone, speakers, and a compression-decompression algorithm to a personal computer. (Duncan, 1998)
- **Video conferencing**
 Desktop video is the next best thing to being there. No longer confined to the room-based equipment of the 1980's, video is available on your workstation and is almost as easy as using the telephone. Video conferencing enables face-to-face interactions with people geographically dispersed without the expense, waste of time, and inconvenience of traveling. There are two types of video: streaming and real time. Streaming video is prerecorded video that is stored on servers, which is played when requested by a user, such as a movie or jpeg file. Real time video is where a video source is created while watched, such as video

conferencing. The following list provides the current audio/video conferencing tools available. (MITRE, 2001)

Audio/Video Conferencing	
<u>Intel Proshare</u>	<u>Speak Freely</u>
<u>MASH multicast-based collaborative applications</u>	<u>Sun Microsystems ShowMe</u>
<u>MBONE Lawrence Berkeley National Lab Vat</u>	<u>VocalTec Internet Phone</u>
<u>MBONE Lawrence Berkeley National Lab Vic</u>	<u>VTEL Video Conferencing System</u>
<u>Microsoft NetMeeting</u>	<u>White Pines Cu-SeeMe Conferencing</u>

Table 3. Audio/Video Conferencing Applications.

- Collaborative e-commerce

Collaborative commerce is the use of an online business-to-business exchange to facilitate the flow of information rather than to process transactions. Business partners can exchange information such as inventory data by using a Web server as an intermediary. In many cases, collaborative commerce simplifies data interchange by eliminating the need for special client software at each customer's site. Vendors in this market utilize Web call-back systems, live text chat, voice over IP (VOIP), and e-mail response management features to supply prospects and customers with critical information for more informed buying decisions. (Alexander, 2000)

1. Application Capabilities

In addition to the above collaborative categories, the following is a compiled list of key capabilities and tools available within collaborative applications:

a. Document Sharing

Document sharing allows users to post documents, such as Excel Spreadsheets, Word documents, graphics or text files and making them available to other users. This may be accomplished via shared network drives, e-mail, Microsoft Exchange public folders or Websites. This allows simultaneous, multiple access to documents and information. (MSTP, 2000)

b. Collaborative Authoring

Collaborative authoring allows several authors to work together to produce a single document, such as an operations order. Sharing of documents with

revisions made in edit mode, and the uses of electronic binders are examples of collaborative authoring. (MSTP, 2000)

c. Messaging

The most common form of messaging is e-mail. Messaging also encompasses on-line chats, video conferencing, Automatic Digital Network (AUTODIN), newsgroups and Web- based postings. (MSTP, 2000)

d. Secure Access

Internets/ intranets must have the capability to restrict access to authorized users, where appropriate. Security is multi-layered. It can be implemented at the network layer, user layer, application layer, and finally at the document level. This security may be implemented by a combination of account/ password pairs, IP addresses, data encryption and secure networking. Thorough security implementation requires special skills and is beyond the scope of this thesis. (MSTP, 2000)

e. Data Mining

Data mining is a relatively new term that refers to a methodology for extracting information from large databases. In essence, Internets/ intranets are knowledge bases. An indexing and search engine, such as Microsoft Index Server must be used to catalog the information contained in the site and allow users to locate and retrieve, or "mine" the information. Data mining gives executive level decision-makers a much greater depth of information. (MSTP, 2000)

f. Discussion Forums

Discussion forums, such as newsgroups, exchange discussions and Web-based forums facilitate on-going dialogs. Unlike E-mail, forums are not targeted to specific recipients. Discussion forums may be moderated or unrestricted. Users may choose to participate or just monitor the forums. (MSTP, 2000)

g. Database Replication

Sometimes databases must be replicated in many places throughout the Internets/ intranets to provide the best response times. Therefore, there has to be a process that allows information to pass from one database to another so everyone in the Internet/Intranet has the most up-to-date information. An example is replication of Exchange Public Folders between other USMC sites. (MSTP, 2000)

Several other key capabilities have been identified in the movement toward collaborative functions, however, this thesis will only discuss the key capabilities used within the United States Marine Corps.

B. MOVEMENT TOWARD COLLABORATIVE COMPUTING

1. Collaborative Statistics

As noted earlier, there are over 1000 software packages that offer collaboration tools. These tools are catching the attention of many small businesses that need groupware for collaboration but cannot afford the expense and overhead of the large conventional collaboration packages. These small companies are the early adapters of the new online collaboration. Apart from these users, interest in collaborative tools drops off dramatically. (Creese, 2000) The market for these offerings is still fairly small, estimated to be around 25 million users. Creese points out that as information use spreads, the pain of managing that information will spread, and the need for such tools will increase.

Real-time collaboration is a burgeoning sector of the collaboration tools market. Collaborative Strategies LLC. estimates that real-time collaboration tools (audio, video, and data) have penetrated only five percent of the potential market. The market experienced a 111 percent growth rate in 1999 to an overall market of \$6.2 billion, with a 64 percent annual growth rate predicted through 2002. (Agnew, 2000)

Although a projected growth rate is predicted, David Coleman, founder and managing director of consulting firm Collaborative Strategies LLC, reminds us that before you implement a collaboration tool consider that collaboration tools provide only about 20 percent of the solution. The other issues involved will be discussed in the last section of this chapter.

2. Trends for Collaboration

The trend toward collaboration is strong. Fueled from two sides, technology and culture. Technology includes the increased proliferation of networks and startling growth of the Internet. Network growth has been explosive for the last eight years. Thirty percent on average. This trend will probably continue over the next decade. Network growth is fueled by economic and organizational pressures such as increased global

competition and a worldwide recession, which was felt first in the U.S. then Europe and most recently, in Asia. (Coleman, 1997)

Cultural changes are another driver for collaboration. We have greater involvement in other cultures. A few years ago, we traveled thousands of miles, taking days out of our regular routines to meet with people in other countries. Today, desktop video and data conferencing provides an immediate, inexpensive and minimally disruptive method to conduct the same meeting. This interaction with other cultures drives changes in our own organizations. In addition to cross cultural issues, implementing any new technology or program forces changes in the organization, many of which are characterized by teams and other collaborative paradigms.

A third driver for collaboration is the "net." Even though the Internet and WWW are not fully interactive or collaborative, vendors are incorporating collaborative functionality into new versions of Web-based products. Research performed by Collaborative Strategies LLC. in 1995 showed that most collaborative functions were migrating onto intranets (the network inside a fire wall), and in the 1998 time frame, moved out to support inter-organizational collaboration. (Coleman, 1997)

A last driver for collaboration is the need to achieve greater efficiency. Collaborative technologies have supported the effort to create new relationships and new ways to work. In today's environment, decisions must be made quickly; and the volume of information is always increasing. Many businesses are challenging the old hierarchical organizational structures. They are reinventing and reengineering using collaborative tools to meet these obstacles. (Coleman, 1997)

3. Collaborative Tools

A handful of software products have come on the market to directly address the difficulties of managing information. The common element of these new information-management and collaboration tools is their focus on reducing the difficulties of sharing, filing, and indexing the most common documents, Web pages and attachments. (Walnter, 2000)

a. Knowledge Collaboration Tools

Whereas e-mail provides simple and effective one-to-one conversational communications, these tools open up one-to-many and many-to-many communications to companies or individuals that need to share more complicated files. Since most are typically Web-based, these products break down collaborative communication barriers among people within an enterprise and their partners and customers working outside the company network. Vendors in the knowledge-collaboration market include Correlate Technologies, Hot Office Technologies, iHarvest, NetDocuments, and Webforia.

Knowledge management is the process by which individual learning and experience is accessed, reflected upon, shared and used to foster enhanced individual knowledge and organizational value. David Coleman of Collaborative Strategies LLC. views knowledge management as the process where data is raw facts out of context.

According to Charles Walter (2000) there is no shortage of knowledge management tools. Some have more collaborative features than others. But many, including conventional collaborative groupware products such as Lotus Notes, Novell's GroupWise, and Microsoft Exchange and Outlook, come with big price tags and complicated client-server installations that typically require intense technical and financial support from an organizations IT department. Most of these knowledge-collaboration products have only a handful of larger businesses as customers, with most of the use driven by individuals using the tools ad hoc for their particular jobs within an organization. Most of the products available offer only a few features, though all have plans to integrate additional collaboration functions and support for larger businesses. (Waltner, 2000)

Though these tools are just getting their footing in the marketplace, they have impressed early adapters by addressing information-management problems previously unsolved by other software. The WWW and Internet get the credit for many of the breakthroughs that make data communications with partners and customers outside an enterprise network worldwide. (Waltner, 2000)

C. VARIOUS TWISTS TO COLLABORATING

1. Groupware Technologies

a. *Groupware Defined*

Groupware vendors have been trying to address computing collaboration needs longer than most other software. The term groupware is widely used but not clearly defined, due to ongoing rapid developments; a consistent definition of the term has proved elusive (Lloyd, 1994). In the broadest sense, groupware refers to any computing technology that helps groups work better collaboratively over digital media (Khoshafian and Buckiewicz, 1995). Some describe it as computer-based tools that can be used by work groups to facilitate the exchange and sharing of information (Bullen and Bennet, 1990). Others defined it as computer-based systems that support groups of people engaged in a common task or goal and provide an interface to a shared environment. (Yen, *et al*, 1999) David Coleman of Collaborative Strategies LLC. explains it as computer-mediated collaboration that increases the productivity or functionality of person-to-person processes.

Groupware is viewed as technology designed from a group perspective, explicitly seeking to enhance various aspects of group life. Groupware can significantly influence the ways people are able to process, manage, and manipulate a wide range of knowledge and information. Groupware raises the possibilities for new forms of organizational design and business practices. Groupware is a technology that addresses the vast areas of collaboration, human computer interaction, and human-human interaction through digital media to bring substantial improvement and transformation to organizations. Groupware builds on the latest advances in information technology, utilizing and building on local and wide area networking as well as all recent advances in software and hardware technologies to achieve both communication and collaboration goals.

b. *Groupware Value*

Many ask the question if groupware design is worth paying attention to? (Brink, 1998) Groupware offers significant advantages over single-user systems. The groupware concept is to foster collaboration and interpersonal productivity by automating many tasks and enhancing the efficiency of others. Whether a product is e-mail or

workflow does not matter in today's competitive business environment. What matters is whether groupware technology provides a solution to a specific business problem. There are many studies behind the benefits of Groupware reasons. The most common reasons people are motivated to use groupware are listed as follows: (Brink, 1998)

- to facilitate communication: make it faster, clearer more persuasive
- to enable communication where it would not otherwise be possible
- to enable telecommuting
- to cut down on travel costs
- to bring together multiple perspectives and expertise
- to form groups with common interests where it wouldn't be possible to gather a sufficient number of people face-to-face
- to save time and cost in coordinating group work
- to facilitate group problem-solving
- to enable new modes of communication, such as anonymous interchanges or structured interactions.

2. Insights for Collaboration

The technology for collaboration is advancing so rapidly that organizations are not able to absorb the tools they require before another application enters the market. This mismatch in the fact that technology is revolutionary and behavioral change is evolutionary, causes stress and strain on the organization and the individuals in it. David Coleman (1997) describes some useful insights that relate to collaboration:

- Western cultures are not collaborative, they are competitive, and re-training needs to take place for collaboration to occur. Right now collaboration is seen as an "unnatural act."
- Collaboration must be tied to a clear economic benefit; if not, it is seen as overhead, and resistance occurs.
- Collaboration must have management support. It is not a grassroots strategy. At best it is a "middle-up-down" strategy.
- Vendors of collaborative software only solve part of the problem, and MIS/IT people are no more expert at solving the "people" problems than the vendors are.
- Asian cultures are more consensus-driven and tend to be more collaborative culturally, but they do not have an advanced technical infrastructure as we do here in the United States.

D. PITFALLS OF COLLABORATING

The real challenge with collaboration technology is not whether you conclude it is useful, but whether your users perceive it as useful. Users seek ways to improve their work and ensure that projects are completed on time and on budget. (Coleman, 1997) Users can effectively review emerging technologies and evaluate their potential benefit.

Additionally, the greatest problems with collaborative technologies are not just technical but rather organizational. Many collaborative issues stem from the lack of direction from top management or the lack of a well-defined business problem or mission. (Coleman, 1997)

Several critical factors identified below have also been impedance to the growing collaborative market.

1. Costs

You may be able to hold off on project collaboration until the technology matures and the checks and balances are put in place to assure data integrity. However, you will likely have to adopt this technology at some point to serve your users. The problem with trying out Web based project collaboration on a test project is its potentially high cost. Getting up to speed with Web-based project collaboration technology can be very expensive. To reduce the investment risk, many hosted Web services offer free "practice" accounts so you can take Web-based project collaboration for a test drive.

Gabrielle Friedly of Buzzsaw.com says, "You can test our project collaboration services for free, using up to 25MB of storage, with an unlimited number of project members." Likewise, Gary Craig of Edgewater of ProjectEDGE.com notes that its service offers "up to 150MB of disk space, with unlimited user access, for practice use." Before anyone invests in a particular vendor's product or services, a test drive is critical. With more than 150 dot-coms competing for project collaboration business, chances are you can test the technology for free and invest only your time to find an application that suits your mission.

2. Ease of Use

One of the major criticisms of many conferencing/collaboration applications is that they are much too complex to use. If they include audio and video capabilities, they

tend to need careful configuration and setting up if their performance is to be vaguely acceptable. BT technologies point out that if a call is made over an IP network (Internet or intranet) problems arise with the address of the person to whom you wish to connect. Also, IP systems have tended to exhibit poor audio and video performance. All of these factors come together in systems, which have great potential, but are far too complex to really deliver the business benefit they promise. (Midwinter & Sheppard, 2000)

3. Security

Security has also been a major inhibitor in the deployment of collaboration technology. Many corporate companies have been cautious about access to the Internet, and have significantly restricted general access. This has made the deployment of public conferencing services difficult, since many users are barred from access. The security issues among collaborative applications are too complex and beyond the scope of this thesis. A thesis dealing with the security issues of collaborative applications is recommended for a follow on thesis.

4. Culture

Businesses are quickly learning that when working with collaborative groupware, technology and infrastructure are only part of the problem. Focusing on the people issues dramatically increases the potential for success. People systems tend to be more complex than technical systems. (Coleman, 1997)

When addressing technical challenges, a technical solution can be found. Even if the technology solves the problem, works well, and is rolled out efficiently, support from the corporate culture is essential to implementation success. If the organizations culture supports the collaborative groupware success, but there is no economic justification for a groupware solution, the implementation could easily fail. Additionally, even if technology, culture, and economics combine to support collaborative groupware, the success of a project can be destroyed by politics. Figure 1 illustrates a survey that was taken by Collaborative Strategies LLC. in 1996, that explains the reasons why organizations have avoided implementing collaborative applications.

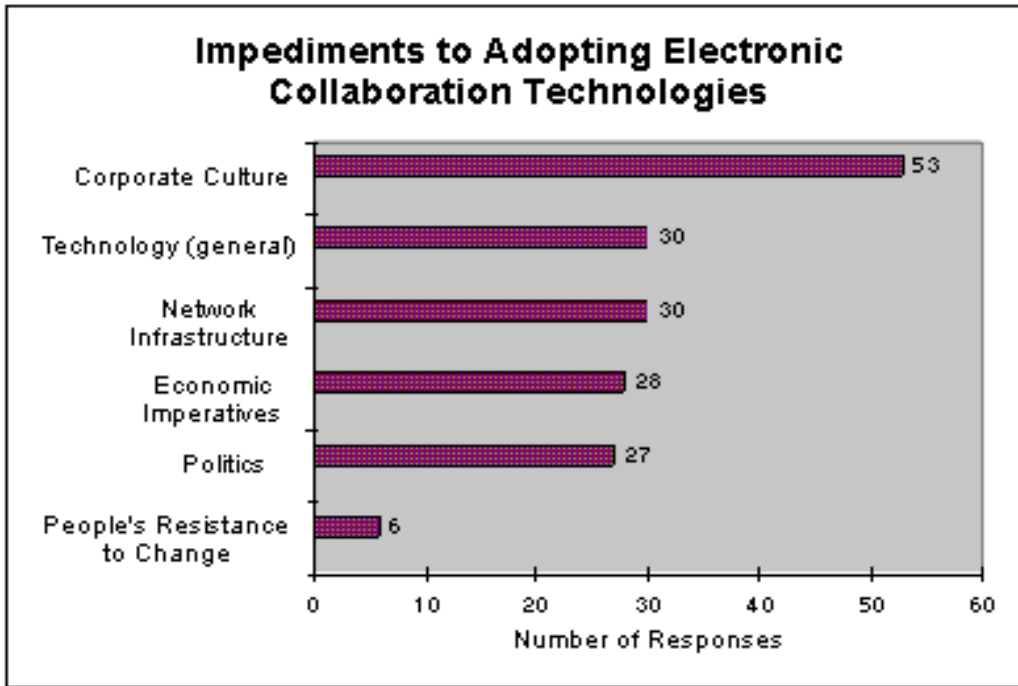


Figure 1. Impediments to Collaborative Technologies. (From Coleman).

III. COLLABORATIVE TOOLS AND THE MARINE CORPS PLANNING PROCESS

A. INTRODUCTION

One of the weapons in the United States Marine Corps (USMC) arsenal is a collaboration tool set. These tools allow people to work together efficiently, without ever needing to leave their desks. If these tools can be packaged in a form that encourages personnel to use them, then they can offer the potential to greatly improve effective business practices between users. This would eliminate the need for teams of people to spend half their time on an airplane while traveling to and from meetings.

B. CURRENT COLLABORATIVE TOOLS

In recent years, the Marine Corps and the Department of Defense have adapted and fielded an extensive standard set of tools useful for collaborative development. Identification of these tools and their capabilities is essential to choosing the correct tool for the job and mission at hand. The goal of developing a collaborative system is that it meets the need of the unit's planning and execution process. Each of the tools identified below are present in today's Marine Air Ground Task Force (MAGTF).

1. Microsoft™ Windows NT

Windows NT is the standard network operation system for the Marine Corps data network. It provides the file services, security, and network operating system. Windows NT can be considered the backbone for the implementation of Internet/Intranets. It is the common operating system for both individual workstations and servers; therefore, integration of products designed for an NT environment is seamless within the intranet.

2. Microsoft™ Internet Information Server

Internet Information Server (IIS) is the Web and file transfer protocol (FTP) server for the Marine Corps. The IIS forms the basis for all Web pages. Its capabilities include:

- Anonymous or Authenticated FTP . These are the standard protocols for exchanging files between machines. Anonymous FTP means user identification and password is not required. Authenticated FTP requires user identifications and passwords to access an FTP site. This prevents sensitive data from being accessible by users who do not have a need to know.

- Anonymous or Authenticated Web Access. IIS is the repository of Web pages, files, and other documents published to a Website. When someone requests a document via a uniform resource locator or Web address (i.e., <http://www.usmc.mil/somedoc.htm>) the IIS searches its file system and returns the document. The server supports static HTML files or active server pages. The server also supports connections to data sources such as Access, Oracle or Sequel (SQL) server.

3. Microsoft™ FrontPage

FrontPage is the standard Web authoring and Website maintenance software for the Marine Corps. It allows rapid development of Web pages using a "what you see is what you get" interface. Via security permissions, FrontPage Websites allow the delegation of Web authoring and maintenance responsibilities. This allows users to easily create and maintain entire Websites.

4. Microsoft™ Office 2000

Office 2000 is a Web-enabled suite of office automation software. It includes the capability to save documents as HTML and/or publish documents directly to a Web server. This is an ideal tool for allowing beginners and advanced users to update their own Web content.

5. Microsoft™ Exchange

Exchange is the Department of Defense standard messaging agent. Through its public folders, Exchange provides robust and customized data stores that play important roles in a unit's Internet/ intranet. Exchange databases are normally accessed via customized forms. Once created, these databases are accessible throughout the unit and externally via Outlook Web Access. Documents may be routed real-time through Exchange instead of using a paper route sheet or other time consuming means. Exchange public folders may also be replicated between sites.

6. Microsoft™ SQL Server and Access

SQL and Access are relational databases. Relational databases are used to link information from multiple databases. Access is geared towards the end user, whereas SQL server is a fully capable database management system for complex applications. These databases provide a large reservoir of data that can be sorted, queried and accessed according to a commander's need. SQL Server and Access databases may be accessed via Web pages.

7. Microsoft™ Index Server

Index Server can help users more quickly find information. It provides indexing and Boolean searching (this method allows for narrower searches) for both Websites and Exchange public folders. Once enabled, Index Server examines every document contained within the Internet/ intranet and enters it into a searchable database. Files indexed include; Word, Excel, PowerPoint, HTML and if a free plug-in is installed, Adobe Acrobat files. Once a user enters a search into index server, a link is provided to each source document meeting the search criteria.

8. Microsoft™ Site Server

Site Server provides tools to record and analyze Website usage and index Exchange Public folders. It will show who is accessing the Website, periods of heavy use, and most frequently accessed portions. This information will help the staff planner learn what information is useful and what information is not. This helps provide tailored information responsive to the commander's needs. Site Server can also provide management tools to the staff to ensure subordinate units have access to or receive documents that require staffing. Effective use of Site Server can help speed the planning process for the MAGTF.

9. Microsoft™ Outlook Web Access

Outlook Web Access (OWA) allows users to access Exchange information via a Web interface. OWA can also be used to provide authenticated or anonymous HTML access to public folders. Exchange account holders may use OWA to check their e-mail, contacts calendar and public folders. OWA also supports the use of customized Exchange forms. To be used with OWA, customized forms must be processed through the HTML Form Converter.

10. Team Folders and Digital Dashboards

Team folders and digital dashboards are a series of Exchange public folders that are accessed via HTML documents viewed within Microsoft Outlook. HTML files allow the Webmaster (or other developer) to standardize formats and guide the users to resources whether located in exchange public folders, the unit's intranet, or the Internet. Digital dashboards allow better knowledge management by consolidating personal, team,

organizational, and external information and providing "single- click" access to analytical and collaborative tools, all in a single, familiar desktop view.

Table 4 displays a recap of the current standard collaborative tools used within the USMC.

Tool	Definition
MS Windows NT	Provides the networking infrastructure and security of Internets/intranets
MS IIS	Web and FTP server for Windows NT
MS Visual Interdev	Web authoring tool for developers
MS FrontPage	Web authoring tool for end users
MS Office 2000	Web enabled suite of Office applications
MS Exchange	Messaging and collaborative system server
MS SQL Server/Access	PC Based Database systems
MS Index Server	Provides full text search of all documents
MS Site Server	Provides indexing of Exchange Public folders and site usage statistics
ODBC Drivers	Drivers to allow access to data sources such as MS SQL server and MS Access
MS Outlook Web Access	An HTML application provided by Microsoft to provide Internet access to Exchange data
Team Folders	A set of MS Outlook team folders each with an associated Web page
Digital Dashboard	A set of content-rich Web pages tightly coupled with MS Outlook. Together the pages provide the staff with information from a variety of sources through the Outlook interface.

Table 4. Collaborative Tools and their Capabilities. (From MSTP).

C. MARINE CORPS PLANNING PROCESS

The MCPP supports the Marine Corps warfighting philosophy of maneuver warfare. Since planning is an essential and significant part of command and control, the MCPP recognizes the commander's central role as the decision maker. It helps organize the thought process of a commander and his staff throughout the planning and execution.

The MCPP applies to command and staff actions at all echelons of command. Commanders at higher echelons, with their larger staffs, longer planning horizons, and access to more information, tend to use a more formal and detailed approach to the MCPP. Commanders at lower echelons may modify the process to meet their situation (staff resources, shorter planning horizons, and information available). Commanders and staffs need information in a form they can quickly and easily understand to assist them in planning and making decisions. Internets/Intranets along with collaborative tools are a valuable tool for providing this information and supporting the MCPP.

The MCPP provides the commander and his staff a means to organize their planning activities and transmit the plan to subordinate commanders.

Through this process, all levels of command can begin their planning effort with a common understanding of the mission and commander's intent. Interactions among the various planning steps allow a concurrent, coordinated effort that maintains flexibility, makes efficient use of time available, and facilitates continuous sharing of critical and relevant information.

The MCPP establishes procedures for analyzing a mission, developing and wargaming courses of action (COAs) against the threat, comparing friendly COAs against the commander's criteria and each other, selecting a COA, and preparing an operation order for execution. The MCPP organizes the planning process into six manageable, logical steps (see Figure 2). (MSTP, 2000)

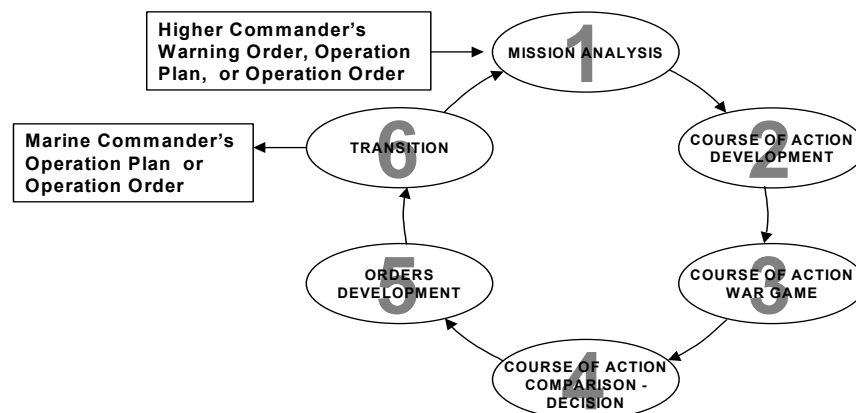


Figure 2. The Marine Corps Planning Process. (From MSTP).

The following information provides a summary of each of the six steps in the MCPP. An example of collaborative tools and an explanation of how those tools can be used to support each step of the MCPP follow will each summary.

1. Mission Analysis

The purpose of mission analysis is to review and analyze orders, guidance, intent, and other information provided by higher headquarters and to produce a unit mission statement. This step forms the foundation for the remainder of the planning process.

Figure 3 illustrates the input, the process, and output for mission analysis. Since the MCPP supports concurrent planning at all levels, thought must be given to ensure simultaneous access to products throughout the cycle. The tools used to produce outputs must assist sharing and collaboration. For example, an acetate overlay may be adequate for use within one headquarters, but it cannot be readily transmitted to remote sites, whereas a Command and Control Personal Computer (C2PC) overlay or other electronic representation may be readily shared.

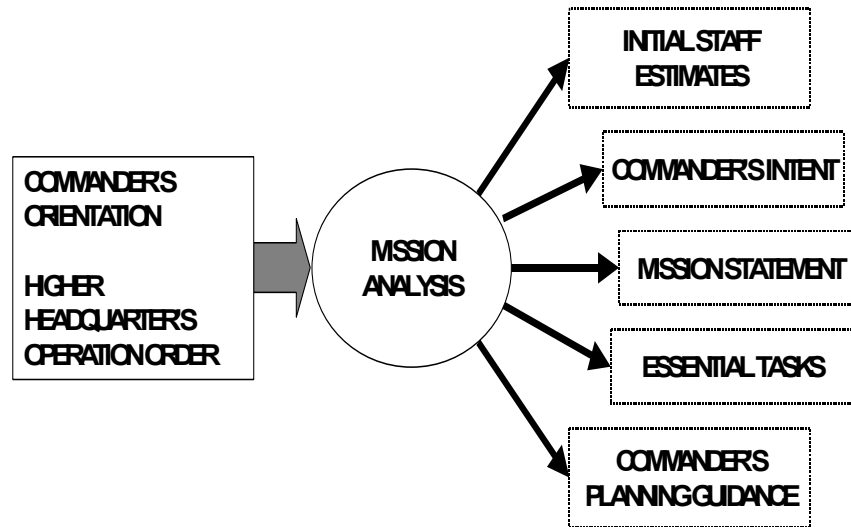


Figure 3. Mission Analysis. (From MSTP).

Once the commander has developed his initial guidance, it is briefed to the staff and posted to the intranet so it may be accessed and referred to by the staff. Likewise, the higher headquarters warning order and/or operation order can be retrieved from the higher headquarters' authoritative Website. During mission analysis, the staff makes

extensive use of the NIPRNET and SIPRNET to gather information. Digital charts and maps are downloaded from the National Imagery and Mapping Agency's SIPRNET Website. Command and Control PC (C2PC) overlays are developed and transmitted between staff workstations. The Webmaster creates a section on the unit's SIPRNET Website and exchange public folders for the operation. The operation's Internet/intranet is the official authoritative site for information related to the operation. To retain information reliability, a single individual in each staff section involved in the planning process may be designated to update appropriate portions of the site. It is imperative this person be familiar with and involved in the planning process. At a minimum, the site will contain an operation calendar; places for all products used and/or produced by the planning process, a place for on- line discussions and a directory of all key personnel.

As they are approved by the commander, the following products may be posted on the unit's Website for dissemination:

- Mission statement
- Commander's intent
- Commander's planning guidance
- Intelligence preparation of the battle space (IPB) products
- C2PC overlays
- Other background information

To provide maximum user flexibility over a variety of network conditions, products should be posted in as many formats as possible. For example, an operation order developed in Microsoft Word should be posted in Word format for local users, zipped format for remote users who have Word, and HTML for those who want to view on line. Other formats, such as .pdf (Portable Document Format) and ASCII (American Standard Code for Information Interchange) are possible. The key is to offer flexibility and ease of use for those using the site. (MSTP, 2000)

2. Course of Action Development

The mission statement, commander's intent, and commander's planning guidance are used to develop COAs that are suitable, feasible, acceptable, distinguishable, and complete with respect to current and anticipated situation, the mission, and tasking/ intent from the higher headquarters commander. See Figure 4.

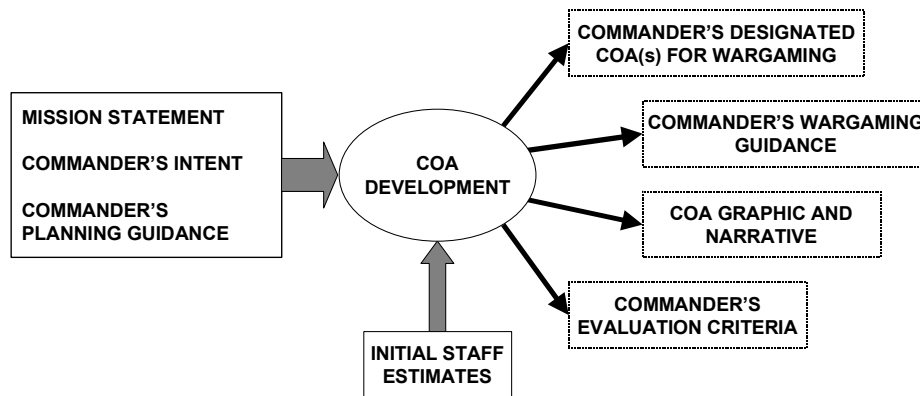


Figure 4. Course of Action Development. (From MSTP).

During COA development, staffs continue to use e-mail, discussion forums and public folders to share information and plan. Once the planning for this stage is complete, products are moved from the unit's intranet to the Internet.

COAs are posted in both visual and narrative form to the unit's Internet. There may be either PowerPoint briefs with speaker notes included or a combination of C2PC overlays with a separate text narrative. Regardless of form, in addition to posting on the Internet, these products should be pushed to critical recipients via e-mail, courier, or C2PC transmission. As an alternative, the items can be posted to the Website, units notified of their location and then verification received when the units downloaded the products. The method is not the important factor; the critical point is that all parties understand the method chosen. (MSTP, 2000)

3. Course of Action War Game

This step involves a detailed assessment of each COA as it pertains to the threat and the battle space (see Figure 5). Each friendly COA is wargamed against selected threat COAs. COA wargaming assists the planners in identifying relative strengths and weaknesses, associated risks, and asset shortfalls for each friendly COA. Additionally, COA wargaming identifies branches and potential sequels that may require additional planning. Short of actually executing the COA, wargaming provides the most reliable basis for understanding and improving each COA.

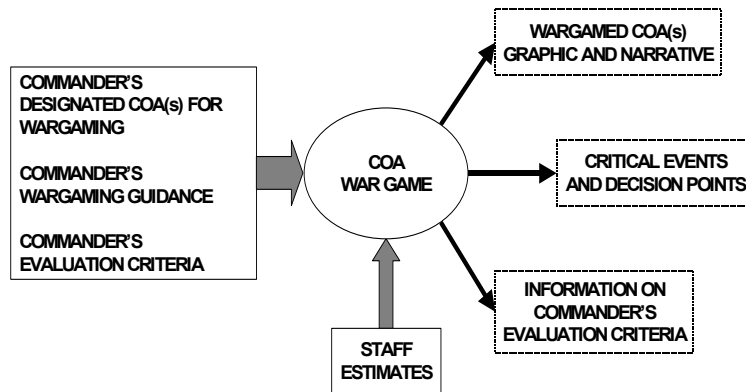


Figure 5. Course of Action War Game. (From MSTP).

COA wargaming allows the staff and subordinate commanders to gain a common understanding of friendly, and possible threat, COAs. This common understanding allows them to determine the advantages and disadvantages of each COA and forms the basis for the commander's COA comparison and decision. COAs designated by the commander to war game are easily retrieved using effective Internet/ intranet procedures that use a standard naming and location convention to record text and visual display mapping products/overlays for each COA developed. During COA wargaming, the staff can use collaborative planning tools to record and share the results of each COA.

Once completed and approved, products should be made available to higher, lower and adjacent units by posting on the unit's Internet. Microsoft Word tables or Excel spreadsheets are ideal for presenting matrixes. (MSTP, 2000)

4. Course of Action Comparison and Decision

The commander's friendly COAs are first compared against established criteria, then against each other. Based on this comparison, the commander selects the COA that he deems will best accomplish the mission. Figure 6 identifies the input, process, and output for COA comparison and decision.

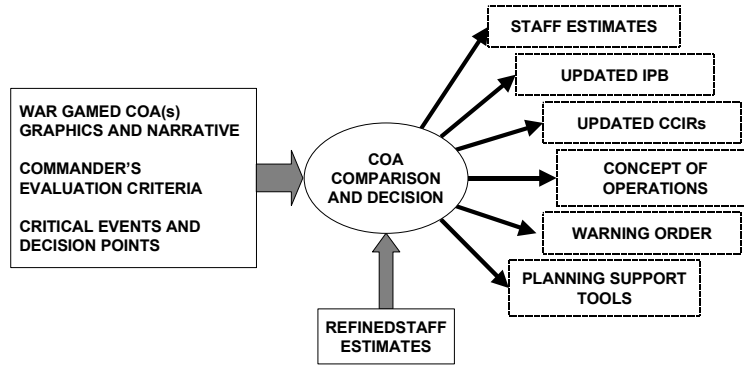


Figure 6. Course of Action Comparison and Decision. (From MSTP).

COA comparison and decision requires wargamed COAs with graphic and narrative, list of critical events and decision points, and information on the commander's evaluation criteria. Other outputs useful in this step may include; wargamed products (COA war game worksheet, synchronization matrix, event templates, planning support tools), war game results (initial task organization, identification of assets required and shortfalls, and updated CCIR's), staff estimates, and subordinate commander's estimates of supportability. The COA comparison and decision process at lower echelons of command may simply be an informal exchange of information between the commander and his staff on the results of the war game. At higher levels of command, the process is normally a formal sequence of activities that may involve COA evaluation, COA comparison, commander's decision, preparation of the concept of operation, and issuance of the warning order. (MSTP, 2000)

5. Orders Development

Orders are developed to direct the action of the unit. During orders development, the staff takes the commander's COA decision, mission statement, commander's intent and guidance, and develops orders to direct the actions of the unit. Orders serve as the principal means by which the commander expresses his decision, commander's intent, and guidance. Figure 7 identifies input, process and output to support orders development. (MSTP, 2000)

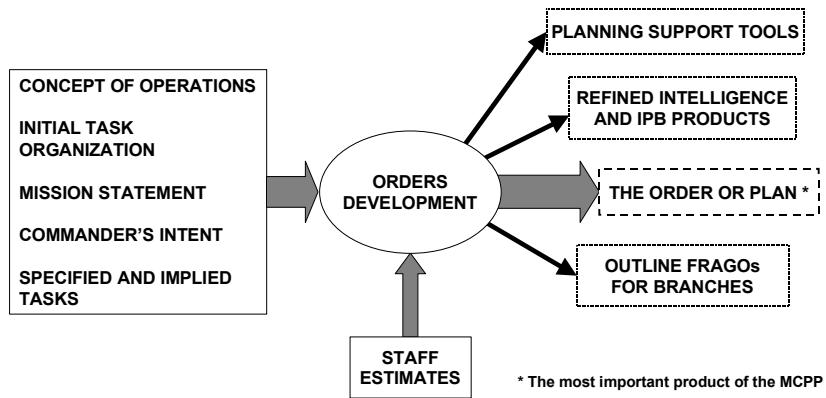


Figure 7. Orders Development. (From MSTP).

The initial task organization, mission statement, commander’s intent, concept of operations, and specified and implied tasks, along with the information developed throughout the planning process, form the input for orders development. Other input can be recorded and shared using Internet/ intranet procedures and capabilities, which may include; updated intelligence and IPB products, planning support tools, updated CCIR, staff estimates, synchronization matrix, commander’s identification of branches for further planning, warning order, existing plans, and standing operating procedures/orders. (MSTP, 2000)

As the operations order is assembled and developed, it may be maintained on-line via Word and Web Folders. It is imperative that the operation order contains footer with a version number. As changes are made to the document, the version number must be changed.

6. Transition

Transition provides a successful shift from planning to execution. It enhances the situational awareness of those who will execute the order, maintains the intent of the concept of operations, promotes unity of effort, and generates tempo. It is a continuous process that requires a free flow of information between commanders and staffs by all available means.

Internets/intranets help to ensure critical and relevant information is being shared. Transition may be conducted by using on- line discussions, newsgroups, and e- mail.

Since higher, lower and adjacent headquarters have access to the products produced at each step of the process via the unit's Internet, they should be familiar with the plan.

Figure 8 describes input, process, and output to support transition.

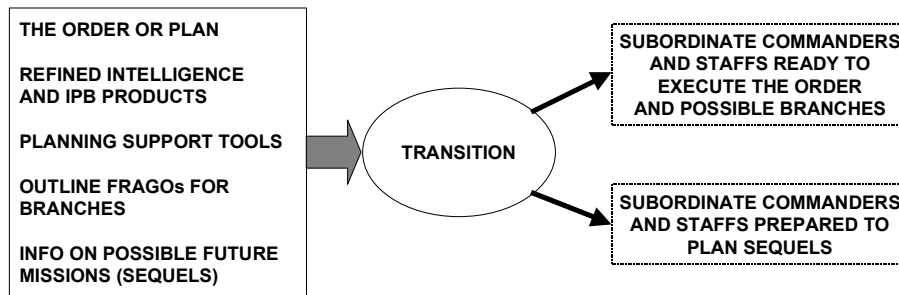


Figure 8. Transition. (From MSTP).

Once the unit begins executing the order, the staff can refer to the Website used to support the planning process at anytime. It can be an invaluable reference for those tasked to execute the plan to ensure they comply with the spirit and intent of the plan. (MSTP, 2000)

D. COLLABORATIVE MATURITY MODEL

The previous section identified the collaborative tool set needed for meeting the needs of a unit's planning and execution process. It also reviewed the Marine Corps Planning Process (MCP) and the areas where these tools offer the potential to greatly improve decision-making. Although these collaboration tools have proven effective, do they have the potential we need to reach the next level? An organization can build a collaborative maturity model that will improve their decision making cycle and assist with reaching that next level. This reengineering will simplify mission planning and execution and increase overall productivity.

Development of an effective collaborative maturity model can help assess our potential abilities with collaborative mission development. The below diagram provides a view from both the technology and human interaction perspectives that were discussed in chapter two. The rest of this chapter will discuss the four levels of the maturity model: network infrastructure and applications, groupware applications, knowledge management, and finally reengineering.

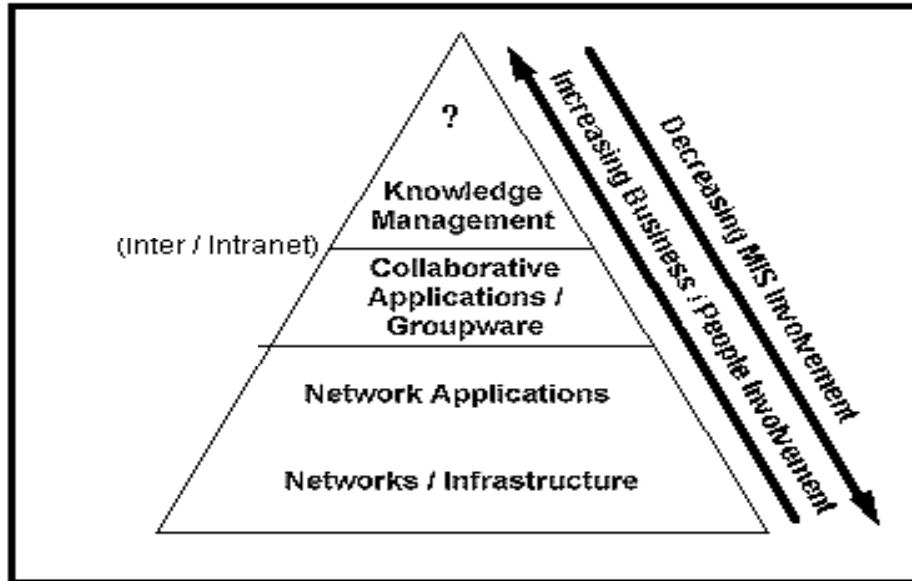


Figure 9. Collaborative Maturity Model. (From Coleman).

1. Network Application and Infrastructure

The Marine Corps maintains a solid network infrastructure to support collaborative technologies. Chapter II explained that groupware technology problems could stem from social issues rather than from technical infrastructure and application issues.

Figure 10 shows where collaborative groupware sits in the IT architecture/network. It lies on a network infrastructure that includes PCs, cabling, network operating systems and administration utilities, or phone lines for a wide area network (WAN). Although groupware is part of the networked applications environment, not all networked applications constitute groupware. For example, access to a corporate database through a network is not necessarily groupware. (Coleman, 2000)

Interactive or discussion databases may be part of a groupware application. Often groupware applications are workgroup-oriented and not enterprise-oriented. The advent of IP networks, especially the Intranet has driven new collaborative infrastructure at a frantic pace.

The Groupware Environment

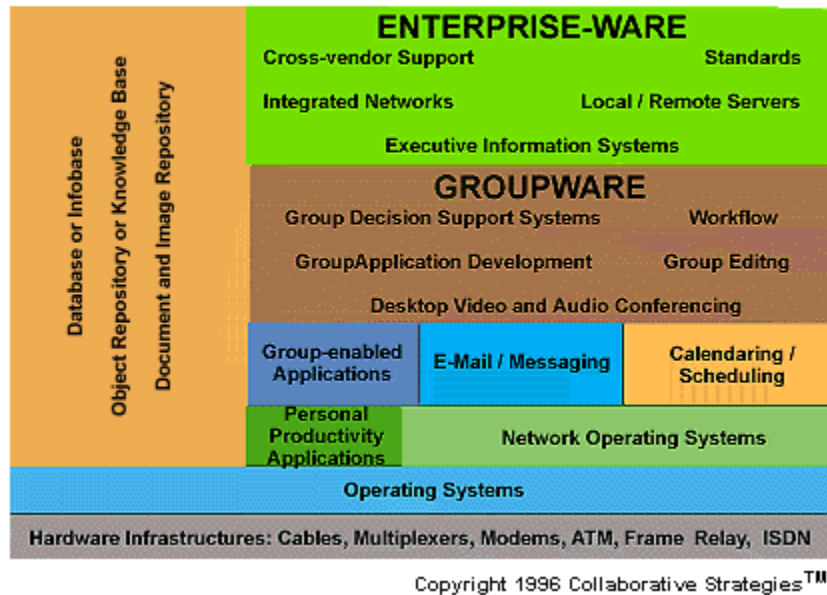


Figure 10. Collaborative Infrastructures. (From Coleman).

2. Collaborative Applications/Groupware

Chapter two thoroughly discussed the collaborative planning pieces available in today’s Marine Corps arsenal of collaborative tools. Rich, robust tools such as, Windows NT, Outlook & Exchange, FrontPage, Internet Information Server, Index Server, & Command and control PC (C2PC). When used properly during mission planning and execution cycles, these tools support communication, collaboration, and coordination, and act as the information glue that ties together an organization. An effective collaborative application will streamline the decision cycle time and increase overall productivity.

3. Knowledge Management

Organizations are realizing that the ability to better manage the knowledge of the company or unit will have tremendous benefit to all levels of the organization. For example, the ability to stop re-inventing the wheel every time a new project starts because the knowledge learned from past projects is available and accessible by all; to collaborate and work with team members around the world, applying the best ideas and experts to problems regardless of where they're located; to coordinate and organize

information so that the appropriate knowledge is shared with the appropriate people to avoid information overload and redundancy of information. (Coleman, 1997)

A knowledge architecture is a framework that evaluates the flow of information in a corporation or organization and helps structure the information so it has meaning and becomes knowledge. Information becomes knowledge when it is actionable, incorporated by people, and they use it. Knowledge becomes a corporate resource with quantifiable value, and that resource can be applied where it is needed for competitive advantage. (Coleman, 1997)

Most organizations have not taken the time to create framework or knowledge architecture under which to map the knowledge of the company. The relationships between groups, divisions, and teams are not clear and therefore, when it comes to creating seamless connectivity throughout the team, they are unable to "see" the big picture together.

Each organization needs to take the time to create a knowledge architecture or framework. A knowledge architecture is not a detailed map of all the knowledge of the company but rather a representation of the knowledge, a set of mental models or frameworks. These frameworks can help an organization reach the tip of the collaborative maturity model, reengineering.

4. Reengineering

People and process are dynamic. Given the arsenal of collaborative tools in the right environment, people will reengineer themselves and achieve a successful mission. For self-reengineering to be successful it requires that people understand knowledge creation, knowledge flow, and knowledge management. In addition, we must be prepared to work with the people, culture, organization, technology infrastructure, and software applications. (Coleman, 1997)

Collaborative Strategies has developed an architecture model that can help an organization reach that last level of the collaborative maturity model. The ideal would be an integrated collaborative project management system using the best collaborative products. They would all be linked together to provide an almost seamless integration of information, process flow, and accountability. Instead of implementing our collaborative

tools in pieces, we can follow a process to integrate all processes. Figure 11 displays this systematic process.

Overall Architecture for Knowledge Flow in a Collaborative Project

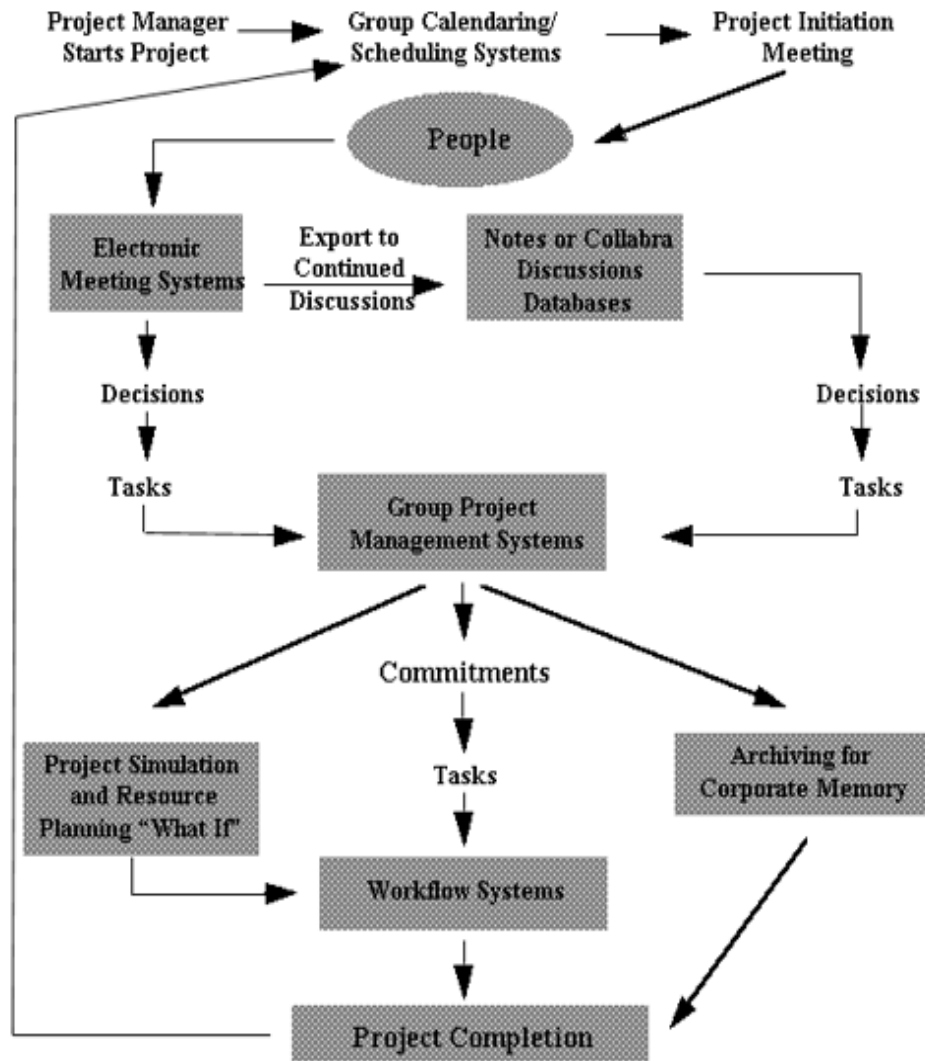


Figure 11. Collaborative Knowledge Flow. (From Coleman).

IV. USMC CASE STUDY METHODOLOGY

A. OVERVIEW

This chapter provides a description of the study variables used to research this thesis.

The intent of this thesis is to determine the usefulness of collaborative tools currently used within the Marine Corps during mission planning and execution and make a recommendation on future implementation. Opinions about collaborative tools were solicited through a questionnaire during a Marine Corps training exercise held yearly at Camp Pendleton, CA. In addition, expert interviews were conducted with Marines stationed at various Marine Corps commands who are currently in roles where collaborative applications are fielded and used extensively.

To evaluate the effectiveness of using collaborative applications, data was collected from two categories:

- A questionnaire solicited at two phases of Marine Expeditionary Force Exercise (MEFEX) 2001
- Interviews with Marines who are familiar with current collaboration applications used within the Fleet Marine Force

B. SURVEY DATA

The goal of the questionnaire is to determine current views within the Fleet Marine Force (FMF) and provide recommendations for improvement or future study. The questionnaire was designed to provide answers to the following research questions:

- What is collaborative computing?
- What are the collaborative tools currently used within the USMC?
- Do collaborative tools enhance or interfere with the Marine Corps planning process?
- Will users easily embrace collaborative technologies?
- What features are important within a collaborative application?
- How do the current standard collaborative tools compare to other collaborative technologies on the market?

The scope of the questionnaire is limited to the Marines who participated in exercise I MEFEX 2001. I Marine Expeditionary Force (I MEF) is located at Camp Pendleton, CA. The questionnaire was solicited in two phases. The first phase of questionnaires were distributed during the Operation Planning Team (OPT) exercise held May 21st through 25th, 2001. The second phase of questionnaires were distributed during the Execution Phase of I MEFEX 2001 held July 19th through 26th, 2001. The survey was made available while the author was on Temporary Active Duty (TAD) at Camp Pendleton during the aforementioned timeframes. Fifty hard copies of the questionnaires were randomly handed out to 50 personnel who participated in the exercise at the various phases. Thirty-nine surveys were returned. Participation was voluntary. Due to extreme time limitations and over tasked billets, many participants did not return the questionnaire. Several participants preferred to collaborate in person and the results of those conversations were added in Chapter V.

In developing the questionnaire it was paramount to make it simple and short due to operational tempo of the exercise. It consisted of nine open-ended questions designed to answer the above research questions. Exact distribution of the participants surveyed was not analyzed; however, the author intended to survey all personnel who participated in the I MEFEX 2001 exercise. This included civilian, reservists, as well as active duty personnel stationed at various Marine Corps commands. Since collaboration tools are implemented differently at each command, sampling one random group of people seemed the best logical approach to generating different results of information. Appendix A contains the survey.

C. EXPERT INTERVIEWS

The expert interviews are designed to capture opinions of collaborative tools from the individuals who currently apply these applications within the Marine Corps. Several of the participants interviewed are Marine officers in billets that research, implement, and train the FMF on collaborative applications. Some of these officers have visions to change the way collaborative tools are applied to current Marine Corps processes. The interviewees were asked similar questions found in the questionnaire, and a few additional questions about the future of collaborative applications within the USMC. The interviews were held during the execution phases of I MEFEX 2001, the 22nd through

26th of July 2001. Appendices C, D, and E captures the information generated from the interview discussions.

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V. FINDINGS

A. INTRODUCTION

This chapter presents the results of the data collected from the distributed questionnaires and the recorded expert interviews. The author's intent of this chapter is to clearly display how the Marines in the FMF currently view collaboration and collaborative applications. Due to time constraints and the voluntary nature of the survey, results do not comprehensively reflect current scientific sampling techniques.

B. RESPONSES TO QUESTIONNAIRE

Nine open-ended questions were designed to gather input from various participants involved in I MEFEX 2001. Each question will be considered separately in this section. The responses for each question were divided into common categories analyzed by the author. A response that was depicted more than once becomes a category. The questions and categorized responses to the collaborative questionnaire are analyzed below. Information that could be quantified was analyzed in an Excel spreadsheet and displayed in graph form. The below questions are in the same order as asked in the questionnaire.

1. What is your definition of collaboration?

This question was answered in the literature review of Chapter II of page six. The question was asked to ensure that the participants surveyed had similar opinions regarding collaboration as explained in Chapter II.

2. How would you characterize your level of experience with Information Technology applications in general?

This question was not part of the data analyzed for this thesis. The author used this question to obtain a general idea of the computer knowledge and skills of the participants surveyed.

3. Can you identify current collaborative tools available to you in the Marine Corps (or other services)?

The following table identifies what the participants listed as current collaborative tools.

<u>Tool</u>	<u>Percentage Identified</u>
Email	20 percent
Outlook/Public Folders	14 percent
Web pages/FrontPage	8 percent
VTC	3 percent
NIPERNET/Internet	10 percent
SIPRNET	3 percent
Netmeeting	10 percent
C2PC	8 percent
Microsoft Office suite	6 percent
Phones	4 percent
AFATDS	6 percent
Lotus Notes	4 percent
Radio Comm.	4 percent

Table 5. Current Collaborative Tools.

Although Microsoft Outlook is the current Email client, the author felt it was necessary to distinguish between Outlook and Email to accurately display the respondents' answers. Email and Outlook were the largest tools identified followed by Microsoft Netmeeting.

4. From your experience does the Marine Corps or other services currently utilize collaborative technologies?

- **Yes** 10 of the respondents recognized Outlook email as the most common collaborative application used today
- **Not enough** 4 stated we underutilized Web pages and the full capabilities of Outlook email

- **Minimally** 5 participants said the USMC is not using them to their full potential. This comment was stated several times but missing the reasoning to backup the response.
- **Limited** 4 said it is difficult to put the applications into full use due to high turnover in billets and changing technology

5. If you have used collaborative tools in the past did you find them effective in the performance of your duties?

Yes – 20 participants stated they have used a collaborative tool. The following are general bullets of what was added:

- Lack of familiarity among users limits effectiveness
- "At last command established paperless process with Lotus Notes"
- Many tools can help tremendously by sharing information quickly and accurately, however, we need to take steps to reduce the overhead (training & manpower) to utilize these systems
- Collaborative efforts are far more productive than planning or working in a vacuum
- It seems to be a continuous struggle to train people using these tools

5a. If yes, do you prefer using these types of applications?

16 participants directly responded yes to this question, supported by the following common reasons:

- "Helps in understanding"
- "More effective and easier to employ"
- "Time is saved from physically attending a meeting"
- "Great for physical separation among personnel"

Four participants had negative responses pertaining to collaborative applications based on the following:

- "There is no better interaction than a group-facilitated meeting"
- "We need corresponding bandwidth to support a forward deployed tactical environment"
- "As a planner, nothing I have used yet replaces the need for face-to-face interaction between people for complex problem solving. Software applications can't show body language, ignorance, understanding, confusion, and bewilderment"
- "Difficult with larger groups and complex issues"

6. Have you used collaborative tools/technologies during any part of the Marine Corps Planning process? (i.e. meetings, planning exercises... etc.)

In the participant surveys, all but two out of the 39 questionnaires answered yes to employing these applications as part of the planning process.

- C2PC for overlays
- Outlook team folders
- FrontPage & IIS for Web posting of critical information
- Net meeting for application sharing
- Email for disseminating information
- System 5 for real world CINC planning analysis

6a. If yes, do these tools enhance or interfere with the planning process?

Seventeen people surveyed stated these tools do enhance the planning process when used properly and everyone has become familiar with the applications being used. Three people said there is much improvement needed in the current collaborative tool set. Two respondents expressed that the Marine Corps has the tools to enhance the process but does not understand the process itself.

7. If a collaboration tool offered everything you need in one application (basically a one stop shop on the desktop) would you utilize this tool or stick with other applications that you are familiar using?

This question generated some interesting thought. Thirteen participants responded yes to using a one-stop-shop, while three stated it depended on several factors.

Those that stated they would use a one-stop-shop application still had hesitations based on the following quoted comments:

- "As long as it was easy to use"
- "If it made the job easier"
- "If it is complicated and requires too many steps I would rather use the tools I am familiar with"
- "Only if it integrated information from other key systems"
- "As long as everyone else is using the same application. In order to collaborate you must be able to communicate with each other"
- "If it provided the same level of functionality as the standard applications"
- "I will entertain all methods. The biggest obstacle will be from those who view the entire IT environment as an end unto itself."
- "I would use it on a trial basis"
- "As long as files are not lost during the long change-over period"

- "Depends on the training required to learn the tools"

Two respondents stated they don't feel a one-stop-shop application can be developed. One application can't do it all . They also expressed that most tools have fewer capabilities than native software. From a functional implementation point of view a one-stop-shop would be met with resistance from these individuals. One respondent suggested asking a different question. "Would a single user interface, or portal that was configurable and customizable be useful?"

8. Rank in order what features would be most important in a collaborative application.

Figure 12 was created from the ranking of each category by the 25 individuals who answered this question. Number one on the chart represents the most important feature within a collaborative application, while number seven represents the least considered important feature.

Ease of use ranked the highest as a critical factor while cost seemed to be the least important factor.

9. Can you recommend other collaborative tools to be used within the Marine Corps that you have read about or used within other services?

All but 8 participants had no recommendation for other collaborative applications. 5 participants stated we have the tools we need but don't understand the full power behind these tools. Recommendations on applications that were suggested more than once are as follows:

- MS Team Calendar
- IDM
- IWS
- C2PC
- TCO
- JIMCIS
- IDM
- GCCS

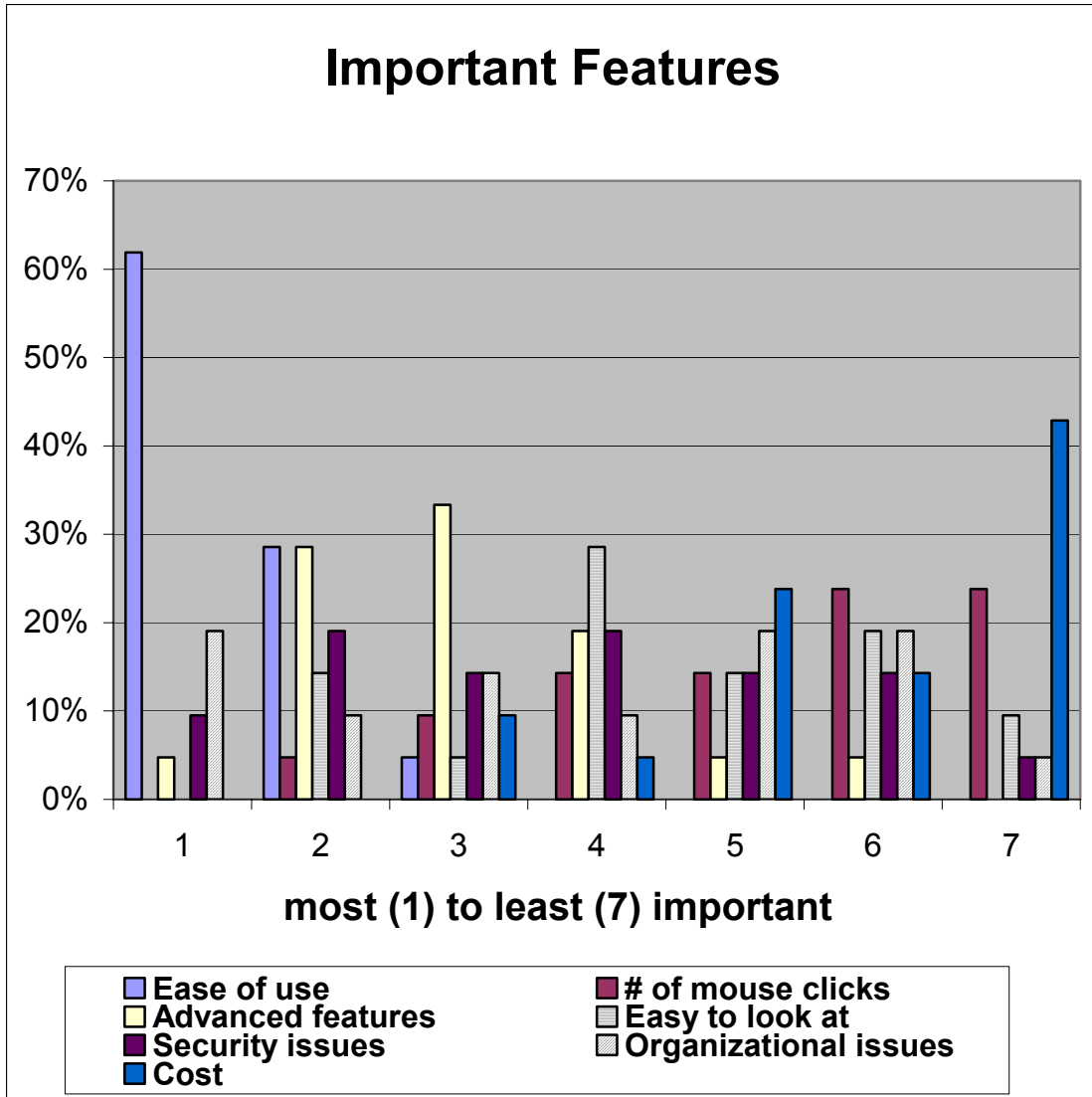


Figure 12. Important Collaborative Features.

C. INTERVIEW OBSERVATION

In the three expert interviews the participants were given similar questions to the ones asked in the questionnaire. The interview results were analyzed in order of the interview questions.

The interviewees enthusiastically identified the current collaborative tool set used in today’s Marine Corps. All three interviewees stated that most people, Marines especially have a very skewed perception of collaboration technology. One interviewee believes that,

Net meeting, VTC and even basic email are very poor examples of what collaboration entails. Many people are blinded by the fact that the telephone is still a great collaboration tool that is widely overlooked. True collaboration occurs when people are able to conduct multiple shared tasks simultaneously and in concert. Windows NT, Microsoft Exchange, Public folders and Outlook are great examples of rich robust collaborative tools.

When asked if the Marine Corps uses the collaborative tool set all three agreed they don't even scratch the surface. They are not applied in a consistent manner and there is not a common understanding of the standards. One interviewee stated that,

Scattered around the Marine Corps there are a few pockets of people with various levels of expertise. These people take the initiative and do great things in the area where they need a collaborative tool for their fielded system or process. Our current way of doing business is taking our G-6 communications personnel and having them set up the infrastructure, and set up the distribution to allow our systems to communicate with one another. The Marine Corps does that well, but is slowly learning how to manage these systems and the information requirements. Information Management is a huge part of the collaboration piece. The Marine Corps has fielded a draft pub on Information Management but it is already 20 months old. Microsoft provides the products in the standard tool set. Current Microsoft products can't help manage all information requirements. To a certain extent these products are critical to daily business, however, an effective process is still needed to assist with managing information.

All three agreed that the Marine Corps has no over arching strategy and no vision on how to employ their collaborative tool set.

Two of the interviewees tried to explain collaboration based on the collaborative maturity model that was described in chapter three. "There are basically three legs to collaboration. You need the infrastructure to support the systems communicating. You need the actual applications, whether it's email, the Web, or a common tactical picture. Lastly, you need to be able to effectively manage all these information systems." All three officers interviewed agreed that the Marine Corps has not yet reached that last leg of the maturity model and Information Management is a critical part of that last leg.

When using these tools with the MCPP it was stated by all the interviewees that the tools do enhance the process but are taken for granted by most users. The reasoning is the average user is unfamiliar with the tools available. Most users spend more time

trying to figure out the application and never really understand the benefit the application could bring. One officer speaks about C2PC,

C2PC is one of the best examples of collaboration. C2PC has to integrate with other systems for a common tactical picture. If the system is not set up properly or not managed effectively by the IS person then the communication does not happen and information flow cannot be implemented. For a collaborative tool to actually enhance the MCPP or any process at that matter you need to make sure the hierarchies of the collaborative tools are built upon each other.

Although the tools do enhance the MCPP, are they truly essential to planning and execution? It was expressed by all the Marines interviewed that most units could not operate without the basic Microsoft tool set. Specifically, one interviewee stated that,

The Marine Corps has taken the processes they have to do business and basically automated them. For example, they have taken the concept of tracking unit locations on a map board and overlays and have automated the process by creating track management capabilities through TCO, IAS, and C2PC...etc. The problem here is to not look at the application but rather look at the process. Basically, think through the process of collaboration rather than automating the existing process. This comes back to Information Management. Also, during an exercise there is artificially built around the MCPP and the tools used since most people using the tools are a few buildings away or separated by a shorter distance. However, when the Marine Corps goes to war and that distance is for real, most people would realize that these tools are absolutely essential and planning could not happen without them. Additionally, full understanding of the processes is critical for collaboration to be effective.

When discussing a one-stop-shop application, the interviewees all agreed that adapting a one-system solution for the entire collaboration need is impossible. However, given today's effective user friendly Web based applications, a one-stop-shop tool that could effectively support the MCPP and other tasks that actually worked would be adapted lock stock and barrel by the Marine Corps. Similar to an answer given in the questionnaire, one interviewee stressed that we need to stop looking for a solution in a software package. In any application chosen, it has to be within the standard Marine Corps tool set, easy to maintain and implement, and easy for the warfighter to facilitate based on their way of doing business. "The Marine Corps does have a standard

collaboration tool set. They just need to utilize the current tools and adapt an interface that is familiar throughout the entire USMC."

All interviewees stated that the future of collaborative tools would continue to impact the Marine Corps. "But, before adapting any more robust collaborative applications, they need to focus on the Information Management process and stop focusing on using existing tools to make life easier. The Marine Corps must learn how to understand and identify problems and isolate the process that MEF's follow and use existing tools to support these processes."

One of the officers interviewed pointed out that:

Many of the issues dealing with collaborative tools are self-inflicted on the Marine Corps. To a great extent, what the Marine Corps does is unique, not unique within DoD but unique as a business place. Many contractors are always trying to sell overpriced tools or applications that are already developed. The bottom line is the Marine Corps already has the tools to develop a unique collaborative tool set. Microsoft has given them 80% of the solution. They need to place someone in charge to orchestrate the framework for collaborative processes. Basically, establish a collaborative czar billet that becomes the advocate for all collaborative issues.

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VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The author found this study provided an interesting insight into the factors surrounding collaborative applications and tools used in today's Marine Corps. The goal of this exploratory study was to investigate collaborative applications and determine whether they enhance mission planning and execution as currently employed. Three detailed interviews and a nine-open ended questionnaire were used to research and answer the above question. The current Marine Corps standard collaborative tool set offers a functional application for the Marine Corps Planning Process (MCPP). These robust tools are not being fully utilized since many organizations within the Marine Corps have a very limited understanding of the applications and how to properly apply them to the current processes inherent to the Marine Corps. Many times the Marine Corps selects software prior to conducting a thorough needs analysis. Instead, each MEF needs to identify the processes by articulating the information flow requirements, then adjust or modify the systems and software to support the requirements for those processes. The key to collaboration is to follow the steps in the collaborative maturity model addressed earlier; ensuring a solid network infrastructure, applying robust applications, mastering information management, and re-engineering the process flow.

B. RECOMMENDATIONS

Based upon the data that was analyzed using the 39 questionnaires and three detailed interviews, the author suggests the following:

- The Marine Corps needs to fully understand the third leg of the Collaborative Maturity Model; Knowledge and Information management. Each MEF needs to take the time to create framework or knowledge architecture under which to map the knowledge of the USMC. A knowledge architecture framework will evaluate the flow of information and help structure the information so it has meaning and becomes knowledge. This framework will create a clear relationship between teams, groups, and even among the other MEFs. Everyone will understand the "big picture", creating seamless connectivity and information flow throughout the team.
- Once the Marine Corps has created a knowledge architecture framework they can integrate collaborative tools into a collaborative project system. These tools would be linked together to provide a seamless integration of

information, process flow, and accountability. Instead of implementing the collaborative tools in pieces, the Marine Corps should systematically implement those tools that support the processes used in the MCPP. Figure 11 reiterates the collaborative knowledge flow process.

- When the Marine Corps reaches the tip of the Collaborative Maturity model; reengineering, someone must orchestrate and frame the issues surrounding collaborative applications and tools. The Marine Corps must implement a strategy and vision on how to effectively employ its collaborative tool set. The organization tasked as lead agency should mandate and guide the teaching of collaborative tools to all users and provide training to the operating forces and supporting establishments.
- Establish a common data driven Web based tool that will eliminate the problem of information overload. A digital dashboard framework is an easy, flexible, robust portal that can bring together all collaboration needs. A digital dashboard is a customized solution that consolidates personal, team, corporate, and external information and provides single-click access to analytical and collaborative tools. The following benefits could be realized by implementing a product such as Microsoft Sharepoint Server Portal 2001 throughout the Marine Corps:
 - Extend familiar products
 - Deliver information, in the office or on the move
 - Focus on business priorities
 - Access multiple information sources
 - Integrate information
 - Interact with information
 - Closer collaboration

Appendix E has detailed information on the benefits described above using Sharepoint Server Portal. MSTP's Battle Staff Facility (BSTF) in Quantico, VA is currently reviewing Sharepoint Server Portal 2001. Several other Marine Corps commands have incorporated a digital dashboard concept.

C. FUTURE STUDY

The Marine Corps should continue to explore and study collaborative applications and the inherent capabilities these have to enhance planning, information management and process flow. Although this is an immense topic to investigate, below are some recommendations for future studies of collaborative applications:

- Develop and implement a Web-based data driven knowledge management portal that is user friendly and incorporates the Marine Corps entire collaboration requirements
- Evaluate and test the security issues inherent to collaborative tools
- Model and develop an effective knowledge management process
- Test and evaluate several collaboration software models
- Test and evaluate bandwidth usage for collaborative applications

Since collaborative technologies change quickly, the evaluation of new and effective implementation strategies should be frequent and flexible. Computer automation has changed how we conduct many facets of daily business as well as everyday life. The Marine Corps should embrace collaborative technologies in order to ensure dynamic, robust, and effective information flow.

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APPENDIX A. QUESTIONNAIRE

COLLABORATIVE QUESTIONNAIRE INSTRUCTIONS

This information will be used for a Thesis study

1. **There is no right or wrong answers to these questions.**
2. **If possible, please be more specific than "yes" or "no".**
3. **You can go outside the boundaries of these questions to illustrate significant points you feel are important.**
4. **All responses will be held in confidence. Only aggregate data will be used.**

Various definitions of collaboration

- Collaboration is about working together and sharing information with each other (David Yen)
- Web-based collaboration allows different team members to work together by using a centrally located repository for all project related correspondence. (Bill Burchard)
- To work jointly with one or limited number of others in a project involving composition or research to be jointly accredited. (Webster's)

BILLET _____

UNIT _____

COLLABORATIVE QUESTIONNAIRE

1. WHAT IS YOUR DEFINITION OF COLLABORATION?

2. HOW WOULD YOU CHARACTERIZE YOUR LEVEL OF EXPERIENCE WITH INFORMATION TECHNOLOGY (word processing, spreadsheets, e-mail...) APPLICATION IN GENERAL?

3. CAN YOU IDENTIFY CURRENT COLLABORATIVE TOOLS AVAILABLE TO YOU IN THE MARINE CORPS (OR OTHER SERVICES)?

4. FROM YOUR EXPERIENCE DOES THE MARINE CORPS OR OTHER SERVICES CURRENTLY UTILIZE COLLABORATIVE TECHNOLOGIES?

5. IF YOU HAVE USED COLLABORATIVE TOOLS IN THE PAST DID YOU FIND THEM EFFECTIVE IN THE PERFORMANCE OF YOUR DUTIES?
 - 5A. IF YES, DO YOU PREFER USING THESE TYPES OF APPLICATIONS?

6. HAVE YOU USED COLLABORATIVE TOOLS/TECHNOLOGIES DURING ANY PART OF THE MARINE CORPS PLANNING PROCESS? (IE. MEETINGS, PLANNING EXERCISES...ETC)

6A. IF YES, DO THESE TOOLS ENHANCE OR INTERFERE WITH THE PLANNING PROCESS?

7 IF A COLLABORATIVE TOOL OFFERED EVERYTHING YOU NEED IN ONE APPLICATION (BASICALLY A ONE STOP SHOP ON THE DESKTOP) WOULD YOU UTILIZE THIS TOOL OR STICK WITH OTHER APPLICATIONS THAT YOU ARE FAMILIAR USING?

8. RANK IN ORDER WHAT FEATURES WOULD BE MOST IMPORTANT IN A COLLABORATIVE APPLICATION.

- EASE OF USE__
- ADVANCED FEATURES OF APPLICATION__
- EASY TO LOOK AT FOR LONG PERIODS__
- SECURITY ISSUES__
- ORGANIZATIONAL ISSUES (I.E. PRESSURES TO USE) __
- COST__

9. CAN YOU RECOMMEND OTHER COLLABORATIVE TOOLS TO BE USED WITHIN THE MARINE CORPS THAT YOU HAVE READ ABOUT OR USED WITHIN OTHER SERVICES?

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APPENDIX B. DOD STANDARD COLLABORATION TOOL MESSAGE

R 291130Z JAN 01
FM SECDEF WASHINGTON DC//ASDC3I//
BT
UNCLAS
MSGID/GENADMIN/J6V//
SUBJ/DOD STANDARD COLLABORATIVE TOOL ANNOUNCEMENT//
POC/JEANNIE TIBBETTS/MAJ/JS/J6V/TEL: DSN227-1209/FAX: DSN227-4937,
SIPRNET EMAIL: JEANNIE.TIBBETTS@JS.PENTAGON.SMIL.MIL, UNCLAS EMAIL:
JEANNIE.TIBBETTS@JS.PENTAGON.MIL//
PAGE 03 RUEKJCS6064 UNCLAS
POC/KEN O'REILLY/LT COL/JS/J33CSOD/TEL: DSN224-0590, SIPRNET EMAIL:
KENNETH.OREILLY@JS.PENTAGON.SMIL.MIL, UNCLAS EMAIL:
KENNETH.OREILLY@JS.PENTAGON.MIL//
POC/JACK SANOCKI/LT COL/JS/J2P/TEL: DSN224-4921/FAX: DSN227-9209,
SIPRNET EMAIL: JACK.SANOCKI@JS.PENTAGON.SMIL.MIL, UNCLAS EMAIL:
JSAN338386@AOL.COM//
POC/WILSON CRAFTON/COL/OSD(C3I)/C3/TEL: DSN327-0287/FAX: DSN327-0276,
SIPRNET EMAIL: WILSON.CRAFTON@OSD.SMIL.MIL, UNCLAS EMAIL:
CRAFTONW@OSD.PENTAGON.MIL//
REF/A/DJS MESSAGE COLLABORATION TOOLS UPDATE DTG 192355ZAPR00/
B/ASDC3I MESSAGE COLLABORATIVE PLANNING TOOLS 051122ZNOV99/
RMKS/1. THIS MESSAGE ESTABLISHES IMMEDIATE GUIDANCE FOR INTEROPERABLE
COLLABORATION AND DIRECTS THE USE OF NETMEETING/SUNFORUM AS THE BASIC
BUILDING BLOCK FOR DOD'S COLLABORTIVE STRATEGY. BY 1 OCT 2001, ANY
COLLABORATIVE TOOL NOT INTEROPERABLE OR NOT INCORPORATING THIS
STANDARD MUST BE RETIRED. NETMEETING/SUNFORUM IS PART OF THE DEFENSE
COLLABORATION TOOL SUITE (DCTS) WHICH IS COMPRISED OF HARDWARE AND
SOFTWARE INCLUDING CUSEEME (SEE YOU SEE ME) NETWORKS MEETING POINT
SERVERS; MICROSOFT'S NETMEETING, DIGITAL DASHBOARD, AND OUTLOOK; AND
SUN MICROSYSTEMS SUNFORUM. THIS DECISION, BASED ON INPUT FROM ACROSS
DOD, IS THE BEGINNING OF A COOPERATIVE EFFORT WHERE GOVERNMENT AND
INDUSTRY COME TOGETHER TO HELP SHAPE THE WAY AHEAD FOR A FULLY
INTEROPERABLE, MULTI-VENDOR COLLABORATIVE ENVIRONMENT. THE JOINT
STAFF AND DISA ARE WORKING A SEPARATE MSG CONCERNING OPERATIONAL
GUIDANCE AND IMPLEMENTATION. IT SHOULD BE RELEASED IN 30 DAYS FROM
RECEIPT OF THIS MSG.

2. BACKGROUND: IN RESPONSE TO REF A, THE JOINT BATTLE CENTER (JBC)
BRIEFED THE OSD/JOINT STAFF COLLABORATION PLANNING TOOLS SENIOR
STEERING GROUP (SSG), 18 SEP 2000, TO RECOMMEND THE APPROACH THAT
BEST MEETS COLLABORATIVE USER REQUIREMENTS AS THE INTERIM (18-24 MO.)
DOD COLLABORATIVE STANDARD. THIS RECOMMENDATION WAS MADE FOLLOWING
AN ASSESSMENT IN JUN 00 OF FIVE COLLABORATIVE SYSTEMS USED ACROSS
DOD. THESE SYSTEMS WERE PREVIOUSLY DETERMINED WITH GUIDANCE FROM YOUR
REPRESENTATIVE ON THE DOD TIGER TEAM AND WITH SSG CONCURRENCE. THE
JBC RECOMMENDED THE DEFENSE COLLABORATION TOOL SUITE (DCTS).

3. THE ASSESSMENT INCLUDED OPERATIONAL PARTICIPANTS FROM SIX OF NINE
CINCS AND IS BASED ON THE USERS' REVIEW OF THE UTILITY, JOINTNESS,
COST AND MATURITY OF THE ASSESSED TOOLS ACCORDING TO PRE-DEFINED AND
VETTED REQUIREMENTS. ADDITIONALLY, THE PROPONENTS OF EACH SYSTEM

PROVIDED INITIAL SYSTEM CONFIGURATION/SETUP AND FOLLOWED-ON WITH OPERATOR TRAINING. A CORE REQUIREMENT IN THE ASSESSMENT WAS TO ENSURE COLLABORATION COULD OCCUR AT ANY WARFIGHTER LEVEL, ESPECIALLY IN THE DISADVANTAGED USER ENVIRONMENT WHERE THE COMMUNICATIONS INFRASTRUCTURE IS NOT ROBUST. NETMEETING WAS FOUND TO BE THE CORE APPLICATION FOR ACHIEVING WIDESPREAD INTEROPERABILITY AND INSTRUMENTAL TO PROVIDING THE BASIC CAPABILITY FOR DISADVANTAGED USERS. INFOWORKSPACE (IWS) ALSO FULLY MET WARFIGHTER REQUIREMENTS BASED ON THE JBC ASSESSMENT AND ALSO INCORPORATES NETMEETING AND SUNFORUM, THUS ACHIEVING THE DESIRED LEVEL OF INTEROPERABILITY. IT IS RECOGNIZED THAT THE ASSESSMENT CAPTURED DATA AT A POINT IN TIME AND THEREFORE IS MADE THE INTERIM STANDARD WITH THE EXPECTATION OF THE LONG-TERM SOLUTION BEING DEVELOPED.

4. TO ENSURE CONTINUED SUCCESS FOR DOD'S COLLABORATION STRATEGY, A PERMANENT WORKING GROUP WAS ESTABLISHED UNDER THE MILITARY COMMUNICATIONS-ELECTRONICS BOARD (MCEB). THIS WORKING GROUP, THE COLLABORATION INTEROPERABILITY WORKING GROUP (CIWG), WILL INCORPORATE THE C/S/A TIGER TEAM REPRESENTATIVES TO ENSURE WARFIGHTER'S MISSION OBJECTIVES ARE MET. THE JOINT STAFF AND OSD POCS ARE IDENTIFIED ABOVE FOR FURTHER INFORMATION. REQUEST YOU ENSURE YOUR ORGANIZATION IS REPRESENTED BY HAVING YOUR POC CONTACT THE OSD/JCS POCS ABOVE.

5. WITH THE ESTABLISHMENT OF THE CIWG, THE STAGE IS SET FOR BEGINNING THE LONG TERM PHASE OF THE DOD STRATEGY. THE CIWG WILL CONTINUE WORKING POLICY, PLANNING AND IMPLEMENTATION ISSUES, TO INCLUDE WORKING WITH COMMERCIAL VENDORS FOR DEVELOPING INDUSTRY STANDARDS. THE GOAL IS TO PROVIDE DOD WITH AN OBJECTIVE COLLABORATIVE CAPABILITY. ADDITIONALLY, THE CIWG WILL DEVELOP AND PROMULGATE THE PROCESS FOR CERTIFYING THAT FUTURE DOD SYSTEMS ENSURE COLLABORATION INTEROPERABILITY. THIS PROCESS WILL BE CONSISTENT WITH AND PART OF THE GLOBAL INFORMATION GRID ARCHITECTURE.

6. THIS IS AN OSD(C3I), JOINT STAFF (J2/J3/J4/J6) AND C/S/A TIGER TEAM COORDINATED MESSAGE.

BT

#6064

NNNN

APPENDIX C. INTERVIEW WITH MAJOR DAVID HENSLEY

Q: How would you characterize your level of experience with information technology (word processing, spreadsheets, e-mail,) applications in general?

A. Extensive, both formal and OJT.

Q: Can you identify current collaborative tools available to you in the Marine Corps?

A: The Marine Corps has a very expensive set of collaborative tools ranging from infrastructure (robust TCP/IP, robust exchange and Windows NT) In addition they have a very extensive tools set that includes, IIS, SQL server, Windows 2000 suite and Microsoft (Outlook, public folders) The Marine Corps has everything it needs.

Q. From your experience does the Marine Corps or other services currently utilize collaborative technologies?

A. They don't even scratch the surface. They use email. That is not collaboration. Some pockets of people that do great things but no over arching strategy and no vision on how they will employ it.

Q: If you have used collaborative tools in the past did you find them effective in the performance of your duties?

A: NO, because I can collaborate with myself. I can collaborate with those that share the tools that I use but without that overarching plan that someone has to provide...you know its one thing to say you have the tools go out and do great things...but...someone has to build the applications cause as you climb up the maturity level people just ad hoc Web sites that some LCpl did. At some point you need application that meets the needs of the MEF and is consistent throughout those organizations.

Q: Have you used collaborative tools/technologies during any part of the Marine Corps planning process? (i.e. meetings, planning exercises...etc)

A: Absolutely and used effectively with tools such as C2PC, Web technology, public folders, and all of these tools can greatly enhance the MCPP if used effectively.

Q: Are these tools essentially o mission planning and execution are could we continue productively without them?

A: In the exercises they are not essential because there is artificiality built into the exercise because everybody knows the plan going in 2. When they plan the exercises they are in the same building (or Miramar) they just have to run up the road 2 minutes or go from cherry point to Lejeune.... so they are not essential when doing garrison exercises are operations...but, if the MC went to war were the wings on one continent and the div is here and you can't just hop in a car on I-5 to get to the OPT people will find these tools essential and they can't do planning without them.

Q: If a collaborative tool offered everything you need in one application (basically a one stop shop on the desktop) would you utilize this tool or stick with other applications that you are familiar using?

A: The operation forces (if I may speak for them) are begging for this type of tool. Now, they do ad hoc attempts on their experienced level, however, if somebody provided them a tool. Probably like a Web based tool that supported the MCPP or supported the tasks they have to do during the exercise and they worked they would be adapted lock stock and barrel. People are hungry for this stuff cause they use it at home and they understand, hey I can check bank balance, why can't I can't I check the ATO.

Q: What features would be most important in a collaborative application.

A: It has to be within the MC standard tool set, we can't use stuff we don't have. It has to be easy to maintain & implement, it has to work, has to meet the needs of the warfighter. And it has to have a motif that interface that people are comfortable with.... the Web paradigm!

Q: Do you feel the MC should implement a standard collaboration tool set?

A: I think that is the wrong question. The MC already has a standard tool set that is well published that the MITNOC sends out. The MC is very good on standardization...we are on the same Network op system, we are all on the same service pack, we have the same Office suite, same C2PC, the MC already has the standard tool set, but what the MC needs is an application that uses the tool set to meet the needs to the warfighter.

Q: Where do you see the future of collaborative applications heading?

A: If I were King for the day, but I will never will be...but I talk to the King offline. We need to get out of the static Web pages, keep applying to Web pages, but public folders as well), but we need to get out of these organically developed home grown solutions that (please don't misunderstand me, LCpl benots or Lt benots are doing great things) but we need to get from static Web pages to data driven Web pages and we need to have applications vice little ad hoc solutions like an RFI management system, or a battle rhythm system are a causality systems, they need no be complicated, they can just be Access data bases with an html front-end or Web in a box (if you will). A lot of the expertise when they merged the OC fields, the MC lost, those who will do the applications, but I am not advocating that the MC has to develop the applications solutions but someone has to set the standard, someone has to say this is our tool set, and if you are going to develop a tool, then it needs to be in this framework, this security model, this database model, this data Access model. Really that is all it will take because if you provide that framework then when a contactor writes an application, or a marine writes an application or an NPS thesis student writes a solution application then it would plug directly in to the existing tool set, so you can get this bag of tools to work together, and like I said, we have the tool set to develop those we have the infrastructure, we just need someone to orchestrate the effort ant set the standards.

Q: Can you recommend other collaborative tools to be used within the Marine Corps that you have read about or used within other services?

A: I have two answers to that question. The first thing is with windows NT and Exchange 5.5 (5 year old technology) and a lot of the things we are trying to do now would be very simple to do when we move to windows 2000 server or Exchange 2000. Much, much simpler. But some of the eliminations we are dealing with are self-infected wounds and Microsoft has already provided the solutions. As far as other applications, to a great extent what we do is unique maybe not unique within DoD but unique as a business place...I see a lot of people, a lot of contractors coming down trying to sell this system that systems, and they are all over priced, for what they do and it seems to me that the tools are already developed and we don't need other applications, I think when windows 2000 server comes out that we use share point server that will do 80% of the collaboration we need to do, but that's not commercial development, it is not paying some beltway bandit 5 million to come up with a solution, I think that when we go to windows 2000 server and adopt share point, that will solve a huge part of our collaboration problem and then you have portal strategy, (not complicated, the 3 click access), we need the applications, that is not complicated, simple Web based tools, you need a strategy on how you will update your Web site (FrontPage, Web based forms) need a data mining tool. Once again we have the tool set, what we need collaborative czar that sites at Marine Corps University and orchestrates the effort. Let restate this paradigm, most universities have an MIS department and that MIS department would teach MIS and provide consulting functions for that organization and somewhere the MC needs that, we don't have it. Someone to teach our student and provide training to the operating forces and supporting establishments. Somewhere there need to be a collaborations czar that is the advocate for the stuff an over sees this stuff.

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APPENDIX D. INTERVIEW WITH MAJOR DARYL KORYNTA

Q: How would you characterize your level of experience with information technology (word processing, spreadsheets, e-mail,) application in general?

A: I am an advanced senior engineer.

Q: Can you identify current collaborative tools available to you in the Marine Corps?

A: First, I would like to start by defining collaborative tools. Collaborative tools are when more than one person can work together to share information freely easily without having to wait on something. So for example, PowerPoint is not a collaborative tool, and net meeting is a poor collaborative tool. Sit and see each other, and only one person can modify at a time. Collaboration is when multiple people can do things...so Microsoft Exchange, public folders are a good use of collaborative tools. Lotus Notes, Lotus Domino is a very good tool. Very intense management requirements to support those, but those are collaborative tools. I think the telephone is a good collaborative tool that gets overlooked...your computer can do several things for you but not necessarily simultaneous collaboration of resources...not even a VTC can do that...you can share ideas just like we can sit here talking. You are collaborating in your conversation and your discussion and your coming up with a workable solution. So anytime you can do that and anytime you can facilitate that throughout a nation, I think it is collaboration...so I can't give you a very specific answer on the types of systems but I think a lot of systems can be applied for it and we kind of confuse that. Let me give you a better example. There is a product called smart boards...it is a wet board type concept where you can take an image from a computer and you can show and shoot it up on the screen and then you can touch the screen to make changes on the computer just like moving a mouse around as well as enter in context and you can save that information and send it out on email. I think that is another poor example to what we term collaboration because all that is, is taking a display from a computer image and modifying it and saving it. The collaboration is everyone sitting in the room it is not the smart board. We have a terminology problem.

Q: From your experience does the Marine Corps or other services currently utilize collaborative technologies?

A: I think we utilize technologies but don't think we utilize them in a standard format. We don't have one common understanding anywhere. We don't even have a common understanding within an organization of collaborative tools. Look at the concept of how we do business here; we have information technologies, which is your G-6 folks. They set up the infrastructure they set up the distribution to allow your systems to communicate with one another. You have information management, which is something we are trying to do. We are getting there but all we have is one publication...6-3 with is just a draft...which says this is how we do business and it already 18 months old...has not been updated and it is focused on Microsoft products...Microsoft is not information management. That just a very small part of it. We don't have anything that does information systems...so we have three legs to collaboration tools...we have to the

infrastructure to support the systems communicating, you have to have the systems, command and control systems, whether it is email, Web, common tactical pictures, the ATO, using PDMCS, weather the system might be you have to have IS. How do all those systems work together? You don't have that. We have a pretty strong leg on IT...were kind of sort of getting there on IM...way off and we have no IS.

Q: Have you used collaborative tools/technologies during any part of the Marine Corps planning process? (i.e. meetings, planning exercises...etc)

A: Absolutely.

Q: Do you think they enhance or interfere with the MCPP?

A: Good question...most people do not know how to use collaborative tools to take advantage of them. So they will spend more time trying to figure out the application...then the benefit the applications will bring them...think about C2PC for example. This is an application that is very good for collaboration as long as you are using it. How many users do you think know how to transmit the overlay to another machine so that it is sitting there? Better yet, look at your hierarchy...back to that IS, IM IT. C2Pc has to integrate with other systems for that common tactical picture...so if those systems are set up right or properly managed by an IS person, which we don't have. Then the communication does not happen and then the training to make sure that happens in the concepts of how that information flow is managed can't be implemented. And that is were we are!

Q: Are these tools essentially to mission planning and execution or could we continue productively without them?

A: Wow, that is a loaded question. I think what the MC has done in general is, we have taken processes that we have to do business and we have automated them so we have taken this concept of tracking unit locations on a map board with yellow stickies and overlays and we have automated the process by creating track management capabilities through IOS, TCO, IAS, C2PC.etc...and we tried to keep moving forward with that...the problem is we need to look to not look at the application but look at the process and we need to think through the process of collaboration rather than automating the existing process. We don't do that, but that is called information management. Go back to those three legs.

Q: If a collaborative tool offered everything you need in one application (basically a one stop shop on the desktop) would you utilize this tool or stick with other applications that you are familiar using?

A: I can't answer that, but I will tell you to go back to the previous answer that I gave you that don't look for the application, don't look for the solution, in a software package. Look for the solution in the process. What is the process that we really need to do to get this information better, before we know that lets figure out what information we need and who needs it, when do they need it and what format, then develop an application to answer that question.

Q: What features would be most important in a collaborative application?

A: User friendly, it needs to be easy for the user to facilitate based on their way of doing business. To often we develop technical solutions to operational problems. You don't want that, an operator cannot figure out (not the mental capacity issue) it's the understanding of how the technology works. The operator does not have that understanding, nor will they have that. So the technical oriented people have to provide the technical solution for it, but you typically get a technical solution to and operation problems. You don't wait to get the users input, we don't listen cause we don't understand the user just like the user doesn't understand the technician.

Q: Do you feel the MC should implement a standard collaboration tool set?

A: No, because who is it oriented towards. Look at the functional areas of warfighting. The collaboration tools that operators need, lets say infantry. They need different collaborative tools then aviation, then fires, then logistics, then technicians. What collaboration tools do the technicians (G-6, communicator) have to do business? Well you might say a program like speed, which does the analysis of your terrain, identifies your frequencies, your allocation of frequencies, well, that does no good to anyone but a communicator. Say C2PC, who uses that, say your operations guys, your logistician guys (maybe). Your aviator's (kind of) different requirements need different solution sets. So no there is not one product.

Q: Where do you see the future of collaborative applications heading?

A: I think we are going to continue automating existing process for awhile, I think it will take the Marine Corps and DoD a couple of years before we actually understand and get our arms around this problem, especially with NMCI, we are not going to be focused on it. However, I think is the most important aspect of where we should be headed. If you look at the C4I requirements and issues, it's all driven by information management, knowledge management, what ever you want to call it today. I am so convinced of that I think that it should be MSTP's priority. Information management and how to understand and identify the problems and isolate the process that the MEF's follow and can we use existing tools to support the processes. Not how do we use existing tools to make our lives easier. First, we need to identify the process by articulating the information flow requirements, then adjust or modify the systems that we currently have to support the requirements for those processes.

Q: Can you recommend other collaborative tools to be used within the Marine Corps that you have read about or used within other services?

A: Again, go back to the definition of collaborative tools. A lot of things I think we can implement that would assist us, only assist us in the existing processes, so first I would identify those processes.

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APPENDIX E. INTERVIEW WITH MAJOR SCOTT MACNAMARA

Q: In a few words how would you characterize your level of experience with information technology applications in general?

A: Very experienced

Q: Identify current collaborative tools available to you in the Marine Corps (or other services)?

A: Making Web pages with FrontPage 2000, but probably the biggest one is the collaborative features of Outlook, and Net meeting.

Q: From your experience does the Marine Corps currently fully utilize collaborative technologies?

A: No, absolutely not. I think you have a few people who have taken the initiative to get smart on a few things just like another software or system that we fielded, we have vary levels of expertise but MSTP is really trying to take that to the next level which I think is a great thing, but beyond that there is just the old mind dog set that exists in the people who are receiving the training or there bosses that bring this stuff in use is slow moving!

Q: Do you find collaborative tools effective in the performance of your duties?

A: Very, extremely. I have been the Information Management Officer (IMO) at 3rd MAW for a year and then educationally I have the graduate degree, which sets me up nicely, but back to the question you asked me. Having been IMO at another command, we were doing these things, using collaborative solution on many of our tasks that we were needed to do. We didn't us so much the Outlook, but we wrote a lot of scripts in a Web environment and wrote everything our selves and made everything with a Web interface.

Q: Have you used collaborative tools/technologies during any part of the Marine Corps planning process? (i.e. meetings, planning exercises...etc)

A: I would have to say NO. But, I have not held a billet were I was an integral part of a OPT or something like that so.....I am aware of others using it in the MCPP...well, I guess I can only say they have used it to scheduled a meeting. But to actually use it in the MCPP No.

Q: Are these tools essential to missing planning or execution or could we continue productively without them.

A: No, not essential. We could continue to operate without them. I think we need to use essential in a more qualified sense in that the world is evolving and if we don't capitalize on the technology (whether we do or don't) the other guy will at some point.

Q: If a collaborative tool offered everything you need in one application (basically a one stop shop on the desktop) would the Marine Corps utilize this tool or stick with other applications you prefer to use or might be inherent to an organization?

A: I would say NO. Cause I am bias to a one-stop shop. This is one of my peeves with Information systems and implementation. There is a mindset out there that we have to have one system that does everything. I am very much against that, I think that systems should come from different communities, the Army should develop AFATDA, and TBMCS developed by the air guys. We should not get wrapped around the axle as to whether those are talking or not. There is value to that sector approach to things were we coordinate in the middle. Let me give to an analogy. What is the value of a community that is ethnically diverse? If you see any value in that (collection of restaurants, so forth) then you should see the values of information systems that come from a different mind set and are designed to talk to those operators. We need to quit thinking everything needs to be homogenous in the MC. Homogenous town would be boring. So a homogenous collaborative tool would be the same. The more you build into something the more you water it down. It becomes less specialized, but in our business we need things to be specialized, that is why we have MOS. Information systems, I am not advocating stove piping, but there is some middle ground there. The end state is not so that everything can talk to everything else, in my view, whether is in war fighting, or personal administration or Intel collection anything. It doesn't matter!

**Q: What features would be most important in a collaborative application.
(i.e., ease of use)**

A: I think the Microsoft look and feel is very important because everybody use this stuff at home and every body come to the table having seem word, excel, and so forth and when you sit down and use an application that does not look that way and you can't navigate it is very frustrating. MCTEEP was that way (I did my master thesis on that). It was not intuitive. So right away the GUI, Microsoft is standard. Whether we want to accept that, they are. And our software needs to appeal to the brain in the same way. That would be the first thing. But comes back to is it easy to use!

Q: Do you feel the MC should implement a standard collaboration tools set?

A: Yes, I think we should set that as a goal. Implemented right a MSTP, if you are talking war fighting. That's what they do. If you are talking a admin shop or squadron I am not sure who would honcho that but I do not think we will ever put everything under one umbrella. The MC now has a CIO, not sure what that guys going to do but we are trying to bring everything together, homogeneous, vanilla, that is going to create a whole new set of problems.

Q: In your opinion where do you see the future of collaborative applications heading?

A: In the near term the power of Outlook is where we are hading. If that is what you mean? It's here to stay, it is growing. I think of Web as collaborative tools with an interactive server and database behind it. It is going to continue, grow and expand. Those coming from training will be savvier since they have been training on them. Most had a mouse before a bike and that will help us out!

Q: Can you recommend other collaborative tools to be used within the Marine Corps that you have read about or used within other services?

A: I think an area we can make a huge amount of money is in the MCTEEP concept. That thing, which was very hierarchy in nature, needs to get implement down to where the units can go in and update their deployment information. If could use a Microsoft project concept to manage our TEEPS out in the fleet that would be great. I think that is one area we should look!

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APPENDIX F. SHAREPOINT SERVER PORTAL 2001 WHITEPAPER

Microsoft Sharepoint Portal Server 2001 extends the capabilities of Microsoft Windows and Microsoft Office by offering knowledge workers a powerful new way to organize, find, and share information. For system architects and developers, Share Point Portal Server is a solution that delivers dramatic new value by combining the ability to easily create corporate Web portals with document management, enterprise content indexing, and team collaboration features.

This release of Sharepoint Portal Server is the first opportunity to learn about the extensive capabilities of the product. The most frequently asked question is likely to be "How can I effectively use Sharepoint Portal Server in my organization?" The goal of this white paper is to help you understand how Share Point Portal Server can help you solve the content management needs of your organization.

What Is Share Point Portal Server?

As an organization creates and collects information, people spend increasing amounts of time searching, organizing, and managing that information. Sharepoint Portal Server combines the ability to quickly create corporate Web portals with search functions, document management features, and collaboration options. Sharepoint Portal Server is tightly integrated with the tools that you use every day—Windows Explorer, Office applications, and browsers—to help you create, manage, and share content throughout your organization.

The Dashboard Site – A "Portal in a Box"

Web portals are quickly becoming a popular means of aggregating information from many different sources into one convenient place. Sharepoint Portal Server provides an easy way to create corporate Web portals and integrate document management and search capabilities.

Sharepoint Portal Server creates a Web portal—known as the *dashboard site*—automatically during installation. The dashboard site offers a centralized access point for finding and managing information. By using a browser to view the dashboard site, users can perform document management tasks and find information. The dashboard site allows users to:

- Browse through information by categories
- Search for information
- Subscribe to new or changing information
- Check documents in and out

- Review a document's version history
- Approve documents for publication
- Publish documents

The dashboard site can provide access to information stored both inside and outside your organization, allowing users to find and share documents regardless of location or format. In addition, you can customize the home page of the dashboard site to display organizational news and other important information.

The dashboard site uses Microsoft Digital Dashboard technology to organize and display information. A digital dashboard consists of reusable, customizable Web Parts that can present information from a wide variety of sources, including Office documents and Web sites. You can add or remove Web Parts to customize the dashboard site for your organization.

In addition to providing a default, organization-wide dashboard site, you can allow users to create customized "personal" dashboards to organize and present information that is especially relevant to them, such as project- or workgroup-specific information. Users can add content to dashboards by creating Web Parts directly from Office XP or by importing Web Parts from a catalog.

Document Management and Publishing

Large and complex information sources, such as a collection of file shares, can be difficult to navigate and use because there is little or no organizational framework to direct users. File shares, for instance, provide only a hierarchical directory structure as a means of organizing content. There is only one navigation path to any given document, and users must know the name of the server that the document is stored on, in addition to the directory structure of folders on the server. When you add other sources of information, such as Web sites, e-mail servers, and databases to the mix of information sources, finding the right information can be difficult.

It may be difficult to share documents with others, control access to those documents, and publish documents in their organization. Important documents can also be lost, overwritten, or hard to find. Sharepoint Portal Server offers a number of features to help streamline your document management such as:

- Version tracking to record the history of documents
- Application of descriptive, searchable information (metadata) to identify a document
- Document publishing control
- Automated approval routes for documents to be sent to reviewers
- Web discussions for online comments by multiple document reviewers
- Control of document access based on roles

Version Control

Sharepoint Portal Server records a document's history to help you track changes and eliminate the possibility of someone overwriting another user's modifications. To edit a document, you must check it out first. This prevents others from changing it until you check it in. Every time you check in a document, Share Point Portal Server assigns a new version number to the document and the previous version is archived. When you check out a document, you retrieve the most recent version unless you specifically select an earlier version.

Document Profiles

Document profiles provide a way to add searchable information pertaining to a document. This information, known as metadata, can help describe or identify the document. By default, a document profile includes basic properties such as Author and Title. You can easily add custom to capture additional information that makes it easier to organize and find documents.

Document Publishing

Sharepoint Portal Server can store both "private" and "public" versions of a document. You can automatically publish a document each time you check it in or you can choose to check in private drafts and publish the document when it is complete. You can generate as many drafts as you want before publishing a version of a document. Only published documents are available for users to search or view on the dashboard site.

Approval Routes

Approval routes are an easy way to ensure that a document is adequately reviewed before it is published. When an author chooses to publish a document, it can be sent automatically to one or more people for review before publishing it. Each of these people, called approvers, has the option of approving or rejecting the document.

Approvers receive e-mail notification when a document requires review. Sharepoint Portal Server supports two approval routes: serial and parallel. Both models are illustrated in the following figure.

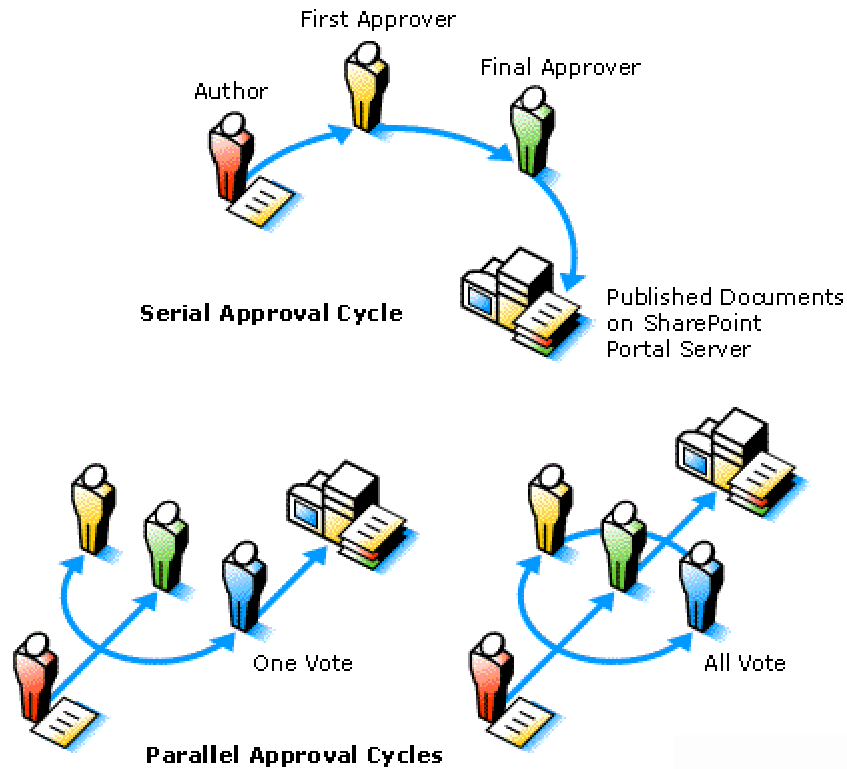


Figure 13. Approval Routes. (From Microsoft).

Discussions

Web discussions allow you to conduct online discussions about a document without modifying the document. Instead of using e-mail to discuss a document or trying to capture conversations about a document, authors and reviewers can now communicate with each other through Web discussions. Simultaneous discussions about a document can occur even if one person has the document checked out. Comments are stored as threaded conversations, grouping comments and replies together. With all comments grouped into a single place, document authors no longer need to compile hand-written comments from reviewers or comments sent through individual e-mail messages.

Role-based Security

Sharepoint Portal Server uses *roles* to control access to content. You can assign the *coordinator*, *author*, and *reader* roles to users based on the tasks they perform. Each role identifies a specific set of permissions: coordinators handle management tasks, authors add and update files, and readers have read-only access to published documents. Sharepoint Portal Server also offers the option of denying a user access to specific documents.

INDEX AND SEARCH SERVICES

An organization's information is usually stored in multiple locations, in a variety of formats. Even if a server infrastructure allows searches across multiple data stores, often only limited text searches are available. It can also be difficult to determine whether the results that these simple searches provide are relevant.

Whether you are searching for something specific or just want to browse through a group of related documents, Sharepoint Portal Server makes finding information easier with several features that make searches faster and more successful.

To make information easier to find, Sharepoint Portal Server offers:

- A single location to search for information stored in many different places
- Keyword searches that search the full text of a document and the document's properties
- Browsing by topic (categories) to find information
- Automatic categorization of documents
- Best Bet classification for documents that are highly relevant to a search
- Subscriptions to keep you updated on useful information

Full-Text Search

The dashboard site provides a full-text search option to search document text and document properties for the keywords that you enter. Sharepoint Portal Server finds all documents that match your search and returns a list of results. For a more specific search, you can use the advanced search option to add document properties, such as Author, to your search criteria. You can also use a search scope to search only a specific set of documents, such as a folder for press releases or a supplier's Web site. In addition to searching from the dashboard site, you can also initiate searches of content included in the index by Sharepoint Portal Server from within Office XP applications.

Content Sources

Organizations keep information in a variety of places such as Web sites, file systems, public folders on mail servers, and databases. Sharepoint Portal Server improves search efficiency by enabling you to search across these information sources at the same time. In Sharepoint Portal Server, each of these is known as a *content source*. By using a wizard to add a content source, you identify the location of the content that you want to make available for searching to link that content to your dashboard site. Share Point Portal Server then indexes information from each content source for quick

searches from the dashboard site. With the addition of content sources, the dashboard site is the easiest place to find information, regardless of its location or format.

Categories

You can organize information on the dashboard site by using categories to group similar documents. This allows users to browse through information by topic. For users who are unfamiliar with where documents are stored, categories help them find what they need. Another advantage is that a document can appear in several different categories. Categories can include documents stored in Sharepoint Portal Server and information from additional content sources.

Category Assistant

Categories are an excellent way to organize your information. However, if you have a large number of documents, categorizing them can be a time-consuming task. To simplify the process, Sharepoint Portal Server provides an automated categorization tool called the Category Assistant. After you have categorized a few representative documents for each category, the Category Assistant compares those sample documents to the uncategorized documents, and then automatically selects the best category matches based on the content in the uncategorized documents.

Best Bets

Best Bets provide guidance to users by directing them to documents considered particularly relevant to their search. A Best Bet is a document selected as the best recommendation for a category or specific keyword. Sharepoint Portal Sever displays Best Bets at the top of a search results list.

Subscriptions

Subscriptions notify you about new or updated information on topics that match your interests. You can subscribe to content you find useful: a specific document, all documents in a folder, all documents assigned to a category, or a set of search results. After you subscribe to content, Sharepoint Portal Sever notifies you when the content is modified, if a new document matching your criteria is available, or if Web discussion comments about the content are added. You can view your subscription notifications on the dashboard site. You can also choose to receive notifications by e-mail.

PRODUCT ARCHITECTURE

Sharepoint Portal Server integrates with and makes use of key Microsoft technologies, including Windows, Digital Dashboards, Office, Microsoft Internet Explorer, the Microsoft Exchange Server Web Storage System and Microsoft Search Service. The following figure represents an overview of the Sharepoint Portal Server product architecture.

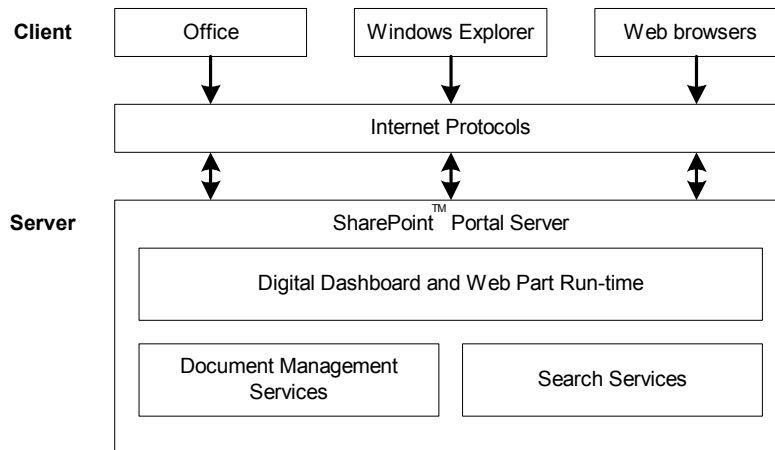


Figure 14. Product Architecture Overview. (From Microsoft).

The client components consist of extensions to Office applications and Windows Explorer. These components allow users to perform document management and search tasks within those applications. The dashboard site, viewed through a browser, provides a Web-based view on the document management and search services the product provides. The core server components include Document Management Services, Search Services, and the Digital Dashboard and Web Part Run-time environment.

CLIENT COMPONENTS

The client components of Sharepoint Portal Server consist of functional extensions to Office and to Windows Explorer that enable document management functions within those applications. For example, after modifying a Microsoft Word document that you checked out from a Sharepoint Portal Server workspace, you could go to the File menu in Word and select the Check In command. Alternatively, you can use Windows Explorer to view and perform document management operations on files contained in a Sharepoint Portal Server workspace. The rich search capabilities of Sharepoint Portal Server are also available from within Office XP when you connect to the workspace that you want to search through Web folders.

Note: Office XP includes the client components of Sharepoint Portal Server. Users of earlier versions of Office must run a simple client setup program provided with Sharepoint Portal Server to add document management functionality.

In addition to providing an aggregation point for a wide variety of content, the dashboard site also provides access to the document management and search capabilities of Sharepoint Portal Server. Users can interact with the dashboard site by using their favorite browser.

The client components described earlier communicate with the server components using standard Internet protocols.

SERVER COMPONENTS

The server components of Sharepoint Portal Server provide the services for document management and search. In addition, the Digital Dashboard and Web Part Run-time provide the functionality that allows administrators and users to create their own dashboard sites to aggregate content into a single source.

Document Management Services

The document management services consist of a store (based in Microsoft Web Storage System technology) and the services that facilitate document management functions like check-in, check-out, and document versioning.

Search Services

Share Point Portal Server makes use of Microsoft Search—Microsoft’s world-class search technology for creating indexes, searching, and retrieving content in the local document store, in addition to external content sources.

The Microsoft Search Service has four main components that:

- Crawl the collected content of a set of URLs for inclusion in an index

The *Gatherer* component can find its way to a wide variety of content sources, including Share Point Portal Server workspaces, Web servers, file servers, Exchange 2000 public folders, and Lotus Notes databases. Customers can extend the reach of Share Point Portal Server to additional types of content by using the product’s Software Development Kit (SDK) to create custom *protocol handlers* that tell the product how to retrieve data from specific sources.

- Parse or *filter* the document to extract the relevant metadata and content

Filters are provided for a variety of document types, including HTML, Office documents, text files, and Tagged Image File Format (TIFF) image files. Developers can learn how to create custom filters, known as *Ifilters*, from the Microsoft Search section of the Platform SDK.

- Include the data retrieved by the Gatherer component in an index

The Indexer component uses language-specific word breakers and stemmers to extract words from the content. Then "noise" words, (e.g. a, the, of) are filtered out, and the content index is generated. Specific-language support is provided for English, French, Spanish, Italian, German, Traditional Chinese, Simplified Chinese, Korean, Thai, Dutch, Swedish, and Japanese. A "neutral" word breaker is used for all other languages.

Note: You do not need to have a localized version of Sharepoint Portal Server to take advantage of this language-specific support for indexes. Support is provided for all the languages listed previously in each language version of the product.

- Perform searches for content.

Users can submit search requests from the Search page of the dashboard site or from Office XP applications. In addition, developers can issue searches programmatically in the form of ADO or WebDAV SQL search queries.

Digital Dashboard and Web Part Run-Time

These server components manage all functions related to presenting the Share Point Portal Server dashboard site through a browser. It displays the user interface and enables dashboard site customization by administrators and coordinators. In addition, this run-time component services requests from Web Parts displayed on the dashboard site.

CONFIGURATION FLEXIBILITY

Different organizations will use Sharepoint Portal Server in different ways. Some want to make use of the product's document management features, whereas others want to take advantage of the sophisticated search capabilities to provide access to documents stored across multiple information stores. Sharepoint Portal Server provides the flexibility to handle:

- Hundreds of thousands of documents stored in a single server, single document management workspace
- Hundreds of thousands of documents using a similar single server configuration where a majority of the content is stored on external information stores
- Millions of documents when dedicated Sharepoint Portal Server content index and search server configurations are used to index external content stores

The scenarios that follow are examples of how the configuration flexibility of Share Point Portal Server accommodates each of these distinct sets of requirements.

Group Collaboration

In this scenario, illustrated in *Figure 3*, a department's primary requirements are the ability to create documents, implement version control, and publish documents within the group.

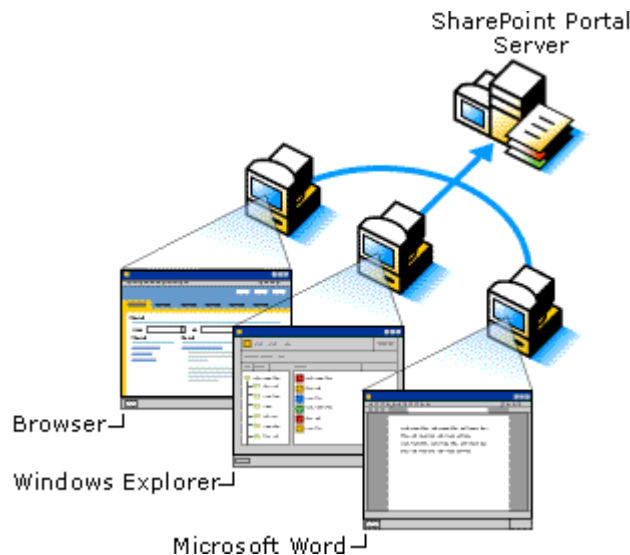


Figure 15. Group Collaboration (From Microsoft).

In this example, the team sets up a single Sharepoint Portal Server computer with a workspace that consists almost entirely of content stored locally. The amount of content stored outside the workspace is small and might consist of content sources pointing to one or two competitors' Web sites. The emphasis is on the document management capabilities of Share Point Portal Server rather than its search capabilities.

Information Search Services

In this scenario, illustrated by *Figure 4*, a group uses Share Point Portal Server to search content stored on its file servers, database servers, and an Internet Web site. The dashboard site also displays organization-wide communication such as announcements, holiday schedules, and human resources information.

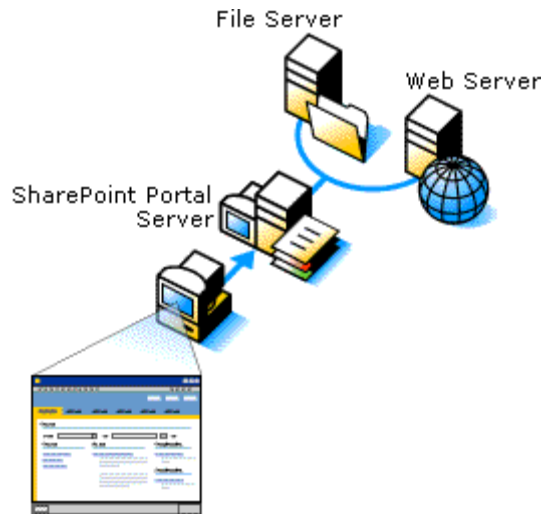


Figure 16. Search Services (From Microsoft).

The Share Point Portal Server computer stores indexes for the configured content sources and makes them available to the dashboard site associated with the workspace. In addition to the content sources that link to documents stored outside the workspace, the workspace itself can contain documents. The group primarily searches its own content, with limited searching on Internet sites. Document management is required only for the documents stored in the workspace. The only users performing document management tasks are those responsible for updating the dashboard site.

Aggregated Search and Document Management

When organizations need division-wide or enterprise-wide search capabilities across a wide variety of content sources, performance and efficiency can be increased by deploying Share Point Portal Server on multiple servers that perform dedicated tasks. For example, you can configure a server to function solely as back-end server dedicated to creating indexes and another to function as a front-end search and dashboard site server.

The configuration shown in *Figure 5* supports an intranet site for an organization that needs extended search functionality but has limited document management needs. This deployment uses two Share Point Portal Server computers: a server dedicated to indexing and a server dedicated to searching. The server dedicated to indexing performs the back-end tasks relating to creating and maintaining indexes; the search server stores workspace content and provides the dashboard site associated with the workspace.

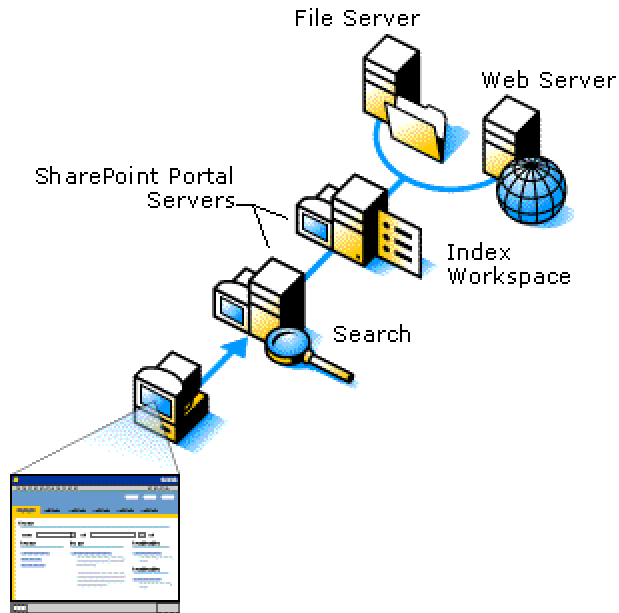


Figure 17. Enterprise-Level Search Services (From Microsoft).

For example, an organization uses Share Point Portal Server to search content stored on its file servers, Lotus Notes database servers, intranet sites, and the Web sites of several competitors. The server dedicated to indexing creates an index of this content and then propagates the index to the search server. The search server provides the dashboard site used for searching this content and stores documents displayed on the dashboard site, such as announcements, holiday schedules, and company press releases.

The index workspace, located on the server dedicated to indexing, is dedicated to the resource-intensive task of creating an index of content stored outside the workspace. This index workspace stores only indexes associated with content sources. After the index is created, it is propagated to the search server. The index can be propagated immediately after it is created, or you can schedule propagation to coincide with periods of low network traffic.

On the server dedicated to search services and the dashboard site, search queries encompass both intranet and Internet content. Only users responsible for configuring and updating the dashboard site perform document management tasks.

This deployment configuration supports an intranet site for an organization that needs extended search functionality but has limited document management needs. This deployment uses two Share Point Portal Server computers: a server dedicated to indexing and a server dedicated to searching. The server dedicated to indexing performs the back-end tasks relating to creating and maintaining indexes; the search server stores workspace content and provides the dashboard site associated with the workspace.

The configuration shown in *Figure 6* supports an organization that requires both document management features and robust search capability. This deployment includes at least three Share Point Portal Server computers: a server dedicated to searching, a server dedicated to indexing, and one or more document management servers. It is important to include a sufficient number of document management servers to support those users that require the document management functionality. For example, each division in a large organization might have a document management server.

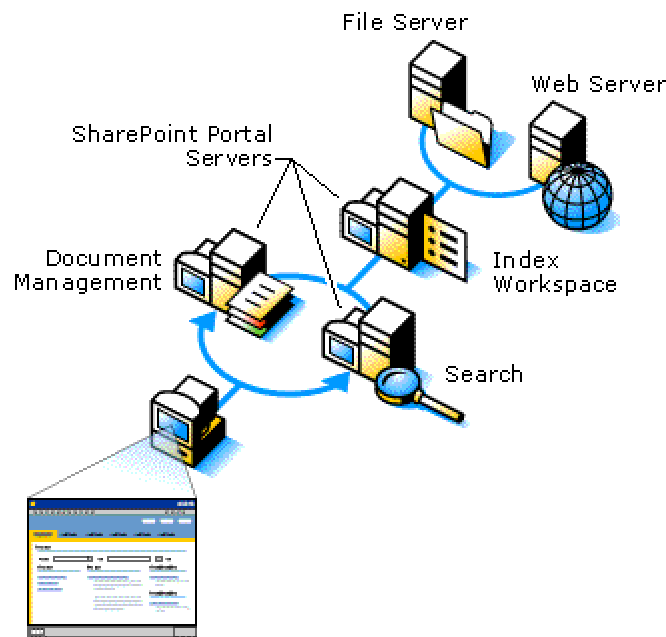


Figure 18. Enterprise-Level Document Management and Search. (From Microsoft).

The document management server stores documents in its workspace. The index workspace, located on the server dedicated to indexing, creates an index of all of the content on each document management server as well as other content from the intranet and Internet. The index workspace propagates its index to the search server. The search server provides the dashboard site used for searching this content and stores documents displayed on the dashboard site, such as announcements, holiday schedules, and organization information.

Organizations can also choose to duplicate read-only versions of the search server in this topology to provide improved response time across a geographically dispersed network. For example, you could have a search server from your company's headquarters in Geneva duplicated to Singapore, New York, and Vancouver. Users in those locations would be able to view the dashboard site and perform searches without having response times slowed by low-bandwidth network connections.

CONCLUSION

For Windows and Office users, Sharepoint Portal Server is a rich server for knowledge workers to easily find, share, and publish information. Share Point Portal Server delivers dramatic new value as a single solution for corporate dashboard sites, document management, content searching, and team collaboration.

For more information, visit the Sharepoint Portal Server Web site <http://www.microsoft.com/servers/sharepoint/>.

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