Intranet Organization:
Strategies for managing change

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Chapter Outline

2005 Preface:

This book was originally published as a web-only book in 1996. Almost ten years later many people still access it every month. I also know that many organizations used the online version of this book in the early formation of their intranets, and that it influenced the products of at least a few companies. For both historical perspective and because many of the principles are still valid, I have kept the online version available.

Over the years I have had requests for a print (or easy to print) version. It was never made available in a form that is easily printable because the original was written in HTML and constraints on my time and the lack of technology making it easy to convert to a printable form conspired against it. Now that the conversion technology has been available for some time, all I can claim is inertia for not having made a print version available sooner. What you are reading is the original HTML version made available as a single PDF document.

The only changes from the original version are a few spelling corrections. Therefore, at this time you will still see hyperlinks at many points. I left these in as blue underlined text in this version to show where they were, even though they do not work as hyperlinks. Most were to web sites and products that were used as examples almost ten years ago, and the links either no longer work or the current targets have been changed. While many of these examples have disappeared, the kindred of most still exist as competitor's products or as features in more integrated products.

The other place you will see hyperlinks is for books and articles referenced. Eventually I may have the time to put together a print bibliography for this version. In the mean time if you want to track down a reference you can either find the link in the HTML version (http://www.iorg.com/intranetorg) or search for the title or author on Amazon.com or your favorite bookseller's web site.

Steven L. Telleen, July 2005

1996 Preface:

Existing books on Intranets focus either on architecting and installing the technology or providing a high level explanation of the benefits. In the former category are the "how-to" books for architecting and implementing servers, networks, software, HTML, CGI, Java and, maybe, page design. In the latter category are often overworked pronouncements about the benefits of (and dangers of not) participating, lists of potential projects to be undertaken, examples of uses today and, maybe, feature/function lists of tools.

Talking to companies that have implemented Intranets, the toughest issues are not the technology but the people issues. What is missing entirely is a book that takes a thoughtful look at how an organization might transition to all these wonderful benefits, what it means in terms of organizational needs, role requirements and reskilling people and how the organizational strategy relates to the technology decisions. In other words, the critical stuff that links strategy and technology.

This book is a "how-to" implement an organizational infrastructure that can exploit and grow with the fast changing technology. It is organized into nine chapters that walk through the organizational issues from philosophy to specific implementation. Along the way, we examine how Intranets relate to management philosophies, the roles and organizational forums required to maintain effective content, the logical architecture of content, issues and strategies for security and availability, implementation specifics, changes in work routines, the evolution of web-based applications and the future of Intranets.

The technology is exciting, the tools more amazing everyday. But without an understanding of the organizational and management implications of this technology the implementer risks becoming part of the road rather than part of the steam-roller creating it. The good news is, if you are a manager or knowledge worker in the paper world, you already know 80% of what you need. This book is intended to help make the translation and fill in the gaps. Its goal is to provide both the understanding and practical guidance for implementing a successful Intranet infrastructure.

Acknowledgements

The ideas in this book were developed over several years, with the support and contributions of many people. Some of the material, first published on the Amdahl Corporation web site, has been included and elaborated on here. Other material is completely new. New knowledge arises from the mixing of ideas, and I owe the mixing embodied in this book to many people, only some of whom are listed below.

I owe my introduction to this technology to the original skunkworks team at Amdahl: Kinji Yamasaki, Ian Kluft, Jesse Mundis, Larry Davidson and Benay Dara-Abrams. I owe a special debt to Ian, who in the early days carried on a passionate email debate with me that helped articulate many of the early issues and key ideas.

The members of the IntraNet Solutions Group at Amdahl followed me willingly through many trying times, often relying on sheer faith to keep going. They are the ones who tried out many of the ideas, brought back the modifications and elaborations, participated in the challenging and engaging discussions, and developed many of the details that made the ideas real. Thank you Jerry Straks, Joe Civello, Cheryl White, Cathi Starr-Young and Rich Schmieder. Your encouragement and contributions not only kept me going, but gave me the courage to publish these ideas in the first place. Bob Hudson and Russ Caple, who joined the team from DMR, also made significant contributions.

The latest infusion of ideas came from the team at Intranet Partners. I can't even begin to describe the energy generated by an organization that was founded on the premise of collecting and mixing Intranet pioneers from different backgrounds and companies to generate the next wave of Intranet knowledge. Bart Meltzer has given me new insights with his practical understanding of how to apply one-to-one marketing techniques and personal profiling to Intranet brokering roles and the development of user-controlled, personal agents. Marty Kacin expanded my understanding of object technology and object design patterns and how they can enable and clarify many of the concepts I have been championing. Jonathan Lewis, whose experience applying Scenario Planning techniques to the development of Internet strategies at several large corporations has added a new dimension to my views on facilitating executive understanding and development of organizational goals. And, there were many others at Intranet Partners who contributed practical insights and new possibilities.

Then there are all the people who provided the management support that allowed me to keep going. Linda Alepin at Amdahl was an early and enthusiastic supporter, especially during the tenuous times before Intranets became popular. Tama Olver, the CIO at Amdahl, sponsored our efforts to role out the official Intranet at Amdahl, and test many of our ideas on a corporate-wide scale. George Purnell, also at Amdahl, took us under his wing when we were in need of a home. Also thanks to Dan Mahoney who recruited the team of pioneers at Intranet Partners that made every day a new learning experience.

Also thanks to all those people I have not mentioned, but who listened and responded: clients and prospects, colleagues, conference attendees, writers and analysts, and the many people who have sent me email with their questions, comments, ideas and encouragement.

Finally there is my family, Clare, Adam, Ashley and Jacob, who put up with all the weekends and evenings I spent on my computer writing and rewriting, and who allowed me to take the career risks necessary to get to the point that I had something to write about. And, thanks Clare for leaving me alone when I needed to be left alone and dragging me off to a movie or some other diversion when I needed a break.

This book is dedicated to the late Olwen Williams, my major professor in graduate school, and the person who supported my eclectic interests, who expanded my horizons by introducing me to the work of Thomas Kuhn and Ludwig von Bertalanffy, and who encouraged me to learn computers.

Chapter 1: Why Do I Care?

Like it or not, we are all cursed with living in interesting times. This is not meant as a call to action or a premonition of doom, for there is little we can do except keep alert and muddle through until the new order makes itself clear. It does appear that we are on the verge of a major punctuation point in human social organization. We have the symptoms of a fundamental paradigm shift as described by the late Thomas Kuhn in his classic book on paradigms, The Structure of Scientific Revolutions. Changes in technology and business are happening so fast that the world seems in constant chaos. Our traditional theories of management and organization seem less and less capable of pointing us to useful courses of action. Entire industries are shifting in form, function and importance.

The term "Information Age" seems to be the most common designation for the emerging order. The paradigm shift to information as primary driver already is taking hold as we explain our present, cast our future and recast our history in terms of the information metaphor. A good example can be found in Michael Rothschild's Bionomics. In this book he provides a table that articulates quite well how we can use the information paradigm to discern useful patterns on a macro scale. He wrote his book in 1990, before the advent of the World Wide Web. I have taken the liberty of modifying his table to take this into account and show the magnitude of the changes we are facing.

Patterns of Information Evolution

Adapted by S. Telleen from M. Rothchild's *Bionomics*

Event	1st Information Explosion	2nd Information Explosion	3rd Information Explosion	4th Information Explosion	5th Information Explosion	6th Information Explosion
Biological						
Earth Forms (4600) (Mil. Yrs.)	1st Nucleotide Chains (4200?)	DNA Appears (4000)	Cell with Nucleus (1500)	Sexual Reproduction Begins (900)	Cambrian Explosion (600)	First Hominids Appear (2)
Mechanical						
Modern Homo sapiens Appear (200,000 Yrs.)	First Paleolithic Writings (35,000)	Sumarian Writing (5,000)	Gutenberg's Printing Press (535)	Science Begins (475)	Industrial Revolution (190)	Electronic Age Begins (100)
Electronic						
Digital Computers (55 Yrs.)	Progammable Software (45)	Networking (30)	World-Wide Web (3)	The New	Information	Age
	Encoding	Copying	Copying Improved	Communication	Proliferation	

The table begins with biological information, coded in chemical form. Life is distinguished from other chemical reactions by its ability to encode and copy information, to reproduce itself. Over time, some information pools evolved more efficient ways of organizing their information and copying themselves. This continued until an evolution in organizational structure led to a major revolution in information generation. The evolution was the nuclear membrane, the revolution was sexual reproduction.

Rothschild calls this phase in the information cycle, "communication," but it has important characteristics beyond our current connotations of that word. What caused the revolution was the ability to break the confines of isolation and add information from other systems. The mixing of information created new information that did not exist in either system before. The rate of innovation exploded exponentially and eventually created the seeds for the next major evolutionary stage. The new stage was set by the development of intellectual information, information that exists as mental patterns in the organism rather than just its chemical DNA.

This new type of information was much more flexible when it came to adding and mixing information, that is learning, but the information pool survived only as long as the individual organism that collected it. The evolutionary benefit of passing this intellectual information to one's offspring, along with the chemical information in the DNA, led to the development of culture. And the invention of mechanical writing started the cycle of information development again, this time for intellectual information.

Prior to the 1400s, the world was a very different place. Ideas and knowledge were confined to localized areas. Sharing and dissemination of new ideas was limited because there was no practical way to share. Writing was the only mechanism other than verbal communication. While writing was more efficient than verbal communication for sharing ideas over time and wide geographic areas, sharing still remained limited by the number of copies available. And, making new copies could only be accomplished by the slow, laborious process of hand copying.

Human organizations developed around these limitations. In many cultures, an entire profession of scribes sprang up to provide new copies of the existing knowledge. But consider the limitations. In a religion like Christianity, which was spreading across many languages, it was probably a good idea to translate the Bible into more than one language. However, if the organization could not create enough copies in one language, how could it realistically support additional translations? What started out as a practical reality, quickly became entrenched as a source of power and prestige. The information gatekeepers had exclusive access to the copies and could relate and interpret the content to support their own positions. Once established, there was strong pressure to maintain the status quo.

In 1450 another revolution happened. The modern printing press was invented, and again the power of information increased exponentially. The technology was evolutionary. It did not tax what was known at that time about materials or technology. It was an easy fit. The organizational and social effect, however, was revolutionary. Suddenly ideas and knowledge could be distributed widely, in quantity. Existing controls on information access became ineffective. Information began to flow and mix and generate new ideas that in turn joined the mix. As the quantity of information exploded, new ways to identify and validate quality information became

necessary. The Scientific Method was one mechanism developed to serve this purpose, and the name we have given to this period, the Scientific Revolution, refers to the methodology developed to manage the information explosion, not the technology that enabled it.

The new information from the Scientific Revolution took physical form in an explosion of mechanical and physical conveniences known as the Industrial Revolution. But the printing press also enabled, and encouraged, public education, democracy, capitalism and the modern corporation. Human organization and culture was transformed radically by the mix of ideas the printing press enabled.

Out of the Scientific Revolution came the seeds for the next stage in the cycle, the world of electronics. As we progress down this path, the advent of the World-Wide Web seems to occupy a position similar to that of the printing press in the mechanical encoding cycle. If so, we are in the beginning stages of a revolution that will affect all aspects of our lives, from business to government, from personal to social. Already we have seen the old controls and models break down. How do I control access to information? who decides what information should be controlled? How do I know the quality of information on the web? How do I keep up with the explosion of information? These questions will get answered. But not until they have shaken the very foundations of the world as we know it.

Moving closer to home

Most businesses today do not implement new technology for its own sake. Nor do they implement technology to help move society toward some new macro stage of evolution. However, experience shows that many businesses do implement new technology based on vague business goals and without identifying many of the critical elements required to reach those goals. Organizations that are lucky stumble onto many of the critical elements as they gain experience. But even the lucky ones often fail to realize the full potential of their investment.

Intranet goals commonly are stated as the specific projects that the organization intends to implement first. Make our collateral available to the field sales force electronically, or provide email and electronic conferencing capability to our employees. While these are useful outcomes, they are not broad enough business goals to justify the introduction of a technology as fundamental as an Intranet. After examining a number of initial project initiatives for their underlying business goals, and talking to many organizations undertaking an Intranet project, there appear to be some common business expectations behind these initiatives.

A surprising number of executives support an Intranet implementation expecting it to create a fundamental change in the way they do business. They expect this change to come from increases in both organizational productivity and personal productivity. They expect improved decision making, higher quality information and increased information visibility to be outcomes that support these productivity gains.

The expectations of many people lower in the organization can be quite different. Their reasons for implementing an Intranet often focus on easier information access and cost savings. It should be apparent that the level sponsoring the Intranet initiative can have a significant impact on both

the goals and what the implementors consider critical elements for success. Easier information access and some level of cost reduction can be achieved with a straight technical implementation. Improving information quality, decision making and organizational productivity cannot be achieved by technology alone. That requires development of the organizational and management infrastructure.

It's all about communication and innovation

At their core, the benefits of an Intranet come from improved communication and innovation within the organization. Tying this back to the global order of things, communication is the stage of the information cycle enabled by improved copying, and communication enables improved decision making, improved productivity, and improved effectiveness. Just as the printing press was the great enabler, lowering the barriers for the average person to publish information on paper, the Intranet lowers the barriers for the average person to publish in the electronic world.

Electronic publishing increases the speed and breadth of information flow across geographic and organization boundaries to a degree unobtainable with paper. The web technology, at the core of an Intranet, makes electronic publishing easy, inexpensive and accessible to the average employee. It improves information access. But the improved access this technology delivers is only an enabler. The rapid sharing of information that previously would not have been available electronically, the mixing of information that otherwise would not be likely to mix, is what creates the revolution.

We have shared computerized content electronically for some time. But this has been primarily the sharing of data, usually in the highly structured context of a specific business transaction. Ideas are something different. Ideas are what give data meaning. Ideas are how we share the context of our experiences and explore the possibilities of our futures. And, it is the sharing and mixing of ideas that an Intranet enables. It allows us to overcome organizational and geographic barriers and share ideas on a scale and with an immediacy not available before.

Perhaps the biggest challenge in the business world today is the ability of organizations to innovate and learn. The premise of many old Star Trek episodes is increasingly the most durable survival skill for business. While access to data can suggest or support specific actions, in the end the unpredictable human force of creativity, of new ideas, is what brings competitive advantage and victory.

Innovation and creativity have been the subject of numerous books and articles. It is a skill that can be strengthened in all of us. But in the end, the basic ingredient of human creativity is the mixing and evaluation of ideas. In fact, it appears that the best predictor of creativity is the number of novel combinations tried, the amount of idea mixing that takes place. Creative people are creative because they are not afraid to try ideas in new combinations, even though most combinations do not survive to reality. The "failures" are not a waste of time, they are the necessary ingredients for innovation.

The same must hold true for innovative organizations. The ability to support diversity and facilitate the mixing of ideas increases the ability to learn and innovate. This is the message of

many management books going back at least as far as *In Search of Excellence*. The most successful organizations value and encourage contributions and sharing of ideas from all their members. An Intranet takes this process to new heights by enabling information sharing, and idea mixing, on a scale previously not possible.

Another message from the modern management books, and the goal of many corporate re-engineering projects, is the need to distribute actions and responsibilities (decisions) closer to the opportunities and points of contact. This make sense from a couple of vantage points. Those closest to the action see the problems and opportunities first. They have the most experience applying the current procedures and therefore are more likely to know where to look for improvements. They are the ones who have to implement the new solution so they have a vested interest in making it work, or continuing to modify it until it does.

All of these are valuable reasons for distributing decision making, but, there is yet another. Distributed decision making allows the organization to try more ideas, more rapidly. And, as we noted above, creativity and learning are directly related to the number of new ideas tried. Mixing of these ideas and experiences is an important ingredient in this process. The Intranet's ability to enable the rapid sharing of directions, experiences and status supports and enhances this effect. The Intranet enables the learning organization.

"It's probably too inexpensive, easy and forgiving"

This was the off-handed comment of a vice president of information systems at one of the Regional Bell Operating Companies. It happened during a conversation we were having on the need for a goals clarification activity. Her observation, based on her experience with their Intranet, was pointing out the lack of business scrutiny that was going into Intranet projects. She clearly had mixed feelings about this situation. On the one hand she felt the need for a business justification, on the other she questioned whether it didn't cost more to do the analysis than to just do the project.

The comment stayed with me because it succinctly summed up many of the major challenges traditional MIS professionals face when confronting an Intranet. It also points out the difference between project planning, which may not always be cost effective, and goals clarification, which is a larger issue than individual projects and project selection.

On first exposure to the idea, MIS professionals find it hard to believe that this statement is really true. They have heard about "inexpensive" and "easy" before, and every time they have gotten into it, hidden technical complexities quickly emerged. Only through experience do they discover that this technology really is both inexpensive and easy. Which leads to a second challenge, it gets out of control.

We tend to apply what we know to new situations, and in the case of Intranet development this often takes the form of treating the implementation as just another programming project. Users are surveyed, or involved in Joint Application Development exercises. The results are documented and MIS develops or installs the applications. The technical publications

organization may be commissioned to create or translate the content . And, the "first" Intranet pages go online.

Before long, pages and web servers are springing up everywhere as users discover that the technology makes publication easy enough for them to master, and most of the software they need to get started is cheap or free. It is so easy they no longer have to wait for MIS to get around to their needs, so they don't.

In most cases, the challenge at this point is not a result of things being out of control, but of people feeling out of control. In the past IT professionals controlled the flow of computerized information by virtue of the technology barrier. Almost overnight, this barrier has come down. Some IT professionals welcome this change with open arms, others go to great lengths to try to impose new barriers in the name of control. The reality is that information control is not gone, only shifting back to the business owners. And this shift creates the new challenge, a change in roles and responsibilities.

Chapter 2: The Issues of Management

As we discussed in the previous chapter, Intranet technology makes the creation and publishing of information easy. It also makes the retrieval and viewing of the information easy. What is not easy is finding the relevant information that is created in this independent environment. What Intranet technology cannot provide is the organizational and process infrastructure to support the creation and management of information. Without this infrastructure there is no efficient way for information to be found. Our paper systems have information infrastructures that have been refined over several hundred years. In most organizations these infrastructures are so integrated with the way we operate that they have become the processes and procedures we use to do business. They are inseparable from our concepts of management, because information is the driver of the processes being managed.

The infrastructures that have developed around the management of information on paper have been largely centralized. The characteristics of paper publishing encourage centralization. Central decisions can be duplicated and sent out the hierarchy, but feedback is relatively slow. It is difficult if not impossible to find and access information not managed by the central structure. Once copies have been distributed to multiple sites, managing updates and local changes becomes expensive and in many cases nearly impossible. This is not to say that decentralized infrastructures do not exist in the paper world. However, they are rare in our managed enterprises.

Managing distributed systems provides interesting challenges that are not found in centralized environments. The biggest challenge is moving from an attitude of control to an attitude of enabling independent decisions and actions. Without some standards, organizations lose their ability to communicate effectively and coordinate their activities. Without some level of support, domain experts become too involved in low level maintenance activities at the expense of the high leverage functions that most benefit the enterprise. The challenge is meeting the needs for coordination and efficiency without destroying the independence of decision making and action that make enterprises strong and flexible.

Control & communication - the key to purpose driven activities

At the heart of the issue lies not only our notions about organizational structure, but our operational paradigm of what constitutes a functional, effective organization. Our traditional organizational structures have focused on a central command and control model. The organization was designed to bring information to the central command site and distribute and enforce the decisions back to the edges of the enterprise. As enterprises became larger and more complex, the number of intermediate steps increased as did the amount of information needing to be processed. While electronic media have sped the passage of information through these steps, and even allowed us to eliminate steps, it has not decreased the amount of information that must

be processed or the number of decisions that must be made. Even with the new technology, the central command and control paradigm appears stretched to its limits.

But how does an organization support effective, goal-directed activity without someone in charge? Here is where the paradigm shift occurs. The distributed command and control paradigm has a body of theory and experience that supports its approach, although many of today's proponents of the shift seem unaware of its existence. The philosophical underpinnings come from a focus of study known as General Systems Theory. Ludwig von Bertalanffy, a biologist, is considered the father of General Systems Theory, and almost every field of science (physical, social, and mathematical) has contributed to its development.

The basic tenet of General Systems Theory is that all systems share certain characteristics that allow them to function as systems, regardless of their type or level of organization. General Systems Theory attempted to identify and document the characteristics common to all systems. What is important to our discussion is a set of calculations done by the Economist and Nobel Prize winner, Herbert Simon (see "The Architecture of Complexity," Proceedings of the American Philosophical Society, 106, 1962). Simon was able to show that a system composed of independently stable subsystems could withstand significantly higher perturbations than systems built directly from their components.

Numerous examples of this principle have been documented in practice. One dramatic example, in 1989 a team at Xerox PARC, headed by Bernardo Huberman, demonstrated an application of this general system principle with a computer program called SPAWN. The problem was to develop a program that could efficiently allocate free cycles on networked desktop computers. What Huberman's team was unable to accomplish using a central command and control model was fairly quickly accomplished using a distributed decision-making model.

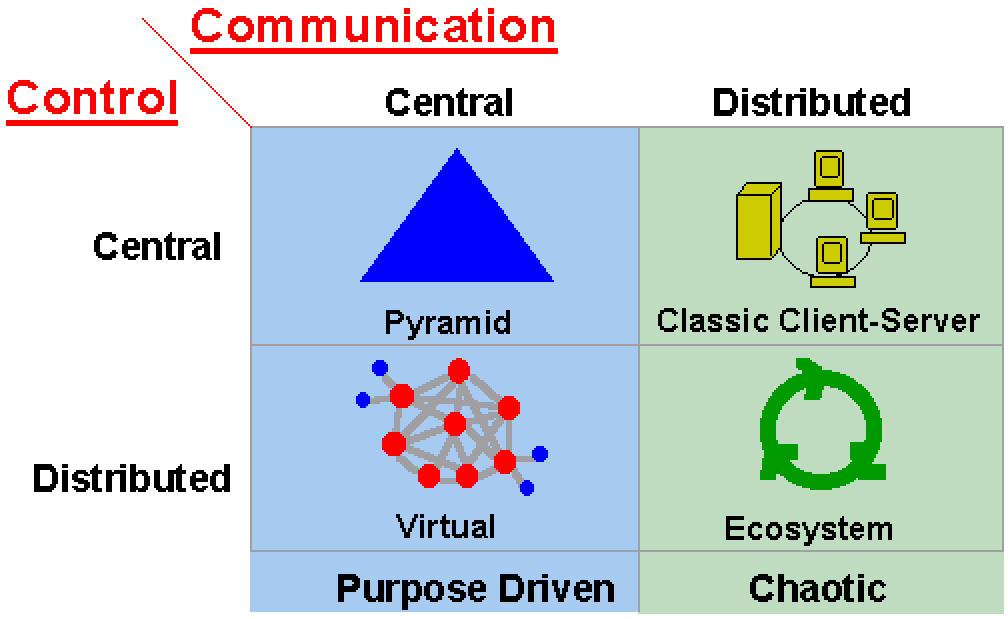
For a system to function as a system, rather than a collection of parts, it must have ways of self-organizing and even directing behavior. If command and control is distributed to the subsystems, then we must look elsewhere for the self-organizing capabilities of the complex system. What the complex system provides is coordination and communication for the self-stabilizing subsystems. The paradigm shift, then, is one of moving from a central command and control model to a distributed command and control model with central communication and coordination.

Before progressing, a quick look at contributions by two current day authors is in order. Both these authors follow in the tradition of General Systems Theory, even if they do not explicitly recognize the heritage. The earlier of the two works is Michael Rothschild's, Bionomics, published in 1990, the source of the "Grand View" table in chapter one. The second is James Moore's, The Death of Competition, published in 1996. Both authors use principles from Biology and Evolutionary Ecology to explain the apparent discontinuities between today's economic and social realities and traditional economic and social models. Both have a grasp on the biological principles that they cover and do a good job of presenting these principles and their relevance to a general audience.

The major difference between these two authors is that Rothschild focuses on competition as the primary dynamic that drives systems to efficiency and stability. Moore, on the other hand, acknowledges the importance of competition, then goes on to focus on several other key forces that determine the diversity and stability of complex systems. He invokes the general principle of coevolution to explain the evolving business ecosystem and explains the development of new "industries" in terms of ecological succession.

Both books are worth reading, Rothschild for his insights into the interplay among information, biology and economics, Moore for his insights into how the broader forces at play in an ecosystem relate to the forces at play in today's business environment. I bring attention to these two books to make another point. At the highest level, these two authors are discussing two distinctly different kinds of systems. Rothschild implicitly views the economy as an undirected or chaotic (in the sense of chaos theory) system. Moore, on the other hand explicitly recognizes human systems as being purpose-driven systems.

These are important distinctions, because both kinds of systems exist in nature. A wild ecosystem is chaos driven. An organism or organization is purpose driven. Agriculture is one example of our attempt to turn a chaotic ecosystem into a purpose-driven ecosystem. The distinction between chaotic and purpose-driven systems is important because it relates to the decision / communication models discussed above. Chaotic systems are the result of distributed communication systems rather than distributed decision-making systems.



The above diagram maps the relationships between centralized and distributed control and communication.

Our twentieth century pyramidal organization structure is a good example of a system designed around central decision making and central communications. This has been a dominant and

successful structure for most large western organizations, be they business, non-profit or governmental. These organizations are guided by a person in charge. In large organizations this person is surrounded by trusted confidants that expand the reach of the decision maker, but this can only be extended so far before the structure begins to ossify or becomes unwieldy.

A possible example of an, arguably, successful central-control and distributed-communication model is a client-server computing environment. The requirement for central management (control) has been a major contributor to making the distributed communication model of client-server computing so unwieldy. We also see numerous examples of unplanned central-control and distributed-communication effects in large organizations today. When Pyramidal organizations get too large, the central-control / distributed-communication model tends to emerge as part of the deformation and communication breakdown process. One aspect is what employees often call the mushroom school of management (they keep us in the dark and feed us lots of fertilizer). Another is the phenomenon known as "skunkworks." Large organizations display these chaotic characteristics because even if the central decisions are intended to provide a purpose, the distributed communication provides too much opportunity for error, embellishment or disregard.

The bottom two cells in the diagram depict the two versions of distributed control and decision making. The first, with a central communication and coordination structure, is a model for complex systems working toward a common purpose. The Intranet/web technologies were developed in this type of structure, and this is the model I suggest will become more common with the widespread use of Intranets in organizations. Higher order organisms are another example of this kind of structure. Our nervous systems provide a common communication and coordination pathway, but most of our body activities are managed locally, reacting and adjusting to both the immediate environment and the information from the nervous system.

The bottom right cell is similar, in that each subsystem reacts and adjusts to those around it. The difference is, there is no purposeful mission being coordinated. The system evolves chaotically. This is typical of natural ecosystems and the species from which they are composed. Evolution is driven by the demands of the moment, not a conscious purpose.

I call the process that drives the distributed, decision-making and control systems adaptive innovation. This refers to the ability of each subsystem to react to its local conditions. The result is not only a larger array of responses than can be carried out centrally, but the ability of each subsystem to tailor itself to its particular environment. In purpose-driven systems, the mission becomes the key information component against which adjustments are made. This is why vision and goals are becoming so important in organizations.

The issue of purpose-driven versus chaotic systems may seem academic, but this is at the heart of the current economic debates in the United States government. The issues around where and how much the government should do in the areas of regulation and stimulation of the economic subsystems are directly related to conflicting beliefs about whether the economy is (or should be) a chaos-driven or purpose-driven system. We will examine this issue more in the final chapter on Intranet futures.

I have come to believe that this also is an important point for some people accepting Intranet development. There are individuals who try to control the publishing infrastructure on the Intranet because the only options they see are the completely distributed (chaos) approach and the completely centralized (pyramid) approach. They do not see how a distributed management approach can be reconciled with purpose-driven results.

Information life-cycle management

Organizational information generally carries content that enables action leading to a gain or loss of resources. An organization amplifies its ability to control those resources by dividing among multiple individuals the work required to reach a goal. For the organization to be effective, activities and progress must be coordinated. An important reason for sharing information within organizations is the agreement on and coordination of these goals and tasks.

A requirement for successful coordination is consistency of information. It is not very efficient if the existence or location of important information remains unknown to an individual who needs it. It also is not very efficient if a team tries to reach a consensus when each member is operating from a different information base that may be incompatible or inconsistent with the others on the team. Some information gets stale and requires attention to keep it current. Most of today's organizational structures and processes have been refined over centuries to solve these problems for paper-based information.

Information currency and integrity is a much simpler problem when the content does not change often, activities being coordinated are not large or complex, and the information is centrally collected and distributed. However, these are not common characteristics of most enterprises today. The distributed environments more commonly found today need to be able to coordinate information in a different way, and this requires a different set of management structures and processes than most organizations have inherited.

Access, power and innovation

The key characteristic of this technology is its ability to shift control of electronic information management from the technology specialists back to the information creators, and control of information flow from the information creators to the information users. If the user has the ability to easily retrieve and view the information when they need it, the information no longer needs to be sent to them just-in-case. Publishing can be separated from automatic distribution. This applies to forms, reports, standards, meeting minutes, sales support tools, training materials, schedules, and a host of other documents that flood our in-baskets on a regular basis.

Making this work requires not only a new information infrastructure, as discussed above, but a shift in attitude and culture. As technology supporters we must retrain ourselves to think in terms of solving problems by providing the tools and infrastructure that allow information creators to do it themselves. As creators of information we must retrain ourselves to publish without distributing. As users we must retrain ourselves to take more responsibility for determining and

tracking our changing information needs, and actively and efficiently acquiring the information when we need it.

From an organizational perspective it is useful to look at how the paradigm shift affects three organizational characteristics: management, communication and leadership.

We already have discussed the pressures for a management shift from central decision making to decentralized adaptive innovation. It was noted that this shift is the real driver behind the explosive growth of Intranets, and is taking place for organizational reasons resulting from complexity and scale. The Intranet implementation strategy in a large organization provides an excellent example of the competing management principles involved in the shift.

A central decision-making paradigm approaches the Intranet implementation by determining which departments will participate, and which functions will be developed in each. It then provides the resources to implement each project in the order determined. This is a "we will do it for you" model. The distributed decision-making approach views the Intranet as a utility and concentrates on identifying and meeting the infrastructure requirements and on quickly imparting the knowledge, skills and tools to all the departments so they can implement whatever projects they determine make sense. This is an "enable you to do it for yourself" or adaptive innovation model.

In practice, reaching agreement on the central project plan often takes longer than a well executed knowledge and skills roll-out. Once agreement is reached a centralized development effort quickly becomes overloaded. Another example of a problem with surface to volume ratio. Our experience has been that in the time it takes to do one project centrally, the decentralized approach generates a project for each department. After the first project, the difference in quantity, quality and responsiveness of content between the two approaches becomes increasingly pronounced. And, since both approaches require implementation of the technical infrastructure, in the central approach, departments often get frustrated waiting for their turn, and begin to implement their own projects anyway. This is one route to the content chaos mentioned above.

The shift in communications is one from publisher push to user pull. In an earlier paper I discussed this concept in more detail. Since that paper was written, the abilities of the technology have expanded to include not just information, but also logic. Ultimately the shift in communications may have a more profound effect on our personal attitudes than the shifts in either management or leadership.

PUBLISHERS

PUSH MENTALITY

- I know what you need - and I'll send it!
- I don't know what you need - so I'll send it all!
- I don't care if you need it - I'll sent it anyway!

PULL MENTALITY

- I know my mission and audience
- I make information available on demand
- I measure and improve information usefulness

Today most of us rely on information push in both our professional and personal lives. It is someone else's responsibility to get the information to us, be it another worker, another department, or the marketing department of the company whose products we buy. The problem is, there is too much information, so our decisions become capricious from an inability to process it all. This causes us to become stressed, always fearing that we have not heard about the latest development that might make our choices obsolete, our career paths unsuccessful or our lives unfulfilled.

DOMAIN SPECIALISTS

PUSH MENTALITY

- Someone needs to tickle me
- Someone needs to tell me what information is available
- Someone needs to tell me what information I need

PULL MENTALITY

- I set up my own ticklers
- I know how to find information when I need it
- My job is to determine what information I need

In an Intranet workshop I was helping to facilitate, we encouraged a discussion of when pushing information was appropriate. One of the participants held the view that since she used many products from a certain vendor, it not only was appropriate, but desirable for that vendor to actively push information about their new products to her. Her rationale was that a pull model required her to go to the information when it may not have changed. However, look at the cost. Her approach not only took away control of her time and priorities (creating information overload), but abdicated to the vendor her responsibility for determining what information was important. This clearly was someone who had not made the paradigm shift on a personal level.

This is not to say that her rationale was faulty. Time is wasted by going to sites just to see what has changed. However, there are a number of methods and tools that solve this problem while leaving control of the information flow with the user rather than the publisher. For example, agents now exist that allow the user to identify specific pages for tracking (e.g. Katipo, WebSeeker). The agent then checks regularly and reports back whenever a change is detected. The user has control, adding and deleting what they want to monitor, without the overload caused by accepting all push materials.

One could argue that some vendors will make insignificant changes on their pages just to get additional "mind share." However, because the user is in control, this type of trickery is a high risk, low reward, activitity for the vendor. A user who is tricked frequently into coming to view something not of interest, not only is not likely to buy that item, but is likely to become disenchanted with the vendor and remove them from their monitoring agent. Instead, the reverse already is happening. Smart vendors are providing tools on their site that allow users to customize their experience and to sign up with (or remove themselves from) agents that monitor very specific information domains at the site. This is the basis of one-to-one marketing.

Part of the shift to a "user pull" paradigm involves not only a shift in responsibility for finding and retrieving information. It requires a shift in the way we relate to information, personally. Our only salvation may be to become comfortable making decisions based on patterns and trends, determining when and where specific detailed information is required and being able to find it quickly. Conversely we must wean ourselves from the belief that we somehow need to know every bit of information out there, regardless of its impact on our current decisions or choices. In a fast changing world, filled with more information than we can assimilate, making a reasonable decision and moving forward is more effective than agonizing over the best decision of the moment.

The paradigm shift in leadership is important because it plays a large role in determining how individuals will react to an Intranet implementation. There seem to be three basic types of resistance to Web adoption. The first is from those who do not understand the organizational and paradigm shift underway. The second is from those who fear losing power (either personal or market) in the shift to the new paradigm. The third is from those who recognize the shift as inevitable, but are trying to slow the progress to gain more time to reposition their products or power base.

In the end, the resistance is likely to be unsuccessful and may in fact be detrimental to those resisting. The underlying organizational requirements are fueling the move to the Web, not the technology per se. General Systems Theory predicts that those organizations that successfully decentralize decision making into self-regulating subsystems will become more stable and capable of managing today's increasingly complex environments than those that struggle to maintain a central decision making model. All three forms of resistance to Intranet implementations are more reactions to the organizational shift than the technology. Leaders in the information age need to provide the vision, stimulate diversity and the mixing of ideas, and prune or transplant inappropriate growth rather than gatekeep the information. Intranets provide a tool to assist in these activities.

Core Paradigm Differences in Tools

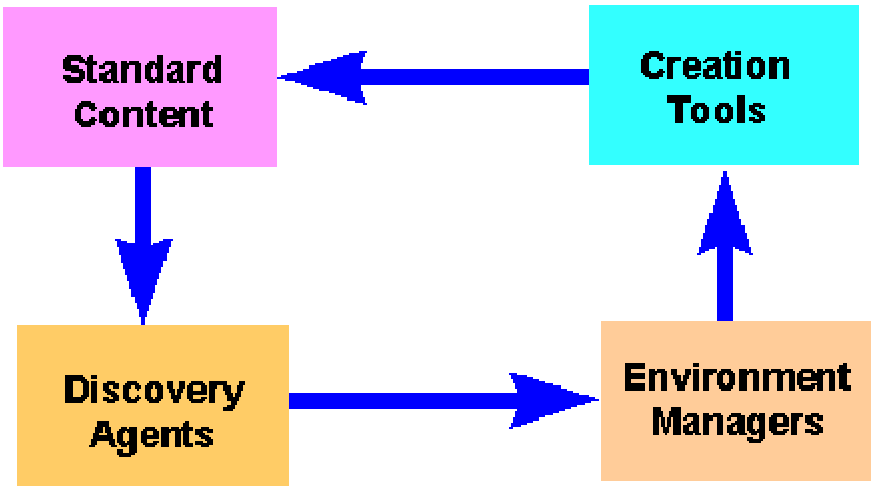
The paradigm conflict in tools matches that of the central versus distributed approach to decision making and the level of control deemed healthy. We can see this conflict in two areas of Intranet tools: Content Creation and Management Tools and Workgroup Tools.

The Web provides a major advance in electronic communication by creating a standard for content. By content I mean the text, images, audio, video and logic, all the objects available to

members of the Intranet. The standards not only allow the content to be used, unaltered, across diverse platforms, it also allows the content to be modified by any standard tool that edits that type of content. As an author, I do not need to be concerned with what specific brand of tool was used to create this content originally. I can and have switched tool brands while creating and editing both the text and images for the web version of this document. Whatever brand of tool I am using at the moment will allow me to view and edit the content.

From a practical standpoint this leads to two conclusions. First, enforcement of a single brand of tool on an entire organization for compatibility reasons is no longer an issue. Second, if the organization is standardizing on a brand of authoring tool for contractual or support reasons, the decision is less monumental than in the past. It is easy to switch to some other brand later. In fact, a long period of transition with a mixed tool set, does not cause problems with content sharing or updates, as long as the standards are focused on the output, not the creation tools.

The following model shows the major components of a distributed management Intranet. By adhering to web standards, the output in each functional box should be independent of the vendor-specific product used to perform the functions in the other boxes. In other words, content created with one product should be editable using another vendor's product for the same class of output (html, java, jpeg, etc.). Likewise, discovery agents should be able to find and catalog content regardless of what vendor-specific product created it or what mix of vendors' products are used to manage and serve the content on the Intranet. Environment managers should be able to take input from any standard discovery agent, and should allow the user to specify the vendor-specific products to be used for editing or creating each class of content.



From a business standpoint it is important to recognize that many vendors with established products are not thrilled with this transportability of content. From a short term perspective, they need time to transition their products. From a longer term perspective they would like some kind of barrier to insulate their established business from constant competition. In other words, they would rather have you invest in their incremental changes than in some upstart's monumental change. The most common tactic is to combine two or more of the functional areas in the model to create a proprietary lock. For example, the environment manager may only work with a

specific discovery agent or a specific creation tool set. The most common incarnation of this is to have the environment manager work only with content stored and cataloged using a specific content manager. (Note: single source content managers serve the same functional purpose in the old paradigm that discovery agents, and the tools that analyze their results, serve in the Intranet paradigm.)

While most content creation and management vendors have added web-standard products, two short term phenomena are helping them maintain their proprietary versions: the need many customers have for parallel paper formatted versions for those individuals not yet Web-enabled and the vendors' ability to easily incorporate viewers for their proprietary content protocols into web browsers as helper applications or plug-ins.

Using the need for non-Web versions of content as a hook, some vendors of authoring tools provide the ability to generate Web content as one form of output from their proprietary tool. Once generated, the Web version can be modified with any standard Web authoring tool, but the result does not go the other way, so only the Web version is modified. Thus the "master" copy can only be maintained in the proprietary format. Until the web-standard content can be attractively printed (proper pagination, etc.), the proprietary solutions will have an edge in the mixed output environment. ForeFront's WebPrinter offers a solution for Windows clients. Many other vendors are just providing plug-in viewers for their proprietary formats. But the plug-in approach just reinforces the old paradigm of content dependency on proprietary authoring tools and creates clutter for the user.

Web-publishing tools tend to fall into one or both of the "Discovery Agent" and "Environment Manager" areas. Historically, the products come from a wider variety of starting points than authoring tools. In addition to basic serving of the files, there are two major functions that these tools provide. One is the ability to efficiently find the content (structuring, indexing, searching) the other is management of the content (availability, update, integrity). In both functions we see the conflict between the central and distributed models.

Any product that requires Intranet content to go through a single point to be published, be it a single server or a single application, is forcing a central decision-making model and the potential for a central bottleneck on the organization. This is not to say that organizations should not have a comprehensive index of their Intranet content. The issue is the way in which such an index is created and maintained.

In the distributed model, an Intranet-wide index resides at some location. It really doesn't matter where. The index is searchable by the attributes and behaviors of the objects that have been indexed. The information in the index is maintained by an automated discovery agent that searches the Intranet links on a regular basis and creates a current map of objects and links to their occurrence. In this way individuals are not constrained from publishing by central bottlenecks, but a reasonably current consolidated view of all the content is available.

This model follows the rules of self-regulating subsystems. The brand of server (hardware or Webware) for individual Web servers in the Intranet is not important to a discovery agent. Individuals and groups can self publish without running into procedural or resource bottlenecks.

The index and agent applications are independent of the Intranet content. If a different brand of discovery agent or indexer is desired, it can easily be substituted.

The publishing tools for content management are less generic than most of the other web alternatives. There are several good tools available today to help authors or publishers manage a complex of related pages, but they tend to be tightly tied to specific authoring tools and web servers. This is mainly due to the various wizards and "bots" that allow non-technical authors to create their own complex functionality. In a distributed decision-making organization, these tools are viewed as distributed aids under the control of the authors or publishers. There is no central command and control manager, nor is there a need for one. Each publisher can use a server with the package she prefers, and the output is standard regardless of the publisher package managing it. The communication and coordination function is handled by the discovery agent/index method described above.

Products using the agent-discovery model are starting to emerge for managing web objects in an application development environment. Examples are products from Wallop Software and NetCarta, which use agents to discover and map the objects and relationships available on an Intranet, including applets, graphics and HTML pages. As these tools evolve they open up possibilities for increasingly flexible and powerful publishing-management and application-development capabilities that are based on communication and coordination rather than central control.

Coordination, or workflow, tools are the newest of the Intranet tools, although the Internet versions of the most commonly used functions in the proprietary workflow packages are actually older. For example, email, threaded conferences, searchable bulletin-boards, news groups and self-service subscription servers are all old Internet functions that actually contributed to the Web standards. In many cases the newer proprietary clones are less flexible than the best of their Internet counterparts.

It was the ability to track and manage processes that distinguished the workflow packages from the traditional Internet tools, until recently. This will be one of the most interesting areas to watch develop in the future. The reason is that Internet and Web implementations tend to coordinate activities via messaging approaches. The traditional workflow packages are primarily database applications that use common variables in a database to coordinate activities. Both of these approaches have their own set of strengths and weaknesses, and applications can be built that mix the two approaches.

Since sharing common data is the essence of traditional workflow packages, a major issue has been the sharing of databases by geographically distributed groups and by mobile computers. The standard way of handling this has been replication of the databases, making multiple copies, then comparing and copying changed files when the opportunity arises. Initially this was accomplished through the proprietary database of the workflow vendor. More recently, application vendors in this market have begun to offer "synchronization" of client and server databases outside of the workflow vendors' packages. These tend to work with many common SQL databases, and the brand does not have to be the same on the client and the server. These same vendors are moving their workflow packages to Intranet technology.

What is most intriguing is the question of how message-based technology, that makes up much of the Intranet tool set, might apply to the world of workflow. Are there opportunities to rethink the problems of workflow in the distributed paradigm, or is this aspect of coordinated behavior inherently dependent on centralized control and therefore best handled with centralized technologies? The interest in applying Intranets to workflow management is recent, and has not yet attracted the number of entrepreneurs that fueled earlier innovation in other areas of the Intranet. The early entrants are primarily building interfaces between existing data-sharing models rather than exploring the extension of the distributed-messaging paradigm to the fundamental problems that workflow packages must solve. However, a few companies, like WebFlow, have begun to develop approaches based on the new paradigm. This is perhaps the most promising area for the next wave of leapfrog applications.

One problem that must be solved is that of asynchronous clients. It is somewhat surprising that Intranet software has not addressed the issue of mobile users, since the basic Internet email technology has long supported mobile users through the caching and queuing of messages. Tools like WebWhacker are beginning to bring these capabilities to Web files, but remain in the view only mode. When Web forms can be saved locally, filled out and queued off-line, then submitted when the user becomes reconnected, a whole new set of message-based workflow tools will become available. The advent of Java and portable objects will encourage this process.

The proprietary workflow infrastructure vendors continue to try and sell central control as their value add in the Intranet market space. Meanwhile tools that support the distributed-control, central-coordination model are beginning to emerge. A candid question anyone implementing Intranet workflow tools should ask of their potential vendors is their commitment, plans and timetables for evolving to a distributed control model. Those vendors who believe they can hold back the tide of distributed decision making (distributed publishing) and pull versus push information indefinitely will likely have a short life.

When implementing Intranet policies, the organization needs to address the issues around standards and proprietary tools for both the short and long term. In general, moving toward Web-standard content and approaches provides the most long-term flexibility for incorporating new functionality and integrating diverse content in the event of changing requirements, mergers or partnerships with other organizations.

Adaptive Innovation

In his book The Death of Competition, Moore advances the concept of coevolution as the new business model. All players in a business ecosystem must coevolve for the system to grow and remain healthy. This same concept is central to the notion of the distributed management model advanced above. Each business element (self-regulating component) finds itself in a continually changing environment. It survives and adds value to the overall mission by adapting to the changing conditions of the organization.

The strength of this new organizational model is its resilience and flexibility. Every part does not have to respond to an attack or opportunity, only the parts directly affected. Likewise, if one strategy fails, the effect on the whole organization is diluted not just by the limited area affected,

but by the strength of resources and relationships of the parts not being challenged. There are more responses and more creative minds trying more things than any central organization could ever manage. And, those responding are the most sensitive to and knowledgeable about the problems they are trying to solve. This is the strength of what I call Adaptive Innovation.

Adaptive Innovation is why an implementation approach that focuses on creating the infrastructure and imparting the knowledge and skills to all the departments has the best chance of success.

1. A small increment of effort spread across each unit in an enabled organization will produce more output than a large centralized effort.
2. If the tools and approaches are useful, the time and effort expended on them will grow by displacing existing approaches and activities that are less useful.
3. The uses and time displaced will be different in each organizational unit based on that unit's determination of what works or what makes sense.
4. Uses and quality of information will improve over time if regular communication among the units is encouraged, because of idea sharing, competition and peer pressure.

Business Implications

Companies are moving quickly to implement Intranets even though the business ramifications are not fully understood. As the MIS director of one company put it: "The potential benefits to the company are as yet unclear, but it appears obvious that we cannot ignore the energy building around the Web."

It is difficult to predict many of the outcomes of Intranet technology because most enterprises adopt the technology to solve a proximate problem, and justify it on that basis. Since the technology, employed to perpetuate the existing management model, also enables an effective, alternate, management model, the original justifying benefits often are accompanied by changes that show up in totally unexpected places.

Desktop computing increased computing costs, but decreased secretarial staff and virtually eliminated typing pools. Implementation of intra-enterprise TCP/IP networks increased networking costs, but generated offsetting savings in telephone and express mail costs (Schlumberger, reported in InformationWeek 1995). In other cases, Intranet implementations have increased some networking costs, but generated savings in photocopy, computer storage, printing, and travel costs. As roles begin to shift, Intranet implementations also may reduce the number of personnel or even eliminate some of the functions required to support today’s paper-based communication.

While many initial Intranet justifications are based on reducing costs, most quantum business leaps come not from cost savings, but from increased opportunities and revenue. As mentioned in chapter one, this type of fundamental change is more appealing to most executives than incremental cost savings. However, these types of benefits are much more difficult to quantify in traditional terms. They tend to be enterprise specific and more story (sensibility) based than numbers based. While numbers usually are presented, they make sense only in the context of the

assumptions that the story makes "reasonable." Chapter 8 on implementation planning presents more information on developing cost justifications.

We are now ready to move to the next chapter where we will examine in more detail the basic roles that support management of Intranet content.

Chapter 3: Who are the Players?

Organizations are largely defined by the way they manage communication. Although we do not often think of organizations in this way, most of the roles in an organization can be defined from the perspective of creating, maintaining, brokering and applying information. Some of the roles in today's organizations are required to manage organized communication regardless of the technology. Others specifically address the strengths and weaknesses of the paper technology that provides the communication medium in most businesses today or in the recent past. Still others have evolved to support our first forays into managing electronic information, where the complicated technology has precluded the average member of the organization from participating directly. Regardless of the technology, organizations require roles that support processes for:

- Goal directed activity
- Communication and coordination
- Verified content
- Information currency
- Protection from liability
- Protection from loss

These roles take many forms and are found from the executive suite to the secretarial support staff.

As the medium of communication moves from paper to the Intranet, these organizational roles need to be examined and adjusted to match the strengths and weaknesses of the new technology. This chapter discusses the major roles that need to be examined or established to support the content on an Intranet. However, an Intranet is a multipurpose infrastructure that supports many types of communication for many purposes. Before moving on, a few words about the types of information found on an Intranet are in order.

Three Sources of Information

At least three sources of content are found in organizations, and all three quickly emerge on enterprise Intranets: formal, project/group, and informal.

The formal information is the officially sanctioned and commissioned information of the enterprise. It usually has been reviewed for accuracy, currency, confidentiality, liability and commitment. This is the information with which the formal management infrastructure is most concerned. These are the formal documents that organizations produce to convey the official, supported information about their products, services and processes. Many of these documents are the first to be considered for Intranet projects because of their official status and wide distribution.

Project/Group information is intended for use within a specific group. It may be used to communicate and share ideas, coordinate activities or manage the development and approval of content that eventually will become formal. In the paper world, the documents that carry this information generally are not shared outside the project or group. They also are not the first to be considered for an Intranet application. However, the Project/Group information is where the Intranet has the most potential to transform work processes and improve both organizational and personal productivity. On the Intranet, Project/Group information generally is not listed in the enterprise-wide directories and may be protected by passwords or other restrictions if general access might create problems.

Informal information occurs in organizations as notes, memoranda, white papers, individual presentations, and other creative work done by individuals. It begins to appear on the Intranet when authors and users discover how easy it is to publish within the Intranet infrastructure. Informal information is not necessarily the same thing as personal home pages. A personal folder or directory on an Intranet server can serve as a repository for the white papers, notes and concepts that may be shared selectively with others in the enterprise to further common interests, for the solicitation of comments or for some other reason. Instead of sending copies, the URL can be given to the interested parties, and the latest version can be read and tracked as it changes. Readers can send email feedback immediately by clicking on a "mailto" link in the document. This type of informal information can become a powerful stimulus for the collaborative development of new concepts and ideas.

The roles discussed below are directed at managing the formal content of the Intranet. Some of the roles carry over easily into the project/departmental information, and their use in this context will be discussed in this and subsequent chapters. The informal information is, by definition, outside the formal organizational management structure. There are, however, points of contact with the formal management structure in terms of protection from liability and loss and being able to distinguish verified content from informal content.

Intranet Management Roles

The formal information of an organization is supported by defined roles. In the traditional setting, where paper is the primary medium of conveyance, the formal information roles are tightly coupled with the functional roles of the organization. The advent of electronic media and computers have stimulated our understanding of the information components of many of these functional roles. This occurred because early digital media were complex and required "specialists" to manage the technology around the content. The lack of technical knowledge by the professionals in the functional areas forced most organizations to separate the information roles from the functional roles. This separation of roles helped us clarify and understand both the information roles and their relationship to the functional processes they supported.

In many ways, this forced separation created a complex and somewhat unworkable environment. Having to create a special project for every functional innovation is not conducive to organizational responsiveness or flexibility. The technical specialists lack of working experience with the functional activities often resulted in applications with less than optimal user interfaces or even differing management assumptions and philosophies. The demand to move information

management back into the functional areas and have functional specialists manage their own technology has been growing and products that support this trend account for most of the recent growth in the information technology industry. This was the appeal of client-server and remains the primary appeal of Intranets.

The evolution back toward unified functional and information roles brings with it the new and rather profound perspective gained during the separation. In the past, many organizations viewed information as a byproduct or output of their functional activity. Today many of these same organizations recognize that information is not an output at all, but the force that drives their systems and activities. This creates a new perspective on what constitutes the real value of many functional roles, the creation, management, communication and application of information. Be it Human Resources, Marketing or Engineering, the primary role of the functional manager in the past was not viewed in terms of managing information. To get the true benefit of an Intranet, this must change. These managers need to understand how information enables their functions and approach their roles from this perspective.

Five distinct roles have been identified to support the formal Intranet content: the Web Administrator, the Webmaster, publishers, editors and authors. One of these roles is new, the others are modifications to and clarifications of roles that already exist in most enterprises. Other roles will be determined by organizations as they evolve their own style, culture and uses. Note that these roles are content focused and do not address the issues of supporting the underlying technical infrastructure.

The Web Administrator, the new role, is responsible for facilitating cooperative opportunities among the various organizations in the enterprise and administering the enterprise content management infrastructure. This is not a technical role although some understanding of the technology is required. The Web Administrator is primarily a manager and facilitator. By contrast, the Webmaster is responsible for the technical infrastructure and tactical operation. The same person may serve in both roles, but to do so requires that she have both of the distinctly different skill sets and enough time to carry out both sets of responsibilities.

The Web Administrator chairs the Enterprise Web Council (discussed later in this chapter) and could report to either the CIO or the Vice President of Strategy. Making a decision as to which it will be depends on the organizational environment and the specific people involved. Because an Intranet shifts power from technical specialists back to functional specialists, there is potential for political conflict and resistance to certain aspects of the implementation. Whichever senior executive is chosen, the Web Administrator role should be viewed as a direct report of that executive and have her active support.

The Webmaster generally is an extension to or modification of existing systems administrator roles. In an Intranet, the Webmaster's primary responsibility is installing new technologies, managing them and helping functional specialists to use them effectively. It is very important that the Webmaster have the perspective of providing tools that enable users to publish, access and customize information themselves rather than one of doing it all for them. As a result of this shifting perspective, many Webmasters are taking on more training responsibilities as part of their job function.

Intranets in large organizations often have multiple webmasters, each frequently associated with a specific, often departmental, web server. Because the term "webmaster" is so well established, it probably is fruitless to propose a lessor designation, like Webduke, for these multiple positions. However, it is useful for larger enterprises to have a Web Grandmaster who is responsible for the formally supported enterprise-web servers and for coordinating the activities of the multiple departmental webmasters. This may include forming and chairing a Web Technical Committee composed of the webmasters. The Web Grandmaster's responsibilities also include managing the enterprise email systems, the enterprise Domain Name Services, the internal, enterprise search and retrieval tools and indices, and tools that provide usage and analysis information.

Traditionally, the webmaster also is responsible for answering, forwarding, and otherwise managing email addressed to "Webmaster." In large organizations or for external pages, providing professional and timely responses to the mail alone can be a significant, time-consuming job. Where this gets to be a problem, it is useful to split the Webmaster function into two, an administrative function that answers and follows-up the mail, and a technical function that provides the tools and technical support to the users. Some organizations distribute the load by directing the Webmaster mail to different individuals or groups based on the page from which the user originated the Webmaster mail..

Publishers determine what kinds of formal information will be created and maintained by their organization. Each line of business and major support area (Human Resources, Finance, Facilities, etc.) will have a publisher. These roles already exist in the functional areas of most organizations today. However, when we view information as a byproduct of functional activities, rather than a key driver, the role is less visible.

Generally, the people who perform these roles today are managers in the organization, but the publisher role today may be diffused across more than one person. The responsibilities of the publisher really belong to the executive in charge of that organization; however the duties usually are delegated. This delegation is fine, but in the information age, the delegation should be explicit, and the person carrying it out should consult regularly with the executive.

The publishers represent their organization on the Enterprise Web Council and may create and chair an Editorial Board within their own organization. The publishers own the processes and policies that both the enterprise and their organization require officially sanctioned information to follow. This includes policies on completeness and timeliness of the information. In larger organizations, the publisher may delegate the monitoring and implementation of policy conformance to editors, but the responsibility remains with the Publisher.

Finally, the Publisher is responsible for keeping the portion of the Enterprise Map at their level and below current. The Enterprise Map is a tool that uses the Intranet to manage the Intranet content. This will be discussed in more detail in the next chapter on Logical Architectures.

Editors are found in organizations that have multiple product lines or service areas. For example, Human Resources might have individual editors for Benefits, Compensation, Equal Opportunity and Staffing. In a line of business, the editor often is the primary marketing person for each

product line. The editor determines what official information will be created for specific activities and manages the information creation and update process, including the formal review cycles. Note that in a development organization, the editor class would include development and project managers.

Authors create the content. This role does not require more definition, because it tends to be well defined and independent of the communication medium. Once again, note that programmers and engineers also create content and as such are instances of the author class. When we get to the chapter on implementation, more time will be spent on how an Intranet affects this key role.

Organizational Roles

The people who carry out the Intranet roles require organizational entities to provide communication and coordination support as they do their work. The three basic organizational entities are: the Web Council, Editorial Boards and the Web Technical Committee.

The Web Council consists of the Publishers for all the organizations in the enterprise and is chaired by the Web Administrator. Some enterprises have further qualified the name as the Web Policy Council to provide an organizational reminder that the council is not concerned with the technical aspects of the Intranet. Personally, I prefer the more general term, because the Web Council serves more functions than setting policy. If the organizational executives have delegated the Publisher role to the right level people, slipping into a technical focus will not be a problem. If they have not, a warning should go up that the executives either do not understand the process or are not committed.

The Web Council is responsible for setting policies, standards and high-level style guides. While this can be very time consuming in the beginning, it quickly settles into a background maintenance function. The Web Council also is responsible for monitoring the Enterprise Map for currency and adherence to standards. As stated above, the concept of the Enterprise Map will be presented in the next chapter on Logical Architectures. This, too, tends to become a rather trivial background function.

The long term value of the Web Council is the communication and coordination function, the sharing of ideas, issues, applications and solutions. If the members come to the meetings looking to share innovative ways to make their information more valuable or accessible, looking to identify functionality that could make their organization more effective at creating and maintaining their own information, then the Web Council will stay vital. If instead the primary focus of the Web Council becomes policy and map maintenance, then it quickly will become a poorly attended, unimportant meeting.

Two issues generally emerge in the Web Council. While the Web Council is not intended to be technical, they will uncover issues and opportunities that require technical support. For this reason, it is a good idea to include the Web Grandmaster as a member of the Web Council. If the role has been split into the technical and administrative functions as suggested above, both individuals should attend. This provides the Web Grandmaster with first-hand knowledge of the issues and opportunities, and provides a link to the Web Technical Committee.

Second, if the organization has an external web-page, the Web Council will likely take a keen interest in it sooner rather than later, even though the organizing charter was focused on the Intranet. This is appropriate since it is very natural for the content on the external page to be created and managed via the Intranet. As the individual entities in the enterprise begin to understand the technology and accrue a rich set of material appropriate for external audiences, they become more interested in how their information is presented as part of the overall corporate image. Depending on the universality of interest, the external page issues can either become part of the Web Council agenda, or the Web Council can spawn a subcommittee for those interested. Just be aware that the Web Council will almost certainly expand its mission to cover the external web as well as the Intranet.

An Editorial Board is set up at the discretion of the Publisher, based on need. In small specialized organizations, the Publisher also may perform the implementation duties of the Editor making an Editorial Board irrelevant. In larger, more generalized, organizations, the management of the official information is delegated to multiple individuals. Forming an Editorial Board is an efficient way for the Publisher to coordinate activities, organize information and impart and monitor policies and standards.

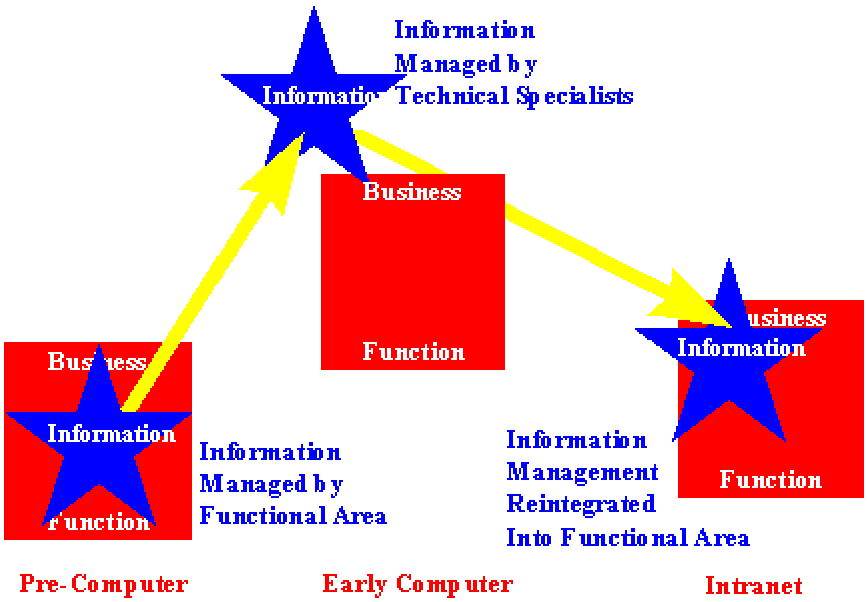
Like the Web Council, the Editorial Board is not focused on technology. They are focused on creating and managing their formal content to be both effective and to meet the enterprise and organizational standards. For this reason, Editorial Board meetings tend to focus on lower level, pressing and immediate issues than the Web Council.

Also like the Web Council, the Editorial Board is responsible for the Enterprise Map at their level and below. However, their job is more complex because they are responsible for linking the Enterprise Map to the content. Often, this can be a less obvious and more creative process than mapping the management responsibility chains above their level. For this reason the Editorial Board gets more involved in issues of creating and updating the logical presentation of the content relationships.

The Web Technical Committee is made up of the Webmasters in the Enterprise. The Web Grandmaster chairs this committee. Their focus is technical. Depending on the history and culture of the enterprise, the Web Technical Committee may define the technical standards, or may be a forum where the technical standards, created in another forum, are imparted to those who must implement them. The Web Technical Committee also provides an opportunity for the Webmasters to share information on innovative approaches and tools that make their Authors, Editors, and Publishers more effective at creating and maintaining their own information.

Having identified the basic organizational roles that support an effective Intranet, the next chapter looks at how the Intranet itself can be used to support the creation and maintenance of Intranet content in this environment.

The Evolution of Information Management



There is no question that the role of IT will change. The final chapter of this book, on Intranet futures, will look at possible directions the MIS and IT organizations might take. Whatever the outcome, it is clear that this technology is driving IT functionality quickly toward enabling knowledge workers to meet their own information needs. The role of MIS is shifting from doing the management of the information for these workers to delivering an infrastructure that supports self-service information management and use.

A few words about why this technology is so powerful. The Intranet technology is evolutionary, not revolutionary. It consists of two sets of standards that work together to provide the environment for organizational revolution discussed above. One set of standards, the Internetworking Protocol (IP), standardizes the way multi-vendor computer systems communicate with each other. The other set of standards, the web standards, standardizes the content and makes it system and application independent. These standards have essentially eliminated the need for information content providers or users to be concerned about vendor-specific variations in most content creation and user viewing tools.

Because it is evolutionary, the underlying hardware infrastructure (and in many cases the system software infrastructure) can be used with little or no modification. The web standards not only affect new information, but provide a form of Rosetta Stone for legacy applications and data as well. And, if the software vendors get out of the way, we also may have system independent standards for application logic and object linking as well, which will make application logic both machine independent and user configurable.

It is important to recognize that the tremendous simplification of technology enabled by an Intranet is based on standards, because many vendors are looking for the first U-turn that will take us back to the world of technological Babel. Experienced Intranet organizations are beginning to understand the very real savings in development and maintenance costs that the

Intranet standards provide. They tend to select products based on implementation of these standards, and set policies that discourage using non-standard features in commercial products. Organizations implementing their first Intranet may be less concerned about preserving cross-vendor standards, because they do not have first hand experience with the benefits. The message, if you are implementing an Intranet, stick to the standards available to multiple vendors. In later chapters we will discuss when and how proprietary advances can be safely implemented.

It will change your organization and how you do business

The introduction of an Intranet is not a revolutionary technology change, but it can create a revolutionary change in the way your organization relates to information, and hence the way it operates. Throughout this book we will explore some of these changes from different perspectives. Below is a list of the basic principles that underlie most of the observations, suggestions and pronouncements in this book. You already have seen some discussed in this chapter. If I have done an adequate job, these principles should become more practical to you as you read the book, not because of the "how to" advice, but because of the different perspective these principles provide on organizational assumptions and options.

The basic principles:

- Organizational Latency (Surface to Volume Ratios slow down centralized organizations)
- Information Drives Function versus Function Generates Information
- Push versus Pull Information
- Self Service versus Do For Me Support
- Communication/Coordination versus Command/Control
- Distributed Decision Making versus Central Control
- Information Access versus Information Quality
- Information Context versus Information Content
- Standardize the Known (don't lock yourself into investing in incremental gains)
- Exploit the Unknown (this is where new knowledge, hence the real value, lies)

Now that you have the keys, it is time to move on and look at the role of management in organizations.

Chapter 4: Logical Architectures

Before discussing the architecture of Intranets, a few background concepts need to be introduced.

Intranets

An Intranet is a communication infrastructure. It is based on the communication standards of the Internet and the content standards of the World-Wide Web. Therefore, the tools used to create an Intranet are identical to those used for Internet and Web applications. The distinguishing feature of an Intranet is that access to information published on the Intranet is restricted to clients in the Intranet group. Historically this has been accomplished through the use of LANs protected by Firewalls. More recently technology has begun to make restricted access feasible in shared environments. The advent of virtual firewalls will extend the concept of an Intranet, but the basic distinguishing feature will remain the protected environment, be it real or virtual, for the Intranet information.

Two Types of Pages

There are two basic types of pages: content pages and broker pages. Content pages contain the information of value required by a user. Broker pages provide context to help users find the content pages appropriate for their current requirements.

Content pages can take many forms. They may be static pages, like the ones you are reading here, or they may be active pages where the page content is generated "on the fly" from a database or other repository of information. Content pages generally are owned by an individual. Over time expect the "form and sense" of content pages to change as more experience is gained in the areas of non-linear documents (hyperlinking), multimedia, modular content and integration of content and logic using applets.

Broker pages also come in more than one form, but all have the same function, to help users find relevant information. Good broker pages serve an explicitly defined audience or function. Many of the pages with which we already are familiar are broker pages. A hyperlink broker page contains links to other pages, in context. It also may have a short description of the content to which it is pointing to help the user evaluate the possibilities. On the other hand, a search oriented broker page, like AltaVista, is not restricted to the author's scope, but it also does not provide the same level of context to help the user formulate the appropriate question.

Combination search and hyperlink broker pages are common today. Search engines return the "hits" as a hyperlink broker page with weightings and first lines for context, and hyperlink broker pages sometimes end in a specific category that is refined by searching that defined space. It is unlikely that hyperlink broker pages ever will be generated entirely by search engines and agents, because the context that an expert broker provides often contains subjective or expert value in its own right. After all, not all content is of equal quality or value for specific purposes,

and even context sensitive word searches cannot provide these qualitative assessments. As the amount of raw content increases, we will continue to need reviewers to screen which competing content is most useful, or identify the official source, for workers in our enterprise.

A special use of broker pages is for assisting with the management of web content. There are several specific instances of these management pages. We call one instance the "Enterprise Map" because collectively these broker pages form a hyperlinked map of all the formal content in the organization. Other sets are used for project management, functional management and to support content review cycles. The use of broker pages for each of these management functions is discussed in more detail in the next section.

The Enterprise Map

A structured set of broker pages can be very useful for managing the life cycle of published content. We call this the Enterprise Map, and while the primary audience for this set of broker pages is management, we have discovered that end users frequently find the Enterprise Map useful for browsing or to find content when their other broker pages have failed them.

With the exception of the content pages at the bottom of the map, the Enterprise Map pages consist only of links. Each page corresponds to an organization committed to the creation and quality of a set of content pages. In today's organizations, commitments tend to aggregate into a hierarchical pyramid, but the mapping technique also could be applied to most any organizational model. The Enterprise Map also does not have to be based on organization. It could be a logical map where the top level is the mission, the next level the major focuses required to accomplish the mission, and so on, down to the content level. Since most large organizations are starting from a pyramidal accountability structure, that is the form of the example that follows.

Using the terminology from the previous chapter, the Enterprise Map begins with a top page, owned by the CIO and /or CEO (with responsibility usually delegated to the Web Administrator). This page consists of a link to the Map Page of each line of business and major support organization in the enterprise. The Map pages at this next level are owned by the publisher for each organization. The Publisher Pages, in turn, consist of links to each of their Editor's Pages. The Editor's Pages may have additional pages or structure below them created and maintained by the editor that help organize the content, but ultimately these pages point to the formal content pages.

This model can scale to governments or large diversified companies. In a government organization, the Administrator's Page would point to all the Agencies, and the map would follow each agency structure to the content level. Since each agency may be a large organization, each may have its own Administrator and Web Council. A major advantage of this mapping architecture is its flexibility. It can originate from the top down or the bottom up. If several government agencies developed their Intranets independently, with this type of Enterprise Mapping structure, they can be linked together at any time in the future by creating the next level map page. None of the existing Maps need to be changed. This flexibility is a result of the distributed decision making central coordination model on which the architecture is built.

The Map provides a commitment (or accountability) view of all the formal content in the enterprise. Management can start at their point in the map and follow the links to all the content which supports the functions for which they are responsible. They also can look at what other organizations provide and how well it integrates. Experience predicts that when a Management Map is first implemented, and managers get involved, they are shocked by the quality and incompleteness of the information for which they are responsible. The reason is that they have never been able to easily browse all the information and create multiple, contextual views of their own when the information was on paper or in rigid electronic formats. The Intranet gives them this ability. Handled properly, demonstrating this ability to managers is a great opportunity to show the strengths of an Intranet for improving not just accessibility but information quality.

An Enterprise Map has several interesting characteristics. Once it is in place, authors and editors can self publish, and the information automatically shows up in a logical structure. Also, content categories and even editor level functions generally are not affected by reorganizations, because major product lines and service areas generally are not added or deleted. Most reorganizations shift responsibilities at higher levels in the Map. This means that when a reorganization does occur, the Map can be adjusted quickly, by the managers affected, by changing one or a few links. Content does not need to be moved around. The result is a very low maintenance path to all the formal enterprise content, without forcing publishing through a central authority that can quickly become a bottleneck.

Shadow Maps

The Enterprise Map provides a management path to all the formally published content. However, management also has a need to see work in progress, formal content that is not yet completed. This is the realm of project and departmental information. A Shadow Map can be constructed for this purpose. The Shadow Map works the same way as the Enterprise Map, but it is not generally advertised and can be protected by passwords or other access controls. The Shadow Map can be enhanced with a few additional Broker Pages to assist with the management of content development.

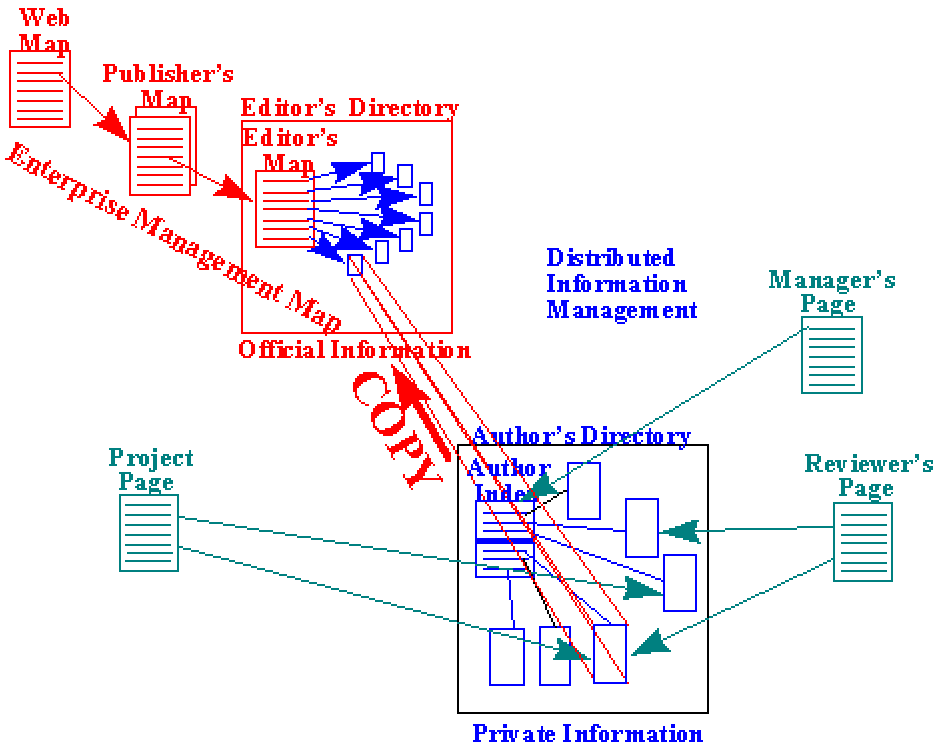
A Shadow Map continues down to the author level. In this model, the author maintains an Index Page that is divided into two sections, work commitments and work completed. When the first draft of committed content is created, the author places it in his web directory and links the item line on his Index Page to the file. As revisions are made, the author places the latest version in the same directory with the same name so the Index automatically points to the latest version. This does not preclude keeping back versions if they are required. The previous version is copied and numbered as it is moved out of the current version status. When the content completes review and goes into "production" the author moves the item from the committed section to the completed section and redirects the link to the permanent address of the published item. Note that this can work for development of non-web content as well by configuring mime types and having the browser automatically start up the appropriate application on the client when the link is activated.

A second Broker Page that can be added is a Project Page. This page is created by the Project Manager and contains item lines for all the project deliverables. When the author creates the first

draft, she not only links the content file to her Index Page; she also notifies the Project Manager of the location so the content can be linked to the appropriate line item on the Project Page. Like the Index Page, as the content is revised the Project Page always points to the most current version, without additional maintenance.

In a matrix organization a third Broker Page can be created by the Functional Manager. This page consists of links to the Index Page for each employee reporting to the Functional Manager. This provides a quick path to the work, both in progress and completed, of all her employees. Once again, after the structure is set up, it takes little maintenance, with each person keeping his own information up to date.

Finally, Reviewer Pages can be created when the content is ready for review. Each reviewer has a "Review Page," which consists of links to all the content in their review queue. When the Editor (or whoever is responsible for managing the review process) places the content into formal review, it is added to each reviewer's page. The reviewers access their page when they are ready to do reviews, and by selecting a link can retrieve and view the content. There are numerous ways the comments and comment resolution could be handled using Internet technology. One is to funnel comments into a threaded-discussion-group format. Automated email messages can be used to notify or remind reviewers of deadlines and status.



The various Broker Pages discussed above are meant to create a model of the basic management functions and how they can be structured. Whether or not the specific model described here is used, the most effective process for managing Intranet content will use Intranet tools and approaches.

When we first conceived of this model, there were no higher level tools to help create and manage the pages for a process like this. Today several tools are emerging to help manage functional sets of pages, and they can be configured to support these processes. Some are message-based, others are centralized, shared-database models with Web front-ends. Over time, we anticipate that a variety of vendors will offer improved tools, based on Intranet paradigms, that are specifically tuned to support the distributed, message-based management model. What ever tools are chosen, the most effective are those that help the functional managers use the Intranet to manage the development of the content for which they are responsible, without requiring technical specialists in between. In the beginning, many managers may find a simple static page implementation of this logical structure more approachable than a more sophisticated automated tool.

General Brokering

Brokers are the main way users find information on an Intranet. A broker may serve many functions. He may provide information to users in the context of specific processes, providing structure for efficiency and consistency. He may screen large pools of content for material relevant to a large number of employees so each one does not have to duplicate the process. He may identify which information is considered official. Or, he may provide interpretation of general information in the context of the organization.

Most knowledge worker jobs today involve some form of information brokering. In the paper world the broker output often is formally sanctioned by the organization and may be the worker's main responsibility. The same kinds of roles will evolve in the Intranet world, and ideally the people in the role today will evolve into the electronic version of their role. These types of formally managed broker pages can be treated as content in the map structure described above.

Most organizations also have informal broker pages that spring up. An individual may start the page for herself, and it gains a following, or she may identify an unfilled need and consciously fill it. These pages can be a valuable way to identify and quickly meet new requirements. However, until these pages are in a formal commitment (or accountability) structure, there is no guarantee that the content is verified or that the author will keep the content current.

The Broker Directory

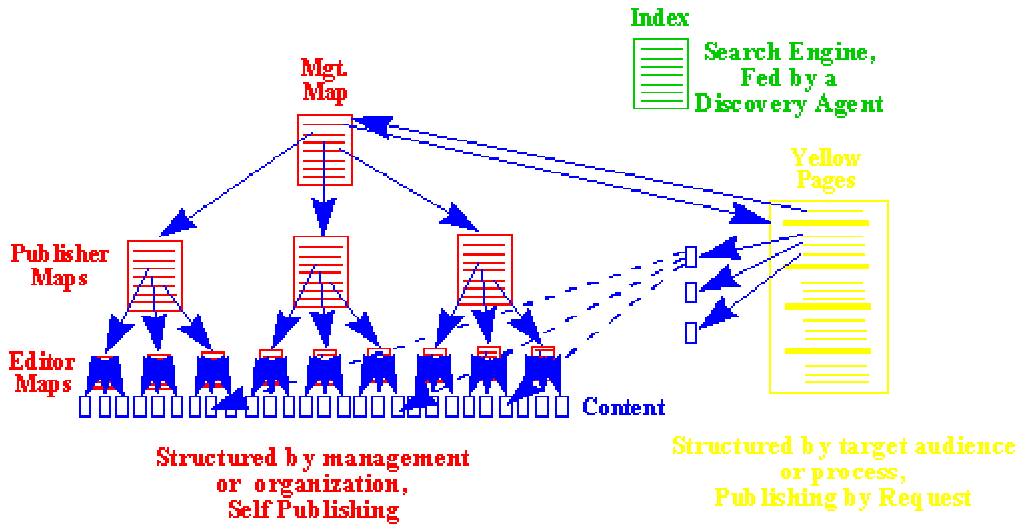
An Enterprise Broker Directory, sometimes called a "Yellow-Pages," organized by subject, can help users find the broker that they need. The Broker Directory generally is maintained by either the Web Administrator or the Web Grandmaster. Because informal broker pages are included in the Broker Directory, some mechanism needs to be included to keep the directory from filling up with outdated and abandoned pages. As with other Intranet functions, the challenge becomes providing the centralized view without imposing a central implementation bottleneck.

One way to handle this is to create a "Sunset" provision for all pages not officially managed by an organizational entity. Any broker can list their page by submitting a web form or email to the Web Administrator or an automated script. However, informal pages are only listed for 60 days. If the broker does not renew the request in 60 days, the page is removed from the Broker

Directory. This allows informal brokers to "self-publish," and protects the directory from becoming a repository of links to abandoned pages.

The Enterprise Index

The Enterprise Index provides users with another way to find information. This frequently is tied to the Search Engine. Keeping with a distributed decision-making model, the Index and Search Engine should not require pages to be published on a specific system or managed by specific management software. The Index and Search Engine should be fed by a discovery agent (Web Crawler or Spider) that regularly searches the Intranet and catalogs the content. This is consistent with the coordination versus control model and also protects the enterprise from major conversion efforts (proprietary locks) if an alternative product or upgrade is desired in the future. The Enterprise Index provides yet another way for users to find the content they require.



Brokering Summary
Three distinct discovery paths need to be provided by the Intranet Infrastructure:

- The Enterprise Map
- The Broker Directory
- The Index and Search Engine

Workflow Management

Workflow management is a relatively new focus for the Intranet. Historically, a number of Internet/Web tools have been available to help with this process. Email, threaded-mail discussion groups and news groups provide forums for discussion and resolution of issues. The HTML "mailto:" function has been used to provide reviewers with easy connections through their browser to these forums.

What has been missing are packages that integrate the functionality of the independent tools, add routing and tracking, and provide the user with an interface that is easy to configure. This appears to be changing with the appearance of companies like MKS, Action Technologies, WebFlow and Netmosphere who now offer web-enabled and web-based products that support groupware, reviewer comments, routing, sign-off, checkout-checkin and project management functionality in an open, web environment.

Access to Database Information

Discrete, structured information still is managed best by a database management system. However, the quest for a universal user interface has led to the requirement for access to existing database information through a web browser. Three models of access can be identified:

- Automatic tailoring of page content
- User specified database requests
- User initiated database updates

From a technical standpoint, there are a number of ways these interfaces can be created. What is important is that access be provided to the authors (knowledge workers) in a way that supports the distributed decision-making, enabling model rather than the centralized expertise model. This means that authors who are relatively naive technically need to be able to incorporate database managed data into their pages.

A number of tools are beginning to emerge that move in this direction. Most of the database vendors and several other application vendors are pushing the use of their databases to manage all the content in the web. The advantage is unique pages can be generated automatically and easily. These are the tools that support the first model identified above, automatic tailoring of page content. The disadvantage is that much of the "distributed decision making" and "do for yourself" paradigm is violated. Experts are still needed to manage and change the database schemas for innovation to occur.

A more promising approach combines a library of scripts (CGI, Java, Active-X, etc.) residing on the hosting web-server with templates, wizards and "bots" incorporated into WYSIWYG authoring packages (e.g. Microsoft's FrontPage). Another set of tools, coming from the database side, automatically converts existing database schemas into hyperlinked web pages that allow users to browse and access the data from their web browser (e.g. Netscheme). When applications that merge these two functional approaches begin to appear, very powerful packages will be available to content providers who need to incorporate database information into their pages.

This approach satisfies both the "distributed decision making" and the "do for yourself" paradigms. At the current time, these approaches do contain a "proprietary lock." The authoring tool and web server extensions are tightly coupled and not interchangeable with other packages. However, at this point the proprietary nature is not unduly restrictive. First, the client remains independent of the authoring tool and server extensions. Second, individual authors can choose to use different tools than those used by their peers, as long as a server with their tool's extension set is available. Third, this technology is still in the early innovative stages, where a significant

amount of knowledge needs to be gained. This is the appropriate stage for non-standard solutions. As more knowledge is gained, one hopes that the authoring tools will become increasingly independent either through standardization of the script libraries or through standardization of object linking technology.

The development of object linking standards and the availability of tools that conform to these standards will increase the power of Intranet technology. These tools, in conjunction with previously mentioned software that uses agents to discover and create organized views of distributed objects, provide a promising base for supporting the distributed decision making and implementation model. A major trend one can expect to see is a move away from the use of database technology (or other structured technologies like SGML) for integrating content enterprise-wide. Instead these tools will be used to manage local content, and integration will take place as needed by linking the content objects through Intranet standard pages.

A major topic in logical architectures is security. This topic is large enough to have its own chapter, which comes up next.

Chapter 5: Security and Availability

Security

The biggest concern most executives and managers have about implementing an Intranet is security. As with other parts of the Intranet implementation, the toughest issues around security are not technical, but organizational and strategic. But, before examining these issues, let's begin with a look at the nature of security in general. Security is not limited to the world of electrons and networks. All of us already know a fair amount about security from the everyday securing of our physical valuables.

Take, for example, the physical analogy of a painting. If it is very valuable, we might be inclined to store it in a vault. However, presumably we bought it not just for an investment, but to enjoy its beauty. Locking it in a vault provides safety, but not enjoyment. We might secure our house, be sure not to advertise our ownership and hang it on our wall where access is limited to us and our friends. If access to the house is adequately protected, this may be an appropriate compromise between functionality and safety. But, if this is a painting we want to share with the world, we might consider hanging it in a museum. The painting is still protected, but more people know about it and it may be more attractive to a thief.

Each of these scenarios has different security challenges. But one thing they all share is that the protection is never absolute. In any one of these scenarios, if the value to the thief is great enough, a security hole will be sought and likely discovered. The more value perceived, the more effort the thief will put into finding a security hole. Security, whether physical or virtual, is a continually changing balance of value, risk and practicality.

To understand security, we must understand the points of vulnerability. I find it useful to break security into three basic threat areas: storage, access and transfer. Once again we can use physical assets as an example.

Storage Protection refers to protection of the assets when they are not in normal use. If you own a retail outlet, you may put a lot of effort into preventing shoplifting. But, no matter how secure you make your showroom floor, if you don't protect your stockroom, someone will come in the back door and steal your goods before they ever get on display. The same is true of your electronic information. Basic computer and file security is required, including securing alternate access points! Since Intranet technology makes information location irrelevant to the logical display, you might consider storing truly sensitive content on a separately secured server with additional protection and special monitoring. We do the equivalent with our physical assets when we put them in a safe, or safe deposit box.

Once we have secured the basic storage of our valuables, we need to consider how we allow access and to whom. Access security has improved dramatically over the past several years, driven in large part by the Internet commerce movement. In addition to the basic password

methods, systems that require physical tokens, some with challenge/response mechanisms, have become practical. Many of the servers and browsers also have the ability to create an encrypted transaction automatically before the user even provides a password, so the passwords and keys are encrypted before log-in. If you use a Netscape browser, this is what key in the lower left corner signifies. If the key is broken the transaction is unencrypted. When the key is whole, the browser and server have negotiated an encryption key, and the transaction is encrypted.

The most recent access control mechanisms are based on the ability of the web server to tailor pages for specific users. Once a user has been authenticated, all interactions are mediated through an object layer that dynamically generates pages showing the user only the choices for which she has access privileges. Because all interactions that the user initiates on the server are mediated by their object representation, the only behaviors available are those defined for that object and the objects it is authorized to access.

The third area of potential threat is protecting information in transit. As any movie buff knows, from *Robin Hood* to *The Great Train Robbery*, valuables in transit make attractive targets for thieves. The same is true in the virtual world. Unless you are using a closed, secured network, your information can always be hijacked in transit. And, even in a closed network the information can be hijacked without extraordinary precautions. The major way to protect it, is to encrypt the transmission or the information on the page. A note is in order here. Encryption/decryption algorithms are subject to U.S. government export restrictions based on national security claims. Until an effective international encryption standard is allowed by the U.S. government, international companies will have challenges using encryption to secure international transmissions, even for intra-company interactions.

In addition to encryption techniques, some organizations have developed methods for strategically breaking content into anonymous chunks for transmission and presentation. This can be done at two levels. Since the user generally knows what they accessed, a page with sensitive information may be designed without any identifying contextual information on it. For example, benefits information for an individual would not include the individual's name, employee number or any other identifying information. If someone intercepts the message, they have lots of data, but no way to relate it to a specific individual.

The second level is at the packet level. When information is sent over the Intranet, the content is broken into small packets, and the packets are reassembled at their destination. The information can be divided in such a way that no single packet contains enough data to derive the sensitive information. On a busy, diverse Intranet, finding enough of the right packets to reconstruct the message is like finding a needle in a haystack. If each packet is encrypted with a different key, the task becomes almost impossible.

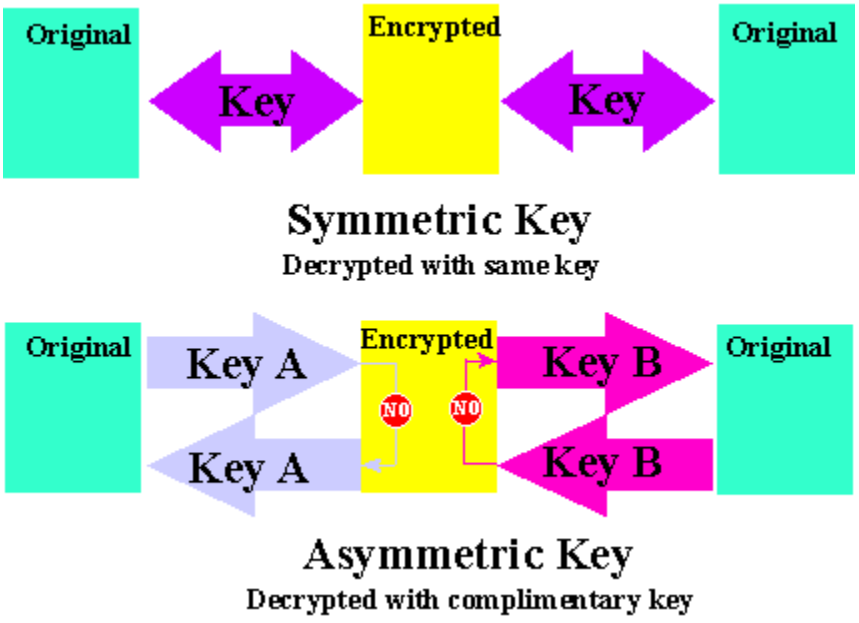
The techniques above can be combined in different ways to make security better than that for most non-computerized information.

The Basics of Security Techniques

Because Intranet security is of such interest to so many people and causes so much discussion, I have included this section that goes into more detail than some readers may prefer. If you are not interested in this tutorial, feel free to skip to the next section on Developing a Secutity Strategy.

Encryption is perhaps the single most important technology for network security. It has uses beyond protecting information in transit. Many encryption algorithms can be used with other algorithms to insure the integrity of the electronic content, that is, to insure that someone has not changed information in contracts or other legal documents after the parties have reached agreement. Some encryption approaches require special hardware, some use tokens (disks or smart cards), others are strictly software. The intense debate over how and where to implement encryption standards encompasses conflicts over everything from national security to individual privacy.

Encryption uses a mathematical formula to scramble the information. The users of the formula provide a key (a word or string of characters) that the formula uses to generate a unique encryption.There are two types of keys in use today. The first is called a symmetric key, because the same string of characters is used both to encrypt the information and to return the information to normal form. The second is called an asymmetric key, because the string of characters used to encrypt the information will not return it to normal form. A different string of characters is required to decrypt the information.

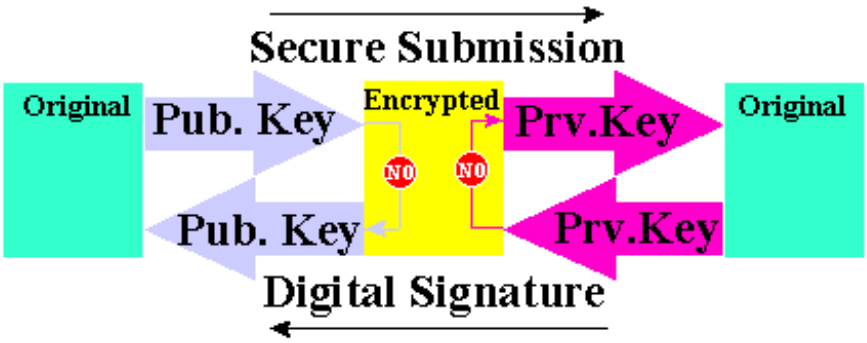


The number of characters in a key is one factor in determining how easy it is to "guess" the key and decrypt the information. This is at the heart of the U.S. export regulations. Currently, the U.S. only allows encryption algorithms to be exported if they use relatively short keys. Inside the

U.S. encryption algorithms with long encryption keys can be used and these are almost impossible to guess.

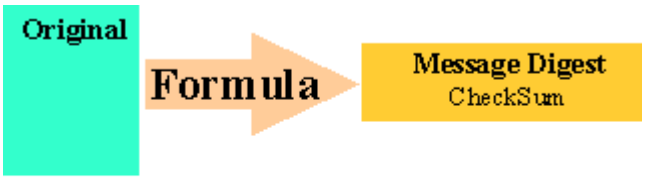
Asymmetric keys have some very pragmatic uses. For one thing, one of the keys can be made public while the other is held in private. This way if someone wants to send you an encrypted message, they can encrypt it using your public key knowing that only you can decrypt it, because you are the only one who knows your private key. This means you do not have to negotiate and remember unique keys for every person with whom you interact.

The other use of asymmetric keys is for digital signatures. If you encrypt a message using your private key, only your public key will decrypt the message. If your public key decrypts the message it proves that your private key was used to encrypt it. Since, presumably, only you know your private key, this acts as a digital signature.



In reality digital signatures involve a more complex process that provides even more protection from tampering than physical signatures. But first we must introduce the concept of message integrity.

Integrity techniques are used to insure that the information received is the same as the information that was sent. This is important for several reasons. First, an error in transmission may have altered or dropped an important piece of information. Second, someone may have maliciously altered the information even though they could not decrypt it. Like encryption, a mathematical formula is involved. In this case it takes the entire set of information and reduces it to a unique numeric sequence. If one bit in the information changes, the resulting sequence will not be the same. The unique sequence, called an integrity check sum, is created and sent with the message. On the other end, a new check sum is calculated and compared to the original. If they match, the message is guaranteed to be the same as sent. The check sum is also called a message digest.



Message Integrity

In most instances encrypting and decrypting entire documents just to provide a digital signature is too resource intensive. Therefore, if the information itself is not sensitive, a digital signature is used by encrypting only the message digest (or check sum) of the document. If the decrypted message digest matches that of the current document, it insures that the person whose public key decrypted the document "signed" it, and it insures that the document being looked at has not been altered since it was signed. This is why even when an entire document is encrypted the digital signature still includes the message digest. It insures the document has not been altered after the signature.

Digtal Signature with Integrity

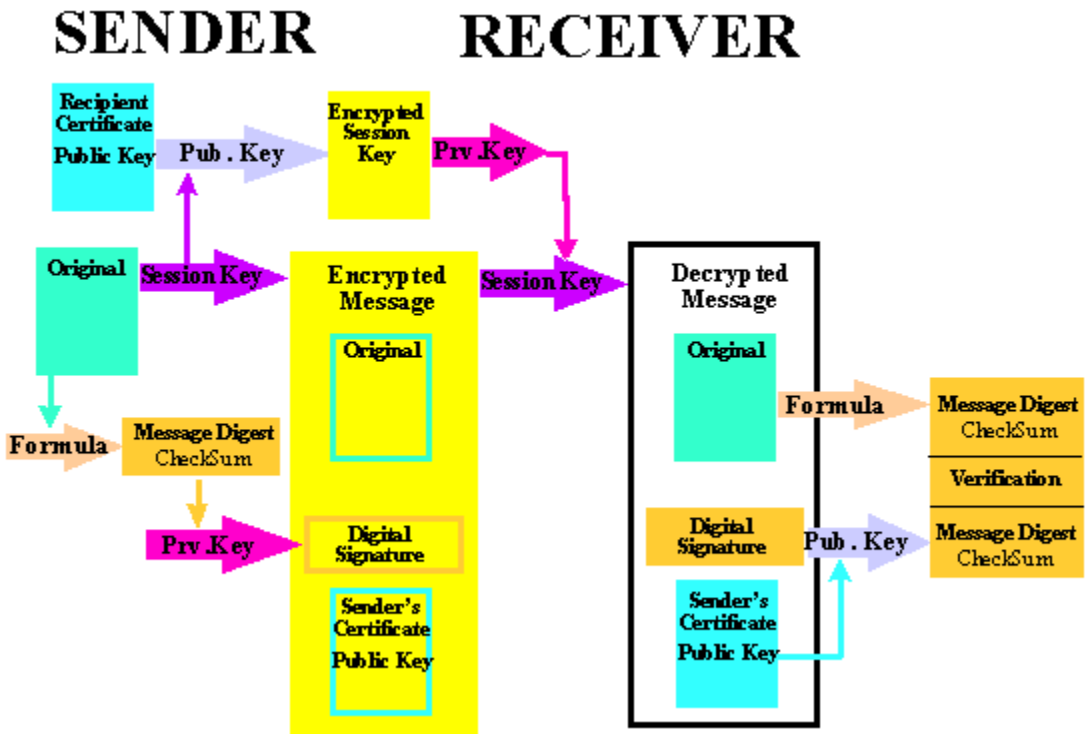
A word often times mentioned along side encryption is "certification." Because you cannot see the person or the premises at the other end of an electronic transaction, in transactions where something of value will change hands we would like to certify that the person or company on the other side is who they say they are. This is the problem certification attempts to solve. In the physical world references and letters of credit serve the function of certification. In the world of commerce organizations like the Better Business Bureau provide certification functions. And, in financial transactions companies like TRW and Equifax provide certification services. Inside the enterprise the corporate picture identification card, managed by HR, is a form of certification.

Electronic certification uses multiple digital signatures to certify the authenticity of the parties. The originating party might provide a certificate with their information on it. Part of that certificate is a digital signature and certificate of the authorizing reference. The digital signature of the reference is based on the check sum of the public information including their certificate, thus assuring that none of the public information has been altered. The reference's public key insures that they really "signed" the certificate, their digital signature insures the itegrity of the information and their certificate contains a reference certifying that they really are who they say they are. Their certificate works the same way, with their reference's certificate and signature included.

Employee Certification Example

The question is, how many levels of certifiers are required and who is the ultimate certifying authority. Where certificates are used today, most do not involve more that three levels of certificates.

Putting all the pieces together, a message secured on multiple levels can be sent over a network using the following model.



As a final note, there are three kinds of activities organizations attempt to stop:

- unauthorized access to information
- unauthorized changes to information
- malicious destruction of information or processes (including introducing viruses)

The access and authentication processes above are methods for dealing with all three. A technique not mentioned above, since it is primarily used for information entering an Intranet from outside, is packet screening. This is software that looks inside each packet received before it is allowed inside the firewall. The packet is screened for information patterns that look like viruses or attempts to break security barriers. Suspicious packets are logged and kept from entering the Intranet.

Developing a Security Strategy

Security strategies should not be based on current or future products or technology. They need to be based on the functional needs and risks of the organization. The toughest part of developing a security strategy is determining what needs to be secured, and from whom. Security is not free. Every time the security level is tightened, the organization pays in terms of increased complexity of access, increased response time and reduced communication. As stated above, security is a balance of value, risk and practicality. Before developing a strategy it is important to understand something about the concept of risk.

What struck me when I read my first book on risk was that most of the book was not about cost-benefit analysis but about perception and psychology. This is because risk is not an objective phenomenon. Some of us otherwise rational people can look at the overwhelming statistical evidence on the safety of commercial airline flights versus personal automobiles and still "feel" less at risk behind the wheel of our cars. A number of psychological factors are involved, particularly our feelings about our personal level of control over the circumstances.

When addressing the issue of security risks it is helpful to remember that risk consists both of objective data and subjective feelings based on personal psychology. Since quantitative data may be difficult to determine, individual experience and comfort levels often take the dominant role. During development of a security policy, it is important to continually remind ourselves that reducing the risk of a security breach comes at a cost, and that cost may be a higher level of risk in some other part of the organization not being considered, like competitiveness.

In theory, the basic formula for considering objective factors is quite simple. One merely needs to determine what the information is worth to those denied access, what it will cost them to obtain it under the current security implementation, and the cost (consequences) to the enterprise if they do manage to obtain it. The objective then becomes to keep the cost of unauthorized access higher than the value to the potential thief, until the cost of security controls exceeds the cost of unauthorized access. Another way of saying this last point is: until the value to the thief is higher than the value to the enterprise of keeping the information private.

In practice this formula becomes more complicated, because "value" and "worth" of information is often subjective, and value to the person initiating the breach may be secondary to the information itself, like excitement or revenge. It also is nearly impossible to predict all the groups that constitute a potential security risk, and the value to each group is a matter of their personal perception.

As part of the objective evaluation, information also should be obtained on the procedures, risk and incidence of unauthorized access of information using current communication mechanisms. For example, many companies maintain security procedures to keep competitors from obtaining specific product or planning information. Yet the competitors usually get the information almost immediately upon disclosure to a customer. The point here is to bring some realism into the security process. You don't want to make it easier for competitors to get the information, but you also don't want to pay the cost of super-securing information that is going to find its way to the competitor through another route anyhow.

Two subjective factors stand out in risk assessment: comfort levels and perceived threats to status. New technologies are always suspicious because we have no experience. We can intellectually step through any number of scenarios, but until we have run a production environment for some time, there is no way to tell what situations may have been overlooked. The comfort level of the person who will be held accountable if a breach occurs is the single most important factor in the level of security, or whether the information will be allowed on the new technology at all.

In my first experience with Intranet development, the Human Resources Department at the company created a wonderful system, complete with access controls tied to the existing corporate information systems. However, the Vice President of Human Resources would not let the system go on line because he feared some hacker would crack the system and access someone else's private information. Even after other companies began publicizing the availability of similar HR functionality on their Intranets he maintained his resistance. Pieces of the system have come on line, one at a time, as this Vice President develops increasing comfort with the risks and controls. No level of new technology would have changed this situation. Only continued exposure, and a program that provides staged experience can help.

Concern over unauthorized access is not the only factor that can affect subjective risk levels. Some people have achieved (or at least perceive) their status and power in the enterprise by limiting access to information. Whether the motivation is control, hiding mistakes or just job security, the result will effect the creation and acceptance of a security policy. In many organizations this type of subjective personal risk will create the most complications in developing a pragmatic security policy. Most of us are aware of studies done in the U.S. federal government on unnecessary classification of information and the ensuing costs. Recent studies in industry show the same patterns.

The most important, time consuming and contentious activity in implementing a security policy will be determining what information needs to be protected. No amount of technology can help with this process, because the factors are individual perceptions and comfort levels. The security policy sets the processes and ground rules for determining how information gets put into or taken

out of restriction categories. Decisions on specific information will be made by the individuals who own the information.

Setting a Security Policy

The first step in creating an Intranet security policy is developing a written charter. The charter consists of two parts: a goals statement and a responsibility statement.

The goals you choose should give the reader an idea of where your enterprise stands on the balance of value versus cost, business requirements versus risk, openness versus gatekeeping and what constitutes the optimum balance for your enterprise. Is your policy one of allowing access to everything unless specifically identified for denial, or is it one of denying access to everything unless specifically identified for access. These will have very different effects and impacts on the culture, productivity and innovation of your organization.

The responsibility section provides a clear statement of how security will be administered within your enterprise including who (what organization and position) is responsible for maintaining and monitoring the corporate Intranet security strategy and policy and who reviews and approves that strategy and policy. It also includes a description of how this function and strategy fit with other security organizations in the enterprise, and what is expected of each organization.

The second step in creating an Intranet security policy is creating a written process that describes how responsibility for Intranet security will be delegated, implemented and enforced. This includes a management section and an individual employee section.

The management section contains a description of responsibilities at each organizational and management level. Security objectives and how they will be monitored are an important part of this section. The objectives should be consistent with the goals in the charter. Where appropriate, standards may be provided that help the manager make decisions consistent with the corporate goals and policies. Standards and security classifications can be particularly useful in helping managers determine when they need to classify (or should not classify) a specific type of information.

A very clear statement of employee responsibilities, expectations and sanctions is required for an effective security implementation. However, the statement is not sufficient if employees are not aware of its existence. The statement should be followed by a well defined employee communication program. The program must address not only the initial introduction of expected responsibilities to each employee, it also must include an ongoing awareness and refresher program. This can be done in conjunction with other security awareness programs and with other Internet standards programs.

The final required part of an Intranet security policy is the definition of an audit program to monitor and manage compliance and risk. Some aspects of the audit program will be discussed later in this chapter. The important point here is that the security policy should explicitly call for regular audits, both internally and by independent auditors, and define how they will happen and who in the enterprise will be apprised of the results. For servers with sensitive information (and

this includes the firewall that protects the Intranet) a program of continuous logging, analysis and monitoring of activity for suspicious patterns is critical. A program of active intrusion testing, looking for vulnerabilities, is also a good idea.

Developing Privilege Tables

Determining who gets access to what information is not a challenge created by Intranets. The issue is as old as information itself. Since information first went up on computers, access control has been an issue. A popular method for documenting, and implementing computer security is the use of "Privilege Tables." A privilege table contains a row of all the unique security classes of information and a list of all users with access to the system. The cells in the resulting table are used to record the access privileges of each user. In each cell a user either has access or does not.

Privilege tables are popular because they provide a documentation format that can be easily implemented in an automated access control program. When a user logs on, the system authenticates her. When she requests access to particular information, the software looks at the privilege table to determine if she is authorized. This type of system not only simplifies the management of who gets access, but it simplifies access for the user. Because of the privilege table, the user only has to be authenticated once, rather than at each access.

An Intranet does create a complication in that Intranet information usually resides on more than one computer system. As of this writing, there were no widely-trusted, commercially-available systems to allow single-point authentication across an Intranet in an acceptable way. Some companies have developed home grown systems, and many of the web server vendors are getting ready to deliver these systems. Nevertheless, using a privilege table to develop and document user access privileges provides valuable process aid.

One of the major issues in developing an enterprise privilege table is determining the granularity of fields. From a process standpoint it is useful to lump users into specific user classes, and make decisions based on the user class rather than the individual. Likewise, it is more efficient to lump information into information classes and again make those decisions for the class rather than each piece of information. In theory, it would only be a matter of matching information classes with user classes, and the job would be done.

In practice, we usually discover the organization has trouble identifying and agreeing on the classes and class definitions, let alone which specific items belong in each class and which user classes get access to which information classes. Perhaps there is an opportunity for software to assist in creating and managing access control at this level. It seems like a natural application for developing classes based on multivariate analysis then feeding them into an object management system. Individual users and information become objects that carry their class affiliations with them as attributes, and object rules can be used to determine access privileges. I do not know of any packages that do this today, but you can follow this logic to help you develop a privilege table manually.

To be effective, development of the privilege table should involve the organizations responsible for creating the information and managing compliance. A method for assisting the process is to develop an initial format for creating information and user classes then have each organization create a set of information and user classes from their perspective. The initial information is consolidated and the process iterated until an acceptable class structure is reached. Putting the latest consolidated information on web pages and iterating through the issues using a threaded discussion group will help expedite this process.

As part of the table development process, and part of the decision making process, look at who has access to this information on paper or through existing processes today. While the process may uncover previously "invisible" problem areas, it will give you a fairly accurate view of what your organization considers acceptable risk.

Security is an Evolving Game

Once developed, a security policy needs regular review and update. The environment is ever changing and the technologies and strategies to breach, and to protect, information will change and coevolve. Three activities should take place at regular intervals in any Intranet implementation where information needs protection: Threat Identification, Active Penetration Testing and External Audits.

Threat identification takes two forms, theory and practice. The theory is done via vulnerability assessment. This is where the information is assessed for value to the enterprise, value to potential security risks and consequences of a security breach. This is generally facilitated by assessing generic security risks and weaknesses for probable occurrence, then identifying additional points of threat. Identifying threats requires experience as well as knowledge, which is why external consultants frequently are retained to help with this process.

The practice of threat identification is accomplished through continuous monitoring and auditing, often with the use of automated tools. The goal is to identify attempted security breaches while they are being attempted. The physical analogy is an alarm system with sensors and a security guard to follow up. However, good security requires more than technology and patrolling. Otherwise it becomes a game without consequences for attempting a breach. Behavioral elements need to be incorporated to make even attempts at security breaches less attractive. The three primary elements are: strict consequences, immediate follow-up and making highly visible examples of those caught.

Active penetration testing involves sanctioned attempts to actually penetrate the security, particularly at known vulnerability points. There are firms that specialize in this type of testing and reporting. A number of software tools also exist that duplicate known hacking techniques and apply them against the target system. Probably the best known of this class is a package called, SATAN, which received a large dose of publicity when first released, because people feared it would be used by hackers to identify weaknesses of targeted systems.

Finally, having your security system routinely audited by outsiders is a must. Internal monitoring and audits are important, but an external perspective is invaluable. Many auditing firms also

conduct penetration testing as part of the audit and provide consulting on threat identification. Because they see a broader range of experiences and results in the course of their business than any one company is likely to encounter, this consulting can be very valuable. However, be cautious. Good security people are naturally paranoid, and they want you to be paranoid too. Don't let them scare you into levels of security that are not good for your business. Know the risks, then make decisions based on the costs to your business of ameliorating those risks.

Security Summary

The sections above can be summarized in six points:

1. View security pragmatically, based on the consequences and likelihood of a failure.
2. Have an official policy and plan
3. Publicize expectations and sanctions
4. Monitor and audit continuously
5. Visibly prosecute violators
6. Use outside experts to provide a broader experience base and remove blinders

Availability

As Intranets become the primary computing infrastructure in organizations, the issue of availability becomes increasingly important. In a very real sense, the network now is the computer, and all the requirements we had for single image systems apply to the distributed systems and network interconnections that make up the Intranet. If a part of the system between the user and the information the user needs is not working, the business function in which the user is engaged is in jeopardy.

In many respects the network environment is more complex than the old mainframe/host environments. When something goes wrong in the distributed network world there are more places the problem could reside. However, as we learn more about architecting for the new requirements, and as our monitoring and intervention tools get better, we also may see the complexities of network computing as bringing many inherent strengths. I believe we have barely scratched the surface of understanding and capitalizing on the strengths of distributed computing.

Network Strategies

There are two diametrically opposed strategies for managing network availability. One strategy is to simplify the network configuration to reduce the number of points of potential failure and to make finding points of failure easier when they do occur. When a system does fail, the problem can be quickly diagnosed and the information brought back on line. This has been the primary strategy of data centers, and hence most corporate networks today.

The alternative is a strategy of optimized complexity. In this model, when a failure occurs, the system is complex enough to provide an alternate path to the information. Availability is as good as the system's ability to reroute the information pathways. The time to find and fix a specific

failure becomes less critical, because the user retains access to the information during the failure. With proper automation, the user would not even know that a pathway was down. The rerouting would happen in real time.

This latter strategy was the basis for developing the Internet standards in the first place. The U.S. Department of Defense needed a way to send computerized information across diverse networks when the status of any given network could change during the course of the transaction. The characteristics of the Internet's built-in self-routing, that some point to as a weakness, also contain the capability to provide strengths in the areas of availability and scaleability.

What does not work is an automated self-routing approach implemented on a simplified network. When a point fails, the system has no alternate resource to provide a route. Yet, these simplified networks are the norm for the Intranets in most enterprises today. What is needed is a rethinking of the enterprise network, with attention paid to subnet optimization for availability. This focus has not received much attention in the context of Intranets. As Intranets become the primary computing infrastructure for most enterprises, architecting subnets for availability will take on increasing importance.

Two basic architectures can be used to provide alternate pathways. The first is what I will call the triangle configuration, because a triangle is its simplest form. Think of each of the three points on a triangle as being a node on the network. Each point is connected to the other two points on the triangle. The most direct way to send a message from one point to another is directly, along the path that makes up the side of the triangle. But what if this path is broken? The message can still be sent by routing it through the other point and on to the destination. This isn't quite as efficient as the direct path, but is certainly more efficient than having no path at all. Of course a complex set of links such as this can be quite slow.

The other basic architecture I call the concentric ring configuration. Think of two circles, one inside the other. Each is a high speed communication backbone. Between these two rings are the local clients or the Local Area Networks (in a triangle configuration). They are connected to both rings. This model provides the efficiency of a high speed backbone, with the redundancy required for automatic availability.

It is worth mentioning that subnet diversity has the potential to not only improve availability, but also performance. By distributing the information across subnets, the network traffic also can be distributed. When information or routing is centralized, performance suffers much like rush hour traffic in an urban environment. Everyone is going to roughly the same location. By distributing the information and routing, load balancing becomes possible, and high traffic areas can be minimized. As subnet optimization becomes more common and better understood, a whole new set of methodologies and tools will begin to emerge to assist with subnet optimization and load balancing.

Redundancy Strategies

The network optimization strategy discussed above is, in essence, a redundancy strategy. It provides for redundant network pathways. Redundancy strategies are not new to computing.

They are applied to other resources in the network today. In fact, redundant servers, routers and storage devices are quite common today. Most enterprise storage devices available are based on RAID technology (Redundant Arrays of Inexpensive Disks). Likewise, many servers have failover options, that provide mirroring and substitution in case of a failure. These technologies can be used to architect highly available Intranets, although this is rarely done today.

Another example of using redundancy to provide availability is the creation of redundant data. Making backup copies of data is a form of redundancy. So is replication for either performance improvements or to support failover processing. Data redundancy is also common for those of us who give electronic presentations and computer demonstrations. It is not uncommon for presenters to carry a copy of presentations or key demonstration web pages on their hard drive, even when the presentation is intended to be given on-line. If online availability becomes compromised, the presentation can be given from the redundant data on the hard drive, in some circumstances without the audience even being aware of the problem. In critical situations, like live presentations, using situational redundancy as a personal discipline is a pragmatic solution today. In some instances this same approach is used by placing the data on an alternate server and network rather than the presenter's hard drive.

Viewing the complexity and distributed nature of an Intranet's technical infrastructure as a strength in providing availability and load balancing is not widespread. However, it is not difficult to see how the demand for this view is almost inescapable. As tools developed for the remote monitoring and managing of client server environments begin to incorporate Internet standards and adapt to these new demands, we can expect the rapid gains in this area that we have come to expect in other areas of the Intranet.

Chapter 6: Intranet Applications

Intranets are the silicon of software. Solid-state technology revolutionized the development of electronic devices by moving the design considerations to a higher level of abstraction. The basic circuits became standard and replicatable, allowing the solution to be viewed as functions rather than wiring. The communication standards of the Internet that provide location transparency, and the content standards of the web that provide client transparency enable the same leap of abstraction in design for applications, allowing solutions to be viewed as functions rather than software code. This is not a new concept in software. Object programming has been pursuing this goal for some time. However, the pioneering efforts at applying object programming concepts were limited by an incompatible and complex infrastructure. By contrast, the Intranet provides both the ability and the incentive to move to an object approach.

Developing Intranet applications is a layered process. First, the technical infrastructure must be created, a process many organizations are completing at the time this was written. Next the point solutions that attract users to the technology must be employed. The tools that make Intranet technology manageable and provide more efficient development environments need to mature. It is only after the infrastructure and tools are built that this technology will begin to show its true impact. This is the point where the radical transformations will begin to occur. In electronics, solid-state technologies first replaced functions that were implemented with earlier generation electronic technologies. Over time, solid-state electronics also began replacing functions that historically were implemented with mechanical solutions, for example, the ignition systems in automobiles. We should expect a similar pattern of evolution from traditional software with the implementation of Intranets.

I have tried to avoid the FUD (Fear, Uncertainty and Doubt) approach to adopting Intranets in this book, but the natural progression of this technology, as outlined in the previous paragraph, makes it difficult to avoid here. The implications of Intranet applications on those organizations that participate in this evolution are going to be profound. It is difficult to see how those who do not lay this foundation and move forward today will be able to catch up and save themselves from the fate faced by the Swiss watch makers or companies like Addressograph when previously mechanical solutions were replaced by solid-state electronics.

The shift in applications requires the evolution and maturity of key tools. The specific outcomes in many of these tool areas are still in flux and will be more affected by the power struggles and buying behaviors of the markets than by the technology. The advice in the 1960s Bob Dylan song: "...don't speak too soon for the wheel's still in spin, and there's no telling who that it's naming," certainly applies here. But the power of the standards also provides clear trends. If those who are the winners now cannot give up the comfort of their proprietary locks and move forward, then a ripe opportunity exists for others to replace them.

Chapter 2 introduced the concept of the four functional boxes in an Intranet environment: Standard Content, Creation Tools, Discovery Agents and Environment Managers. It now is time to revisit those boxes in more detail, look at the trends for the tools in each, and how previous

solutions can be viewed in comparison. We will begin with standard content, followed by creation tools, discovery agents and, finally, environment managers. We end with environment managers because this provides the springboard for creating the higher level business applications. By this point it should be apparent that Intranet applications are not the monolithic chunks of software code we have come to know as software, but a distributed software environment that provides structure where necessary and also allows for user driven customization.

The Application Infrastructure

Standard Content

The act of standardizing on content (the output) rather than the tools that create the content is what makes the Intranet work. If you hear someone agonizing over whether to standardize their company on a particular brand of Intranet browser or server, you can be certain they have not yet attained a fundatmental understanding of what is important, and different, about the Intranet. The maintenance of vendor independent content standards is the one sacred goal that all users must defend in the market if they don't want their benefits to vanish, and standard content is enforced by standard browsers. Any content that starts with "This page best viewed with (*fill in the brand name browser*)," is a step toward destroying the fundamental fabric of both the Intranet and the World-Wide Web. Standard content and vendor independent browsers are synonymous, and just as video tape recorders, CD ROMs and a myriad of other technologies could not develop without strict adherance to their standards, so Intranets (and the WWW) cannot develop without standard content and vendor independent browsers.

This standardization of content, along with the transparency of location, provides a significantly different option for supporting applications than the traditional MIS approaches. Not only does all the functionality no longer need to reside on a single general-purpose server, a case can be made that the single server approach often is not as desirable. A specialty server is less complex, since it doesn't have to solve the general problem, is significantly smaller, since it doesn't have to integrate additional functionality, and is more reliable and easier to maintain, because it is significantly more simple. By spreading smaller servers around the Intranet, there also is more opportunity to distribute the traffic on the network. What is important is that the server delivers standard content, not the brand of server hosting a specific function.

A number of companies are coming out with very inexpensive turnkey web servers (hardware and software) that can be installed and operated by non-technical personnel (see: Cisco , Cobalt Microservers, Compact Devices, and Microtest). One can anticipate other specialty servers that support web-enabled databases, specific functions and vertical web application logic (see Encanto Networks). This is part of the Intranet trend toward modularization of applications into functions that simplify the creation, implementation, maintenance and use of the function. We will see both the trend to break larger applications into simplified functions and the trend toward domain specialists managing more of their own information and process functions to continue into other areas of the Intranet.

Before finishing this discussion of standard content, it is important to note that standard content no longer refers to text and graphics only. Logic (methods and processes) also are being standardized. The winning standard appears to be logic conveyed in the Java language. However, there are other options for providing users with logical operations in the standard content environment of the Intranet. The logic can be processed on a specific server and the user interfaces (forms and reports in database terminology) can be provided so they meet the content standards. In fact, this is the most widely used method for providing logic on Intranets today. This also is the way many application vendors are "web-enabling" their existing applications. We will look at more variations on this theme, and some possible trends and options, later in this chapter.

Content Creation Tools

Standard content creates an interesting dilemma for vendors of content creation tools. After all, prior to standard content what kept you from using one brand of word processor one day and another brand the next? It was the proprietary content that each word processor created. You could not edit or view the output you created yesterday with a competitor's product. This was great for the winning software vendor, because entire organizations were forced to standardize on a single brand in order to share content. It was not great for users who needed to collaborate to get their work done. An Intranet changes that - if you insist on standard content.

With standard content, any creation tool (editor) can read and change the standard content. Thus one can switch from one editor capable of handling standard text content (HTML) to another on a whim. In fact, the text in this book has been edited using at least five different editing tools crossing Macintosh and PC platforms. The images have been edited using three different editing tools, and some of these images also have been edited across both Macintosh and PC platforms. Since Java logic is coded in basic text, Java code, too, can be edited across different vendors' tools. While this was not the primary reason for developing the standard content, it is an unavoidable outcome.

This is a positive development for consumers. To remain competitive some vendors have begun to move from spending their R&D dollars perpetuating proprietary locks to competing by adding features to make the content creation tools easier for non-technical users to use. This drives the enablement process. However, sometimes these tools encourage rather poor habits. For example, one major vendor has a very nice WYSIWYG editor, but when adding images, the default is to create a copy of the image in the same folder as the page. If the author does not explicitly uncheck the box, every time he edits the image link, multiple copies of the image are generated all over, and the author has just created an electronic version of the update nightmare frequently seen in both the world of paper and of client-server. Other packages provide easy features but in the process take over, and modify, the management of the links. This locks the user into the package for future updates and can even lock the user into publishing on a specific brand of server.

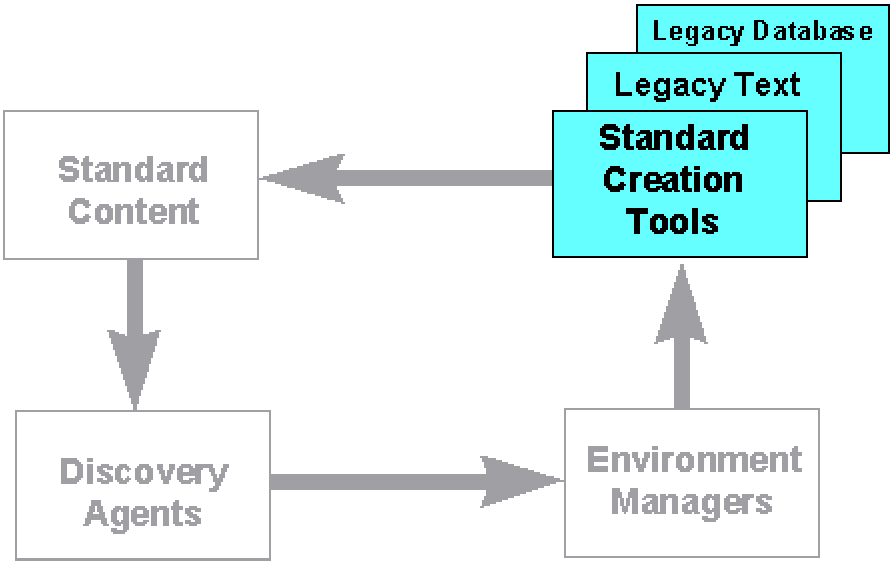
There are many more examples, but the point for users and those who support them is to be on the alert for defaults that encourage behaviors that don't take maximum advantage of the Intranet's transparency of location and for packages that take over and modify the standard

content so that in the future it can only be edited and managed by that package. This latter point will be discussed again with environment managers, because many vendors seem to be trying to maintain the lock their creation tools had with proprietary content by shifting the lock to proprietary environment managers.

In addition to direct creation tools, there are indirect creation tools. These are tools that take exisitng proprietary content and convert it into standard content. Some tools do this as a discrete function, while others create a dynamic environment between the two formats. In both cases, indirect tools tend to be used where some reason exists to continue managing the information in the proprietary tool set for some time.

When a discrete function tool does the conversion, the standard content version is stand alone. If the original version changes, another discrete translation occurs, and the earlier standard version is replaced with the latest version. If the standard version is changed, there usually is no reverse translation process, other than to explicitly make the change in both places. In this way, discrete function conversion tools tend to keep the development and maintenance environment locked in the proprietary toolset. Discrete function tool sets are tied to most of the proprietary document editors that existed before the advent of standard content, e.g. Adobe, Interleaf, etc., or the general purpose, Net-It Central.

When this was first written, Microsoft's Internet Assistant was included in this section. However, with the release of Word-97, Word has become a standard content editor, that not only will save the edited content as HTML, but will read, modify and resave HTML content created with other editors. This makes moving the corporate document standard to HTML a matter of policy and changing habits for many companies, rather than a wholesale conversion decision.



Dynamic environments are common when the interaction is with information managed in a database. In these instances, the translation to standard content is made "on demand." This may be done through a forms interface interacting with CGI or Java scripts on the server, or through an automatically generated set of pages that let the user browse the database (e.g. Netscheme).

Most of the tools for creating database links to standard content outputs are for SQL and Object Oriented databases, and most database vendors now provide a set of tools for their products. However, some tools also have been developed for MVS and VM environments (see: Simware, Amazon, Polaris, Idea).

Discovery Agents

This leads us quite naturally to the area of discovery agents. The reason is that DBMSs are a highly structured case of a discovery agent. Traditional document management systems also fall into this category. The purpose of both of these tools (and their approaches) is to discover specific information on demand. The difference between these tools and the modern spider-based discovery agent is the amount of pre-structuring of the information that must take place before the discovery agent will work. And, it is the pre-structuring that quickly becomes complex as the size of the database grows.

A spider-based discovery agent takes advantage of the standard linking and location transparency of a web environment to find information. For this reason spider-based discovery agents are not limited to predetermined structures on specific servers. The early agents have tended to be general purpose, they catalog the entire web. See the Web Robots Database for a list of discovery agents. These general purpose discovery agents often are combined with parts of DBMS or Document Management technology. For example, most general web spiders use an indexing and search tool licensed from a document management vendor (many from Verity, originally a document management company).

In addition to general purpose spiders, specialty agents are emerging that provide more focused discovery for their client. For example, discovery agents can be used to map web and document links and check for breaks in page links (BiggByte, Dr. Watson, Inspector Web, Linklint, lvrfy, Net Mechanic) or to monitor specific pages for content changes (Katipo and WebSeeker). Many specialty agents use database management technology to manage the discrete, highly-structured data about their tasks. However, rather than using general purpose database management software, we find the more progressive agent vendors custom writing the database for specific agents. This is another example of the modularization discussed above. Over the past two decades we have increased our knowledge of effective database approaches and algorithms to the point where the option of writing a highly targeted function must be weighed against carrying the burden of database generality and full function that will never be required by the agent. The standard environment of the Intranet provides these special purpose agents with the linkage and consistent interface that used to be available only from a rigidly integrated structure within a full function database.

Discovery agents promise to be one of the richest Intranet tool focus areas over the next few years. Agents can be either client or server based depending on the application. But regardless of where they reside, a discovery agent's power comes from its ability to enable each user to control her own information access and flow. We just now are beginning to scratch the surface of discovery agents. As we gain more experience with their application we should expect them to replace the discovery function in a number of the applications that today rely on databases for

their discovery and coordination capabilities, just like solid-state ignitions eventually replaced mechanical rotors and points in engines.

How soon will this happen? It already has started. SAIC developed and demonstrated a prototype application for the FBI that used AltaVista to spider and index the FBI's Oracle database of case files. Queries that previously took over 20 hours and required formal SQL statements to be submitted, were generated using the AltaVista key word interface and returned the results in 4 seconds. Add to this the interactive "Refine" feature that AltaVista provides, and the feature/function takes on a dimension previously unavailable to the non-technical members of the community.

It is not hard to imagine creating a common search index across multiple, diverse, databases using this same approach. The implications as an alternate way to solve at least some data warehouse requirements are astounding and could revolutionize the discipline. It also could replace the current approach of generating meta-dictionaries for other cross-database application development environments.

Using a tool like Netscheme, mentioned above, rather than scripts, to create a hyperlink schema into the database, that the spider could search directly, would revolutionize the process even further. These approaches all share a cooperative object model that uses the common content and navigation standards of the web for interoperation. Our ability to shed our old perspectives and assumptions is all that holds us back from seeing even more ways to simplify and enhance our digital environments.

Environment Managers

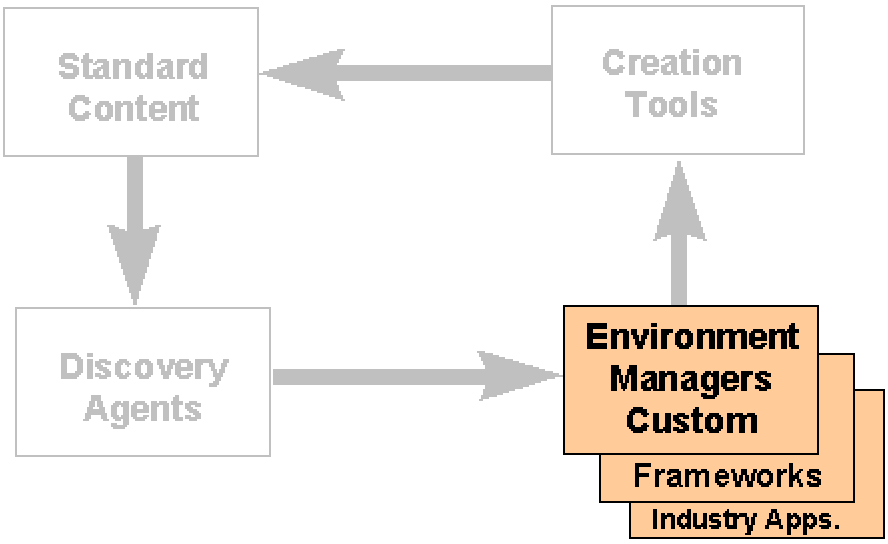
Environment managers are a diverse lot. They often are sold as site managers or web managers or web development environments. Many are tightly tied to tools in one or more of the other functional areas. Their purpose is to provide an integrated view of the content and tools so new development can be accomplished efficiently. Examples of environment managers range from FrontPage (Microsoft) and SiteMill (Adobe) to NetObjects, Edge, HAHT, Wallop and Netcarta. It should be noted that most vendors have not viewed their products as environment managers. Many products that act as environment managers originally viewed their function as managing all the information in the company. More recently, the vendors have recognized that it is more realistic to think in terms of managing a related complex of pages. Each complex of pages is viewed as a web in its own right.

The problem with most environment managers is their tight coupling with their own vendor specific tools. What is required is that the environment manager allows each user to specify both the tools and the server of choice. For some projects (webs) being managed it may be more efficient for users to use the tools they find most productive and work on their own servers rather than to be forced to use the environment manager's tool set and server. This is possible using discovery agents to feed the environment manager, but few products support the concept today. As mentioned above, proprietary locks work by forcing the coupling of tools in one of the functional areas with those in another. Since Intranet content became standards based, the only

alternative creation tool vendors have for creating a proprietary lock is to tightly couple their tools with their own environment manager.

Bucking this trend, a few companies have done a good job of separating their functional components and creating an open environment manager. One of the best is Interwoven's TeamSite. Another interesting new type of environment manager is MovieWorks. Today only available on Macintosh platforms, it manages a multimedia environment. However, in 1998 it is expected to become available for Windows platforms as well. Only one of the features that makes this product interesting is that it does not attempt to integrate the various editors, but to integrate the content the editors put out. The output can be viewed using any browser that supports QuickTime.

Environment managers are discussed last not only because they integrate the other three functions, but because high level applications are environment managers. If you think back on the major functional areas, you should be able to see that this is the case. A high level application has a content base from which it draws, a method for discovering the relevant content, and tools for updating or adding to the content. If the process being supported is highly structured and well understood, then the environment manager is very focused and looks like a standard transaction-based application. If the process is only partially structured, then the environment manager looks more like a framework or more general purpose tool. If the process is unstructured, the environment manager looks like a custom development environment.



For most of our experience, all four functions have run on a single computer (or complex of computers) and have been integrated because a single vendor dictated the specific vendor brands that could be used. The time has come to rethink our high level applications in the new paradigm, taking into account the location transparency, content standards and new capabilities. This is the future of Intranet applications. The content is no longer static or localized. Applications are the management and manipulation of the overall knowledge base to meet diverse requirements and goals. Specific tools come and go.

Process Building Blocks

Before looking at how all this comes together in an application, it is worthwhile to review some of the basic process tools used and the functionality they provide. These are listed below with a short description of each.

Mail

Electronic mail was one of the earliest functions on the Internet, and in many ways is the basis of much of the web technology. The content standards for mail and the web technology are shared. Mail is an important tool for Intranet applications because it provides the major form of PUSH.

Threaded discussion

Threaded discussions are an integration of email and web functionality. A threaded discussion organizes what amounts to emails around subjects and discussions. The discussion is accessed using the web browser and the user genearlly starts by viewing an index of the contents in her web browser. Generally the index is organized by subject, with the primary statement listed first and the replies underneath organized by date and author. However, some threaded discussion managers allow the user to select a view of the content by date or author as well. Indentation is used to show the relationship of replies to each other. To view the content, the user selects the link. To add a response, a form is included with each message or the user selects a reply button and an in-browser form pops up for entry. This is a PULL medium. Newsgroups can be considered a user-initiated, push version of threaded discussion that uses normal email rather than a browser.

Document to threaded discussion

This is an integration of threaded discussion with standard web documents, and is valuable for reviews, negotiation and collaboration. In one implementation , the tool takes a web document and tags each paragraph with an icon. By selecting the icon next to a specific paragraph, the browser brings up the discussion thread for that paragraph. This organizes the comments around the paragraphs, facilitates simultaneous discussion among mulitple parties and provides documentation of the issues and resolutions. The threaded-discussion content also can be sorted to provide whole document, date and reviewer views of the discussion. The SamePage product from WebFlow provides this functionality. However, the current version insists on changing and managing the document links. For documents without links it works fine, but if you have links be prepared either to be locked into publishing through the WebFlow environment manager, or to manually changing all your links back when the collaboration is complete. WebFlow intends to correct this problem in their next version do out later this year.

Forms to mail

Forms to mail provides an easy way to collect information that you might otherwise have requested in an email. The form is accessed and filled out using a standard web browser. Often the notification and request of the desired respondents is done using email. The advantage of the

forms is that the form is clearer than email questions, the response is easier and the results are in a standard format. Forms to mail can also be used on a strictly pull page for feedback and collecting information about the audience.

Forms to database

This works exactly like forms to mail, except the results are fed directly into a database manager. A CGI or Java script or an interface provided by the database vendor mediates the results. This can be used to populate or update a database or to query a database depending on the script.

Database to HTML

This is basically a database report formatted in HTML. One use is to return the results from a form-to-database query. However, a more sophisticated use is to generate custom pages for a user based on the user's profile. The profile might be based on personal interests, history of past accesses or it might be based on security clearance. The page generated then contains only the information of interest or only the information that user is allowed to see.

Personal Agents

Personal agents were discussed in the previous section. They provide an intermediate option between complete push and complete pull, and might be viewed as user initiated push. The key to a personal agent is that it is controlled by the user. The user can turn on specificly targeted push, turn it off and direct what it is looking for. Agents can be used to monitor pull pages so the user knows when updates occur without continual checking (Katipo and WebSeeker). Agents can be used to screen, sort and even delete incoming mail. They can be used to search, monitor and screen the Intranet for specific content The actual logic and processing may reside either on a server or on the client. For example, Amazon Books provides a server-side personal agent called, "Eyes,"that screens for books with specified characteristics. A company specializing in agents that provide options between complete pull and complete push is First Floor.

Standard Script Libraries

This is a relatively new class of Intranet functions that generally work with specific environment managers. The scripts are provided as "extensions" to the web server software. The environment manager has wizards that walk novice users through the process of developing otherwise complicated functions. For example, by responding to a wizard, a non-technical user is able to create their own threaded discussion or create a form that returns an email or feeds a database. The extension library consists of CGI or Java scripts and the wizard creates the proper HTML tags to activate the scripts. Today these are all proprietary, but this is a ripe area for standardization. If the individual companies don't standardize on script libraries, some company is bound to create a generic library of functions with a call translator so that pages generated by any popular wizard can run off their script library.

Shared White Boards

These are applications that facilitate Intranet collaboration. The same window, or page appears on more than one computer. All of the participants can both make changes and see the changes as they are made. The use of this technology will increase as organizations gain experience with and incorporate Intranet collaboration into their work cultures.

Voice and Video Conferencing

Today these frequently are used in tandem with other Intranet technologies, over a separate infrastructure. The technology already exists to integrate both voice and video conferencing in the Intranet infrastructure (for example see VXTREME). As the bandwidth increases, and the technology matures, this integration will become more common.

How Applications Work

To start this section let us take a look at how traditional applications work. Generally the application is separated into three major functions: the user interface, the logic and the database. Additionally, the developer must decide on which platforms the application will be supported. It should be apparent that from a software developer's perspective an Intranet application immediately eliminates some of the choices. The user interface already is defined as a standard, and the user already has obtained the the software of her choice to run on her system of choice. This leaves the application developer to concentrate on the usability, logic and the content discovery and creation aspects of the application.

Traditional end user applications generally have two major limitations. They limit the user's ability to reformulate or restructure the interaction, and they interact with data from a pre-structured, single database. For complex solutions, like Human Resources, Help Desk or Sales Force Automation, the data required by the user often resides in multiple legacy databases and a large portion is semistructured, idea-based information, not the discrete quantities and numbers that databases manage so well.

For these reasons, most application packages in these markets focus on the logic that supports the structured part of the problem and on the user interface. The legacy information may be acknowledged, but is not the main thrust of the marketing and sales effort. The obligatory statement that, of course, the legacy databases can be integrated is made, and the focus returns to the structured process logic. And yet, in the implementation, the knowledge-base problem is the significant barrier to an effective application, not the structured process logic.

True Intranet applications are still in their infancy, but one point should be clear. An Intranet application starts from the perspective of the knowledge base, not the perspective of the structured application logic. The application logic is one resource in the knowledge base that leverages the environment to perform specific functions. This is a significant difference that is possible only because of the vendor-independent communication and content standards of an Intranet.

We can expect Intranet applications to evolve over time. The applications we see today tend to be traditional applications, modified to take advantage of the standard user interface. This type of application retains the tight integration of functionality in a proprietary implementation and the dependence on its database for information discovery and display. The next wave of Intranet applications will begin to integrate solutions that extend to functionality beyond the structured and semi-structured processes of traditional applications. The use of spider-based discovery agents will begin to feed application logic, and the logic will begin to facilitate the interaction of higher level ideas over the raw manipulation of data that characterizes computer applications today. As our knowledge about discovery agents and their implementation improve, the application logic will begin to unbundle from today's structured database model. This will both increase the need for vendor-independent, object-interface standards and facilitate the unbundling of integrated logic into functional objects. See Corel's Java for Office as an example of early moves in the direction of unbundling logic into functional objects.

So what will these applications look like? They will be built on the standard content and discovery agent model. They will focus on semi-structured and unstructured parts of the problem. They will facilitate self-customization by the user. Structured logic and processes will be developed and shared by anyone, and many will be single-use "throw-aways."

The one characteristic of an Intranet that makes it different from all previous computer-based infrastructures is not the wealth of information available, but its ability to make everyone a publisher (and soon a programmer). This fact is often either overlooked or viewed as a problem that has to be managed. In fact, if a medium does not allow everyone to publish, outside the "fill-in-the-blank" structure of previous computer technology, then real communication cannot happen. The organizational interaction is limited to dictates and highly structured feedback.

How can we move to the much desired "learning organizations" if we hide in structure and cannot embrace some chaos and inefficiency? If we already know how to structure the problem and the information, how can we learn? Learning is the process of discovering structure. If we can only manage the knowledge (the repository of our previous learning) that fits into our currently understood structures, how can we advance our knowledge as we learn radically new things?

This is not to say there is not a place for structured processes or broadcast information. However, the new infrastructure does allow us more options in the way we approach and define problems. The key considerations in Intranet application architecture will be twofold: the desirable level of structuring and when content needs to be pushed rather than pulled. A new generation of "push" tools are emerging that give users more control. See Marimba's Castinet product, the Pointcast Network product or FirstFloor's Smart Delivery product as examples. Complex Intranet applications will support a mixture of push and pull possibilities, applied to gain the best overall effectiveness.

In their book, *Decision Support Systems*, Peter Keen and Michael Scott-Morton identified three classes of processes which they called, structured, semi-structured and unstructured. Prior to the time of their work, computer applications primarily focused on structured processes. These well-understood, repeatable processes fit the original "batch" mode of the technology quite well. The

concept of Decision Support Systems opened the world of computer applications to the support of semi-structured processes. This was enabled by the advent of interactive computing from video terminals, which meant that users could interact with programs while they were running.

The introduction of Intranet applications extends computer functionality to include support for unstructured processes. The user has the capability to scan (browse) and screen (search) unstructured information to help formulate more specific questions or to stimulate new ideas or approaches. The process building blocks in the previous section can be combined in various ways to support all three process classes. Additionally, the technology allows the application author to mix modes of support within a single solution.

Building Intranet Applications

What will Intranet applications ultimately look like? Until we have more experience, it may be impossible to tell. However, the following is my attempt at five general rules meant to help sort through some of the issues involved in designing an Intranet application.

#1: Think beyond traditional applications - think about the whole function.

Because Intranet applications are modular, we can support more complete functions. We do not have to pre-structure all the processes and information. We do not have to build all the pieces at once. Think about the objectives, the end result and alternate ways to get there.

#2: Develop the process in terms of functional classes and how they relate to each other.

As complex, general-purpose applications begin to deconstruct into more simplified functional logic, we will see how functional classes can be shared across specialty domains. For example, most applications can be defined in terms of the four functional classes listed below.

- Tracking (customers, resources, trouble tickets, inventories)
- Configuring (products, solutions, benefits, financial instruments)
- Informing
    - Publication (pull)
    - Notification (push)
- Exchanging
    - Negotiations (ideas)
    - Collaboration (ideas)
    - Transactions (money)

Whether the number of basic classes is more or less than four, and whether these are the "right" four, is not the point. The point is that classes such as these allow us to reuse our content and tools across a broader range of domains than the content and tools embedded in the current "silo" applications. As we gain more experience the most effective classes will emerge.

#3: For each function within the solution identify whether the process being supported is structured, semi-structured or unstructured.

For each functional class ask what you expect of the user: repetition and standard behavior or thought and innovation? Recognize that some of each may be required in the process of reaching an end result. However, for a specific functional class in a specific process the degree of structure should be identifiable. Determining the degree of structure will help identify the tool or approach for implementing the functional class. When the processes in a functional class are well structured (e.g. money transactions, scheduling, tracking, user profiling) database technology is indicated. When processes are less structured (e.g. requests for others' experience, innovation, creation, negotiation, exception handling) the message-based technologies are more appropriate.

#4 View each interaction with the user in terms of the appropriate degree of push and pull

This concept has been presented in detail in previous chapters. When identifying push-pull characteristics for Intranet applications the following guidelines are useful:

- Push what is needed now that has a short life
    - One-time Notices and Requests
    - Personal Communication
- Pull what will be referenced in the future
    - Anything printed for large numbers of employees
    - Recurring communication (e.g.standing meeting minutes)
- If it is not obvious, consider subscription agents (list servers & personal agents)

#5 Support learning by individuals and the organization.

Unlike traditional applications, Intranet applications should be designed with adaptation and learning in mind. Individuals can learn in several ways. They can learn from the knowledge base, by retrieving what they and others have previously learned and captured. They can learn by recombining and extrapolating what they, or the knowledge base, previously learned. They can learn from experience, through random or systematic trials. For the organization, learning means not only solving the problem, but capturing the experience in the knowledge base.

It should be obvious that learning can happen in both structured and unstructured environments. Any complex Intranet application should provide an area for unstructured activity, an area where new knowledge can be generated. These areas may take the form of discussion groups or chat rooms for asking questions or brainstorming ideas, or they may be tools that allow users to create what I earlier called throw-away applications. These are applications that are so quick and easy to create that non-technical users can quickly build and publish custom functionality. Examples that exist today are the wizards that let users create a threaded discussion group within minutes to discuss their single issue or to create a form to collect structured feedback. In the future, we will see Java applets that look like spreadsheets, can be configured for specific functions just like today's spreadsheets, then included in an HTML page.

Summary

The final form of Intranet applications is impossible to predict from our current experience base. Early Intranet applications are primarily traditional applications with a web front-end. As we gain more experience, traditional, general-purpose applications will begin to desconstruct into more specific functional classes, enabled by the location transparency and content standards of the Intranet. The use of spider-based discovery agents will become more wide-spread, and replace pre-structured databases in at least some applications. Functional classes will be applied across traditional application silos. Intranet applications will expand to support unstructured processes in addition to the traditional structured ones. Applications will no longer be viewed as "programs" but as learning systems that gain knowledge, both structured and unstructured.

Chapter 7: Work Changes

The communication explosion resulting from the printing press eventually led to the Industrial Revolution and dramatic changes in the way people worked, the skills they needed and the views they held on what constitutes value and status. The communication explosion resulting from the Internet and Web technologies promises to be no less sweeping in its scope. In this chapter we will revisit concepts introduced in the preceding chapters and explore how they might affect our work and work environments in the future.

Key to understanding these changes is the concept of structuredness and the value we place on structured versus unstructured content and processes. In much, but not all, of the industrial world today, we have a tendency to place value on structured content and processes while we view unstructured content and processes as less important. In a world where wealth is based on efficient production, and production efficiency is based on breaking work into discrete chunks that can be optimized as linear processes, this makes sense. But the world already was changing even before the advent of Intranets. The book The Seven Cultures of Capitalism (if you can find a copy) provides useful insights into the nature of value and wealth in this context.

As manufacturing processes became well understood and widely used, the measure of value began to shift. Quality started to replace simple availability of goods as a business differentiator. But today, even quality is becoming less of a differentiator, while innovation and personalized service have started to emerge as the value differentiators in business. A point to note in this trend is that what constitutes value is shifting from attributes easily supported by structure to attributes that require less structure. At the higher levels of business, this has always been true. Business is about conversations and commitments. Both are unstructured processes. Only after the commitments are made do the structured processes become important to support meeting those commitments.

The trend toward increased valuation of unstructured processes is true not only in business. In this century the world of science, the evangelist of structured processes and content, also has begun to produce work acknowledging the importance, and primacy, of unstructured processes. The writing of Thomas Kuhn, mentioned in Chapter 1, is all about the role of creative, unstructured processes in science. But even before this, Albert Einstein provided numerous quotes along these lines, including his famous, "Imagination is more important than knowledge." This statement of Einstein's may be the best overall description of the work changes the current revolution will encourage. Increasingly, business value will come not from production, but from imagining innovative things to produce and how to apply what is produced in innovative and personal ways.

A distinction that has been emerging for some time is that of information versus data. It became apparent several decades ago that the context of data was more important than raw data itself. In his book, The Art of the Long View, Peter Schwartz, President of the Global Business Network, suggests that even this distinction is not sufficient. He contends that the human mind learns best

from stories about possibilities and implications rather than from facts, checklists and process descriptions. People perform better in novel or adverse situations when they understand the story that is unfolding as opposed to when they follow procedural descriptions, no matter how well rehearsed.

The success of Shell Oil over the past few decades, where Schwartz was involved in strategy development, is a tribute to the value of the unstructured approach in business. The use of scenario planning, a story-based approach to knowledge, allowed Shell to prepare for many world events that were unthinkable to their competitors before they happened: including the fall of OPEC's influence in the price of oil and the dissolution of the Soviet Union.

The use of scenarios to explore and prepare for future possibilities is becoming a powerful tool. The process helps us understand our options and where we may have choices. But the term I am beginning to hear more and more in conversations with business executives and strategists is not about data, information or even possibilities. It is the term "meaning." In the world of structure we were concerned about the correctness of data. In the world of imagination and innovation we are becoming more concerned with the meaning of information. In many areas of business, trends and gestalts are being recognized as more important than the absolute correctness of any specific data value. The business questions are shifting from "what do we **need** to do," and "**how** do we do it" to "what do we **want** to do." In a very real sense, business strategists are rushing headlong toward the existential search for meaning, Can the impact on the rest of the business be far behind?

Meaning happens at the intersection of the individual and the community. Meaning comes from applying a value system to a challenge. The challenge provides the energy, or driving force, and the value system provides the standard against which we measure the usefulness of specific information, approaches or even the importance of the challenge itself. If our value system identifies a challenge as important, and specific information as useful for confronting the challenge, the information is meaningful. If our value system rejects the challenge or the information, for whatever reason, it becomes meaningless.

Key to value and meaning is the concept of communities of interest. Communities of interest are the strongest forces in creating and reinforcing value systems in individuals. They are an important concept for understanding and managing many aspects of an intranet (or Internet for that matter).

Development of Communities of Interest

Communities of interest are a part of being human. They have evolved over time with the evolution of information systems discussed in the first chapter. At one time, an individual was born into a community of interest, her tribe or local community, and lived in it all her life. Today, we still are born into our first community of interest, our immediate family.

But, as we grow older and become independent, most of us have more choice in our potential communities of interest than in the past. Modern transportation and communication allows us to

move and affiliate with individuals at much greater distances. But geography still remains a strong factor in maintaining strong, close, communities of interest. That is, until recently.

The Internet has suddenly made distance and time much less of a factor in maintaining communities of interest and their support structures. Individuals with like interests and values can find each other, and reinforce and evolve each other's ideas almost instantaneously, regardless of their physical location. The same is true on intranets. As more people in an organization become adept at intranet communication, they will begin to find each other and form communities of interest that cross today's organizational and geographic boundaries. In fact, a role that should be developed consciously in intranet organizations is the role of cross-pollenator, individuals who are responsible both for actively spreading ideas across existing communities of interest and stimulating the development of new communities of interest.

We should note that communities of interest are different than virtual work groups, another phenomenon enabled by an intranet. The basic difference is that individuals are assigned to a work group, whereas they voluntarily belong to a community of interest. Here are some specific implications of that difference.

1. Communities of interest are self-subscribing - virtual work groups are mandated or appointed.
2. Communities of interest maintain their own history, statistics, stories - in virtual work groups these are maintained by the larger organization.
3. Neither is bound by physical geography.
4. Communities of interest set their own goals and visions - in virtual work groups the goals and vision are set by the larger organization.
5. Communities of interest generate their own rules and codes - in virtual work groups internal rules and codes are heavily influenced by the larger organization.
6. Communities of interest enforce their own rules - in virtual work groups enforcement is largely carried out by the larger organization.
7. Communities of interest maintain their own reward systems, usually non-monetary - virtual work groups are rewarded by the larger organization, often with direct or indirect monetary implications.

Virtual work groups, particularly effective ones, tend evolve community characteristics. This is what is happening during the early phases of team bonding. However, unless they become an organizational renegade, they continue to take their direction, gage their effectiveness and gain their rewards from the larger organization.

Most groups in a larger organization are a hybrid, somewhere on the continuum between an independent community of interest, that has become alienated from the larger organization, and a completely focused virtual work group, that fails, or provides sterile results. As we move from a command-and-control, machine, model of organizations to a virtual community model, understanding how to nurture independent virtual communities and at the same time keep them integrated will become increasingly important. This may be the biggest organizational challenge of the new era.

Community Roles

In his book, Organizing Genius, Warren Bennis identifies at least two roles for managing creative groups that provide some insights into managing the new organizations. One is the role of the visionary, the person who articulates the challenge and its resolution and who spends her time reinforcing the common image. The other is the role of the guardian of the community, the person who negotiates the commitments with other communities and the larger organization.

While the roles of visionary and guardian are important for community cohesion, there are numerous other roles that are equally important for the effective functioning of the community. A vital role is the brokering of information. As David Shenk, author of Data Smog says: "Knowledge is power, but an unregulated stream of information is rarely the best route to knowledge."

The brokering of community information generally is accomplished by a collection of agents. Both individuals and communities have two distinct information needs: the need to collect information to gage current conditions and the need to impart information that will create a desired effect. We will refer to these as sensory agents and action agents. Current organizational roles, with which we already are familiar, can be classified in this way.

Roles that fall under the sensory agent category include the collection of information, the organization of information and evaluative reactions to the information.

When we go to a government agency to file for a license or certificate, the person who we interact with is an information collection agent. The same is true of the person in our companies who processes our benefits information, payroll hours, etc. Clerical roles tend to be information collection roles.

In contrast, the functions we most associate with librarians are those of an organization agent. They organize the information so it can be found, and act as brokers, assisting those who are not as familiar with the contents or organizational structure to find what is meaningful. But formal librarians are not the only example of this role. Administrative assistants in an office perform this role as do database administrators. Anyone who spends their time organizing information so it can be found again is acting as an organization agent.

Finally, historians, critics and analysts provide a community evaluation of the information. While the community may allow everyone to participate in this role, most communities have a limited number of recognized authorities who provide the community-accepted evaluations. There are many ways to become an authority, ranging from being sanctioned by the community leadership, to building a populist reputation and following among the community members. Visionaries, revolutionaries and cult leaders are evaluation agents whose value systems differ from the official community leadership.

Evaluation agents provide a bridge to the action agents, because their vision and value systems can stimulate and mold the actions of the community.

Action agents translate information into physical action. Traditional action-agent roles in organizations tend to be manufacturing and sales. Engineering falls somewhere between an evaluation agent and an action agent. There is a point worth noting about how complex systems regulate and refine their actions. This generally is done through the use of tension-opposing forces. For example, our muscle tone is a measure of the balance between different sets of muscles that pull against each other. The tension created gives us very accurate control over our movements, once we learn how to coordinate the forces. Likewise, most of our hormonal systems have on and off hormones that balance each other and help us track the daily changes we encounter.

We already are aware of some of these tension agents in our traditional organizations. The tension between manufacturing and sales is one well documented example. In this case, the manufacturing operation does not want to get "stuck" with inventory and have to lay-off workers in the future. The sales organization does not want to miss sales and market share because product is not available. The tension between the two, presumably, keeps the organization on an optimal track. Another example is the check and balance system put in place by the U.S. Constitution. Here a three-way tension system (Congress, the President and the Supreme Court) was deemed necessary. It is interesting that a fourth agent (a sensory agent) also is required to maintain the proper control, that is the free "press."

Action agents are not all outwardly focused. Systems require action agents to perform infrastructure maintenance and improvement. We see these agents at work everyday both in our companies and our government institutions. They remove waste, move walls, put in and repair roads and communication lines and a myriad of other tasks.

As mentioned above, an infrastructure maintenance-agent role that every large organization should consider, explicitly, especially with an intranet, is that of cross-pollenators. I know some companies, like Hewlett-Packard, have a formal organization and role to do just this. As intranet communities of interest begin to develop, these proactive ambassadors will become critical to the continuing mix and integration of ideas. They are important organizational catalysts.

Values and Wealth

When speaking to audiences, I often start with a version of a very old story, that is particularly relevant today. In this version of the story, a woman comes out of her office building after work on a dark winter evening. She sees one of her colleagues under a street light in the parking lot seemingly searching for something. She approaches him and asks if she can help. He explains that he has lost his car keys and would very much appreciate another set of eyes.

After some time of searching, the woman becomes convinced that the keys are not there and suggests another strategy. She asks where he last saw his keys, so they could trace the path back to that point. Recognizing immediately where she is going with this line of questioning, he replies: "Oh, I know where I lost them. Over there." And, he points to a dark spot across the parking lot under a tree.

The woman, flabbergasted, says: "If you lost the keys over there, why are you looking for them over here?"

To which the man replies: "Because the light's better."

As absurd as this story sounds, this is the way we approach many of our decisions. When justifying intranets, we attempt to use ROI measures that are well known (under the street light) because the real value may not be conventional or easily measured. The same is true of how we pay for and reward individuals and companies for the "new" value. What we value and how we pay for it are critical elements in the evolution and survival of organizations in the emerging order.

Remember, before the industrial revolution (an outcome of the printing press) value and wealth were viewed very differently than today. Land and gold may still be important, but as Adam Smith pointed out, the route to attaining them is through control of the processes. Today we appear to be shifting again. We went from property to means of production with the industrial revolution. We now are moving from means of production to means of knowing as the key value.

At the dawn of the scientific revolution, the process manufacturers (wineries and breweries) wanted to protect their processes by hoarding information. Their researchers were not allowed to share their basic research, because it was considered a trade secret. Fortunately, some of these early scientists took a risk and published their key research under pseudonyms in order to advance the whole field more quickly. The most famous case is that of a brewery researcher who published under the name of Student. One of his publications, to this day known only as the Student t-test, still stands at the base of the scientific method as an elegant way to determine if experimental differences are more likely the result of chance or of the proposed hypothesis.

This entire book is based on the premise that hoarding and gate keeping information is detrimental to learning, knowledge and the evolution of both individuals and business environments. The incredible inefficiencies and expenses that the business community at large put up with in the early days of computerized information, because our value and wealth systems reinforced the hoarding of ideas and their application, is incredible.

With the advent of I-net technology, we are seeing cracks in our traditional value systems and what constitutes wealth. Traditional products and packaging are being replaced, and goods are moving to commodity status faster than ever before. How to make enough money to support the development and manufacturing of products is, increasingly, a mystery. This must be similar to the confusion and sense of powerlessness faced by the nobility and landed gentry during the early days of the industrial revolution, as the basis of value and wealth shifted from land and gold to processes and goods.

It is not information *per se* that is the newly valued commodity. As David Shenk, the previously quoted author of Data Smog, says: "Information used to be as rare and precious as gold. Now it is so inexpensive and plentiful that most of it ends up being remaindered and shredded, as if it is worthless garbage." What is of value are vision and ideas. With the availability of cheap and

plentiful information, the process of learning and synthesizing is replacing the process of manufacturing.

So how might our value systems change to reward the creation, distribution and use of valuable ideas. Today's value systems reward the hoarding of the ideas. From our manufacturing, process, oriented view we believe that if a company's products aren't protected as a monopoly for some period of time, companies would not invest in new knowledge. We as a community agree to pay the monopoly prices to the manufacturing process owners, for a defined period, as a way to support advancement of the community as a whole.

But is providing a manufacturing monopoly the only way to compensate people and companies for their ideas? Is it the best way given the information changes going on today? Is it possible to separate the generation of ideas and knowledge from the manufacturing processes, just like the manufacturing processes were separated from their tie to land ownership during the industrial revolution? What if ideas were paid for by how widely they were used, rather than how narrowly they were monopolized?

One can speculate on a value system that ascribes a base value to an idea, instantiated as a patentable process or product. But the "patent" holder would not have control over who could use the idea in product creation and manufacturing. The patent holder would be guaranteed the unit price for each unit produced, from everyone who used the idea. Thus, the way to greatest wealth would be to create ideas, instantiated as processes or products, that are widely shared and used by many manufacturers, rather than monopolized by one.

In an intranet environment, the same message holds true. How do we reward people for sharing knowledge and ideas? How do we reward them for learning? It is not only our management structures that have to change. Our value and reward structures also need to be examined. We must look for ways to reward people, both financially and in terms of influence, for creating and furthering the general knowledge. Moving from means of production to means of knowing as a base value requires rewarding people for meaning, synthesis and discovery along with their ability to continually restructure the future possibilities.

What does it mean to people?

Starting with the CEO:

Earlier we discussed the role challenges play in meaning. Of course, challenges occur at different levels. The mission, or vision, of an organization provides a common challenge to all the members. By challenging herself to meet the mission, or obtain the vision, each member of the organization helps move the organization toward a coordinated goal. At the same time, specific implementation, and even strategy, challenges are left to each individual to solve. Vision and vision statements become critical in a distributed decision-making environment.

So how do organizational visions come about? Are they the product of a genius leader? Sometimes. But, genius induced visions often are difficult to sustain, even by the "genius." As pointed out above, visionaries are a class of community sensory agent that share a subclass with

analysts, critics and historians. This is a very different view from the common stereotype held by most Anglo-American capitalist cultures, of the independent leader, somehow superior to and removed from the community, heroically leading the way to prosperity.

Most successful organizational visions are a synthesis of the unfolding trends and knowledge in the organization, mapped against future scenarios. As change continues to accelerate, it will become increasingly important to view vision as an evolving process rather than a discrete goal. The biggest failure of most organizational visions today is that when they are developed, the corporate visionaries don't begin, immediately, crafting the vision that will replace it.

The role of the chief executive, the person responsible for articulating the organizational vision, will increasingly become that of a common mirror reflecting the total image back to each part of the organization. The model needs to shift from decision-maker hero to community consolidator. The person, or people, filling this role will need to be adept at synthesizing the challenges and responses of the organization as a whole, seeing the implications and trends, developing thoughtful scenarios and feeding those back to the individual decision makers, not as decisions, but as possible (organizationally productive) futures. The future visions provide the value guides that allows each individual to make independent decisions that are meaningful to the organization as a whole.

Managers:

Today many managers view themselves as managing "the process." They take or set goals, devise a detailed plan of action, then motivate and monitor their employees actions according to the plan. As we begin the dawn of the information age, some managers already are beginning to realize that successful management always has been accomplished by managing the knowledge and facilitating the flow of information. As the trend continues we can expect knowledge management to become **the** business of managers. Managers, in effect are a kind of action agent, as described above. They take in the sensory information and send out effective (action stimulating) information. As managers discover the strong "sensory" power of the intranet, they will encourage all work to be done there.

The most effective managers, and companies, will evolve patterns of work that imbed the normal process of doing business into an intranet communication infrastructure. The traditional role of managers as a sensory agent, storing and forwarding information flowing between upper management and workers, will be subsumed by the intranet itself. The manager role will begin to focus more on the agent functions of analyst/critic and cross-pollenator. Managers roles will, in effect, become the regulatory agents described above.

Knowledge Workers:

As managers move out of the sensory agent role, knowledge workers roles will need to shift to handle the new opportunities and challenges of being wired directly into the knowledge base. As with managers, many knowledge workers will begin to view their role in terms of knowledge brokering rather than content output. Helping other knowledge workers find meaningful content for a specific problem will become more important than pre-packaging the notebooks, manuals

and summaries that are so common today. It is possible that this level, more than any other, will involve the interplay and integration of automated tools and human judgment. This also will create the biggest challenge for new organizations.

A recent newspaper article referred to a Harvard Business School, "Management Updates" newsletter that talked about learning styles and active versus passive learners. According the information in the newsletter, only 10% of today's organizational population are active learners. We can expect the new workplace to demand and be increasingly dependent on active learners. Whether passive learning is a condition of our upbringing, our educational patterns, our organizational pressures or our genetics is unknown. Whatever the case, we can expect increasing tension to build.

From the individual perspective, this may mean a decreasing number of jobs where passive learners can get by. Just as there are many fewer jobs today than in the past for people without a high school (and now college) education, we may see the same displacement of passive learners begin to occur. From the organizational perspective we will see pressure to meet some needs by structuring roles to accommodate passive learners, simply because there are not enough active learners to go around. This is another reason middle managers will not disappear entirely. One of the functions of a middle manager is to focus energy and knowledge to help passive learners be successful in their jobs. However, the pressure will be there to minimize this type of overhead in organizations, and the degree to which it is tolerated will be dependent on how successful we are at creating a higher percentage of active learners.

As is implied above, the new knowledge worker needs to be more proactive than reactive. They will need to customize more of their own information flow themselves. This means being able to determine what information she needs, knowing how to find it and knowing how to use personal agents to scan, screen and track it. This involves both problem solving ability and the willingness to take responsibility for and control of the information used everyday in every task. It also involves continually re-evaluating and readjusting the personal agents to match the changing requirements of the job. These are all attributes of active learners.

Measurements of self worth, also will be challenged by the new environment. Many of us measure our self worth on the job by how busy we are during the day. When our day is packed from end to end, so we can barely get to everything, we feel worthy. Never mind that what we spent our time doing was reactive busy work that had little direct impact on the outcome of the organization. Proactive behavior requires periods of quiescence for re-evaluation and retuning. Those who measure self worth by busy-ness will need to re-calibrate to other indicators of success.

Finally, we can expect organizations to struggle with how knowledge workers are measured and compensated for the value they add. Good ideas generally come from the interaction of multiple people, even when only one gets the credit. Bennis Organizing Genius gives examples of this, ranging from Michaelangelo to Walt Disney. An intranet, with virtual communities and casual collaboration, will likely make measurement and fair compensation for value-add even more nebulous. We ultimately may arrive at a solution as the agent roles described above become better defined and valued. This will only come from experience.

Summary

Intranets give us the power to manage in new ways. Taking advantage of the opportunities requires shifting our view from managing things to managing knowledge and information flows. This shift requires us to look at the entire organization as a knowledge base, not just the information in applications and databases. The workplace becomes a complex sharing of sensory information and localized activities that change the knowledge base as they happen. The operational metaphor will shift from one of factory processes and parts to one of objects and agents. As the organizational metaphor shifts from machine to organism, control will be viewed in terms of opposing tensions rather than engineered solutions. People become the key element, not as versatile machines, but as important repositories of unique knowledge to be shared and blended. This leads us to perhaps the most exciting possibility: a shift in perspective from the Industrial Revolution as the golden age of individualism and exploitation of community labor to the Information Revolution as the golden age of community development and nurturing of individual knowledge.

Chapter 8: Planning and Implementation

Great Intranets are not great because of their sophisticated design or the level of automation they have achieved. Great Intranets are great because they help people communicate in new and useful ways. A high level of sophistication or automation may, in fact, inhibit true communication, by limiting free input and response to all but a sophisticated few. When an Intranet achieves true greatness, it is impossible to single out individuals responsible for its success, because the energy and innovation are in conversations spread widely around the organization, and the participants all feel responsible. This chapter assumes that the goal of an Intranet is to enable as many people in the organization as possible to be full participants in the communication process.

Understanding what you hope to achieve, your vision for your intranet, is an essential first step in the planning process. Without explicit expectations, there will be no way to determine success. Either anything you do will be considered successful, because there are no expectations, or nothing will be successful, because the odds of accidentally hitting unstated expectations (that are likely a moving target) are almost zero.

Expectations for an Intranet can range from existential visions (We expect to change the way we do business or the business we do) to referential goals (We expect to make these processes faster or more efficient). The level and scope of expectations will determine the best approach for planning the Intranet. For example, expectations based on an existential vision generally will focus more on the development of individuals and organizations, and the technical infrastructure will be viewed as a set of referential goals in support of that development. Expectations based on referential goals generally focus on web enabling existing applications and processes as a less-expensive, more-efficient (and user friendly) way of providing computing and network services. The main focus of this chapter is on development of organizations and individuals, but first a few words about technically focused intranet implementation projects.

If your intranet development effort is oriented toward technically-based, referential goals, then you or your technical specialists most likely have some idea of how to plan for your intranet implementation. It is similar to other application development projects. As long as the scope of the Intranet application matches the existing application scope, an Intranet application project will be faster, cheaper and easier than traditional development efforts. However, many organizations quickly evolve requirements for (or use the Intranet as a justification for) applications that require new integratation of data from multiple, legacy, sources.

Many of these projects quickly begin to look like a traditional back-office database integration exercise, rather than a web project. The only web parts are the scripts that create the user interfaces. To get more benefit, the solution can be re-architected to include more web-based functionality in the application delivery. However, this takes both an understanding of the paradigms and approaches, which as indicated in earlier chapters of this book, can be quite

different from traditional approaches, and skills with the new languages and tools (see also: Telleen & Meltzer, Intranet Systems Integration). There are tools designed to integrate multiple data sources (usually through some form of meta-dictionary) and insulate the applications from direct knowledge of the underlying databases or data structures (see Allaire Cold Fusion and NeXT WebObjects as two popular examples).

Perhaps the biggest differences from many earlier application development approaches are the continuing, rapid development of new applications that can be integrated into the solution and the ability to rapidly develop end-user access to traditional data sources. Therefore, it should be no surprise that the two biggest differences in the planning and management of a complex Intranet application project are the need to accommodate shifting options and expectations and the use of prototyping techniques, rather than the classic "waterfall" planning and development techniques. This requires good expectation management and change management skills, in addition to understanding Rapid Application Development (RAD) techniques. It also requires a technical architecture that supports diversity through modularity. I generally tell clients to develop their architectures with the ability to change support for any function using a newer component, *from a different vendor*, every 18 months. This requires architectures based on community-owned standards rather than products.

My observation has been that, in general, the length and complexity of a technical application development project can have more to do with the understanding of the new Intranet architectures and tools by the planners and technicians than with the type of project. Approaching the development with a traditional mental model will produce traditional results. If you do not have the experience in-house, you may want to contract for it initially. But even here you need to beware. There are still a lot of traditional implementation houses that have picked up the Intranet marketing mantel as a way to sell traditional integration services and approaches. You can easily end up with a mega-intregration to maintain rather than a modular architecture of standard components that allows you to evolve functions independently over time. If the project does not quickly deliver useful applications that stand on their own and easily integrate with newer applications as they develop, you need to take a critical look at the architecture and approach.

In contrast to the complex, structured, web-application, an Intranet effort that is focused on the development of individuals and organizations tends to have much more modest enabling technology requirements. In fact, complex application development projects, and complex applications themselves, tend to inhibit effective Intranet adoption for the more conversational, learning and knowledge functions an Intranet can support. In this area, the technical aspects fade into the background as basic infrastructure, and most of the functionality can be purchased at moderate prices and managed with increasing ease. The complex issues shift to the productive integration of the new functionality into the organization, and the shifting of responsibilities and behaviors of individuals.

An Approach to Organizational Development

If the objective is to distribute responsibility and decision making, then any organizational development program must support this goal. This creates an implementation challenge, since

any decision made at the top undermines the objective. One approach to implementation is a series of workshops that introduce the participants to the issues and initial support structure and help them define the initial decisions that each needs to make. A major objective of the workshops is to create a community that supports each individual in making responsible commitments and decisions from within her role.

The workshops take place within a larger implementation structure. The critical steps in the larger implementation structure (in implementation order) are to:

1. Create appropriate **roles** and organizations for managing informal, formal & controlled content,
2. Implement the baseline technical **functionality** to enable self-support,
3. Facilitate the **adoption** of the required roles and skills by the people in the organization,
4. Create a critical mass of intranet **participation** within the organization,
5. Create **"rules of the road"** (standards & policies) that promote the efficient flow of information with minimum imposition on the communicators.

The first two steps are done prior to the workshops. The remaining three are outcomes of the workshops. All these steps are preceded by an Executive Awareness Program designed to increase executive understanding of the issues, generate support for the process and help each executive identify the initial workshop participants (their designated Publisher).

Basic Roles

The publishing model developed below is based on the concepts of managing formal and informal content as described in earlier chapters. The primary function of these roles is for managing **formal content**, although a few rules apply to informal content areas as well. Organizations may have other roles defined, but these are the core roles that every organization needs to fill:

- **Administrator**
- **Publishers** (sometimes called "Content Owners")
- **Editors (**Sometimes called "Content Managers")
- **Authors** (sometimes called "Content Creators")
- **Webmasters**

These are roles, and the names may vary from one company to another. For example, the editor role at one company is called a "Gatekeeper." However, the role is essentially the same, a project manager for formal content. A brief description of each of the roles follows to help you identify the substance behind the various names.

INTRANET ADMINISTRATOR

Description:

The Intranet Administrator is responsible for coordinating and facilitating the overall functioning of the Intranet. The focus is primarily on the strategy, organization and quality of the Intranet as an effective communication environment. Where the Intranet Administrator reports organizationally varies widely from one company to another. I have seen the role filled by CIOs, direct reports to the CIO, the V.P. of Quality and the V.P. of Corproate Communications. Regardless of where they report organizationally, this position should be filled by a senior level person.

Responsibilities:	Skills:
• Chairperson of the Web Council • Develops and champions the overall Intranet strategy within the company • Monitors, facilitates and coordinates the development of all Intranet policies and standards • Coordinates policy, standards and management interfaces with other organizations • Develops and presents executive awareness and update programs • Monitors and coordinates Intranet skills requirements and training at all organizational levels • Owns the Intranet standards documentation • Owns the top level of the Enterprise Map	• Understands Intranet technology capabilities and their pragmatic application • Able to focus on business needs and opportunities over technology • Has a passion for enabling distributed capability and decision making • Able to synthesize diverse opportunities into cohesive strategic frameworks • Excellent speaking, writing and leadership skills • Able to develop rational justifications for Intranet programs and investments • Able to generate credibility with and respect from participants at all levels

PUBLISHER

Description:

The publisher is responsible for determining what information her organization regularly provides to others, both inside and outside the corporation. Each major organizational or functional unit will have a publisher. When we view information as the primary driver of business functions, this role defines the interfaces to all other organizations and clearly is the responsibility of the functional head of the business unit. In practice today, this role is filled by a person who reports directly to the functional head of the organization or business unit.

Responsibilities:	Skills:
• Develops the content approval process for her organization • Identifies and negotiates the information input requirements of her organization • Identifies and negotiates the information output requirements of her organization • Chairs her organization's Editorial Council • Monitors, facilitates and coordinates the implementation of all Intranet policies and standards within her organization • Owns her organization's standards for formal information • Represents her organization on the Web Council	• Understands the business and how information drives her organization's functions • Able to understand Internet technologies and their application to the business functions • Has a passion for enabling distributed capability and decision making • Able to develop and implement effective policies and standards • Excellent speaking, writing and leadership skills • Able to develop rational justifications for Intranet programs and investments • Able to generate credibility with and respect from participants at all levels

EDITOR

Description:

The editor performs the role of project manager for the creation and management of formal information related to a specific area or focus in his organization. Most large or complex organizations have several editors, one for each focus. The editor determines which specific information needs development or attention, identifies and obtains the authoring (or programmer) resources, manages the project through the development and review cycles and formally publishes the sanctioned information for which he is responsible. These roles generally exist outside the Intranet with titles like, Product Manager, Marketing Manager, Software Development Manager, etc. Note that information also can be software logic, product specifications, product designs or manufacturing processes. Therefore, the term "editor" as used here includes the project managers of these functions in addtion to the traditional document-based meaning, if the output is published on the Intranet.

Responsibilities:	Skills:
• Identifies specific information required for a project • Identifies and obtains the resources required to complete the project • Develops and manages project schedules and timelines • Ensures that information follows corporate and organizational policies and standards • Identifies and manages the appropriate reviews and sign-offs • Publishes the the approved content on the proper servers • Participates as a member of the Editorial Council • Works with the webmaster to ensure proper availability, access controls, backup and archiving	• Excellent organization skills • Ability to identify and document project requirements • Ability to develop, document and manage to realistic project timelines • Ability to understand and manage to corporate and organizational policies and standards • Excellent speaking, writing and leadership skills • Understanding of when to use pull versus push publishing technologies • Ablity to generate credibility with and respect from participants at all levels

AUTHOR

Description:

Authors create the basic content on the Intranet. The content may be textual, graphical or logical (software code). Generally, content is created for a specific purpose. However, once available, content often is redirected toward other purposes. The Intranet can amplify the ability to reuse and redirect content. Intranet authors need to keep this in mind, and create content that both meets the proximate requirement and remains as modular and flexible as possible.

Responsibilities:	Skills:
• Meet the information requirements of the immediate audience • Adhere to creation, presentation and interface standards • Design and organize content to be flexible and reusable	• Expertise in the content field • Understanding of Intranet presentation technologies and options • Good presentation (writing/progamming/etc.) abilities and practices • Ability to use appropriate creation (authoring/programming) tools • Good understanding of vendor-independent, Intranet standards and protocols

WEBMASTER

Description:

The Webmaster is responsible for maintaining the Intranet technical infrastructure and provides the bridge between the technology and its use by non-technical specialists. The focus is on enabling the domain specialists and their communities of interest to communicate and innovate on the Intranet with as little direct dependence on technology specialists as possible. The role has two major aspects: technical architecture and administration, and support and user services. A Corporation may have multiple webmasters filling these roles for one or more web servers. The "grand-webmaster" coordinates the overall technical standards and may chair an Intranet Technical Council consisting of the other webmasters.

Responsibilities:	Skills:
Technical • Administers and maintains one or more web servers and their software • Provides backup and archiving of web server content • Administers and ensures that access control and security requirements are met • Acquires and installs shared applications, tools and libraries that enable domain specialists to create and maintain their own content and solutions • Provides and maintains the Intranet search engine • Provides interfaces to corporate databases and legacy applications • Provides or arranges for custom Intranet application support to domain specialists **Support** • Reads and takes timely action on "Webmaster" email: • Forwards domain specific Webmaster mail to the appropriate people o screens out "junk" mail o answers generic site mail • Informs domain specialists of new Intranet enabling capabilities • Provides or arranges for training on how to use the client-side tools	• A strong desire to enable non-technical users and make them self-sufficient • Experience with systems administration, systems programming • Experience with web servers and web-based applications • Experience with object-oriented approaches • C, C++, Java programming • CGI, Perl script programming • Experience with DataBase Management Systems • Good interpersonal communication skills • Strong writing skills

Enabling Functionality

The functionality required to support the basic organizational development process is neither complex nor expensive, if the basic IP network infrastructure already is in place.

- Each publisher and editor needs to have access to the intranet (connection and a browser)
- Each publisher and editor needs to have a user-friendly HTML authoring tool and basic graphics tool that saves in GIF and JPEG formats
- Each publisher and editor needs to have a place to publish his/her pages and an easy way to put pages there, by themself
- Ideally, a web-based discussion forum (threaded discussion) capability will be provided on the Intranet for use by the Intranet Council
- Early in the implementation, a spider-based search engine needs to be implemented, to find and catalog content.

One additional consideration:

- A room needs to be provided for the workshops where the participants can share computers (ideally 2 to a computer) that contain the authoring and publishing tools they will use and a connection to their intranet publishing sites.

For organizations with slow responding technical support, most of this functionality can be provided with a Micro-webserver. These servers require zero technical administration and are priced at around $1,000 (see Cobalt Microservers, Compact Devices and Microtest).

A word about browsers. As stated in an earlier chapter, the community-owned standards are what make this technology work, and the browser is where those standards become real. Since the two major vendors continually have some features that are not yet standard, and not shared by both, the consumers are left with the responsibility of enforcing the standards in their own organizations, if they want the benefits of this revolution to last. There really are three choices. The first is to give up, standardize on one brand of browser and let the organization drift into the proprietary hooks - a solution with many expensive risks down the road. The second is to standardize on one brand of browser and attempt to enforce the adherence to community-standard features in all pages - an expensive, on-going policing and enforcement exercise. The third is to mix both major brands of browsers among the community - a structural checks and balances solution. The authors have to stick to the common standards or half the audience cannot use their content.

MIS types often argue that it is too expensive to support two brands of browser, an argument I have never understood. Browsers are one of the least support intensive applications on computers, ever. And, if the issue is that individuals will call the help desk when a page contains a non-standard construct that their browser cannot read, the solution is just as simple. There is an owner name and contact information on the page, tell the caller to register the complaint there. This is not an MIS or help desk problem. It is cheaper to support two brands of browser than to try to enforce the standards explicitly, or face yet another *ad hoc* integration effort when the next unforeseen requirement emerges.

Adoption

The adoption process can be accomplished through a series of staged workshops that help each participant:

1. Understand the role
2. Accept the challenge
3. Identify key decisions
4. Explore the issues
5. Discuss known strategies
6. Receive support in the decision process.

I generally use a seminar and three types of workshops to facilitate the adoption process. The Awareness Seminar is used to educate executives (and others) on the general nature of an Intranet, specific management issues that need to be addressed and the publishing and roll-out model that I use. The Planning Workshop is for the publishers. Using a series of exercises, it helps the publishers understand the issues and the role. At the end, the participants are asked to accept the role for their organization or identify the correct person to replace them. This is followed by the Publishers' Workshop. The exercises in the Publishers' Workshop help each publisher identify and begin making key decisons. At the end, the publishers capture their results by building their Map Pages and identifying their editors. The last exercise in the Publishers' Workshop is the formation or initialization of the Web Council. The exercises in the Editors' Workshop continue the process down to the editors' level. In the process, the editors extend the Map Pages and begin identifying Intranet content and projects that they intend to implement.

Participation

The biggest barrier to participation is the lack of an enabling infrastructure for the publishers, editors and authors. If the technology is too complex or restricting, the policies and rules are too severe or the initial publishing standards are set too high, the publishing and communication will remain spotty. If the publishers and editors are encouraged to experiment and push the knowledge and publishing ability further down into their organizations, a critical mass of participation will emerge rapidly. This is why an important component of the workshops is to provide a permanent publishing space for each participant, and to have them publish at least one page in that space during the workshop.

During the participation phase it is important to use the Web Council as a source of both support and competition to slowly raise the content quality bar, not through official policies, but through pride and competition. It is during this period that the few simple policies, the Map Pages and the organizational roles will help keep the process manageable. It is also during this phase that a spider-based seach engine will become a required function.

If you begin to hear many complaints about "too much" information (or content of unknown quality because you did not implement an identifying logo for formal information as suggested

below) take that as a sign that you are reaching critical mass. Your Intranet now has a life of its own, and the Web Council can turn its attention to tuning and coordinating activities.

Rules of the Road

Policies should be viewed like traffic laws. They should be kept to a minimum, and their function should be to help everyone reach their individual destinations with minimum interference and maximum safety. The first rule of the road should be that all other policies that apply to behavior using other communication media, also apply to the Intranet. This includes all of the harassment, good taste and confidentiality policies that your organization most likely has.

Second, there are some rules that apply to all pages, formal or informal, to help others who might access the page determine what they are looking at. These rules are what I call the "Triad," because there are three of them:

Rules for Every Page

Every page, formal or informal must include:

- Explicit Identification of the Page Owner
- The Date of Last Revision
- A way to Contact the Owner

In some companies and industries, a fourth rule is added: the level of confidentiality, so the viewer knows immediately with whom they can share the information on the page.

Formal Publishing Standards

In addition to the rules for every page, it is wise to develop rules for formal pages - those pages officially published by a sanctioned organization within the corporation.

- Each formal organization should develop an explicit Review Process
- The corporation should adopt an Identifying Logo for formal content that can only be used by the editors on pages that have completed the sponsoring organization's review process
- Formal pages should state the official Access Status - who can see this content
- A corporate or organization specific Look and Feel may be appropriate
- Consistent high level Navigation Aids should be developed as a standard

Awareness Seminars

The Awareness Seminar is a lecture format presentation used to introduce intranet organization concepts to executives and potential publishers and editors. The basic structure of the presentation I use is:

- Internet and Intranet Background
- Intranet Benefits
- Intranet Issues
- The Management Model
- The Implementation Model

The Awareness Seminar creates a common level of understanding about the process and sets expectations for what is to come.

The Planning Workshop

The workshops all follow a similar pattern. They begin with generative exercises designed to explore the conceptual territory to be covered. This is followed by individual (or in this case, small group) exercises designed to begin focusing. Next are review exercises that support decision making. Finally, there is a "planning" exercise that focuses on what needs to happen next.

Specific goals or outcomes to be achieved at this workshop

- Understand role as both information consumer and publisher
- Understand responsibilities as an information publisher
- Identify key classes of information that need to be managed
- Identify specific publishers for the information classes
- Identify technical support and training requirements to fulfill publisher role

What is expected of the participants in the workshop process

- Collect, share and explore their own domain requirements and commitments
- Support (and challenge) each other in focusing and decision making
- Identify and plan individual and community goals

The Publishers' Workshop

The Publishers' Workshop follows a sequence of exercises similar to those described in the Planning Workshop.

Specific goals or outcomes to be achieved at this workshop

- Understand the structure and role of the publisher
- Support each individual publisher in making basic decisions
    - what information his/her group will sponsor
    - who will create and manage it
    - how it will happen
- Create the top level of the Management Map
- Initialize the Web Council

What is expected of the participants in the workshop process

- Collect and explore their own domain requirements and commitments
- Support (and challenge) each other in focusing and decision making,
- Plan and implement community goals
- Recognize that this is a community, everyone is both a producer and a consumer of information, so everyone will be expected to put on both hats at different times during the day

The Editors' Workshops

The Editors' Workshop follows a sequence of exercises similar to those described in the Planning Workshop.

Specific goals or outcomes to be achieved at this workshop

- Understand the structure and role of the editor
- Support each individual editor in making basic decisions
    - what information (s)he is responsible for managing
    - how it will happen
    - what support is required
- Acquire basic strategies and skills for creating and managing intranet information
- Create the editors' level of the Management Map
- Create an index page to support brokering to different audiences

What is expected of the participants in the workshop process

- Collect and explore their own domain requirements and commitments
- Support (and challenge) each other in focusing and decision making,
- Plan and implement community goals
- Recognize that this is a community, everyone is both a producer and a consumer of information, so everyone will be expected to put on both hats at different times during the day

Author Training

Author training is not the same type of workshop as the previous three. It focuses more on teaching new skills required for this medium than on management decisions. However, in addition to teaching how to use the various authoring and publishing tools, it is important to educate the authors on the management concepts and policies of the organization. Therefore, if you choose to have a third party provide the technical training on tools for your authors, you still should create a session that covers the management and policy basics. In most organizations I have worked with, the role of author training and support has been handled by the webmaster function, often as a half-day, hands-on class offered at regularly scheduled times.

Two points to consider in author training. First, while it is important to encourage content creators to adopt these skills, training the secretarial and administrative support staff in authoring skills can be one of the most effective approaches to developing critical mass. It often is a secretary who "types-up" and distributes meeting minutes and other documents that are ideal for Intranet publishing. They often adopt the new medium faster than other positions in the company, and can act as a facilitator in moving the managers and staff they support to the new approaches, particularly if coached to do so. Second, don't just teach technology; teach HTML style too. A book that I find particularly good in this area is Bryan Pfaffenberger's The Elements of Hypertext Style.

The Web Council

The Web Council often goes by different names. It sometimes is called the Intranet Council, the Intranet Steering Committee, the I-net Council, or other names. The function is to provide a forum for community discussion, coordination and decision making. In a very large organization, for example a conglomerate of companies or a large government body, one might have more than one level of Web Council. Each company, operating unit, or agency might have their own Web Council, with a cross company or agency Web Council being formed of the Web Administrators from the constituent organizations. The concept is scalable if need be.

The following is a generic structure for a Web Council:

CHARTER:

To guide the development and evolution of Web technology as a tool to improve communication, business processes and profitability within the enterprise by promoting effective business use and supporting community owned standards, diversity and enablement of the intranet community and its individuals.

MEMBERSHIP:

Each major line and support organization should have a member on the Council. This person will be considered the "Publisher" of information for that organization. Publisher in this context refers to the business and organizational authority, not the technical implementation. The member should have the ability to commit his organization to the development, maintenance and sharing of specific intranet content and to negotiate information requirements from other organizations. Members need to understand the business processes and information flows of the organization they represent. They do not need to start with an understanding of Web technology, but must be committed to gaining an understanding of intranet capabilities.

COUNCIL RESPONSIBILITIES:

- Provide a forum for discussion of issues on effective I-net* use and usability
- Negotiate organizational and individual commitments for ownership of key I-net content
- Share and promote useful ideas and skills among the Council and within the members' organizations

- Facilitate the development and brokering of I-net policies and standards
- Collect and support requirements on current and future I-net needs

* I-net refers to the enterprise use of this technology across the Intranet, the Internet and Extranets. The broader context is included here, because most Web Councils broaden their scope to cover the use of the technology and infrastructure regardless of the access decisions made about specific sets of content.

A Few Words About ROI

Return On Investment (ROI) is a question that frequently gets raised during Intranet planning exercises, so it needs to be addressed here, even if definitive answers are not possible. A number of studies have been conducted on Intranet projects with ROIs ranging from over 1,000 percent to a more modest 20 to 40 percent. Why the big difference? It depends on who did the study, who was studied and, most importantly, what variables were considered legitimate in calculating the return. Like the security discussion in Chapter 5, ROI can be reduced to a very simple formula:

$$ROI = \frac{\text{Incremental Revenue or Savings - Investment}}{\text{Investment}} \times 100$$

But also like security, applying the ROI formula in complex strategic decisions will involve the participants' assumptions and comfort levels more than straight arithmetic.

If you require an ROI to proceed with an Intranet project, then surfacing these personal assumptions and discomforts becomes critical. There are no easy answers on how to do this. Peter Schwartz's, The Art of the Long View, provides one approach, based on scenarios and story telling as a way to understand the variables and implications of decisons. Peter Senge's, The Fifth Discipline, provides another approach, based on systems thinking and language to help see inter-relationships that are separated by perception and time.

However you get to the variables that will be used, there are three steps that must be completed for a credible ROI:

1. You must have explicit objectives for the project
2. You must have appropriate measures for the objectives
3. You must collect baseline data before starting

Because many Intranet projects deal with existential objectives, rather than referential objectives, coming up with appropriate measures can be a major challenge. The easiest measure is calculating direct monetary outlays, which is why organizations have a tendency to rely so heavily on this measure, even though it often is not the most important factor for the organization's long-term health. The next easiest is calculating increased revenue. However, even

here assumptions and feelings begin to dominate the equation. As we move to time, knowledge, innovation and satisfaction as important organizational outcomes, the difficulty of agreeing on explicit value continues to increase. Yet these latter outcomes often are the ones that keep organizations from getting to the desparate point where cutting costs in a struggle for survival becomes the only option in a re-enforcing, downward spiral.

I find it interesting that ROI seems to work best when the project involves improving an existing, budgeted, process. "By doing it the new way we save this much or can produce that much more for the same cost." It is more difficult to produce ROI numbers for new processes, new approaches and new infrastructures. We can tell the ROI on the new phone system (compared to the cost and features of the existing one), but how many companies, even today, can calculate the ROI on having a phone system at all? Even with all the experiential information we have, from decades of use, it still would be a difficult undertaking to quantify and get agreement on the value of the basic phone system in new-project, ROI terms. If you don't believe it, try it in your own organization.

However, the importance of subjective decisions is not confined just to projects involving existential objectives. Even projects with the easiest measurements, direct money outlays, can involve subjective decisions and untested assumptions. Let's take a look at an important, and expensive, cycle to which nearly every business can relate.

A high percentage of companies use Microsoft Office for their primary document creation. A high percentage also pass these documents around electronically. This requires the reader to have Microsoft Word or Excel or PowerPoint in order to read the electronic version. Most companies and consultants like myself have these programs for just this reason. Our clients and partners pass us documents in these formats, and we can't read them without the proprietary software.

We are about to enter on another round of a predictable cycle, a new version is being released. Like most new versions of proprietary products, previous versions of Word, etc. cannot read anything created with the newer version, even if the document does not use any new formatting or other features. Of course, the author can explicitly save a copy of the document as a down-level version, but this adds a level of complexity to the management and sharing of documents that is annoying at best. The result is tremendous pressure to upgrade to the latest version, even if you don't need the new functionality, just to share documents with the partners, clients and other internal departments who upgrade first.

I suspect that most companies eventually will make this upgrade without a serious ROI study of the options. In fairness, many companies will evaluate the worth of the new features compared to the costs of upgrading. And many will delay the upgrade for some period of time. However, most will make the switch eventually based on the reactive costs of not being able to share documents with those who have switched, or finally, lack of vendor support, rather than positive forward benefits.

As stated above, ROI seems to work best in comparative situations, so an obvious scenario would be to investigate the ROI of moving to community-owned standards for documents as compared to upgrading to the latest version of the proprietary product. The Internet and Web

technologies are based on community-owned standards. This is what makes them work. One of the major standards is the HTML document standard. There are several advantages to this standard over the proprietary document protocols of the past. One is that any HTML document can be read or modified with any HTML editor (even a straight text editor for those with the inclination). Therefore, documents can be shared with anyone without worrying about whose brand of software was used to create it. A second advantage is that HTML readers (browsers) display what they know, and just ignore what they don't. Thus, if I have a down-level reader (browser) I still can read much of what is on most pages.

Nearly every company today has the ability to generate their documents in HTML. What is the ROI for moving your company to an HTML standard as opposed to upgrading to Office '97? On the expense side, you may be able to forgo the proprietary upgrade for many employees by looking at other, less expensive, WYSIWYG HTML editors that provide more HTML functionality, and you probably won't have to upgrade the hardware. Anyone who has Office '97 can use it as an HTML editor by saving the documents in HTML format rather than Word format. How would the ROI shift if you requested your partners to send all documents in HTML instead of Word, and began using HTML versions as the "official" managed versions of documents for your department or company as opposed to upgrading to Office '97? It used to be that printing was an issue with HTML, but ForeFront's WebPrinting for Windows now provides a solution.

On the cost side, you may have to do some additional training if you decide to move people to a less expensive, more functional HTML editor. And, some people complain that HTML does not let them do formatting that is as sophisticated as their proprietary applications. However, one should even do an ROI on this. What is the cost of the sophisticated formatting capability that cannot be duplicated in HTML versus the return that the sophisticated formatting provides to the business? You may even want to investigate if moving to more basic formatting actually improves business content and understanding. On the training side, look at how much training really would be involved for people who already use word processors, and is it really any more than the training required to use the new word processing functionality that you are paying for in the latest version of your proprietary word processor?

Finally, don't forget the run-out to the next cycle. We can assume that a new version is already in the works. What is the ROI on beginning the move to community-standard content now, so that when the next cycle comes around you have more choice in whether and how fast to transition to new features. In general, the community-standard content allows you to add functionality in pieces, and continue to share content in highly mixed environments more easily and for longer periods of time than the mega-application model of the proprietary products.

The point here is not whether you should or shouldn't upgrade to Office '97. The point is that most companies will not even ask these questions in an ROI context as they prepare to spend the money. Not only do ROIs contain many subjective assumptions and drivers, but the process often is applied unevenly and with varying rigor across our businesses.

The final point mentioned above on ROI was collecting baseline data. This is critical, unless the ROI was just a project rite of passage that will be put on the shelf and ignored once the project is

approved. This is particularly true if you need measures for anything other than the basic accounting numbers that most organizations collect routinely. If you don't know the starting point, how do you know if you really improved? As an example of a non-accounting measure, in my planning workshop, I use a pre-workshop data collection exercise that gives the participants some insight into their own (and the aggregate group's) information overload quotient. I encourage the participants to do this exercise on their own again as their intranet develops, as a very personal way of seeing how (or if) their control over their own information flow is improving.

Summary

Implementing an Intranet begins with an explicit understanding of the objectives being sought. If the primary focus is on implementing specific technical functionality for delivery on an intranet, then existing application development approaches can be used, with appropriate modification for the new tools and techniques. If the primary focus is on organizational adoption and development, then a people oriented approach is required.

The approach presented here was based on five steps: identifying the roles, providing the enabling functionality, facilitating adoption of the roles and skills, encouraging participation and providing enabling policies and structure. Roles were suggested and defined, and a series of workshops was described as a way to introduce and support distributed decision making in the organization. The creation and publishing of Intranet Map pages by each participant during the workshops, in a way that each could continue on his own after the workshop, was viewed as critical to the success of the effort.

The chapter concluded with a discussion of the issues around ROI and Intranets. Calculating ROI can be difficult, and requires some careful thought. While the formula for ROI is simple and appears objective, there are many implicit assumptions behind the numbers that complicate the issues. The most effective use of the ROI technique appears to be the comparison of an already implemented and budgeted process to the new process. An example of how such an ROI might be constructed to justify moving to HTML as the document standard in an organization was given.

Chapter 9: Intranet Futures

"Difficult to see. Always in motion is the future." In the movie *The Empire Strikes Back*, the Jedi Master, Yoda, uses these words to answer Luke Skywalker's plea to know a specific outcome in the future. Futures are never clear, because there always are alternate possible futures that depend partly on our own individual choices and partly on the sum of choices we all make.

In the rest of this chapter I will present three possible scenarios for the future of intranets, not as the only possible futures, or to pick one as correct, but as a discipline to explore the implications of our choices and actions. The three scenarios are: Digital Feudalism, Digital Democracy, and The Digital Reformation.

Digital Feudalism

The Stage

Digital Feudalism arises when one vendor controls the market through a combination of their proprietary protocols and large market share. In the pre-industrial days, feudal lords arose by controlling the land. In digital feudalism they arise by controlling the digital landscape, the protocols and standards that allow the operation and sharing of digital information. Like the feudal lords of the past, the new lords of digital space arbitrarily set rules that favor continuation of their positions and demand tributes and taxes from their subjects in the form of price setting based on what the market will bear rather than competitive alternatives. The digital armies that each lord tries to amass consist of the various application vendors and integrators that can be enticed to develop their skills and wares in that lord's proprietary digital landscape and the analysts that act as ambassadors and emissaries for the digital domains. Some of these armies see themselves as contenders for the position of Emperor or Shogun. These Digital Dukes form uneasy alliances, each vying for the position of Emperor.

In feudal societies, the dominant organized religion frequently provided the only effective restraining force on the feudal lords, and that was limited and always in a delicate state of negotiation. Somewhat ironically, in digital feudalism it is the government that finds itself in the tenuous position of trying to negotiate restraint for the good of the community. And, as with the church in advanced feudalism in Europe, the government finds itself as mistrusted as the feudal lords, because of abuses within its own power structure.

The control of the digital lords reaches into the serf organizations through a series of positions (CIOs to programmers) that get and maintain authority through organizational sanction and technical knowledge, much like the bishops and scribes in European feudal times. Most have a vested interest in keeping the digital foundation centralized and complex, because, subconsciously, they understand that complexity maintains and builds their own power by

forcing all information to flow through their gate. It is through their loyalty that an Emperor eventually will emerge.

Once committed to a specific digital lord, the serf organization (customer) finds itself increasingly under that lord's control. It becomes more expensive and time consuming to switch allegiances with every piece of data, new generation of logic or piece of equipment that gets committed to the digital lord's proprietary landscape. The feudal structure feeds the complexity, and provides relief, by automating more and more functions in a single, integrated solution. This, of course, reinforces the hold of the digital lord and the security of the internal scribes. The dependency becomes complete.

Like all closed systems, the cost is stagnation. New features and functions have to be integrated, an increasingly expensive and time consuming task even for the digital lord. The integrated results not only are increasingly rigid, but require constant attention by the digital scribes to configure and maintain their functioning. The ability of the workers who create and modify the information to control or improve their own processes all but disappears. As with landed feudal systems, or those created by misguided Taylorism in the industrial age, the workers lose power and commitment, and the serf companies begin to suffer in terms of productivity and innovation. A caste system begins to emerge.

The Route There

Digital Feudalism arises out of confusion in the market place. In the beginning this confusion is unavoidable since we have no experience with the new technology or its application. Products compete based on innovative and distinctive features and functions. This is the experimental stage of the market. As the market and products mature, each begins to add and emphasize the features and functions that customers find valuable, and de-emphasize those that they do not. As our collective knowledge grows, the products begin to look quite similar, and differentiation comes from marketing and market share, rather than significant differences. However, underlying the functional similarity are proprietary protocols and tags, the "land" of the feudal lord.

At this point, the companies falling behind in the marketing wars begin to form a standards movement. The leaders, of course, see no reason for standards. If the community standards begin to look viable, the leaders have developed a very effective strategy to maintain their position. If Digital Feudalism arises out of confusion in the market place, then the most effective strategy is to maintain the confusion. The leader, or leaders, join the standards process. From the inside they may try to slow the standard, or water it down to render it ineffective. However, the most effective strategy is to embrace the standard, cultivate two or three additional companies, then break away proposing an "improved" variant of the standard that the rest of the players won't support. This maintains confusion in the market place, as the analysts recommend waiting on implementing standard products until the winner of the standards "wars" is declared.

We have seen this multiple times in the past several decades. This was how IBM and Digital dealt with the standardized operating system, UNIX, that threatened to commoditize their hardware. While the tactic effectively weakened UNIX, the microprocessor created the same

effect. Without a standardized operating system, the existing feudal lords inadvertently created an environment that favored Microsoft and Intel as the new feudal lords. Today, Intel continues the same strategy by creating proprietary ports and busses on the standard PC architecture, forcing peripheral suppliers and customers to choose, in an attempt to drive its pitifully weak competition completely out of the market. It looks like the same strategy is shaping up in the writable DVD market. Several vendors (which coincidentally manufacture the currently available standard, writable CD drives) have broken away from the main standards group and proposed an alternative standard, creating confusion in the marketplace and probably extending the market life of their conventional CD products. And, Microsoft appears to be taking a similar approach with JAVA and the web browser itself.

Of course Microsoft has another approach that has proven very effective. Because of their dominance at the operating system level, they can set arbitrary rules that give them the advantage in other arenas. The combination of steady revenues from the basic operating system and control over the internal operating system protocols allowed them to slowly overtake and displace application vendors in the spreadsheet, word processing, presentation and an expanding array of other markets. As they expand into the internetworking markets, they are using their desktop monopoly to drive their servers, with approaches and protocols that pre-empt the fast developing and more open community standards. If they can dominate either the browser or the web server market, they will have control. If they can dominate both, the control will come quickly and be absolute. There is no question that dictatorships are more efficient at these activities than democracies, at least in the short run.

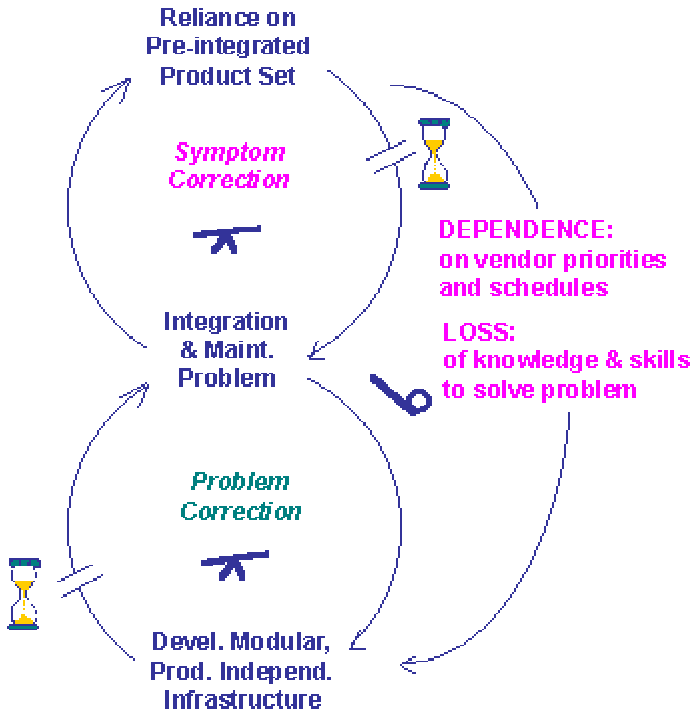
It is this perceived efficiency that is so seductive. Historically, democratic societies like the Romans (with Julius Caesar) or the French (with Napoleon) or more recently Germany (with Hitler) have regressed to an Emperor model. The Emperor provides a quick fix to the messiness and confusion that accompanies diversity. In at least some cases, the would be Emperor covertly encouraged the confusion to hasten the transition, just as the digital lords do today. The short term efficiency takes precedent over the longer term cost. In religions these archetypal patterns (taking short term gains that create long term costs) are called sins. The reverse (taking the short term expense for a long term gain) is called a sacrifice.

Just as in political democracies, the feudal lords can only gain and maintain control with the compliance of the community. The road to digital feudalism is built through a series of systems archetypes that Peter Senge (The Fifth Discipline) calls, "Shifting the Burden." Most companies start out in the digital world adding applications one at a time. Soon, they want to move content from one application to the next, or one machine to the next. The integration is difficult, and the central problem of integration and maintenance of applications arises. There are two routes to alleviate the discomfort. The more difficult and uncertain approach is to develop a modular, product independent infrastructure, based on community standards, a digital commons. The quicker fix is to alleviate the symptom by shifting the burden to a product supplier who will provide a suite of pre-integrated products in their proprietary digital landscape.

The quick fix, however, is not permanent, eroded by the ever increasing need to integrate both new applications and to share content with other organizations who picked a different vendor. The vendor problem can be solved by the Emperor phenomenon described above. But, the

integration and maintenance of an increasingly complex application suite eventually overwhelms even the Emperor's resources and management capabilities. New features are slower to be added; schedules slip; work patterns become more rigid. This is not a problem for the Emperor, however, because any serious competition has long since gone out of business.

A consequence of shifting the burden is that the organization that shifts the burden begins to lose the very knowledge and skills that are most important to move from symptom correction to problem correction and resolve the crisis. If this begins to look like a drug dependency cycle, it should. Drug abuse is a "Shifting the Burden" system too.



Empires never last forever, and eventually a whole new structural approach arises, which offers a new solution to the business problems, and an invasion or revolution begins. Of course by this time, there is a legacy of proprietary content that cannot be easily or cheaply converted to the new solution. So, an immense amount of effort and money is spent either converting the content or creating and maintaining "middleware" to translate between the systems. What started as cheaper and more expedient eventually eats up (and probably surpasses) the savings on the back end of the cycle.

Effect on Diversity

Structurally, feudal systems do not select for diversity. They are a reaction to the inherent messiness and confusion that accompanies diversity. Just as political monopolies (the old Soviet Union for example) that try to centrally manage production and distribution of products decrease diversity, so do economic monopolies. The centrally managed integration strategy mentioned above makes it increasingly difficult to add new features, but even when new features do become

available, they are added when it makes the most profit for the vendor, not the most benefit for the customer. Just as in feudal Europe, there are few opportunities for free market competition. Most entrepreneurs require the patronage of a feudal lord to survive, and any significant success will be appropriated quickly.

Anyone who studies complex systems knows that diversity does not arise from a lack of regulation. Complex systems are built on a series of structural checks and balances that regulate and maintain diversity. When components in a complex system escape their checks and balances and increase their numbers at the expense of diversity, we view the consequences as a serious, often terminal, illness. When a set of cells monopolizes an organism, we call it cancer. When algae monopolizes a pond we call it putrification. Just as ignorant or static regulation can cause the illness or death of a complex system, so can the lack of regulation.

Effect on Roles

Digital feudalism tends to maintain the current roles and structures found in most modern corporations. It is based on the Taylor organization model of shifting the burden to an outside expert, and thus supports the current M.I.S. and I.T. structures as consulting information engineers. It encourages the non-technical business specialists to continue avoiding responsibility for meeting their own information needs, keeping them dependent "users." Finally, it is a modern formulation of McGregor's Theory X management. Any seasoned M.I.S. director will tell you that attempts to democratize the digital environment will just cause them headaches in the future, because the business units will quickly tire of managing their own information and turn it back to M.I.S., after they have made a mess of it. This is the modern information version of workers lacking the necessary internal motivation to act responsibly. McGregor looked at this as a self fulfilling prophecy. Senge would view it as the degeneration of the required knowledge and skills that comes from long-term shifting the burden.

For the average employee this model becomes the equivalent of the assembly line for the information age. Automated programs, developed by the information engineers, are mindlessly fed with data by workers who are not required to think, and have little ability to alter the complex processes and programming to meet their customers special (and changing) requirements or improve their own productivity. Those who create the automated systems extol the virtues of efficiency and standardization created, while the workers using the systems become increasingly frustrated with their ability to improve things and increasingly alienated from their jobs.

Digital Democracy

The Stage

Digital democracy does not come from making information and automated applications more easily available to non-I.T. specialists. It arises by making the digital environment, the ability to create, share, maintain and change digital content *and processes*, directly available to non-I.T. specialists. While it is possible that this could occur with enabling technology created under a benign dictator in digital feudalism, the conditions that create and maintain digital feudalism

make it highly unlikely. Remember, central integration and complexity are part of the structural wall that maintains the power structure at all levels.

Therefore, the second scenario is based on enabling technology that allows non-I.T. specialists to choose and deploy their own enabling technology. One route to digital democracy is for web microservers (see Cisco, Cobalt Microservers, Compact Devices, Encanto Networks, Microtest, THiiN Line) to catch-on as a new functional delivery device. Web microservers are based on the concepts of location transparency and "objectization" of the functions. They start in departments as basic web servers that are well behaved network devices and require zero systems administration. This means they plug into the network, do not require systems configuration or set up and are discoverable and supportable by SNMP, LDAP directory servers and other automated network services.

Next, software vendors begin to sell their solutions bundled on these servers. This starts with functionality for small and medium businesses (see Encanto Networks) and departments in large organizations. Eventually, the savings in systems administration costs become apparent so the "objectization" of functionality spreads to traditional corporate-wide functions. The application vendors, too, see savings because it is less expensive to develop and provide support for a system that they have complete control over, they are the only application running on and that they configured.

As experience is gained, both customers and suppliers begin learning better ways to modularize functions for the most manageability and flexibility. The traditional hardware and software markets break down, and server-side operating systems become completely transparent (and unimportant) to the customers. Customers don't care what the operating system is, because they no longer see it or manage it. They buy functionality, the way we buy an answering machine or a fax machine and plug it into our phone systems today. Only, in this case it might be "project management" or "workflow management" functionality.

The functional applications interact with each other using standard content or agents, so they do not assume or directly affect one another as new functions are added and old ones are retired. Spider-based agents and LDAP directories begin to feed objects the way pre-integrated databases feed applications today. Issues around authentication and access privileges also become objectized as LDAP, certification and digital signature technology matures. The architectural and management perspective shifts from central-control and integration to self-control and discovery, from one-size-fits-all to supporting and managing diversity. The result is that digital functionality can be purchased and controlled by the non-technical departments and workers, giving them more control over their own information management and the ability to upgrade functionality with their changing requirements.

In this scenario, the future is developed by diverse companies, driven by free-market conditions. Businesses can add new technology continuously, in manageable chunks, without the huge conversion or integration issues found in today's centralized approach to systems that require end-to-end process and technical integration to work. Additionally, many of the systems administration costs around creating and managing the end-to-end integration disappear as web microservers begin to appear with LAN spiders, load balancers (see Network Appliances

NetCache and Sun Netra Proxy Cache) and other distributed systems management functions to support the shared infrastructure responsibilities.

An analogy might be the objectization that has taken place in electronics over the years. When many of my generation bought our first compact disk player, we had an older stereo amplifier, bought before compact disks were commercially available. But, the compact disk player plugged into the amplifier and worked, and it was not manufactured by the same supplier. The same was true of the audio portion of the VCR and will be true of DVD technology. Over the years many of us have changed out and upgraded components, one at a time, until none of them are the originals, without ever replacing the whole system at one time.

Pre-combined systems have not gone away. They are just less flexible objects that meet certain needs, generally around portability. My experience with pre-combined home stereo systems has been that when something happened, like the compact disk player quit working, the cost to fix it made getting a whole new system the lower risk choice. When I had three combination systems sitting around, each with a component not working, I finally went out and bought components. Interestingly, the modular components haven't broken (which may have something to do with simplifying and specializing). If they do, they can be replaced (or upgraded) individually. And, I am sure that DVD units will get attached to those amplifiers sometime in the future. The trick is learning the most effective level of integration for specific uses, or in general systems language, the most stable points of equilibrium.

The Route There

The community-owned web standards effectively make operating systems and server hardware brands unimportant. It doesn't matter what operating system underlies any specific web browser or web server. When the proprietary protocols that define the defensible landscape are removed, by the digital commons, it creates an extremely threatening proposition for the reigning lords of digital feudalism. They will do everything in their power to either confuse the market or effectively capture the new territory and guide it back to proprietary dependencies.

As in all democratic models, for digital democracy to occur, the citizens (customer organizations) must take the initiative and responsibility to create and maintain their own digital landscape. The democratic system in the United States remains viable because a structural system of checks and balances was invented to maintain the diversity of ideas and power. In the digital world, customers must value digital democracy, then invent and implement a structural system of checks and balances that prevents the capture of their digital landscape by any vendor. If organizations do not value digital freedom enough to create and maintain these checks and balances, the road back to feudalism will be swift and silent. It is easy to blame the system or to say that the actions (vote) of our organization can't make a difference, but as Benjamin Franklin said at the beginning of the American Revolution: "Gentlemen, if we don't hang together, we will all hang separately."

Three important players in establishing digital democracy, as more than a temporary revolt in the feudal structure, are: Executives, C.I.O.s and Analysts and Writers. Executives first must pay attention to the digital landscapes they are creating in their companies. This may mean updating

their knowledge of the technical possibilities and issues. The C.I.O.s must make a commitment to the principles of digital democracy. This is in-line with the CIO position, since most were created and staffed to shift perspective and focus away from the technology and back toward the business. This is just a continuation of that democratization process. Finally, the analysts and writers are important agents in helping to pull together and give form to the vision of the community-owned digital landscape, the digital commons. Without their focus on and defense of the principles of digital democracy and the digital commons, a key ingredient is missing. They are the "Fourth Estate," the free press of digital democracy who help document the journey and alert the community to abuse and vandalism of the digital commons.

Government also plays a role in this scenario. Recently, the United States government has begun to recognize the threat of digital feudalism and has brought legal action against Microsoft to try and maintain diversity. While government recognition of the importance of diversity is a positive sign, the success of this particular technique is questionable. Past experience suggests that by the time the symptoms become actionable, the competition already is dangerously weakened. Furthermore, by the time the court cases and appeals are concluded, the competition will be gone, regardless of the legal or political outcome. The anti-trust laws were designed to protect against economic price fixing in the industrial age not monopolistic control of digital landscapes. In today's environment, these laws treat symptoms rather than correct the systemic problem.

A more proactive course would be for the government to build a preference for diversity into a structural form of checks and balances. They are a large enough buying block that this becomes a more effective, timely and lasting tool. There are many creative ways they could create checks and balances. One, presented for example purposes, would be to create a purchasing policy that says that within five years no more than 50% of the systems in any government organization can be from the same vendor. This would mean that no more than 50% of the operating systems on the desktop could be from Microsoft, no more than 50% of the web browsers could be from Netscape, no more than 50% of the microprocessors could be from Intel.

To create even more diversity, the maximum percentage could be lowered to 40%, thus insuring at least three vendors in each category. Unlike traditional government regulation, an approach like this encourages and supports free enterprise, and it is not confined to the United States government. The European Economic Community, other large government purchasing blocks and even large corporations have this same power to implement structural checks and balances that strengthen their own ability to cope with future change and strengthen the free enterprise system in the process.

The example above is not very different from historical government policies requiring three competing bidders for major purchases. Again, the problem with the three bidder policy in the digital age is that it was designed to maintain price competition, not to maintain an open digital landscape, a digital commons. Dell, Compaq and Gateway meet the three bid policy, but all three are part of the same digital empire. The diversity is in packaging and marketing only, not in who controls the digital landscape.

The advantage to the structural approach is that it is not simply a reaction to a threat "from out there." It recognizes that we all are part of the system that creates these results, and that under the current structure, digital feudalism is the outcome. In another turn of events it might have been IBM, Apple, Netscape or the XYZ Corporation rather than Microsoft and Intel, but without appropriate checks and balances it invariably would be someone. The structural approach also works dynamically into the future, using the strengths of the free enterprise system to maintain diversity and free enterprise itself. If it is widely adopted, it becomes the social compact of the modern digital age, a cultural ethic that helps us to "hang together" to maintain the digital commons important to each of us individually.

Effect on Diversity

Digital democracy requires diversity. Democracy provides for individual choice, and individual choice requires diversity to choose among. In digital democracy, the question is not whether to support diversity, but how much diversity can be supported and what kinds of regulating processes are required to maintain it. The approach suggested above is one possible way to regulate the current leader, and encourage a certain level of competition as a minimum. It changes the rules of the game to insure companies always have viable competition to keep them competitive. However, a set level of diversity is not the only requirement to keep competition healthy. The three-way competition among American auto makers lost its driving force in the 1960s and was only rekindled by additional competition from the outside.

Effect on Roles

In digital democracy, the role of M.I.S. and I.T. changes from the "do-for-you" technical specialist of the Taylor model, to the maintainer and supporter of the organization's digital landscape. The goal becomes strengthening the organization by enabling and strengthening everyone's ability to create, share and use organizational knowledge. Without an I.T. commitment to provide an infrastructure that supports long-term enablement, diversity, change and choice, the foundation of digital democracy will not hold.

Intranets have the potential to become a key enabler (and the technical infrastructure) for learning organizations. As the digital technology continues to become more accessible to non-technical people, it will enhance the way we interact as organizations. However, we must remember that many of the current roles in our organizations have been dependent on technical information specialists longer than their current occupants. This has hindered individuals from gaining the understanding, vision and skills they need to take on the new responsibilities of digital democracy. Gaining the understanding, vision and skills will require growth, support and mutual respect from everyone. There is no recipe for making this transition, but the transition itself forms the basis for a learning organization. Marvin Weisbord, in his book, Productive Workplaces, provides an excellent introduction to the democratization of the workplace and the challenges this entails. His principles apply to this intranet scenario even though the book was written before the advent of today's intranet technology.

The Digital Reformation

The Stage

This scenario is called the digital reformation because like the Reformation in Europe, it challenges the digital priesthood. In its extreme, I.T. and M.I.S. departments are disbanded, and the computing infrastructure is moved to Independent Service Providers (ISPs). Programmers and network administrators work for the ISPs rather than internal organizations. The only remnants in the internal organizations are functions dealing with strategic needs and contracts. The Chief Knowledge Officer (CKO) has replaced the CIO and is focused more on the use and sharing of information to solve existential and unique business problems than on the technology and infrastructure of data transactions, storage and retrieval.

Organizations no longer have large physical facilities as most people work from home or small, local centers. Content to be shared is placed on servers on the Virtual Private Network (VPN). Some of the servers may be owned by the organization, but the ISP can provide the resources in a more cost effective way by distributing the working servers around the network and providing automatic load balancing through caching proxy servers.

Most companies started with a single ISP, but the encryption and authentication technology makes it possible for employees to use different ISPs for access across the Internet. This has stimulated a battle for services, the larger ISPs attempting to provide advantages only available through integrated services, and the smaller ISPs offering better local support and pricing. The integrated services of the larger ISPs are designed to capture the customer outside the community-owned standards. It is not clear if diversity will remain or a few feudal lords will arise in the ISP space, although under the current system of checks and balances the emergence of feudal lords in this scenario is a question of when rather than whether.

The Route There

The digital reformation scenario is driven by a different dynamic than the previous scenarios. Here the driving force is the mobility and distribution of the workforce. Already the combination of congested highways, expensive office space and extensive travel is leading many workers to the virtual office. The intensification of these pressures, combined with improved network and communication services and increasing experience with managing virtual projects will likely fuel the continuation of this movement. As this happens, the intranet as digital infrastructure begins to take on a new dimension.

The networks of most organizations are not extensive enough to cover the physical geography of the new virtual workplace. The cost to build a private network is prohibitive. Therefore, most organizations already have turned to an ISP to provide these services outside their central campuses. Sophisticated encryption and routing allows these ISPs to provide each organization with a VPN at a fraction of the cost of a physical private network. As the workplace continues to move toward the virtual office, it does not take much to imagine a time when the ISP network accounts for most of the network traffic and expenses in many organizations.

As this happens, the question begins to arise as to why maintain any server hardware at all. Why not locate the hardware at the ISP site and let them operate it. This may be done as a service where the customer owns the hardware, or by the customer renting the data space, processing power and even application functionality from the ISP. At first there will be concern about letting a stranger handle the data. However, with experience (and the development of checks and balances), this concern will subside, just as it did with letting banks hold our money.

The process ends when the organizations begin to close down their own private LANs and data centers, disband their M.I.S. departments and manage the I.T. function as they would their auditing, banking or phone services.

Effect on Diversity

The effect on diversity is uncertain. If a majority of the computing infrastructure shifts to the ISPs it will reduce the server market to many fewer customers. Either of the previous scenarios could be adopted by policies of the ISPs. Large ISPs could form a tight alliance with specific vendors (or their own vertical company as Microsoft appears to be doing) for special prices or favors, or they could form their own buying block to enforce diversity. If they can create a high enough hurdle to keep customers with their service, they can even play out both scenarios at once. On the one hand the ISPs become the new digital lords, and on the other they force diversity and competition among their suppliers.

The single most important factor may be how much of the computing infrastructure organizations choose to keep themselves. The use of organization-owned web microservers as network plug-ins for functional applications and data storage would maintain the ability to switch, or even share, ISPs. The organization might keep their devices at their own site, or on the ISP site. The important factor would be the ownership of the devices and their contents.

Effect on Roles

The Digital Reformation creates the most extensive changes to the roles of technical information specialists. As these roles shift and consolidate under ISPs one can imagine a transformation on the scale that occurred as the role of scribes transitioned to typesetters and printing press operators working for printing companies rather than the Church. Overall, fewer people will be needed to maintain the infrastructure (although absolute numbers may stay the same as a higher volume of information and traffic builds) and the functions they perform will shift in focus and skills.

The effect on non-I.T. specialists is not as clear, and may be difficult to distinguish from the effects of the overall shift to working in a virtual office environment. There will be pressure to enable non-I.T. specialists to do more for themselves, because it is too expensive to provide direct support in the virtual environment. The level and quality of enablement will likely be the way ISPs compete for corporate business in the formative stages of the transition. It also is likely to be the place where they attempt to create proprietary locks.

As in the the Reformation in Europe, both dictatorships and democracies can emerge. There may be a long series of revolutions as organizations adjust and learn new styles of coordination and interaction.

Conclusion

How intranets and organizations will co-evolve is uncertain. As indicated in the earlier chapters of this book, there appear to be some information trends in motion that span billions of years. There is no question that intranet technology has opened up new possibilities for enabling more open and democratic management processes, continuing a corporate trend that spans the entire Twentieth Century. But, the digital landscape and the digital commons are new territory for us, a territory that has not yet developed the checks and balances of a stable system. In American culture, developing checks and balances in the digital landscape requires the painful shift of cherished values, our automatic mistrust of any form of conscious regulation in the external market. The alternative, developing checks and balances for the digital landscape by unguided trial and error, may require us to go through an indefinite period of digital feudalism.

Avoiding digital feudalism requires us to replace our naive view of the world as a simple system built on immediate and predictable causes and effects with a view that the world consists of many complex systems interacting in non-linear ways. In direct contrast to a value that mistrusts regulation, the key value has to shift to embrace structural regulators that maintain the order, self-stabilization and self-organization at each level of system interaction. There is no question that applying regulations based on simple system assumptions to complex, interacting, systems will cause undesirable, and sometimes disastrous, results. But, a knee-jerk reaction, that denies the importance of stimulating and inhibiting regulators in a dynamic state of balance, also can destroy the very outcomes we wish to achieve. Both the framers of the American Constitution (checks and balances) and Adam Smith (the invisible hand) recognized the importance of these complex systems regulators, even before general system dynamics were formally studied.

However, perhaps this counter-intuitive effect, of unregulated free markets degenerating into monopolies, is not so far off from our real values after all. The free market does not seem to be a cherished value for processes inside the organization. Here lack of choice and control seem to be the most commonly enacted value, particularly among those responsible for the digital infrastructure. The emergence of digital feudalism makes this position more tenable. We do not have to acknowledge our own values and desires for simple solutions and control. We can continue to espouse democratic values and blame any discrepancies on forces outside our control. Our love-hate relationship with the feudal lords reflects our own internal conflicts between the responsibilities of freedom and the impotence of dependency; between the sacrifices of equality and the exhilaration of power.

In the end it comes down to honesty and values. How honest are we willing to be with ourselves about our real motivations and values. Espousing free markets without assuming responsibility to maintain diversity when they begin to degenerate to monopoly points out a dishonesty in values. Espousing democracy without assuming responsibility to maintain choices for everyone points out a dishonesty in values. Humans seem to be particularly adept at maintaining these

discordant espoused versus actual values, a phenomenon psychologists call cognitive dissonance.

The future of intranets and the future of human organizations are intimately tied. The direction taken will not be determined by technology, or free markets. It will be determined by our choices and our values. The only question that remains is how consciously we will make those choices and how willing we are to face our own internal conflicts among diversity and control, power and democracy, responsibility and dependency. As we wrestle with our modern warlords and demons, we find ourselves living in interesting times, with uncertain outcomes.

About the Author

Dr. Telleen brings a rare combination of business experience and skills to today's multi-channel marketing challenges. Formally trained in scientific research, he went on to accumulate over ten years of practical business experience while managing traditional marketing and strategy organizations for both startup and Fortune 200 companies.

In 1994 he began applying his business experience to the adoption, management and effective business use of the web medium. Since that time he has provided an international set of clients with pragmatic advice on the appropriate use of the web medium and its integration with traditional business channels.

Based on his understanding of the need for communication and consensus among a company's business managers and the very real constraints on their time, Dr. Telleen has developed methodologies for maximizing the results of participating managers' time, both in terms of reaching consensus during their IORG sessions and in using the outputs to manage their ongoing business.

Dr. Telleen's business experience includes management positions at ETA Systems, Amdahl Corporation, and Giga Information Group (now part of Forrester Research). His advice on the effective use of the web medium has helped over 100 companies in many industries including: Altera, Astra AB, ChevronTexaco, CIBC, Eversheds, Hyatt Hotels, Northwestern Mutual Life, Syngenta, US Department of Transportation, and Weblink Wireless.

He received his Bachelor of Arts, Master of Arts, and Doctor of Philosophy degrees from the University of Colorado at Boulder, and is a member of the Sigma Xi Scientific Research Society.