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A written language and a transportable recording medium were key elements in the advancement of humankind. Five thousand years ago the Sumerians, using their cuneiform system of writing, recorded business transactions as well as epic poetry on clay tablets. For the thousand of years that have followed we have improved upon our methods of communication with others and upon how we prepare, organize, store, and share our collective knowledge. Now the Internet and the World Wide Web application operating together are causing a fundamental change in the way we have done things for millennia. We are engulfed by this new environment that is, from an historical perspective, merely in its infancy. This paper presents twelve premises regarding the digital environment that is, from an historical perspective, merely in its infancy. This paper presents twelve premises regarding the digial environment that are not only reminders of major changes that are occurring, but also serve as "bumper stickers" for others to consider as they examine this new environment.

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Is what's past, Prologue?

2003 Miles Conrad Memorial Lecture, February 25, 2003

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Abstract. A written language and a transportable recording medium were key elements in the advancement of humankind. Five thousand years ago the Sumerians, using their cuneiform system of writing, recorded business transactions as well as epic poetry on clay tablets. For the thousand of years that have followed we have improved upon our methods of communication with others and upon how we prepare, organize, store, and share our collective knowledge. Now the Internet and the World Wide Web application operating together are causing a fundamental change in the way we have done things for millennia. We are engulfed by this new environment that is, from an historical perspective, merely in its infancy. This paper presents twelve premises regarding the digital environment that are not only reminders of major changes that are occurring, but that also serve as "bumper stickers" for others to consider as they examine this new environment.

1. Introduction

Thank you so very much for inviting me to be the Miles Conrad Lecturer for 2003. I am very honored and humbled. In the nearly twenty years of my NFAIS association only one other Federal employee, Kent Smith, from the National Library of Medicine, has been selected for this honor. To be placed in the same category as Kent and Mel Day, who was a Miles Conrad Lecturer before I came to DTIC, is humbling. To be only one of the few Miles Conrad Lecturers from the Federal sector is certainly a great honor. I thank Kent for establishing a model, both as an effective Federal Manager and as the first Fed to be President of NFAIS, for opening this opportunity to others and setting a high standard to be met. I'm proud that Paul Ryan, DTIC's Deputy, Gladys Cotter, a former DTIC associate, and I were given the opportunity to serve the Federation as its President.

Before I proceed I want to give the standard disclaimer that many use. What I say today is entirely based on my own thoughts and opinions. It does not represent the position of the Defense Technical Information Center or the Defense Information Systems Agency, our parent organization.

I am somewhat surprised by the paucity of Federal employees to be honored with this lecture, since the Federal Government often has been a prime mover in the advancement of both the information industry and the overall information access and delivery environment. Back in the 1980's, Martha Williams said during the debates of the public/private sector competition: "one should bear in mind the fact that information science research and development funded by and carried out by the Government has been instrumental in bringing the information industry to the position it is in today". In many cases, government agencies funded efforts pioneering electronic publishing, developing databases and launching online retrieval services. This hasn't changed. There still are organizations providing value added services after the government agencies have done the heavy lifting. Obviously, the Internet, developed and initially funded by the Department of Defense, and extended to other communities by the National Science Foundation, is currently the most visible government facility aiding what Outsell calls the Information Content (IC)

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Industry. The Federal Web Consortium funded the development of the first Web Browser, MOSAIC, with several federal organizations including DTIC, NLM, and NASA contributing funding. NLM, for example, can reasonably point to the success and creation of BRS, which was formerly a back up Center to NLM at SUNY.

Let me first briefly tell you about the Defense Technical Information Center and also the overall federal library and information community since both have greatly influenced me. Beginning in 1945, and under several different names, DTIC has been acquiring, organizing for discovery, and distributing DoD funded Scientific and Technical Information (STI), ranging from management information to technical reports. We are DoD's central STI repository. We provide permanent access to the information in our collection, store and distribute full text documents, and operate and maintain bibliographic and other databases. We also operate over one hundred Department Web sites handling, on the average, nearly 9 million HTML page downloads a week. In addition to furnishing the National Technical Information Service (NTIS) copies of publicly available technical reports, along with citation data we have over one hundred thousand full text technical reports available on-line to the general public.

DTIC is part of the more than 2,000 libraries and information centers operated by the federal government. They form an information infrastructure that extends around the globe to serve federal workers and the American public. The Federal libraries and information centers sustain and strengthen federal programs. They further their agencies' missions by providing access to information where and when it is needed, using information technology to augment traditional services.

In serving their agencies, libraries and information centers serve the people – the taxpayers – who depend on the federal government to manage the country's laws and regulations, to provide social programs and to pursue foreign policy initiatives. Many government libraries and information centers are open to the public, while others limit their services to their own department or agency because of mission, staffing, or budgetary constraints [1]. They are also good customers of the commercial Information Content Industry as well as active participants in the Information Content Industry.

Before I came to DTIC, I was in the information technology business, not information content management. I designed systems, evaluated and bought computer hardware and software. But, one of the jobs I had in high school was that of a Printer's Devil – I cleaned the presses, melted lead for the ingots used by the linotype, swept the shop, and made deliveries. It may not have been glamorous work but it did teach me about the world of putting ink on paper.

A decade ago, as NFAIS President-elect, I was responsible for the NFAIS Annual Conference. The theme I chose was "If Change is Inevitable Why Aren't We Changing – or Are We?" This was just the beginning of the tremendous growth curve of the Internet and the early days of the World Wide Web. Five years ago, as the editor of the International Council for Scientific and Technical Information (ICSTI) quarterly newsletter FORUM, I published a small paper called Premises for Developing World Wide Web Strategies [2]. This was about 3½ years after DTIC went operational with our first Website. This was also the first publication of ICSTI's FORUM as an entirely electronic publication. Clearly, these two events indicate that, in my mind, the old offset press paradigm, once viewed as the most effective vehicle for mass publication, was being superseded.

In a recent Frank and Ernest cartoon [3] there was a sign that read "Today is the first day of the rest of your life, but so was yesterday, and look how you messed that up". Seems to be it is a good warning to heed.

I developed these premises to remind me that we are just at the beginning of far-reaching and thoroughgoing change. A written language and a transportable recording medium are key elements in the advancement of humankind. Five thousand years ago the Sumerians, using their cuneiform system of

writing, recorded business transactions as well as epic poetry on clay tablets. For the thousand of years that have followed we have improved upon our methods of communication with others and of how we prepare, organize, store, and share our collective knowledge. Now the Internet and the World Wide Web application operating together are causing a fundamental change in the way we've done things for millennia.

Dr. Mike Nelson, now of IBM, says one must have what he calls "Bumper Stickers" serving the same function as an "elevator speech" – to explain something in a very short timeframe. When I first met Mike he was on, then-Senator, Al Gore's staff. While Gore did not invent the Internet it was Gore, supported by Mike, who brought us the High Performance Computing and Communication Act of 1987. This Act brought us what Gore called the "Information Superhighway". After Gore became Vice President, Mike Nelson joined the Vice President's staff spearheading the implementation of many content related enterprises such as the Digital Library Initiative. So my Premises are not only reminders to myself of major changes that are occurring, but also bumper stickers for others to consider. They may seem very basic but, as one of Mike's current bumper stickers says, "The Internet revolution is less than five percent complete".

Supporters and detractors alike, with few exceptions, agree that the Internet and facilities such as the World Wide Web are having a profound impact on most segments of life. There would be little argument that this impact will increase as the Internet and concomitant services mature. Phrases such as "sea change", "a new paradigm", a "culture change" have been used to the point of triteness. Despite overuse, these phrases accurately describe the societal changes taking place. That's why I paraphrased Shakespeare for the title of my talk, "Is What's Past, Prologue?" My premises aren't very profound and they are obvious. But as William Safire said, "Never assume the obvious is true".

Sometimes, in the rush to do things, we simply forget the obvious. This is particularly true when a large cultural change is upon us. During the 5000 years since the development of writing, humankind continually has improved ways to store, organize and transfer our knowledge in physical containers such as tablets, books, newspapers, and journals. Ten years ago, when an easy to use Web browser became available on the Internet, the world suddenly began a massive change. People refer to an "information explosion". However, I prefer to think of it as an evolving revolution. High speed, flexible telecommunications enhanced by relatively easy to use software are revolutionary, but they also have permitted nearly everyone the flexibility to be creative in the way they do their job. This is the evolutionary part. You can make technological changes much more quickly than you can make people change the way they think, interact with one another, and do things. Today, I'm going to re-examine my premises of five years ago and see whether or not they still hold. As John Perry Barlow, former lyricist for the Grateful Dead, and co-founder of the Electronic Frontier Foundation said, "Nowadays, it's too hard to predict the future. So, I settle for predicting the present".

2. Premise I: The electronic environment is not a linear extension of the paper environment

My friend and colleague, Bonnie Carroll, and I jointly coined this premise. The electronic milieu that the Internet offers cannot be viewed as merely an extension of the paper-oriented world that arguably arrived with Guttenberg's press. This is obvious, but that's not the point of this or my other premises. Remember that I developed them to help me – and others – to remember that although things may seem to be obvious we don't always change to do what should obviously be done.

An article in a recent Washington Post opened by saying "Here's the flip side of the digital age's magic act: It's also making information disappear". The article was about the Library of Congress' announcement of the plan for the National Digital Information Infrastructure and Preservation Program [4].

The Librarian of Congress, James Billington, said, "The digital history of this nation is imperiled by the very technology that is used to create it".

The need to change the way we do things in digital archiving should be obvious. Yet, while progress has been made, we still need to consider the old saying "After all is said and done there is always more said than done". Granted there has been progress in the last two or three years but, we are still a long way from identifying, and then solving, all of the digital archiving challenges.

ICSTI, the International Council for Scientific and Technical Information, has been addressing this issue for at least five years. Last February, ICSTI, CODATA, the Committee on Data for Science and Technology, and ICSU, International Council of Scientific unions, held a joint seminar on preserving the record of science. This was the first time that the text and data communities got together to discuss this mutual problem [5]. Recently, ICSTI, published a statement that says:

> "Despite the growing efforts of many of the varied stakeholders involved in generating, organising and providing access to scientific information and data, much of it in digital form is still at risk of being lost to future generations.
>
> The same can be said of the digital data collected over the past forty years. Data from the Viking mission to Mars is just one example of expensively gathered, important information that has already been lost.
>
> More needs to be done as a matter of urgency to put in place systematic structures which can ensure the long-term availability of the records of science to all who need them, bearing in mind the special difficulties that developing countries have in accessing digital publications.
>
> A comprehensive scientific digital archive is likely to be a complex network resulting from discipline-specific, institutional, national and international initiatives. Further work is required to define archiving policies, to be clear about where responsibilities lie and to ensure that a properly supported, funded and sustainable infrastructure is put in place which can stand the test of time" [6].

Here's another example of why my first premise still is germane. Last September, two articles were published in *Information Today* decrying the decision by the Office of Management and Budget, fondly known as OMB, to allow Executive Branch agencies to have their printing done, if cost effective, by other than the Government Printing Office [7,8]. The concern of the two columnists was about the loss of public access to federal documents through the Federal Depository Library Program (FDLP) and direct GPO sales.

I don't disagree with the concern about permanent access to government information. However, I think that we must begin to address the future based on today, not based on models used in the past. More and more government information is being produced, stored, and disseminated in digital form – it may never be printed. It is, however, not always easily found. The production and access issues are different.

In this case, NTIS and DTIC each are committed to maintaining permanent public availability of the government information in their collection. More and more these organizations are receiving documents that have been "born digital" and never printed. GPO's taking the needed copies from the print orders of the various government organizations to populate the FDLP doesn't work if there is no print order. It's obvious to me that the old model won't work in today's environment. There should be a single system to allow publicly available information to be found regardless of where it may reside. But it should not be dependent on the old printing policies. This important issue must be discussed in today's

environment; rather than discussed based on legends of the past. The digital environment has changed relationships. I am pleased that when the new Public Printer has said that he wanted to move from the "Nineteenth Century Paper and Ink environment into the Twenty-first Century". He also said that 60% of the documents GPO now receives are digital. This is good, but I wager that many of these documents were "born digital" and acquired by GPO some way other than printed documents.

A final example. In his 1994, Miles Conrad Lecture, Ron Dunn said:

> "Have I missed something? Has it suddenly become easy to go out on the networks and find a specific fact, locate a particular document, or answer a question without sorting through a bunch of electronic junk? Has it become simple to conduct an online search? [9]".

Two sentences later Ron asked: "Is everything standardized?"

Today, several years after the introduction of the Web, the fact that the digital environment is not a linear extension of the paper environment is beginning to be exploited. The concept of open access, if implemented as envisioned by its supporters, will significantly change the information production and distribution model. This means that basic business models must change and that impact metrics must also change. The Open Access advocates seek to establish "common standards whereby articles stored on compliant servers can form a global library allowing searching, data retrieval, cross-linking, and stable long-term archiving [10]". In other words, using capabilities such as XML, the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) [11], the Handle System® [12], and the Dublin Core metadata standard, they seek a technology-based library environment of distributed but interlinked information sources. One example is an open source system called DSpace™. Over the past two years, the Massachusetts Institute of Technology (MIT) Libraries and Hewlett-Packard Labs have been collaborating on the development of DSpace to function as a repository for the digital research and educational materials produced by members of a research university or organization. "Running such an institutionally-based, multidisciplinary repository is increasingly seen as a natural role for the libraries and archives of research and teaching organizations. As their constituents produce increasing amounts of original material in digital formats – much of which is never published by traditional means – the repository becomes vital to protect the significant assets of the institution and its faculty [13]". Looks like the answer to Ron's decade old question may be "Yes!" in the not too distant future.

A network is an array of resources – both people and digital – a whole, a complex configuration that offers possibilities with far greater potential than the sum of its parts. Scientists, believing in the need for the free-flow of information as a foundation for research and knowledge, see that Open Access offers them an opportunity to change the current environment and relationships by networking content and making it available, without the barrier of cost.

The so called 'wire-world' of today, which is fast becoming the wireless world of tomorrow, provides more flexibility than one can imagine. This flexibility, however, requires actions in many sectors. Take the issue of cyber cash and the potential to pay fractions of a cent so one can buy a small portion of information. Even if we had the capability to find specific bits of information across the wide array of information resources currently available, we don't have systems that allow us to extract the small amount of information we need and to pay for it. By and large we still adhere to the old economic business model that assumes one delivers information as a complete document, recording, or video. I think that new business models are required.

I want to point out that my premise isn't based on a belief of the demise of printing. I believe that ink on paper will be here for a long time. As the Printing Industries of America point out

> "Communications gurus have foretold the demise of print for at least a quarter of a century. Despite changes in consumer habits resulting from the Internet, printing is an industry and an information technology that continues to defy these predictions. At a time when methods of communicating are becoming increasingly complex, print-ink on paper has consistently proven to be the most reliable medium to convey images and ideas" [14].

3. Premise II: The internet and the WWW permit a fundamental change in human communications

Throughout the history of humankind the sender (author) controlled the structure and content of the message. Also it was a one-to-one relationship, or a one-to-a-relatively-few relationship. To me, Guttenberg's greatest contribution was that he greatly broadened the "one-to-many" construct. Radio and television broadened it even further. Whether one-to-one or one-to-many through broadcasting there was limited interaction. Premise Two is intended as a reminder that we are on the cusp of a fundamental change in the way we exchange knowledge, express opinions, and do business. Now the receiver also has control. The receiver can actively participate in near real time. She or he can pick and choose portions of several information sources and combine them to create new content. We now have "great many to one" and "great many to great many" relationships. Blogs, for example, are websites that although normally run by individuals permit a great deal of interaction among participants. Blogs, an advanced type of chatroom, combine the "(...) feature of soapbox commentary, gossip, and news about specific subjects" [15]. What is of interest to me, is that they cover multiple areas and allow multitudes of people to enter into discussions. This certainly wasn't possible very many years ago.

Another example. Interactive games allow people to compete with many other people most of whom they will never meet in person. Hundreds or thousands of people with personal computers with multimedia capabilities, participating in realistic looking and sounding video games, and interacting with others with high bandwidth Internet connections is something only recently possible.

4. Premise III: It's the content, not the storage medium that, is of interest to a user

There's no doubt that technology has dramatically changed the information business. But information content, not information technology, is what's most important. It's the message that's important – not the medium! This sounds elementary, but apparently it's not that obvious to the large and influential worldwide information technology sector. Just follow the agenda of the World Summit for the Information Society (WSIS) to see what I mean. Currently, it has little or nothing to do with information content. Sponsored by the International Telecommunication Union, the first phase of WSIS will take place in Geneva this December. A second phase will take place in Tunis.

The WSIS challenge states:

> The global information society is evolving at breakneck speed. The accelerating convergence between telecommunications, broadcasting multimedia and information and communication technologies (ICTs) is driving new products and services, as well as ways of conducting business and commerce. At the same time, commercial, social and professional opportunities are exploding as new markets open to competition and foreign investment and participation. The modern world is undergoing a fundamental transformation as the industrial society that marked the 20th century rapidly gives

> way to the information society of the 21st century. This dynamic process promises a fundamental change in all aspects of our lives, including knowledge dissemination, social interaction, economic and business practices, political engagement, media, education, health, leisure and entertainment. We are indeed in the midst of a revolution, perhaps the greatest that humanity has ever experienced. To benefit the world community, the successful and continued growth of this new dynamic requires global discussion [16].

I certainly agree with the challenge. However, as I examine the agenda, the WSIS centers on their phrase "The accelerating convergence between telecommunications, broadcasting multimedia and information and communication technologies". I know that UNESCO, ICSU, CODATA, and ICSTI are concerned about the lack of discussion regarding information content. These organizations, organized by ICSU, will be meeting in March to discuss the matter and plot a course of action.

Science is "Shared knowledge of cumulative efforts". To be of value, information must be more than a series of digital bits delivered to electronic devices. It is far too easy to become enamored with the technology and forget the raison d'être, namely the delivery of useful information or data. While information technology is extremely important, the content it delivers is the element that influences the "Information Society".

In 1965 Gordon Moore observed that the number of transistors per square inch on integrated circuits had doubled every year since the integrated circuit was invented. In subsequent years, the pace slowed down a bit, but data density has doubled approximately every 18 months.

The Internet, the introduction of the World Wide Web, the development of Java and other languages to allow interaction with Web resources, are vitally important information technologies. They are important, however, only in the context that they enable the delivery of content, whether the content is contained in text, images, raw data, audio, or other forms of content. We in the information content business must continually find ways to exploit technology for our customers rather than be exploited by it. To me a more important phenomenon than Moore's Law is that involving storage devices. Storage capacity is doubling every six months. This means that with expanding bandwidth and faster processors huge amounts of content can be held locally, multimedia, large scale simulations, large libraries all can reside on a laptop. Our challenge is twofold. First, to be creative in offering new products and services. Second, to find ways to assure the quality, consistency and reliability of the content since it may be widely distributed.

Information technology, in and of itself, merely supports the creation and sharing of knowledge. Knowledge and the resulting wisdom come from people. A technology, on its own, can provide neither. Thus knowledge, whether in its primary form or as secondary products to which value has been added, must be managed so that its meaning is well understood, and so that exactly the right knowledge sets are available to the right people at the right time. Knowledge management is the discipline of promoting a collaborative and integrated approach to the creation, capture, organization, access, and use of an enterprise's information assets. Which leads to my next premise.

5. Premise IV: The transfer of information is an inseparable part of the business process

This, like all my other premises, is a given. It's obvious! However, we still are at the relative beginning of a dramatic change in the way organizations work. A robust information infrastructure improves the productivity and effectiveness of the business process. Today, nearly everyone in an organization has a networked computer on his or her desktop. But it wasn't too long ago that this wasn't the case. Knowledge management – a concept looking for a definition – seeks to share the knowledge assets of the organization

or communities of interest inside or outside of the organization, and thereby expand the value and impact of those assets. The concept attempts to share documented and undocumented knowledge, and formal and informal knowledge that is written down, say in a personal notebook, but isn't widely available to the organization. IBM's Larry Prusak defines knowledge management as "...the attempt to recognize what is essentially a human asset buried in the minds of individuals, and leverage it into an organizational asset that can be accessed and used by a broader set of individuals on whose decisions the firm depends" [17]. However, defined, "Knowledge Management" is part of the centuries long continuum of information management advances. So what's new?

The tremendous interest in knowledge management is a result of the realization that an increasing percentage of an organization's value is in intellectual capital. Organizations have always recognized that information is part of their basic operation. They have not, however, always viewed it as a corporate asset to be made available throughout the organization. With the recognition that the easy-to-use capabilities of Internet Web browsers could be adapted to be used for non-public use through Intranets, organizations are increasingly making information services available to all employees – not just selected ones. Additionally, electronic collaboration and coordination improve effectiveness as well as efficiency. It is vital that we in the information content management field help find new ways to make this possible.

6. Premise V: The user – not the provider, determines the value of information

Much of the past thrust of those in the information diffusion chain, be they primary publisher, secondary publisher, document provider, librarian or others, were anticipating user needs and responding to them. But, users now control their own destiny by independently accessing information that has not been prefiltered, and doing so on their own schedule. Products and services such as published bibliographies, indexed bibliographic databases, and current awareness offerings were, and still are, designed to help reduce "information overload" by attempting to predetermine what a category of user (e.g., chemist, biologist) may need. The value gained from insightful selection of material, careful editing, and ensuring expert review and content quality is needed more than ever. An organization's or individual's willingness to pay for and spend time using a product or service is based on the assumption that there is a value to this expenditure.

The networked world, however, adds a new dimension – in fact, a transmutation of economic analysis that is changing or altering the form and nature of this analysis to a higher form. Users now have much more flexibility in finding useful information, formatting it in a manner they desire and, through serendipity, finding other valuable information. But what is the value of everyone having the same version of a piece of information or of having it immediately available? How can the information provider determine the real value of its offerings? That's the challenge. Determining direct costs is not a major factor.

As we all know computers are programmed in a binary language that reduces all information to bits – zeros or ones, on or off switches. When people reduce their thinking into a simple yes or no, Dan Close, of the University of Oregon refers to them as "binary minds" [18]. Decisions based on favorable Cost/Benefit ratios often made decisions clear. Financial costs are relatively easy to determine. Tangible benefits, although somewhat more difficult to determine, can be ascertained. But how does one determine the value of beginning an experiment from a more advanced position because previous complementary work was discovered? How does one place a value on having people normally "out of the loop" to be as well informed as those "in the loop"? How does one assess the value to someone outside your immediate

organization when his or her job is made easier? How does one determine the value of one of our products or services? The purpose of information is to change behavior to better achieve objectives. The challenge of the electronic information provider is to develop metrics for determining the intangible benefits. "The intangible benefits of technology are emerging as the most important of all" [19]. In fact it leads one to ask, "What is the business?" [20] and "How is success measured?"

7. Premise VI: Quantity is not quality, stuff is not information, information is not power, it's only potential power

I find it interesting that when I first used this premise many people reacted to my use of the word "stuff". Now many use this term to describe the indescribable. I'm sure I had nothing to do with the spreading of the word. Just as one man's junk is another man's treasure; one person's information is another's stuff. In fact, that's what all of us in the information organization and provision business do – we help people find the information they need in the mass of stuff. But information has only potential power. Its power is realized only when it can be put into the mind of a person (or a machine) to be used to create knowledge. Merely delivering a container of information (e.g. a monograph, a journal) has little value.

Placing information in a context where it can be more readily absorbed enhances its value. Visualization, multimedia documents, data ready to be immediately run in a simulation enhance the value of information and lead to the expansion of knowledge. You can describe the beauty of the second movement of Tchaikovsky's Fifth Symphony, you can enhance your understanding of it by reading the musical score, but its real beauty comes from hearing it. I'm not even sure you can describe in words the passion and drive of something from Phish, particularly one of a twenty-minute solo break. That's what makes me so excited about the potential of very high bandwidth and massive storage capacity which gives us the capability to greatly expand the value of information through its delivery in many forms.

Considerations such as finding aides, access and delivery tools, and maintaining the integrity/authenticity of information are critical factors in assuring that the potential power of information can be exploited. The more we can do to help transform information into knowledge, the more beneficial we become. Knowledge is Power, not information.

8. Premise VII: The internet/WWW is a mission critical facility

I didn't think this premise was needed any longer. I wrote this premise just prior to speaking at a federal Information Resources Management (IRM) conference. As I was preparing my remarks I read an article that included a statement by a Federal Department CIO that the Web was not a mission critical element. I disagreed, using this premise.

The Web has enabled government managers not only to increase taxpayer accessibility, but also to expand citizen awareness of the immense amount of data and information available from all levels of government. Today there isn't a government agency that doesn't have several Websites providing direct access to government data and information. As a consequence, valuable tools such as government research, statistics, and electronic maps, are available to citizens from coast to coast. All of this is made possible by the government's efficient, effective utilization of information technology products and services.

In the commercial sector e-commerce can't exist without the Internet with a Web interface. However, as the dot com bursting bubble showed us, Web technology without a saleable product leads nowhere. What changed my mind about premise was a January 2003 op-ed piece Robert Samuelson wrote in the Washington Post [21] suggesting that, at least in economic terms, the Internet is not very important. He cited some business failures to build his case. Certainly technology can't be blamed for bad business decisions. While I take issue with Mr. Samuelson, I will change my premise to read **The Internet Is Mission Critical**. The Internet brought about a basic change in telecommunications protocols and architecture. It has allowed many networks to work together. The World Wide Web, however, is a software system that provides a human interface to the Internet. Whether the Web is replaced in the not too distant future has no bearing on the future of the Internet.

9. Premise VIII: Use of the World Wide Web is not an information technology issue – it's an information management issue

The Internet was the result of work of information technologist. The World Wide Web was the inspiration of a non-information technologist. Adding the culture and professional background of information science to a technology base, the Web now offers the capability to allow a user to discover, access, and use information tailored to their real-time needs. The Web has coalesced information management and information technology concerns into a more unified whole. The functions of evaluating, organizing, announcing, disseminating, and archiving information are basic information science. Copyright, access control, and privacy concerns are policy considerations and are also information management issues. While information technology may be used to address these issues, they are not information content issues. These are the issues that must be resolved as the medium matures. Information technologists can't be the ultimate decision-makers.

10. Premise IX: A robust electronic information infrastructure supporting one community can be exploited by other communities with only a marginal increase in cost

This premise addresses the very nature of our business. An organization's electronic information infrastructure handles electronic bits and bytes. It is unaffected by the internal structure of the content or the intellectual content. Conversely, the human portion of the information infrastructure is greatly impacted by intellectual content. The human element is the portion of the infrastructure that puts order to the electronic chaos. And in this world of information overburden this is a most critical need. We at DTIC early on discovered that, because of our information content delivery culture and our non-parochial electronic infrastructure, we could expand our services to others outside our community while still improving delivery of our traditional services. We offer information management in addition to information technology. Aggregating Information, that's what NFAIS members do!

11. Premise X: Although the Internet is a public utility all information is not public information

This is obvious for those in e-business. Your business records and your intellectual property should not be openly available. It's not so clear regarding government information. This is the reason I developed this

premise. In 1985 I was on a panel at the first NFAIS conference I attended. When the floor was opened for questions the first question, directed at me, was about sensitive but unclassified (SBU) information and what right had the government to do this with a public good. Nearly twenty years later this question is still being asked.

Federal government organizations were given their missions in 1787 with the signing of the U.S. Constitution. In the Preamble the goals were given as "(. . .) establish Justice, insure domestic Tranquility, provide for the common defence, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity (. . .)" [22]. Note these are all services, not products.

All government organizations create and use information to fulfill their roles in serving citizens. Just as informed citizens and commercial businesses rely on access to information to increase their knowledge and improve their performance, so do government organizations. Democratic governments moderate this need with the requirement to be open to the people and accountable to the legislature, as well as to protect the privacy of individuals, to provide for the economic and defense security of the state, and to assure fairness and equity in fulfilling their missions. In fulfilling these roles are there barriers in access to information to be overcome while maintaining an efficient and economical system that balances the public right to know and the need for government organizations to produce and use information to accomplish their missions? It must be realized that the definition of information is, at best, ambiguous. What is not ambiguous is that both in form and in use information is multidimensional and varied. The purpose of much of Federal Government information primarily is to accomplish the mission of the organization. This brings with it a responsibility to do such things as: protect an individual's right to privacy; maintain information integrity; information security and intellectual property rights, and protect internal advice, recommendations, and subjective evaluations, as contrasted with factual matters, pertaining to the decision-making process.

Today, one of the concerns is the relationship between scientific openness and national security. Recent advances in biotechnology present both opportunities to further scientific knowledge and possible threats to national security, depending on how the specific scientific information is used.

Last month, "the National Academies and the Center for Strategic and International Studies cosponsored a public meeting to bring together scientists and policy-makers to discuss whether current publication policies and practices in the life sciences might lead to the inadvertent disclosure of "sensitive" information. The meeting's goal was to start a dialogue between the life sciences and national security communities that might eventually lead to the development of a common set of publication policies for journals in the life sciences" [23].

As a result of this meeting, a joint statement, released at the American Association for the Advancement of Science (AAAS) Annual Meeting, ten days ago, the concept of self-governance by the scientific community – an alternative to government review of forthcoming journal articles – was declared. Thirty-two of the world's leading journal editors and scientist-authors called for renewed vigilance and personal responsibility among their ranks whenever potentially "dangerous" research is presented for publication.

However, it was emphasized that the scholarly publishing community "must protect the integrity of the scientific process by publishing manuscripts of high quality, in sufficient detail to permit reproducibility" [24].

So the answer to the question regarding Sensitive but Unclassified government information, at least in my opinion, is that there is a need to have limits on certain types of government information distribution. The Premise remains valid!

12. Premise XI: Our vision must extend beyond our rearview mirror

It's always important to realize that the World Wide Web is very young. Although we must never forget past lessons learned, we must also remember that one can't navigate a boat by watching its wake. We must continue to be innovative and challenge the status quo. Those who do not do so are no longer assured of business survival. It may sound strange from a career bureaucrat, but I've always felt it is my job to challenge the status quo. If the status quo is right it will take care of its self. If it is not right and no one challenges it, it will remain. Jonathon Kellerman in his novel "Flesh and Blood" [25] says: "Forgetting Comes with Experience". However, we can't afford to forget the "Lesson's of History". The Lessons of History by Will Durant and Ariel Durant is one of my favorites. The Lessons of History consists of a number of short chapters, in which the Durants summarize what their study of history revealed on various themes, such as war, morals, government, religion, etc. Although certainly not a profound work, it contains a number of insights. The insights that all of us have gathered over the years also cannot be forgotten in the developing digital age. Remember that all easy problems have already been solved.

13. Premise XII: Whatever we do will be wrong – so let's do something anyway!!! (as long as it's in the right general direction)

While the time frames may differ, the life cycle of a specific piece of information technology is short, measured in months rather than years, and continues to decrease. Coincident with these advancements, the power and functionality continue to not only increase, but also to accelerate. Driven by competitive and entrepreneurial spirit, the IT industry, once dominated by a few, now offers a myriad of excellent alternatives, any one of which may serve a needed function. The problem is that there is little time for analysis. Again, the Web is young and, like a child, is growing faster and learning at a rate far greater than a mature entity. The result is that mistakes are inevitable. The need for a corporate direction and overall philosophy is more critical than ever. That is why I developed these premises.

When I first was given the honor to address you I emailed many of the Federal people I know in the content management business asking for their suggestions on what I should talk about. Most suggested Federal Information Policy. While interesting to me, Federal policy has not changed as dramatically as I perceive the digital environment has already changed us. So I decided to take a holistic approach and cover a wide range of considerations, using as a base, these considerations I spoke about five years ago. No matter how complex the information environment before the advent of the Internet, it is now an order of magnitude greater. Henry Wadsworth Longfellow wrote, "If you wish a thing to be well done, you must do it yourself". I doubt if that was possible in his day and I know it's not possible today. Look at all the specialties that now must work together to field a product or establish a service. Information technologists, security specialists, lawyers, information scientists, market analysts and many more disciplines must work together often requiring a vision of a future far different from the past they've experienced.

Isn't it a bit of irony that the digital environment could lead us back to a digital prehistoric time? In the Washington Post article I cited earlier, Librarian of Congress, Jim Billington, also said "We are in danger of losing history itself, if we don't save it, chances are nobody else will either". Three thousand years after the Sumerians, the Chinese invented paper, and three hundred years after that, they used paper for writing. But more centuries passed before paper was used extensively in Europe. As NFAIS member, Fred Lerner, says in one of his books, after Gutenberg issued the first mass-produced Bible in the early 1450s, the art

of printing spread rapidly across Europe. Fifty years later, there were two hundred sixty places were it was practiced, with tens of thousands of titles and at least ten million volumes produced [26]. More than half was literary, historic, or scientific. This, in today's jargon, was certainly an "information explosion".

5000 years ago ancient humans invented writing. 500 years ago humans interested in the resurgence of the pursuit of knowledge brought us the printing press. 50 years ago modern humans brought us the computer. 10 years ago the World Wide Web arrived. Each development brought with it significant need to change. The only difference is that time frame for reacting are compressed at an increasingly quickening rate of acceleration.

In addition to consulting my colleagues and reviewing, I chose my ties for this conference with specific intent. I wore one that was based on an Illuminated manuscript to remind me of the time prior to Guttenburg.

I chose one with Mickey Mouse in front of an orderly shelving of books. This to remind me of two things. Order currently does not exist in the digital and networked world. Second, to remind me that Mickey represents what I believe is a terrible perversion of the words in the Constitution, "To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries" [27]. It says nothing about corporate entities. Copyright is supposed to benefit creative people – artist, musicians, and writers. We, the people, grant a monopoly to a copyright holder because we feel it's important for the copyright holder to make a living. I have no problem with authors giving assigning their rights to organizations for the purpose of aggregating and publishing. I do have a problem, both with continual copyright extension. I also have a problem with the European Database Protection Directive, which can be interpreted to allow perpetual copyright protection for factual databases.

Today's tie is a stack of books and reminds me that it would not be as interesting if it represented digital objects.

I titled this lecture by paraphrasing Shakespeare. I'll end that way also by paraphrasing one of the closing remarks in "Much Ado About Nothing" – "The Internet is a giddy thing, and this is my conclusion". As to the question posed by the title of this lecture "Is what's past, prologue?" the answer is yes. But Shakespeare also says, "Have patience, and endure" [28].

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