



Info Tech Talk

A Newsletter on Enabling Information Technologies by the IRMC Information Operations and Technology Department

Taking Web Learning by SCORM

By Michael Miller and Les Pang

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SCORM is... a suite of technical standards that enable web-based learning systems to find, import, share, reuse, and export learning content in a standardized way.

Q: What is SCORM?

A: SCORM is the acronym for *Sharable Courseware Object Reference Model*. It is a suite of technical standards that enable web-based learning systems to find, import, share, reuse, and export learning content in a standardized way.

Q: How did SCORM come about?

A: The Department of Defense (DoD) established the Advanced Distributed Learning (ADL) initiative in 1997 to develop a DoD-wide strategy for using learning and information technologies to modernize education and training. This effort also aims to promote cooperation between government, academia and business to develop e-learning standards.

The ADL initiative has defined high-level requirements for learning content, such as content reusability, accessibility, durability and interoperability to leverage existing practices, promote the use of technology-based learning and provide a sound economic basis for investment.

One of the mandates was the creation of interoperability standards. Many of the first web-based "Learning Management System" (LMS) products used proprietary "middle ware" and data models to track learner performance. Some of the issues that were found included:

- Learning content could not be moved from one LMS environment to another;
- LMS products often could not integrate

learning content created for other systems.

- Could not create searchable content or content repositories

A new approach for Internet delivered learning was envisioned where learning objects can be reusable, searchable, durable, and accessible. This approach would enable customized learning experiences that match a learner's needs. Such learning experiences would be assembled "on the fly" and would adapt intelligently to the learner. Learning objects could include assessments, simulations, performance support, as well as directed learning experiences.

There were a number of parallel efforts to standardize various aspects of Internet-based learning systems. Unfortunately, these efforts were not initially coordinated and there was a great deal of confusion about where each of the work groups was headed. In early 1999, the first version of the Sharable Content Object Reference Model was drafted as a way to integrate and "connect" work from other organizations. This draft served as a catalyst to get vendors working together. The first version of SCORM was released in January 2000.

Q: What is SCORM to be used for?

A: SCORM is written primarily for vendors and toolmakers who build Learning Management Systems and learning content authoring tools so they know what they need to do to their products to conform with SCORM.

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Architecture's Role in the Enterprise Ecosystem

By Carolyn Strano, Professor of Systems Management

It's hard to pick up a magazine or any news source these days without hearing about enterprise architecture. Examples are:

- "Homeland Security crafts enterprise architecture" – Government Computer News 2/24/2003;
- "Enterprise Architecture tops managers' concerns." – Federal Computer Week - 12/20/2002;
- "Office of Management and Budget releases an enterprise architecture aimed at aligning agencies' programs with their administrative systems" - Government Computer News – March 12, 2003.

There is no doubt enterprise architecture is a "hot topic." Why? What is all the fuss about?

To answer this question we must first define an enterprise and then explain why an architecture is useful and important to an enterprise. Webster defines an enterprise as "an undertaking of great scope, complication, or risk" or "systemic and industrious activity." With regards to information management, the term enterprise is used because the scope of the undertaking may span across several organizational boundaries. For example the enterprise needed to "secure the homeland" is certainly much larger than can be contained within the Department of Homeland Security.

Enterprises normally share one common bond in that they are complex – that is they are made up of many interdependent activities such that any change that is made to one of the parts of the enterprise has the potential to impact the entire enterprise. In order to manage this type of complexity, it is critical that these interdependencies are clearly understood. This requires the use of a management tool that explicitly describes relationships of each part of the enterprise within the context of the whole. This tool is known as an architecture. Let's look at an example.

Last weekend I was walking along a nature trail in a planned community in Virginia and noticed that the creek that runs along the trail was becoming a large pond, thanks to the craftsmanship of the local beavers. This pond was not a part of the plan for this community but the beavers evidently had independent, isolated ideas and in the pursuit of achieving these goals, they were impacting the ecosystem for this community. Initially their work was not a concern but as the impact began to be more and more significant, it became apparent that the beavers' goals needed to be better aligned with the "enterprise" that they were impacting. A few years ago a simi-

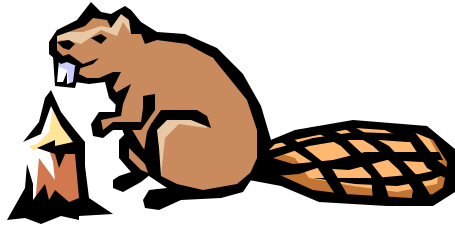
lar incident by the beavers made national news when the work of a beaver family was threatening the well being of the treasured cherry blossoms at the tidal basin in Washington, D.C. Those beavers no longer reside or work in the tidal basin. We are told that they were moved to another site by the park rangers but we are left to speculate on what *really* happened to them. Similarly when information needs begin to transcend across organizational boundaries into broader and broader enterprises, there is a need to align many of the previously isolated, independent activities such that there is an optimal balance of needs being met for the enterprise. Otherwise in all probability if one or more individual activities are misaligned with the common goal of the enterprise, like the beaver, it will eventually be removed in order to bring harmony to the enterprise. So how to we go about doing this?

First of all we must clearly understand the activities that are important to each organization or mission operation. Then we must understand the information that is required to enable the success of the mission. Finally we need to be able to explain the specifics regarding the infrastructure that is needed to provide the information to those *who* need it, *when* they need it and *how* they need it.

So you say, what's the big deal about that? Why not just describe the mission and the information needs and share them with each other. Well this is much easier said than done. In order to be meaningful, we need to understand the context of these descriptions. We must also understand the syntax. In other words when we make a statement using the English language, we must first understand the meaning of the words used in the statement and then understand the placement of the words in order to make sense of the statement. Take for example the statement "Time flies, if you can, but you can't because the interval is too irregular." Does this sentence make sense? It does if you realize that in this sentence "time" is being used as a verb and "flies" as a noun. This type of ambiguity makes it very challenging to explain interrelationships of complex enterprises. Thus we need a mechanism that provides the needed structure to reduce ambiguity.

The models that are used to represent the individual parts that make up the enterprise provide such a mechanism. This is not something new. We have used models for years to represent complex relationships. Take for example music. If everyone used different notation to represent music, it would be very difficult for musicians to play music composed by different

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composers and it would be impossible for the conductor and musicians to play a specific composition that combines different sounds produced by different instruments. Mathematics is another example. It may be difficult at first to learn to use the models (i.e. read music or mathematical notational) but once this skill is mastered, it enables an order of magnitude improvement in communication.

Ok, you say, but why enterprise architecture and why so much talk about it now? Well the information age recognizes the tremendous potential and opportunities that exist in sharing information today because of the improvements in technology. Never before has it been possible to exchange so much information, so quickly. We are no longer constrained by technology. However, this capability cannot be fully recognized in the most optimal manner without a structured approach that acknowledges the interdependencies and impacts of localized choices that are inadequately coordinated across the entire enterprise. So how do we do that you ask? Well we are still struggling with the answer, but, there are several initiatives in place that have made a good start at providing the answers.

The Federal Government's Chief Information Officer Council has developed three documents that provide guidance for federal agencies.

- **“A Practical Guide to Federal Enterprise Architecture”** that describes the tasks involved in developing, maintaining, and implementing an enterprise architecture.
- The **“Federal Enterprise Architecture Framework”** describes a structure for enterprise architectures that cross federal department boundaries.
- The **“Architecture Alignment and Assessment Guide”** explains how the enterprise architecture should be used to influence managerial decisions within an enterprise.

The Office of Management and Budget is developing a Federal Enterprise Architecture in terms of reference models that provide the “business” or operations of the federal government and the interrelationships of the infrastructure needed to support it. Many federal, state, and local governments,

nationally and internationally, as well as industry are developing and implementing enterprise architecture frameworks to structure the many architectures within the enterprise and enable the identification of opportunities to abstract components that may serve several enterprises.

Links to these referenced guides and examples may be found on the National Defense University Knowledge Net, enterprise architecture section at www.nduknowledge.net

Notice that as I use the term architecture, I am referring to operational as well as technical relationships. This is a commonly misunderstood term as it is commonly used in information systems to refer to technical systems interrelationships such as network topologies and wiring diagrams. In contrast the enterprise architecture is all about the operations of the enterprise. The technology is an important enabler of the mission needs but the architecture must be able to describe the operations independent of the technology components that support it in order to maximize the flexibility and utility of the architecture. Often the entire enterprise architecture descriptions consist of sets of technical standards or communications diagrams. Although these are an important part of the architecture, they are no more or less important than the descriptions of the business processes, information flows, data, and applications. Each of these must be included in the architecture and the explicit description of how these relate to each other is what makes the enterprise architecture a powerful management tool.

Bottom line: If we are to succeed in managing information in an environment that is changing at an increasing rate and becoming more and more complex then we must use a structured and systematic approach that enables communications among many different disciplines from many different perspectives. That is why there is so much talk about enterprise architecture today. It is that the mechanism that provides the needed structure and discipline. It is the blueprint that explains how all of the pieces fit together to transform the capabilities and services of the enterprise. It describes the overall enterprise strategy using conventional modeling techniques that enable all of the various disciplines to play on the same sheet of music. It guides the individual components of the enterprise so that, unlike the beaver, their hard work and efforts are in synch with the overall strategic direction of the enterprise. In short the enterprise architecture is the mechanism that protects the enterprise “ecosystem.”

Navy's New Approach to Process and IT Management

By Mary Ann Rockey, Head, Technology and Innovation Cell Logistics Planning and Innovation Division, Deputy OPNAV for Fleet Readiness and Logistics (N4)

What is Enterprise Resource Planning (ERP)?

Christopher Koch describes Enterprise Resource Planning (ERP) software as "... a single software program that serves the needs of people in finance as well as it does the people in human resources and in the warehouse. Each of the departments typically has its own computer system optimized for the particular ways that the department does its work. But ERP combines them all together into a single, integrated software program that runs off a single database ..." ERP software, by and large, covers business areas that are common across organizations and they are linked or integrated with an organization's unique business systems not covered by an ERP.

Why Implement an ERP?

ERP not only provides standard integrated software, it also brings along business processes or methodologies based on industry best practices. To get the benefit of ERP you have to use the business processes and work methods outlined in the software. ERP benefits come from business process standardization and improvement as well as software replacement, standardization, and integration. ERP software often provides an organization with a greater level of integration across the enterprise than would be possible with their existing systems. ERP software can provide an organization with a jump-start towards achieving Enterprise Integration. Typical business areas or modules contained in an ERP include:

- Human Resource Management
- Financial Management
- Supply Chain Management
- Procurement
- Logistics and Materials Management
- Planning and Budgeting
- Sales and Distribution

But, in many organizations ERP implementations have turned into horror stories where a vast amount of resources are spent only to have the project cancelled with very little salvageable benefit. In fact, it has been estimated that as many as seventy five percent of all ERP projects fail to meet expectations. They require a significant investment in terms of money, time, and management attention. They often require radical changes in the way people do their work, organizational structures, and in most of an organization's existing information systems. So why in the world would any organization in their right mind invest in an ERP system?

The answer, for many organizations, is really rather simple. Can ERP provide a significant improvement and savings over

how the organization is doing business today? And, in many organizations, the answer is a resounding and dramatic yes! In his article entitled "Costly, Painful and Worth It," Derek Slater states, "Taking a long-term view ... the only thing more expensive [than ERP] is not using these tools ..."

Business Case for an ERP system

Organizations prepare a business case as part of a sound IT investment strategy. In the federal sector, sound IT capital planning is mandated by several laws and statutes. A business case provides a structured method for organizing and presenting a business improvement proposal and facilitates thorough IT capital planning. A business case pulls together, in one document, the data and analyses needed to reach a decision regarding various alternatives in a systematic way. For a specific project, the business case will outline the benefits and risks associated with each alternative. The business case should also be used to analyze and select implementing an ERP system versus other options, including the status quo of using existing systems.

A business case analysis is also a good tool to use when selecting a specific ERP vendor. As an example, the Naval Sea Systems Command (NAVSEA) and the Commander in Chief U.S. Atlantic Fleet (CINCLANTFLT), in its Navy Enterprise Maintenance Automated Information System (NEMAIS) program, evaluated the costs and benefits of an ERP, major system upgrades to existing systems, and the status quo. After selecting an ERP, the commands used a business case to select among competing software vendors and among implementation vendors. The business case is also being used to track the progress of the program and alert managers when key milestones are missed. The business case was then presented to an IT investment board where the final decision was made. The business case for the NEMAIS program was examined along with business cases for three other major ERP programs in the Navy.

A business case analysis should include the business drivers, such as the need to replace legacy systems, obtain better, more accurate and timely decision support information, improve global operations management, comply with laws and regulations, enterprise integration, and business process improvement and standardization. Some or all of these business drivers might exist within an enterprise.

A business case should identify the business benefits of an ERP and balance them with costs and risks. Both quantitative and qualitative costs and risks should be identified. Thomas Davenport, in his book "Mission Critical, Realizing the Promise of Enterprise Systems," categorizes benefits into three areas; savings from new approaches to work, savings from dismantling

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legacy systems, and revenue enhancement benefits. His description of “revenue enhancement” also fits public sector organization, benefit areas would include; improvement in customer service, ease of expansion and growth, and better decisions.

Many organizations put a great deal of effort into analyzing and selecting the software application. And, the right software is an important cost factor. But, other factors often end up costing much more than the software itself. Cost considerations should include required hardware upgrades, installation costs (including employee time and consultants), implementation costs (including training, testing, employee lost time performing their usual duties and consultants), and continuing costs from operating, maintaining, and upgrading the system. The project budget should be devised from the business case analysis, directly linking the amount of investment to the factors in the business case

The City of Dayton, Ohio in its *eGovernment Business Case Development Guide* identifies eight areas of risk: financial, resource, technical, management, operational, political, organizational, and timing. Financial risks include both the uncertainty of internal funding and the uncertainty of actual costs. Resource risks include the availability of key personnel, training, skill levels, technical expertise, and consulting. Technical risks include those associated with the complexity of the technology, interface requirements, scope creep, and implementation methodology. Management risks involve the level of upper management support, the experience of the project manager, stakeholder involvement, and ability to minimize scope creep. Operational risks are those associated with the end user environment and involvement, including the existing infrastructure, stability of the business environment, and ability to meet end user needs. The political risks include responsiveness to legislative mandates, change in the political environment, citizen support, and impact of failure. Organizational risks include alignment with business strategies and overcoming business problems. It can be minimized when the implementation is well thought out and aligns well with the strategic goals and vision of the organization as a whole. Timing risks involve an analysis of the impact of an implementation later than what is planned.

A clear definition of the scope of the ERP system is crucial to the success of the implementation. Scope creep is one of the driving factors of failure. It is also important to identify clear metrics in the business case analysis. This allows managers to track the progress of the ERP and make sure that the value proposition in the business case is being met.

The business case analysis is also a good tool for the vendor selection process because it can provide a defined methodology for selection and tie in criteria that strategically aligns with the needs of the organization. The National Defense University (NDU) used a business case that provided collaboration amongst the various colleges within the university. The colleges participated in the assessment by using an IT Assessment Scoring Guide and in vendor selection by using a vendor evaluation scoring mechanism. This was a particularly useful business case methodology for such a decentralized organization because it provided a level of participation by each of the colleges in the university.

Implementation Planning

The business case analysis is a good lead-in to implementation planning. Thomas Davenport identifies implementation planning as “... the most difficult part of the project...” Because implementation lays the foundation for the entire project and the value gained by doing the project.

Change management is perhaps the most crucial and difficult parts of implementing an ERP system. Changing a software package is always a difficult endeavor. But ERP is even more difficult because it most often involves changing business processes along with the software changes. And, changing the way an organization does business is always a difficult management issue. Pre-conditions to successful ERP change management include:

- A strong, visible and committed senior-level executive who continues to be the ‘cheerleader’ for the project
- Realistic expectations spelled out in a comprehensive succinct business case analysis tied to the strategic goals of the organization
- Empowered trained workers who believe in the project
- A clear vision that is communicated throughout the organization
- Sound management processes, including strategic planning and IT capital budgeting
- Key people assigned full-time to the ERP implementation team
- A budget with enough resources to meet implementation requirements
- Middle management buy-in
- Defined milestones and deliverables

Strong project management is also critical to successful implementation. The project planning must include a clear definition of the scope of the project. This scope must be adhered to and scope changes kept to a minimum. The timeline must be clearly

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Navy's New Approach (cont.)

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defined and articulated in a Project Objectives and Milestones (POAM) document. Implementation should be measured and reported against the POAM requirements. A budget and spend plan should be spelled out early and deviations should be closely monitored. The project management plan should clearly articulate roles and responsibilities, particularly between software vendors, employees, and the implementing vendor. Emphasis needs to be placed on the workload considerations of the internal employees as well as vendors. Adherence to a project management methodology will increase the odds of success.

A risk management plan is crucial to the success of the project. ERP implementations are complex tasks involving many risks. Risk management plan would include managing all eight areas of risk identified in the business case analysis, they include: financial, resource, technical, management, operational, political, organizational, and timing risks.

Successful implementation requires sound technical infrastructure migration strategies for existing systems. A well-planned technical infrastructure migration supports each step of the ERP implementation. The technical infrastructure must support each phase of the implementation. If significant changes to the infrastructure are required, they must be planned to coincide with implementation, so that installation and testing are complete prior to implementation.

Key Issues and Challenges

An implementing organization faces many issues and challenges. From a policy perspective ERP systems are usually quite different from an organizations previous experience. ERP systems require an organization to adopt the business process dictated by the software instead of designing the software around the way the organization does business. This normally requires organizations to do business process reengineering alongside software change. And the business process reengineering effort is dictated by the software solution.

Managerial issues and challenges are numerous. They include maintaining employee satisfaction and enthusiasm, ensuring training needs are met, planning for surge capabilities, focusing on customer needs and maintaining a clear mission focus. Managerial issues and challenges can be minimized when a clear business case analysis is completed and project management best practices are followed.

There are also many technical issues and challenges of ERP, they include, definition of system requirements, integration requirements, a comparison with the overall architecture plan,

ability of the current infrastructure to support the ERP, data management and data migration. Security is a primary concern as information is shared amongst various departments in an organization. Some security features are imbedded in ERP software, some will be part of the infrastructure planning, and some will emminate from business processes. Security considerations should be of primary concern to the organization.

Role of the CIO

The CIO should have a role in the initial business case analysis and the selection process but should not be the primary decision maker. The CIO should make sure that the investment fits into the overall IT Capital Planning process and that the investment is fully justified. The CIO should be a voting member of the investment board, alongside the functional components that will be using the system.

The CIO also plays a role in the project management of any enterprise-wide implementation. The CIO should ensure that qualified project managers are selected from functional components. The CIO, and the CIO organization, should act as an advisor to the project manager and be part of the overall team. The CIO should take an active role in ensuring that project management exists and is structured and deliberate, following project management best practices. In this way, the CIO can help ensure the successful implementation of the ERP in the organization.

Navy's ERP Pilots Mark a Novel Approach to Process and IT Management

In the case of the Department of the Navy, the cost of the status quo in the business case analysis is extremely high. The Navy currently runs tens of thousands of legacy software applications that are redundant, inefficient, costly to maintain and upgrade, nonintegrated, and nonstandard. In this type of environment, the integrity, quality, and reliability of information flowing from these systems is often not dependable.

This problem stems from the Navy's historically decentralized method of buying, developing, and operating computer applications. Business processes were likewise mostly nonstandard. Business processes and the IT planning, development, implementation, and management to support those processes were primarily the responsibility of local managers. These managers bought or developed information technologies, as they deemed appropriate to resolve problems or improve their processes. This decentralized structure resulted in some extremely innovative and unique approaches to meeting

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the Navy's challenges. But, the resulting hodgepodge of legacy systems also created a number of problems, including:

- Hundreds, or even thousands, of redundant nonintegrated systems performing the same or similar functions.
- A limited ability to share data and information across various organizations, or even across business units within one organization.
- Large-scale Enterprise Integration (EI) efforts, such as the Navy and Marine Corps Intranet (NMCI), Network Centric Warfare, Navy Enterprise Portal (NEP), and the Web-Enabled Navy (WEN), are prohibitively expensive to implement and difficult to manage because of the sheer number of systems in use.
- Pockets of innovation are only sporadically applied across the enterprise.
- The payoff from technology investments and improved processes and methodologies are reaped by only the implementing organization even though many organizations may be doing the same of similar types of functions.
- Enterprise-wide initiatives are stifled by the plethora of technologies that such initiatives would need to interface with at each activity.
- Many high payoff investments are not made because local activities cannot afford to invest in large-scale applications alone or are limited by each organizations level of expertise and funding.

In recognition of the challenges of decentralized management and the enormous benefits of achieving enterprise integration, the Navy has recently begun to shift towards a more centralized technology management approach. Several large enterprise-wide initiatives mark this shift, including the implementation of four ERP pilots.

The Navy is investing more than \$1.5 billion in four ERP pilots over the next few years. Each of the pilots, using a comprehensive business case analysis recommended SAP software. An IT capital investment board, that included the Department of the Navy CIO, approved the recommendation of the four pilots and approved their business cases.

Project Cabrillo, sponsored by the Space and Naval Warfare Systems Center (SSC) in San Diego, is focused on improving the business operations, process, and support systems of the Working Capital Fund (WCF) at the SSC San Diego. Project Cabrillo addresses the integration of overall business practices and processes including: strategic planning, project management, financial management, procurement management, asset management, and human resource management.

The SIGMA program, sponsored by the Naval Air Systems

Command, is focused on program management. The pilot phase of the project is intended to demonstrate program management capability using data and processes from the E2C Hawkeye program office and will impact NAVAIR Headquarters, North Island, Patuxant River and Orlando locations. The pilot uses several of the modules within the SAP ERP, including: financial accounting and controlling, project systems, industry solutions, human resources materials management, and sales distribution.

The Supply Maintenance Aviation Reengineering Team (SMART) program, jointly sponsored by the Naval Supply Systems Command (NAVSUP) and NAVAIR, is focused on supply chain management. The scope of the ERP includes all levels of maintenance applicable to the E-2C Aircraft and the LM-2500 Gas Turbine Engine programs.

The Navy Enterprise Maintenance Automated Information System (NEMAIS) program, sponsored by the Naval Sea Systems Command (NAVSEA) and the Commander in Chief U.S. Atlantic Fleet (CINCLANTFLT), is focused on optimizing the intermediate and depot level maintenance support and repair processes.

A Navy Enterprise Resource Planning Convergence Team (NECT) was recently stood-up to develop a convergence plan for the Navy ERPs. The consolidation effort is aimed at implementing a Navy-wide solution that is planned and managed in a coordinated way. Though the convergence effort is probably well worth the strategic pause, many of the benefits of the ERP pilots are based on rollout beyond the pilot stage. The NECT effort pushes these ERP benefits further out into the future.

Recommendations for the Future of Navy ERP systems

Successful ERP implementation across the Navy will provide a leap forward for achieving Enterprise Integration and the vision of network centric operations.

ERP convergence should continue and the Navy should make a commitment to use ERP for all business areas covered by ERP modules.

Business cases for ERP are difficult to develop because the cost of many of the existing processes and supporting applications are hidden or undocumented. Until recent NMCI rollouts, many of the applications Navy used were unidentified. Legacy application reduction should continue in all areas, even those covered by ERP. Selection of approved or standard applications within business areas covered by ERP should be considered interim standard applications and the ability to migrate to an ERP should be a high priority factor in the selection process.

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The challenges faced by the Navy's ERP pilots are enormous. But, in a recent (25 September 2002) review of the pilots by the executive Steering Group (ESG), very few substantive problems and issues were raised.

ERP program managers and meeting attendees must be encouraged to openly discuss issues and concerns without being labeled unsupportive of the overall effort.

As an example, the ERP convergence effort clearly put the ability to achieve Return on Investment (ROI) at risk for each of the pilots, yet very little was discussed regarding this risk factor. ERP implementation issues must be openly discussed and debated so that objective solutions can be reached. ERP implementations face tremendous barriers, all issues should be addressed and resolved in a timely manner.

SECNAV policy must be issued that directs Navy activities to use enterprise processes and applications to perform non-unique functions.

This policy should require that an exhaustive evaluation of existing commercial and government solutions already in use precede any new software purchase or development. Software development should only be undertaken when it is determined that no viable commercial product exists to perform the business function. Functional Area Manager (FAM) approval should be required before any Navy activity can buy or develop software applications.

The Navy has made significant progress on the path to achieving the vision of enterprise integration. Implementation of a converged ERP implementation will help achieve that vision. Successful deployment of ERP software can provide a significant leap forward for the Navy.

Managing Technology Successfully

By Les Pang, Professor of Systems Management

A recent technological phenomenon has been the growth in popularity of home-based local area networks. Homeowners are setting up these wireless networks called "Wi-Fi" or 802.11b systems to connect computing resources throughout their residence. Many people are discovering how useful it is in sharing an Internet connection, expediting the movement of files, and sharing printers. However, issues and challenges occur -- wireless frequency conflicts involving microwave ovens and cordless phones; physical obstructions such as thick walls, aluminum siding and brick walls; and security breaches may occur when the proper encryption protocols are not implemented. In this microcosm, the potential for improvement is there but it takes sound management to ensure success.

On a broader scale, technology permeates throughout the operations of the entire enterprise. If properly applied and managed, it enables key processes that the enterprise can use to better develop, deliver, and manage its products and services. If not properly utilized, it will pose serious risks to the efficiency, effectiveness, security and even the viability of the enterprise.

Recognizing the profound impact of technology, three questions arise which are imperative from the perspective of the CXO (an all inclusive term for CEO, CIO, CFO, etc.):

- What do CXO's need to know about technology?
- What technologies they should know about?
- How does a CXO keep up with technology?

These key questions are addressed in this article. The responses presented here are based on experiences which are both personal and those of students who have attended the Information Resources Management College. The list is presented in no particular order.

What Does a CXO Need to Know about Technology?

Recognize that Business, not Technology, is the Driver - Articles and television programs about new technologies tend to grab the attention of CXO's some of whom cannot wait to try it out in their organization. Technology should be implemented only if it "fits" strategically within the organization, that is, it enables a specific set of business objectives. It is clearly necessary to link the potential application of a technology to the strategic plan of the organization. A strong business case should be prepared before any technology is implemented.

Establish an Enterprise Architecture - The CXO has the role to create a framework that goes all the way down to the weeds to ensure data, application and hardware interoperability. The CXO should lead in formulating the enterprise vision, architectural principles and corporate standards to ensure consistency throughout the organization. A common mistake is to leave the architecture at too high a level of abstraction that it becomes useless.

Focus on People Not Only Process - Common complaints are that technology people are difficult to deal with, the systems are not intuitive, a lot of money is spent with no payoff, and the old way

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of doing things is far easier than the new way. Japanese managers have adopted a novel approach to IT management. IT managers work alongside users, so there is no "us versus them" mindset. Implementation should be focused on people first then on process because it is people who make things happen.

Identify and Manage Risks - After the horrendous events of September 11th, we now recognize the need for disaster recovery and contingency planning. CXO's need to objectively understand the threats we face, perform a vulnerability analysis and conduct risk assessment to mitigate risks involving existing or new technology.

Know How to Measure Technology Success - Management guru Peter Drucker stated "If you can't measure it, you can't manage it." There are many models that can be used to measure success including the Balanced Scorecard, Capability Maturity Model and ISO 9000 standards. These models also help to provide targets to help an organization improve.

Practice Effective Change Management - Most failures dealing with implementation of new systems are due not to technology itself but people's failure to adapt to changes brought forth by the new technology. Change management practices including upper management ownership, migration planning, fit-gap analysis, user awareness, and training and education are all necessary to reduce the risks involved in transitioning to a new technology.

Manage Expectations - A CXO should avoid promising too much from a technology-based project. Make sure that the customer understands what issues the technology will and will not address. Be sure to throttle any unrealistic hopes or ideas. It is necessary to work together to understand each other's viewpoint and come to mutually acceptable perspective. Failure to deliver will hurt the CXO's credibility.

Investigate an Outsourcing Strategy - Technology typically consumes significant amounts of resources, manpower and time. Outsourcing such as seat management can allow manager focus on the core mission of the enterprise, ensure improved accountability of computing resources, and deliver the state-of-the-art in technology. However, it becomes necessary to guard oneself against potential pitfalls. For example, it is very important that the contract is written properly

and in sufficient detail to ensure that it covers all the possible contingencies.

Nurture your External and Internal Customer Relationships - A CXO should promote a more customer-centric culture and environment. Unfortunately, many managers and employees focus on the day-to-day processes involved in delivering products and services. As a result, often overlooked is the customer. Also, there is a need to integrate customer channels, for example, the web page, e-mail, fax, kiosks, mailings, phone, and others in order to maximize customer convenience, satisfaction and loyalty.

Identify the Best Practices and Lessons Learned - Before migrating to another technology-based solution, it is important to learn from others who have implemented the technology before and are willing to share their experiences. Excellent sources include the CIO Council web pages at: <http://cio.gov/>



What Technologies Should CXO's Know About?

Technologies with much potential for practical application now and in the near future include:

Integration Technologies - These technologies help to ensure that data and applications can freely move throughout an enterprise seamlessly and in real time. This will accelerate the pace of decisionmaking, improve organizational responsiveness, and reduce data error rates. Examples of these technologies include enterprise resource planning systems, customer relationship management systems, middleware, enterprise application integration, enterprise portals, Extensible Markup Language (XML), and web services (Microsoft .NET and Java J2EE).

Security - To address hacker attacks and other intruders, key technologies in this area include intrusion detection systems, authentication techniques, encryption, wireless security safeguards, and public key infrastructure.

Storage - With the continually increasing demand for storage for data and multimedia, one must turn to novel storage devices such as USB-based pen-sized portable storage units, off-premises storage providers, storage area networks, and fabric attached storage.

Mobile Technologies - The objective here has been to de-

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Managing Technology Successfully (Cont.)

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liver to the users of handheld or other portable devices at least the same functionalities found on a networked desktop PC. We have seen its capability of these devices grow to include global positioning system-based location services, wireless e-mail, and convergence with the cellular phone architecture. It is expected that this growth in functionality to continue particularly within vertical markets such as the medical field.

Wireless Technologies – A number of innovations have been developed in this arena including wireless personal digital assistants, Internet functionality on cellular phones (using Wireless Application Protocol), and wireless e-mail appliances (Blackberry) Also, wireless local area networks such as 802.11b and BlueTooth address the problem associated with the proliferation of network cabling.

Business Intelligence and Analytics – A common complaint is that organizations are drowning in data but is thirsty for knowledge. One way to maximize the value of data is to apply sophisticated statistical algorithms to large databases in order to identify trends, associations and anomalies. This approach has been particularly fruitful in detecting fraud and abuse.

Collaboration Technologies – During the past few years, the value of collaboration has been recognized as an effective means for knowledge sharing in order to improve efficiency and effectiveness and maximizing innovation in an organization. Examples of these technologies include virtual rooms, shared whiteboards, audio/video conferencing, and e-Learning approaches.

Biometrics – Authentication of individuals can now be done by the use of facial recognition systems, retinal/iris scans, hand geometry, fingerprints, and other means. These approaches represent a significant improvement over passwords and other weak user identification techniques.

Nanotechnology – Moore's law which states that processing power doubles every 12-18 months will be in effect as long as nanotechnology continues to evolve. Its impact lies in the miniaturization of computing processes and key hardware components.

Virtual Enterprise Technologies - A virtual enterprise is defined as the grouping of independent enterprises brought

together to fulfill specific customer needs. As an example, Dell Computer Company focuses on marketing, customer support and integration while the computer components, delivery services, and other supply chain requirements are accomplished by other companies. It is more a logical architecture than a physical one -- the customer feels that he/she is dealing with a single entity. Technology enables this concept by providing improved inter-enterprise security, B2B information flow, and B2C transaction processing.

How Do CXO's Keep Up with Technology?

Technology changes rapidly and a CXO needs to keep up with technology in order to identify and implement those which offer significant business value to the enterprise. However, keeping up with technology is not a trivial task considering the overload of information coming from all directions. Here are a few suggestions on strategies for keeping on top of technology.

Keeping in touch with the customer – To identify the technologies your enterprise may need, a CXO needs to get an idea of the customer's profile, requirements and even their system infrastructure. Incidentally, a customer can be either internal or external to your organization. Also, customers may also provide insight on emerging technologies which may have applicability in your environment.

Portfolio Management - There are many similarities between managing a portfolio of technology products and services and managing a stock portfolio. CXO must know what and when to buy, when to hold and when to dispose technology. This is a useful strategy for motivating a CXO to constantly examine the environment to ensure that the technologies being used still add value to the enterprise.

Education – Continuing education in technology for all CXO's is necessary. For example, the Information Resources Management College has an excellent course called "Critical Systems Technology" which probes the rapid advances in all aspects of information systems technology from the perspective of a CXO. Particular attention is paid to software development technologies, data management, computer systems hardware, human-computer interfaces, voice recognition, natural language understanding, collaborative technologies, telecommunications technologies, electronic commerce, and virtual reality.

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Environmental Scanning – A wide range of periodicals and newsletters can help serve the information needs of CIOs, CSOs, CEOs and other government and corporate executives whose business survival depends on the strategic use of information technology.

Pilots/Prototyping – A key best practice in implementing technology is to try it out first on a segment of an enterprise. Besides testing a technology's suitability within your environment, word of a successful pilot will help to ensure early buy-in from the rest of the organization.

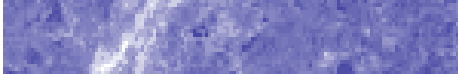
Networking – It is no surprise that much of a CXO's time is spent networking with other CXO's, customers, and other stakeholders. These networking opportunities allow one to learn of new technologies, issues and challenges associated with these technologies, and successful migration strategies.

Research Groups – Gartner, Forrester, Giga, IDC and others provide technology intelligence, industry analysis, market data, and strategic and tactical guidance to builders, providers, and users of information technology.

Idea Management – Ideas relating to the application of technology are generated continuously from employees, partners or customers of the enterprise and it necessary to capture ideas so it can be nurtured and developed accordingly. Also, CXO can provide the impetus toward moving to a more innovative environment by promoting workshops, brainstorming sessions, and other events aimed at idea generation.

Passion – An effective CXO is one with a personal drive to achieve and maintain excellence within the organization. This internal motivation will help in the enterprise to progress using technology as the enabler.

In conclusion, CXO should look at technology like a carpenter looks at tools for building a home. One must select the right set of tools for the right job. Also, one must be careful that the tool does not end up hurting the house owner (picture a hammer landing on the carpenter's thumb). The vision of a home, built with state-of-the-art technology (such as wireless networks) and meets the requirements of the owners, is achievable through effective knowledge and communication.



“CXO should look at technology like a carpenter looks at tools for building a home. One must select the right set of tools for the right job.”



(Continued from page 1)

In an LMS, there is a set of services that launches learning content, keeps track of learner progress, figures out in what order (sequence) learning objects are to be delivered, and reports student mastery through a learning experience.

Most web content consists of simple hyperlinks from one page to another. In the SCORM world, the LMS is "smart" and knows what is to be delivered to learner, when the learner has mastered a skill or competency, and can branch to the right content when needed (e.g., for remediation). Regular web content and servers do not know how to do this.

Therefore, SCORM is useful in standardizing how to launch and track directed learning experiences, and to define the intended behavior and logic of complex learning experiences so content can be reused, moved, searched for, and re-contextualized. Simple hyperlinked web sites do not need SCORM because the user are not being tracked and assessed for skill/competency mastery.

Q: What is in SCORM?

A: SCORM is described as a bookshelf housing volumes (specifications) that originated in other organizations. Note, however, that often these specifications have been extended, and additional detail and implementation guidance has been added. SCORM is, therefore, more than just a collection of others work, though it directly relies on the source specifications.

SCORM has three parts:

- Overview - discusses the model, vision and future
- Content Aggregation Model – covers how to put learning content together so it can be

moved and reused. This model includes a dictionary of tags that are used to describe learning content in a variety of ways.

- Run Time Environment – describes how content is launched and the learner's progress is tracked and reported back.

Q: What has SCORM done so far?

A: So far, SCORM can show how to tag content, package, aggregate learning objects, launch content, and track learner performance. SCORM has been focusing on the development of a standardized way to represent complex sequencing and navigation of content objects. Sequencing is crucial to representing complex behaviors of learning experiences in a standardized way. It will add capability to the current SCORM specification. Future versions are expected to expand the initial scope of the SCORM as technology further develops.

Q: As a faculty member, why should I care about SCORM?

A: When acquiring an LMS, you need to make sure that the package is SCORM-compliant. If it is compliant, you can take advantage of its useful functions such as tracking learner development, advanced searching capabilities, and the sequencing of learning objects.

Q: Where can I get more information?

A: More information is available at the Advanced Distributed Learning website:

<http://www.adlnet.org>

Sources:

<http://www.rhassociates.com/scorm.htm> and
<http://www.adlnet.org>

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300 5th Avenue Marshall Hall (Building 62)
Fort Lesley J. McNair, DC 20319
(202) 685-2096
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**Department Chair: Dr. Chrisan Herrod
Newsletter Editor: Dr. Les Pang**