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Untying the Gordian Data Knot

A Paper on Information Engineering (IE) and Corporate Information Management (CIM)

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ABSTRACT

Untying the Gordian Data Knot
A Paper on
Information Engineering (IE) and
Corporate Information Management (CIM)

by
LTC William F. Reyers

The basic building blocks are coming together, but the most difficult work is yet to come. DoD must find the best way to transition the data in its legacy and migration systems which today are integrated into a gigantic gordian knot.

The Defense Information Systems Agency (DISA) provided the above assessment in September 1992 as part of the DoD status report on the CIM initiative. This assessment succinctly identified the major challenge for CIM. The current data in DoD systems must transition to the future DoD systems. DoD has selected the Information Engineering approach to accomplish this data transition. As such, Information Engineering and its associated data standardization processes become the pacing factors for the successful implementation of CIM. As Paul Strassmann stated, "Without standardized data, there is no CIM."

With the success of CIM totally dependent on data standardization, it is important that we understand this effort, the progress to date and the probability for ultimate success. This paper explores CIM and Information Engineering and discusses several impediments that can hinder CIM if left unaddressed. The paper also contains an alternative to the current data standardization process underway. The alternative provides a way to accelerate CIM implementation while simultaneously providing the foundation for future data standardization.

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SECTION I: INTRODUCTION

In 76 B.C., Petronius Arbiter penned his famous aphorism on reorganization. He stated that every time an organization got to know what it was doing, someone reorganized it.

In the mid 1980's, James Martin began to advocate the Information Engineering (IE) approach to Information Management. He stated that data standardization represented the new frontier to be conquered to obtain cost-effective Information Management. The IE process consists of a comprehensive business analysis to derive the data needed to operate an enterprise. A comprehensive business analysis requires the total decomposition of the functions and activities of the entire business. This IE approach is time-consuming and expensive.

Now, the Department of Defense (DoD), amid multiple reorganizations, has adopted IE as the foundation of its Corporate Information Management (CIM) initiative. CIM represents DoD's latest attempt to control the exponential growth of funds spent on information management. DoD and the military departments of the Army, Navy and Air Force currently spend $15 billion a year on information management.[1] CIM does not just target cost savings. The true benefit of CIM lies in improving the ability to make better decisions by providing decision makers with accurate information produced in the most cost-effective manner.

CIM currently receives much publicity. Most of it centers on the technical side which includes the design, development,

acquisition and operation of information resources. The technical portion of CIM represents a small part of the total information business. The remaining portion of the business, the functional side, receives very little publicity. Yet, the functional side of the information business consumes most of the resources, offers the greatest potential for cost savings, and drives the technical side.

A review of associated costs and identified potential savings reveals the magnitude of the resources involved. As stated above, DoD spends $15 billion a year on the technical business side of Information Management. Under CIM, using consolidations and other management improvements, DoD expected to save $6.9 billion over a seven-year period.[2] Current revisions have lowered the expected savings to $4.5 billion. On the functional business side, DoD expects to save $29.1 billion during the same seven-year period by improving its business processes under CIM.[3] Thus, the stakes are high and the savings on the functional side represent the critical success factor for CIM.

The reader should note the impact of these figures beyond CIM. In downsizing the DoD, the Bush administration formulated a budget that projected $71 billion savings over a seven year period from Defense Management Reviews (DMRs). The savings result from efficiencies. CIM initiatives represent 49% of the $71 billion savings. On 12 February 1993, Secretary of Defense Aspin announced that a bi-partisan committee would review these

figures. The fear is that these savings are not achievable, and if not, the 1.6 million man base force is underfunded. Thus, the future of DoD force structure and programs relies on the ability to validate and obtain these savings.

So, let's recap the situation. DoD needs to improve its information management business. Requirements for better information coexist with requirements for information produced more efficiently. The dollar savings have already been targeted and announced. DoD has initiated CIM to accomplish this improvement and simultaneously to save $36 billion. CIM relies on IE to achieve its goals. IE relies on a lengthy and costly business process redesign conducted by the functional user organizations to accomplish the IE goals. Meanwhile, the functional organizations which will accomplish these business process redesigns face a future of continual reorganization as DoD downsizes and restructures for the future defense missions. All of this begs the question: can CIM ever succeed?

This paper looks at this issue and others that loom as significant challenges for CIM. The intent is not to bash CIM and then conclude that we cannot get there from here. In the era of forthcoming budget and force structure reductions, CIM represents a way to achieve both technical and functional efficiencies. With this in mind, I will provide an overview of IE (Section II), and CIM (Section III) and then identify several challenges which need resolution for CIM to succeed (Section IV). Sections V and VI will present recommendations and conclusions.

SECTION II: INFORMATION ENGINEERING

> Information Engineering is an integrated set of formal techniques for the planning, analysis, design, and construction of information systems from an enterprise-wide business perspective.[4]

IE represents the foundation of CIM. An understanding of IE enables a better understanding of CIM. A review of the short history of automated information management provides the necessary background for understanding IE.

A. BACKGROUND

In the beginning, when computers were first applied to business applications, the technology was very expensive. All efforts centered on the efficient use of the Central Processor Unit (CPU), the most expensive part of the computer. Everything was subordinated to CPU use. Because of this, centralized operations became the norm. Batch processing -- where input data is acted upon in minimum CPU time to produce output -- achieved efficiency. Application languages such as COBOL were designed to support this centralized, batch processing mode. Data was treated as a proper subset of the application. No data sharing was envisioned and data was "stovepiped" from the bottom of the organization to the top.

The high cost of technology also drove the application of technology to areas where money savings were the greatest. Business areas characterized by repetitive application of the same processes were automated because it saved money. Functional managers automated areas such as pay, personnel and supply.

These areas shared the common characteristic: a uniform process could be applied to a large number of entities; calculate wages, update inventory, update employee files. Although some similar data existed as common elements among the applications, data redundancy and increased storage costs were cheaper than CPU time.

Government and industry invested heavily into these systems. Most of these systems are still with us today. In fact, it is estimated that DoD has 10,000 application systems employing 1.4 trillion lines of application code.[5] We refer to these systems as "legacy" systems. Legacy systems share similar traits: large (1 Million+ lines of code), centrally processed (on big, expensive computers), stovepiped (unshared data), and expensive to maintain.

In the early to mid 1980's, the growing demand for more information intersected with the decreasing cost for information technology. Meanwhile, Government and Industry found themselves wedded to the unresponsive and expensive information systems they created in the 1970's.

In 1982, James Martin appeared on the scene. Although he was not the first to recognize the problems, he was the first to articulate an integrated solution. Since then, he has published 42 books on how to solve the problem. His 1982 book, Strategic Data - Planning Methodologies, republished in 1989 as Strategic Information Planning Methodologies, established a new basis for information planning. He then published a trilogy on this new approach: Information Engineering.

IE offers disciplined techniques for information systems

from planning and modeling to implementation and maintenance. Two central tenets underlie IE. First, the organization's business and its information systems are inextricably linked; that is, there is a symbiotic relationship where each cannot exist without the other and together they give life to the organization. Second, data and processes are the constants in this relationship while technology and organizations are the variables.[6]

IE broke the paradigm for information systems planning. It put the user in the lead role and the systems engineer in a supporting role. IE consists of four phases: planning, analysis, design, and construction. These phases do not simply focus on the production of information systems. Rather, they place more emphasis on business process redesign before automating the process. This is important as most business processes were designed prior to the modern computer, and those that followed tended to sub-optimize their own information technology without regard to the entire organization.[7] IE provides a model for innovation and improved efficiency as the power of modern telecommunications and total organizational needs are applied to the business processes.

B. AN INFORMATION ENGINEERING OVERVIEW

IE has four important characteristics: an enterprise-wide perspective, a business focus, customer involvement and an automated approach to developing information systems.[8] These four characteristics, along with the IE techniques for planning, analysis, design and construction, drive the IE process. This process produces a series of plans, models, diagrams and matrices

built around three basic products:

1. Business Models which detail the functional processes;
2. Data Models which identify the data needed and its flow;
3, Interaction Matrices which relate the business models to the data models.[9]

One can easily imagine the complexity of all this. Thus an automated approach becomes absolutely critical to IE. To support the need for an automated approach, the IE industry has created a definition language and supporting software for modeling the enterprise, its businesses, its processes and its data. These are called I-DEF tools for Integrated Definition. I-DEF tools support the planning and analysis phases of the IE process. CASE (Computer Assisted Software Engineering) tools pick up where the I-DEF tools leave off. CASE tools support the design and construction phases of IE. Modern CASE tools provide a repository for all the I-DEF and CASE products, interrelate those products and generate the computer code for the information system.

The IE process begins with the planning phase. In this phase, the senior managers in the enterprise articulate the corporate strategic vision along with the functional vision and the functional processes. The planning phase produces the Strategic Information Plan which contains the enterprise model and identifies the Critical Success Factors (CSFs) for the enterprise . This phase normally takes 3 - 6 months to accomplish.[10]

With the enterprise model in hand (and in the I-DEF data base), the analysis phase begins. Here, the divide-and-conquer principle takes over as the entire enterprise begins the

functional decomposition of the processes they use to accomplish their business. Each functional process is decomposed until it reaches an activity level where it cannot be decomposed any further. Business process redesign begins at this point. Business process redesign takes the activity along with its processes and subjects them to a simple test. This test determines if the activity and process support the CSFs for the enterprise. That is, if they provide an added value, they are retained, but if they add no value or add a negative value they are eliminated. This results in a logical design for each business area of the enterprise based on the processes required to accomplish its business and the data required to support the processes. This phase results in two basic products: the Logical Process Model and the Logical Data Model for the enterprise. These models become part of the integrated data base of the I-DEF tool. The I-DEF tool creates the interaction matrix between the data and the process models. These matrices enable the detection and reporting of any duplications or inconsistencies among the models. Iterative rounds of analysis and model updating resolve any problems. This phase normally takes 6 - 12 months.

With the Logical Data Models and Logical Process Models completed, the design phase begins. In this phase, the logical models are transferred into physical models. The data model enables the design of the data base. The process model enables the design of action diagrams or mini-specifications. The CASE tool becomes operative in this phase. The I-DEF and CASE repositories grow. This repository is often referred to as the Encyclopedia. The data dictionary resides in the encyclopedia.

A data dictionary does not contain the actual data that an enterprise uses. Rather, it contains data about the actual data an enterprises uses. This data about data, or Metadata, identifies the standard term for the data, the acceptable values of the data, who creates and uses the data and what applications require the data. Since a data item sometimes has more than one name associated with it, the norm for legacy systems, the Encyclopedia also has a thesaurus function. The thesaurus cross references all other names or aliases of the standard data name to the standard data name. The actual data that an enterprise uses for its business process are contained in data bases, not data dictionaries.

With the planning, analysis and design phases complete, and automated I-DEF and CASE tool repositories, the construction phase begins. One simply presses a button and the CASE tool generates the computer application code for the information system. Most CASE tool vendors claim their CASE tool will automatically generate 90-95% of the application code. After testing. the system is fielded (implemented).

The information system then enters the maintenance stage. This stage normally consumes 80% of the system's life cycle cost. IE supports this stage extremely well and offers significant cost savings. As changes occur to the processes (models and diagrams) and/or to the data (models), one simply updates the repository. Once the repository is updated, one simply presses the button and the CASE tool generates the updated application code. With this capability, the days of undocumented software patches will disappear and maintenance cost will shrink.

SECTION III: CORPORATE INFORMATION MANAGEMENT (CIM)

A. DEFENSE INFORMATION MANAGEMENT AND CIM:

DoD Directive 8000.1. Defense Information Management (IM) Program, dated 27 October 1992, establishes policy and assigns responsibilities for the implementation, execution and oversight for the Defense IM program. It governs the continued evolution and improvement of the essential elements of IM. These include the functional process improvement program, information resource management, and the supporting information technology and services throughout the Department of Defense. It does not mention CIM. The manual that implements the directive, DoD Manual 8020.1, Functional Process Improvement, 5 August 1992, specifies that CIM is the implementing initiative for Defense IM.

CIM is an initiative that represents the largest undertaking of its kind ever. It operates at multiple levels in both the functional and technical business sides of DoD and the services.

Quantifying the resources involved shows the magnitude of this initiative. As discussed in the introduction, CIM targets $36 billion savings over seven years while redesigning the business processes and information systems that DoD uses. Recall that the technical side alone accounts for $4.5 billion of savings over 7 years out of annual expenditures of $15 billion. This annual expenditure supports 1,700 Data Processing Installations, 38 major Central Design Activities, 1.4 trillion lines of code, 650,000 work stations and terminals, 10,000 Local Area Networks, and 102 long distance networks.[11] Despite the huge expenditures and tremendous number of IM resources, our systems are outdated, unresponsive to users' needs and expensive to

maintain. CIM will solve this. In the words of the Director of the Defense Information Services Agency (DISA):

> Imagine a large telecommunications company... like AT&T, merging with a large computer/ADP company... like IBM, to form a "soup to nuts" information services company... like EDS. DISA is going to be the EDS for DoD.[12]

This statement serves to highlight the complexity and magnitude of CIM just on the technical business side. But CIM represent more the this. CIM also redesigns how the functional users will do their business.

Earlier, I stated that IE serves as the foundation for CIM. Further, I defined IE using the traditional IE definition as a set of techniques. Thus CIM and IE are not synonymous. DoD went well beyond simply adopting IE (a set of techniques). CIM takes IE and superimposes a policy structure to make it a methodology.

A methodology is more than a set of techniques. A methodology is a complete set of managerial procedures that facilitate the definition of the business and the development of information systems. Thus, an IE methodology applies the principles and techniques of IE to identify, define, and solve information related business problems.[13]

The CIM initiative really consists of multiple parallel actions involving policies and procedures in the functional and technical areas within DoD. A review of the CIM initiatives shows the adoption of the IE techniques on both functional and technical sides. The adoption of the IE techniques on the functional user side at the managerial levels allows everyone in the DoD business to speak the same language, to use the same procedures and to operate in support of a shared corporate view.

B. POLICY ACTIONS

DoDD 8000.1 establishes the DoD Information Management Program. Among other things, it sets as policy the following:

1. The need for information shall be determined by the function supported.

2. Data and information shall be corporate assets structured to enable full interoperation and integration across DoD.

3. The identification and validation of process improvement shall be based on DoD approved activity models that document functional processes and associated data models.

4. The principle of fee for service shall govern information services.

5. A centrally managed infrastructure for computing and communications shall be used.

6. Approved DoD-wide methods, approaches, models, data, tools, information technology and standards shall be used.

DoDD 8000.1 further specifies that the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence shall serve as the principal staff assistant for the Defense IM Program and provide for the development and maintenance of an IM model(s) that presents an integrated top level representation of DoD processes, information flows and data.[14] It further charges each principal staff assistant in OSD and the Chairman of the Joint Chiefs of Staff to develop, integrate, implement and maintain functional strategies, plans, objectives, architectures, IS strategies, and related models and repository contents that support the functional mission. Finally, DoDD 8000.1 establishes 14 principles of information management, two of which follow:

- Proposed and existing business methods must be routinely subjected to Cost Benefit Analysis which includes benchmarking against the best public and private sector achievement.[15]

- Information shall be managed through centralized control and decentralized execution.[16]

These two principles bring important changes to information management in DOD. The former introduces activity based costing into the routine management of functional areas. The latter aligns DoD IM with its organization. This is a cardinal rule of information management. Effective IM reflects the organization. The DoD organization is one of centralized control and decentralized execution. Our legacy IM systems represent centralized control and centralized execution. The cost of technology at that time dictated this as DoD automated.

C. CIM POLICY IMPLEMENTATION

DoDD 8000.1 begot DoDM 8020.1, Functional Process Improvement. This "how to" manual encompasses all activities related to the collection, use, and dissemination of all data and information regardless of the medium or intended use. It specifies:

> Central to success of the Defense IM Program is the concept that the OSD Principal Staff Assistants, as the senior functional proponents supporting the Secretary of Defense, must exercise all necessary authority and responsibility to continuously evaluate and improve their functional processes, data requirements, and information systems.[17]

The manual also provides the DoD enterprise model and charges all functional area managers to develop the functional architectures for their areas. These functional architectures will then result in the functional area strategic plans and business models which then feed the data management and information strategy plans. All these plans feed into the CIM Implementation Plan.

The functional area strategic plan has a long-term time horizon (ten years) on actions to achieve functional objectives for the functional area. The CIM Implementation Plan has a near-term time horizon (12-18 months) to implement CIM in the functional area as the vehicle for functional process improvement.[18] The different time frames clearly show that CIM is not a program that will solve all problems in five years. Rather, it is the near-term vehicle for implementing long-term solutions.

To identify long-term solutions, functional managers implement the IE techniques. Starting with the DoD Enterprise Model, they begin the functional decomposition and business area analysis. They identify the value-added activities to continue or streamline and the non-value activities to delete. As the former Director of Defense Information, Paul Strassman, stated:

> ....savings result from changes in business methods and revision of DoD policies rather than in more efficient computerization. There is no point in having a computer do something faster if it should not be done at all.[19]

DoD adopted the US Air Force's (USAF) I-DEF tool and mandated its use for this business area analysis. Now, all functional managers in DoD use a standardized modeling tool to develop their process and data models.

DoD does not have a standard CASE tool. Those available in the commercial sector do not interoperate among themselves or with the DoD I-DEF. So, DoD initiated action to acquire one that will interoperate. In August 1992, the USAF, acting as the executive agent for DoD, issued a Request For Proposal for an Integrated Computer Assisted Software Engineering (I-CASE) tool. The contract is scheduled for award in June, 1993. The

deliverables will provide DoD with a standard I-CASE tool that interoperates with I-DEF, builds a repository, and automatically produces Ada code.[20]

D. CIM PROGRESS TO DATE

To recap thus far, the policy to implement the IE methodology is in place and is being implemented. One IE tool is in place and the other is coming. Responsibilities are set and actions are underway.

Do not let the recent dates of the DoD policy documents confuse you. CIM has functioned for almost four years operating on interim guidance. CIM has accomplished many things in these four years that further underpin its potential for success. A partial review of these accomplishments follows.

In addition to making IE a standard methodology, DoD tackled another problem associated with IE. Simply stated, IE does not adequately address how to bring legacy systems up to date. James Martin never really addresses how to evolve these old batch systems with their private data bases into the modern IM world. He assumes a clean slate. Industry simply out-sources the operation and maintenance of their legacy systems while they restructure their IM world. DoD took a different approach. Faced with tremendous redundancy (a minimum of five systems for every application; DoD, Army, Navy, Air Force, and Marines), the cost for out-sourcing became prohibitive. CIM decided to consolidate on a few systems and then migrate these few systems to Standard DoD systems. "This approach takes maximum advantage from the legacy systems, and minimizes cost and technical risks while

addressing DoD-wide technical and functional integration issues."[21] The CIM Office of Technical Integration (OTI) estimates that 10,000 systems with 1.4 trillion lines of code exist to support nine functional areas. To date, OTI has data on only 1,600 of these systems.[22] But consolidation is under way.

Today, 626 systems exist to support pay, health, personnel and logistics functions. By 1996, these 626 systems will be consolidated into 58 systems.[23] In the Defense Base Operating Fund arena, 162 systems currently exist. By 1996, they will be consolidated into one system.[24]

The CIM consolidation process is simple. After a functional and technical review of all systems supporting a function, the functional manager selects the system that meets the functional processing standards and data requirements the best. This system becomes the "migration" system and DoD mandates its use by all users. As a "migration" system, the system will become the standard system. This means it will undergo transition to a standard technical environment and employ standard data elements. The functional managers must present a cost justified business analysis to add increased functionality to the system (recall the importance of activity-based costing discussed earlier).

Consolidation actions continue at a rapid pace. In the pay arena CIM has reduced 70 systems to 12 and these will go to 7 by 1996.[25] Reducing the technical support from 70 systems to 12 enabled DISA to reduce billing rates for its fee service by 22.5%.[26]

Actions to standardize data are underway too. At the end of FY 92, users submitted 38,000 data elements for deconfliction and

standardization. In one case 150 aliases existed for one data element.[27] In recognition that without standard data elements, interoperable information systems will remain a myth, DoD has incorporated data administration programs in every DoD functional business area.

In October 1992, the Office of the Assistant Secretary of Defense published The Status of the Department of Defense Corporate Information Management (CIM) Initiative. This document details CIM accomplishments to date. Finance, Personnel, Health, and Materiel & Logistics functional managers describe their progress on their business process improvements, data modeling, and functional economic analyses. They further identify target dates for the completion of their process models, data models and business improvement plans. This report also presents the technical perspective. Actions are under way. Things are progressing. But, it ends on an ominous note:

> The basic building blocks are coming together, but the most difficult work is yet to come. DoD must find the best way to transition the data in its legacy and migration systems which today are integrated into a gigantic Gordian knot.[28]

SECTION IV: SIGNIFICANT CHALLENGES TO CIM

A. OVERVIEW

The "Gordian" knot of data cited in the preceding section represents the most significant challenge CIM faces. It can absolutely stop CIM dead in its tracks. As the "Godfather" of CIM, Paul Strassman, stated,"Without standardized data, there is no CIM."[29]

Other challenges also exist; such as, organizational inertia, building open systems networks (standards), building an information utility (infrastructure), defining the degree of centralized and distributive information management, and, finally, doing all this in an era of declining resources where the organization will undergo continual reorganizations. None of these challenges individually represent a showstopper as data does. However, collectively, they can smother CIM.

The underlying challenge that CIM faces is that DoD is the first activity of its size in the world to undertake an initiative of this magnitude. Because of this, DoD will have to go it alone in many areas. Commercial products simply do not exist in many areas. Private sector examples of success do not exist. DoD in most cases must trail blaze unchartered territory.

A discussion of some of these challenges highlights the tremendously difficult work that lies ahead for the CIM initiative. Such a discussion follows.

B. THE CORPORATE DATA BASE UTOPIA

ISSUE: Assume we untie the "Gordian" knot of data and all the data is standardized and in the data dictionary. The problem now becomes one of how to transition the migration systems to the standard systems employing standardized data. How will this be done? How long will this take? How much will this cost?

DISCUSSION: The answers to these questions become the key for CIM's success and the pacing factor for CIM's implementation. Without standardized data operating in the field, all the fully interoperable telecommunications networks, computers and applications are for naught. Automated systems will not be able to talk to each other in terms and values that are constant. So, we must get standardized data operational in the field.

The solutions to accomplish this remain undefined. However, the CIM consolidation initiative limits the scope of these problems. For example, prior to CIM, 70 pay systems in DoD required data standardization. Now, only 12 pay systems require it and by 1996, only 7 systems will require it. This makes the problem easier.

When the actual transition begins, two other major problems will arise. The first is data synchronization which addresses the need for the data to remain constant over time throughout a distributed data base. The second is the cross reference of standard data to legacy and migration systems data.

Synchronization problems occur in the data base design and operation stages. The physical data bases must be designed with synchronization in mind. Decisions on how many physical data bases will exist (one or many), their locations, and the population they support will drive the design of the information

infrastructure. DoD's world-wide and around-the-clock operational requirements create design challenges on a scale not yet encountered by industry. Data values must remain consistent. Whether we employ mega-data centers or completely distributed data bases, operating over 24 time zones, 24 hours a day by its very nature inhibits consistent data values.

The actual fielding of the standard systems employing standardized data poses additional challenges. The magnitude of DoD information management operations precludes a single cut over from migration systems to standard systems. It will take time to field standard systems. During this time migration systems and standard systems will operate simultaneously to support field operations. Given this reality, CIM will have to develop automated procedures (black boxes) that enable the reporting, merging and use of both non-standard and standard data.

The development of these black boxes will help solve the second problem, reference back to non-standard systems by standard systems. As we transition to standard systems, all historical data will be left in its legacy or migration format (unless we bear the expense to transition that too). For many reasons, system reconstitution and audits, among others, DoD must have a capability to cross reference standard data values to historical non-standard data values. This black box capability simply must exist.

The Information Management industry has not produced solutions to the challenges cited above. In fact, academia still wrestles with theory in many of these areas. DoD will have to invent solutions on its own.

C. ORGANIZATIONAL INERTIA

ISSUE: CIM imposes a new methodology on the largest business organization in the world. Managers in the functional areas must review everything being done to do it better or to eliminate it. This is hard to accept after the organization has produced the strongest fighting force the world has ever seen, and the US won three wars in four years; the Cold War, Operation Just Cause (Panama), and Operation Desert Storm. In short, how do you teach an old dog new tricks?

DISCUSSION: Fortunately, DoD recognized this problem up front. This early recognition resulted in realistic time frames for CIM implementation. DoD provides the best account of this:

> Even the most ambitious initiatives can succeed only by making steady progress one step at a time. Human factors not information technology are the pacesetters for the rate of progress of CIM methods. The legacy of procedures and assets, along with institutional motivation to change determines the rate of these changes.
>
> The CIM Executive Leadership Group(ELG) recognized this organizational inertia: "many aspects of the Department of Defense's business functions and activities are cumbersome and inflexible, particularly in light of the pace of changing world events."
>
> The ELG did not see this as a insurmountable problem. Instead, the ELG estimated about a decade to be the time to make the Department-wide changes in the approach to examine the business processes overall.[30]

So, CIM adopted a ten year planning horizon from the beginning. Further, CIM is not operating in isolation. DoD has also implemented Total Quality Management (TQM) techniques for improving business and organization performance. The IE methodology compliments TQM. The Information Strategy Plan developed by IE correlates to the Strategic vision in TQM. IE emphasizes end-user involvement in all phases while TQM emphasizes customer satisfaction. IE employs Joint Planning Teams while TQM employs Process Improvement Teams. IE uses system metrics at the function points while TQM uses quality metrics.[31]

Organizational inertia will exist no matter what. The fact

that it has been factored into the CIM implementation planning represents the first step in solving the inertia problem. TQM and IE operating either individually or in tandem will provide the means to overcome the organizational inertia problems.

D. STANDARDS AND COMPETITION

ISSUE: Building a standard information system requires technical standards and standard contracts to acquire compliant items. These tend to limit competition. But Congress demands competition. Can we build a standard network system and still provide for competition?

DISCUSSION: In the past, the services have run headlong into this problem. Now, the magnitude of the problem will grow as DoD will build the infrastructure for itself and the services.

The good news is that industry has recognized the direction of CIM. Since CIM began, industry has become more serious about producing open systems compliant products. Multiple vendors now have off-the-shelve products that employ POSIX (Portable Operating System Environments), GOSIP (Government Open Systems Interconnect Protocol), Ada Compilers and other products which comply with open system standards. Industry now cooperates among themselves in the pre-competitive stages of product development to insure common industry standards. So, it appears industry can support the competition for open system standard items.

The government needs to develop the acquisition strategies and contracts to support this environment of numerous available vendors. One of the TQM principles calls for long-term relationships with suppliers. However, long-term contract awards by DOD to any single vendor will be viewed as non-competitive. The upcoming award of the I-CASE contract in June 1993 will serve

as a good test case. If one firm wins a long-term award, the others will howl to Congress and the acquisition system will grind to a halt. DoD acquisition managers must develop ways to spread contract awards for common items among multiple vendors. This will allow DoD to build its information infrastructure without running afoul of Congress.

E. CHICKEN AND EGG PROBLEMS

ISSUE: The next decade promises reduced resources for DOD. Yet, CIM will operate the old information infrastructure while it builds the new open systems infrastructure. What strategies must be put in place to allow this to happen?

DISCUSSION: The results of the data problems and the standards problems discussed above directly affect this problem. Building a standard infrastructure without standard data is mindless. Open systems compliant products are essential for DoD's new information infrastructure. The magnitude of the existing infrastructure also plays heavily. Recall that 170 data processing centers, 38 central design activities, 1600 automated systems, 10,000 LANS , and 102 long-distance networks must migrate to the new infrastructure. Most of the existing infrastructure relies heavily on proprietary standards. For example, most of the Army's application systems rely on IBM's MVS (Multiple Virtual Storage) for their operating system and the IBM System Network Architecture (SNA) for terminal communications. The Air Force relies heavily on Burroughs computers. The reliance on proprietary standards and the proprietary infrastructure must be replaced to achieve the open systems environment.

So, DoD must spend to maintain the old. DoD must spend to

acquire the new. Then DoD must spend to transition the old to the new. Given the projected resource streams, this will take decades. The black boxes discussed as part of the data challenge can also serve a purpose here. DoD needs industry to develop black boxes that can serve as translators among the various hardware, software, data, and telecommunications baselines.

F.THE INFORMATION UTILITY

ISSUE: Once in place, the information infrastructure will operate as a fee-for-service utility. How can this be maintained when vendors will come in the back door offering users cheaper but nonstandard services?

The Harvard Business Review documented this problem back in 1974. In a fee-for-service environment, users will look for cheaper ways to do business. This places competitive pressures on the infrastructure manager which are healthy. However, if not controlled, sub-system optimization will occur at the expense of the entire system. This accounts for our current state of affairs; namely, optimized sub-systems have resulted in an inefficient total system.

Fortunately the CIM policies preclude this mode of operation. The emphasis on activity-based costing and process review from the enterprise perspective promotes system optimization and demotes sub-system optimization.

G. PETRONIOUS ARBITER MEETS JAMES MARTIN

ISSUE: IE requires functional organizations to model their business processes. DoD will undergo numerous recrganizations as it evolves to support the new world order. Petronius said, every time we got to know what we were doing, someone reorganized us. With 12- 18 months required to analyze business processes, how will organizations ever stabilize to define what they are doing?

DISCUSSION: Anyone who has lived through a reorganization realizes that a new organization requires a learning curve and time to become operational. Yet, IE relies totally on the organization to define its business processes. If the reorganization cycle lies within the cycle of the ability of the organization to defines its processes, gridlock will occur.

While this appears logical, the reverse will probably occur. Recall the discussion on organizational inertia. Reorganizations can actually help solve this organizational inertia problem. Assigning new missions to new groups provides the potential for fresh views. These new organizations will also receive assistance from IE as the repository retains process and activity diagrams from the previous organization. Thus, the learning curve should be reduced.

SECTION V:RECOMMENDATIONS

Given all the foregoing, what should CIM do. I emphatically say, drive on. However, there is one long pole in the tent that can stymie CIM: data standardization. CIM implementation could be accelerated by throttling back on data standardization. Let me explain.

Data standardization at best remains an arcane science that has not evolved much beyond the applied research stage. While commercial products abound that tout the benefits of standardization and how great everything will be once you get there, getting there is the problem. To get there, one enters an esoteric land of onerous naming conventions and rules. The products reside in the data dictionary, along with schemas and other repository information. Yet, repositories from one vendor cannot interact with repositories from another vendor. A crying need for artificial intelligence exists here. What has happened is that we managed to breakup the private "stovepiped" data bases of application systems to create private "stovepiped" data bases belonging to Data Base Management Systems.

The technical standards for relational schemas and Structured Query Languages among other critical standards need to be finalized and approved. Lawrence Berkeley Laboratory estimates that it will take a minimum of four years to build and merge the data dictionary, compatible schemas, a thesaurus and distributed access.[32] Many experts consider this an optimistic estimate. And when done, all this will simply provide a capability to support

the development environment. The production environment in the field remains to be resolved. The commercial support does not exist for what CIM needs to do.

I do not advocate the abandonment of data standardization, only a modification of the approach. If consolidation works so well for the application systems, then, DoD should adopt it for data standardization. DISA should simply mandate that the data which exists in the migration system is the standardized data. Then, all systems must standardize on this data. The black box translators I discussed before can be used effectively here too.

Data has remained constant throughout DoD. Soldiers in the revolutionary war and Dessert storm had names (a data item). Supplies always had stock numbers (a data item). Why waste time in having functional managers redefine what they already know. DISA should standardize on existing data elements and move on.

DISA should leave the ultimate data standardization for CIM 2, or the "Son of CIM". DISA should continue to construct the data encyclopedia as an parallel action. The encyclopedia will eventually absorb the black boxes as a matter of due course. If DISA does this the next iteration of CIM will be much easier because DoD will have a stable data baseline and Industry will have matured the products to support data standardization needs better.

SECTION VI: CONCLUSIONS

After my research, readings, and discussions, I leave this subject confident that CIM can succeed. I make this judgement using the litmus tests of accomplishments. The functional managers are redesigning their business processes, not talking about it. The mandated consolidations are producing savings, not projecting them. The information infrastructure is coming into existence, not simply being planned.

Nothing breeds success like success. CIM has experienced many successes to date. This is not to say that CIM does not face tremendous challenges in the future. But, the DoD leadership has established a robust policy structure which will serve as a strong foundation. The leadership has also established realistic time frames to achieve modern Defense Information Management while using CIM as the implementation vehicle.

While technical challenges will continue to abound, the smartest thing DoD did was not to get overwhelmed by them. By adopting the IE methodologies, DoD has chartered a course that will modernize its business processes while the technical issues get resolved. This puts the functional managers in the lead position where they belong. It recognizes the symbiotic relationship that exists between business functions and their information systems. This will result in supportive information management systems.

Perhaps the greatest benefit of CIM lies in that it provides DoD a structured methodology to review how it does business

exactly when it needs one. The cold war has ended. But, the structure of DoD remains a legacy to that war. The business process redesign currently underway postures DoD to jettison the legacies of the cold war while readily adapting to the new roles, missions, and functions that will develop as the new world order evolves.

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