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*Essential Paradigm
for
Information Technology Standards Success*

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1.0 Introduction

The effect of standards and conformance tests on competition and innovation in the digital age is significant. During the United States Senate Judiciary Committee Hearing, “Competition and Innovation in the Digital Age: Beyond the Browser Wars” held on July 23, 1998, testimony and responses to questions centered on three power points supporting that:

- A single dominant market share vendor [BusTech_98] is able to control its core and other ancillary markets if it is able to *unilaterally declare* that previously unrelated products are in fact, interrelated. Once declared as related, the dominant market share vendor is then able to rationalize the melding of these formerly unrelated products into an inseparable product suite. A single price is then charged for the product suite to the great disadvantage of other vendors who only sell or service the previously unrelated products. [Fortune_97]
- A single dominant market share vendor is able to control smaller, technologically excellent and possibly future competitors by forcing these vendors to engage in “partnering agreements” that force the lesser partner to sign-away intellectual property rights and also sign-away the right to sue for any intellectual property rights infringements so that the “smaller partner” can access critical-to-existence software interface routines.
- A single dominant market share vendor is able to control its market area if it prevents, subverts, or takes advantage of technology areas which do not have publicly arrived-at, voluntary-consensus standards that are validated through robust and enforced conformance tests.

This paper addresses the third of these points, that is, standards. While the United States Senate hearing was focused on one American company, Microsoft, and even though this paper employs Microsoft as the “case study” for explaining the paradigm of successful information technology standards, this paper is not intended to be an anti-Microsoft document. For example, if this paper were written in the mid 1980s, the case study would have been IBM.

It was ironic indeed, that the hearing “Competition and Innovation in the Digital Age: Beyond the Browser Wars” took place just 25 or so years after The Committee on Data Systems and Languages (CODASYL) End User Facility Interface (EUI) committee defined the essential components of the paradigm upon which Xerox and then Apple build their computer-based visual desktop. About fifteen years ago, Microsoft, a struggling small company wanted to innovate with their PC operating system by making use of these “CODASYL EUI public-domain” concepts.



The Apple Corporation, wanting to maintain their dominant vendor position with the Lisa and McIntosh computers attempted to quash the small innovative Microsoft. Apple was not able to prevail, thus giving rise to the Window's operating system. It was in no small part because the Apple desktop was based on the CODASYL EUFI "standard" that Apple was unable to stop Microsoft's use of the computer-based visual desktop concept.

As to the importance of standards, Senator Hatch, the chairman of the Judiciary Committee asked the panel of witnesses, Mr. Kertzman from Sybase, Mr. Ellison from Oracle, Mr. Papows from Lotus, and Mr. Jeffress of Electronic TV Host if they felt that software industry standards were important. In their response, the panel members made the following points:

- Standards are essential in the information technology software industry to prevent dominant vendors from exercising the three abuses cited above.
- The Government--as the largest single information technology software buyer--should ONLY buy Standards Conforming Products.
- To prevent market dominance by a single vendor, which would inevitably result in a dramatic reduction in innovation, that standards and standards conformance were essential.
- Government procurements of information technology products should lead the way

2.0 Standards, Conformance Tests and Competition

Successful, accepted, and widely implemented and followed standards in the software industry are comprised of three critical elements:

- A significant market share vendor community (SVC)
- Publically developed, available, and evolving standards (STD)
- Enforced conformance tests (ECT)

When one or more of these elements is missing the standard generally fails. The standards cited in the table that follows supports this assertion. The table identifies the standard, a characterization of the standard's success including the state of the three critical elements (see above), and a brief description of the evolution and business purpose of the standard.



Essential Paradigm for Information Technology Standards Success

Standard's Area	Characterization	Vendor, Standards, and Conformance Tests
COBOL, a computer language supporting commercial applications	Success SVC: yes STD: yes ECT: yes	Widely supported by IBM in the 1960s and 1970s. Implemented by every major computer vendor and only recently by independent software vendors. This language serves the commercial/business community Specified by CODASYL and standardized by ANSI. Conformance tests that were developed and administrated first by the U.S. Navy and then by the National Institute of Standards and Technology (NIST).
FORTRAN, a computer language supporting scientific applications	Success SVC: yes STD: yes ECT: yes	Widely supported by IBM, CDC, and UNIVAC in the 1960s and 1970s. Implemented by every major computer vendor and by software vendor. This language serves the scientific community Specified by CODASYL and standardized by ANSI. Its conformance tests were acquired and administrated by NIST.
"C," a computer language support the development of systems software applications.	Success SVC: yes STD: yes ECT: yes	Initially developed by ATT's Bell labs, and then standardized by ANSI. The language has been implemented by every major hardware and computer language developer. It serves the "low level" application (e.g., word processor, spread sheet, DBMS and operating systems development market) Conformance tests were acquired and administrated by NIST.
Ada, a computer language supporting U.S. DoD military applications	Failure SVC: no STD: yes ECT: yes	Specified by U.S. DoD rather than CODASYL or ANSI. Developed by small vendors to serve the needs of only one customer, the U.S. DoD. Conformance tests were developed by Ada Joint program office. The language serves the needs of the DoD for development of military type software applications. Ada was not adopted as a main-stream language by any significant market share developer (e.g., IBM or Microsoft) nor is used as the development language for commercially available applications.
POSIX, a set of operating system independent functions that enable applications to run on different proprietary operating systems	Somewhat successful SVC: no STD: yes, but old ECT: yes	Specified as a set of operating system "calls" by IEEE (as a standards organization) as a common interface to proprietary operating systems. Not really evolved by IEEE so it doesn't provide sufficient support for modern, distributed systems. Never broadly/widely accepted by significant market share vendors such as Microsoft or IBM.
IRDS, a computer language and functions that support the management of information technology specifications	Failure SVC: no STD: yes ECT: yes	Specified by the U.S. NIST. Standardized by ANSI. Conformance tests and a prototype implementation was created by NIST. No significant market share vendor accepted, implemented, or vended the product to its commercial customer base.



Essential Paradigm for Information Technology Standards Success

Standard's Area	Characterization	Vendor, Standards, and Conformance Tests
SQL, a computer language that supports the computer and operating system independent definition, access, maintenance and security of data.	Success SVC: yes STD: yes ECT: yes	Specified by ANSI. Based on prior 15 years of research and prototype developments by IBM and other corporations. Standardized by ANSI 1986 and ISO in 1988, SQL became the world-wide standard for structured and formatted data. significant market share vendors such as IBM, Oracle, Informix, Sybase implemented the standard, as is, because the U.S. Federal Government's conformance tests mandated conformance prior to sale to Federal agencies. The standard has undergone three major, upward compatible enhancements: 1989, 1992, and 1999 (est.).
GIF, the specifications of the physical structure of computer generated and stored graphics.	Success SVC: yes STD: no ECT: no	The significant market share vendor creator and proprietary format that has largely been unchanged. It became a de facto standard through the world-wide acceptance of the Internet. Even though there was no formal standard or acceptance tests, GIF became so wide spread in such a short time that it could not be displaced.

The remainder of this paper addresses the three elements that form the basis for successful, accepted, and widely implemented computer software information technology areas. The example employed to illustrate these factors is the data management language, SQL that is employed in database management systems (DBMS). In the software industry there has been no other single class of software that has been as successful. SQL DBMSs operates on every hardware platform, through every commonly available operating system, and is managing data of every possible type across industries world wide. A reasonable extrapolation from a 1995 survey that estimated the annual income related to all products involving SQL is about \$50 Billion dollars in annual 1998 sales.[Market_96], [Deutsch_9602]

If these three elements were operating within other classes of software such as operating systems, word processors, spread-sheets, there would have been no need for the hearing, "Competition and Innovation in the Digital Age: Beyond the Browser Wars."

Within the context of these three elements, *success* has a special meaning:

Success here is not determined by counting the quantity of users who have purchased and are using a software product from one vendor as opposed to another vendor. Rather, *success* is measured by the quantity of different vendors who provide software products adhering to the software standard. Supporting the standard must also be conformance tests that enable users to determine whether their purchased products actually conform to the standard.

Within the scope of this definition, the operating system Unix is a *success*, while Microsoft operating system Windows (3.1, '95, NT, and 98) is a *failure*. In the case of Unix, while there is



no formal ANSI standard, there is a significant market share vendor community that generally advances the operating system in standard ways.

When application software vendors (as opposed to operating system software vendors) develop application software systems such as DBMSs, spread-sheet packages, payroll systems, etc, especially for porting among Unix operating systems, then the effort to recast a package for a different Unix brand is more or less trivial. In actuality, the application packages have to be recompiled for each different Unix brand. That however, is in marked contrast to the effort to have an application package then work with the Microsoft's Windows operating system. The application must largely be rewritten. This means that application vendors cannot just have one C library for their application programs for both the Unix and Microsoft operating systems. Rather, they must have two: One for all Unix operating systems and the other for the Microsoft Windows operating system.

While the level of effort for the set of all Unix operating systems is roughly the same as it is for the Microsoft operating system, the key difference is that for Unix operating systems there are many different vendor from whom it can be purchased. But for the Microsoft operating system there is only one vendor. Consequently, if it subsequently happens that "your" class of application software is targeted by Microsoft for inclusion into the Microsoft operating system, or if your application software--as a competitive offering--is targeted for extinction through other similar marketing practices, then Microsoft can raise the cost of the critical-to-existence software interface routines. Additionally, because Microsoft alone owns the specifications of these critical-to-existence software interface routines they can be changed without notice of any kind to application software vendors.

The value then of publically developed standards is that only the standard's organization can change the standard to which application software vendors build products. No one vendor can control the specifications of the critical-to-existence software interface routines.



3.0 A Significant Market share Vendor Community

From 1965 through 1985 information technology standards were dominated by computer hardware vendors. That is, Control Data Corporation, Univac, and IBM. DBMSs were generally offered by the hardware vendors. Starting in the early 1970s, independent DBMS vendors arose. Each vendor both specified and implemented data management very differently. Companies or Federal agencies were commonly known as "System 2000 shops," "Total shops," "IDMS shops," or "IMS shops." Because of the significant differences among DBMSs, the cost of conversion from one DBMS to another was prohibitive, and the ability to accomplish data sharing was virtually nil.

From 1970 through 1985, the IBM Corporation was developing an alternative approach to their mainline DBMS product, IMS. This new product, DB2 was based on a simple, elegant and mathematically provable model of data called relational. The paradigm of the relational data model is two dimensional tables whose rows of data are interrelated through shared data values. IBM developed the various languages that supported relational database definition, loading, query, update, and maintenance.

IBM was the significant market share vendor. In 1984, the Oracle Corporation of California brought out the first commercially available relational DBMS. Oracle was able to do this because IBM had widely discussed and published the essential information necessary to understand and build a competitive relational data model DBMS. Quickly, Oracle also became a significant market share relational DBMS vendor. Soon thereafter, the Informix Corporation and the Sybase Corporation also brought out relational DBMS products.

By 1985 there were at least six different sources for DBMS products all based on the same underlying relational data model. The significant market share vendor community had formed.

Because there was such a significant market share vendor community for just one DBMS data model, all other previously significant market share vendors who had supported their own proprietary data model based DBMSs started to wain. In 1984 relational data model DBMSs accounted for less than 20% of the installed licenses. By 1990, they were 80% of the installed licenses. As of today, well over 95% of the DBMSs conform to the relational model.

Relational DBMSs operated on every brand of hardware and every major operating system. Because there were multiple DBMSs vendors, quality, performance, features, and competition increased, prices decreased.

At the beginning, the significant market share vendor, IBM, was essential to begin the innovation. In the end, there was a community of significant market share vendors all of whom



implemented essential the same features and facilities. Users were then free to buy from the lowest price, highest quality and performing vendor with the largest quantity of features.

End users were not locked into any one vendor. Databases could be commonly defined, data could be commonly prepared and stored in different vendor databases. Training was able to be accomplished by universities. Today, there is not a single university computer science department that does not teach database management and the relational database computer language, SQL.

Third party software vendors are vendors who develop “add-on” tools or application packages for DBMSs including for example, enhanced query languages, report writers, data dictionary tools, or finance and accounting, inventory, manufacturing, distribution, and human resources.

The third party vendors are able to “safely” develop their tools and application packages because there are multiple DBMS vendors through whom they can sell their products. The “third party vendors” are not locked into just one significant market share vendor who can dictate critical interface software specifications, prices, and other terms and conditions.

While a single significant market share vendor may be needed to start the effort, a key to the success of the effort is a community of significant market share vendors who can offer both end-users and third-party vendors safety as they employ the significant market share vendor community’s product within their information technology applications. The internal tension among the members of the significant market share vendor community cause increased competition, quality and features while at the same time reducing price and risk.

4.0 Publically Developed, Available, and Evolving Standards

The second critical element is the publically developed, available, and evolving standard. There were three time periods for data management standards: 1965-1985, 1986-1998, and 1999 and beyond. There were no standards during the first period, simple basic standards during the second period (1986, 1989, and 1992), and a truly advanced standard at the start of this third period (1999).



4.1 The 1965-1985 Era

During the 1965-1985 era, there were no ANSI data management standards organizations. Consensus documents were however built, but because there was no conformance tests and certifications, vendors implemented these consensus documents their own way. They were sort of like “standards homonyms,” wherein functionally they “sounded” and maybe had verbs that were “spelled” the same way but at the level that defines portability, the functions meant something different.

1978 was start of ANSI data management standards organizations. From 1965-1985 many different types and kinds of data management systems came and went. It wasn't until the significant market share vendor, IBM, had developed and then essentially released to the public domain its specification for the relational data model before there was any real consolidation of the different approaches to database management. IBM became the second, but the biggest vendor in the significant market share vendor community of relational DBMSs. Oracle was the first.

4.2 The 1986-1998 Era

During the second era, 1986 through 1998, IBM's SQL language was transformed from a de facto standard into a de jure standard. Two critical events supported world-wide acceptance of SQL versus all previous DBMSs.

- The ANSI data management standard was required to have both a data definition and a data manipulation language component so that it could be both complete and be tested.
- Congress, through public laws such as the Brooks Bill required that Federal Government agencies procure data management systems only after they were first certified by the National Institute of Standards and Technology (NIST) as conforming to the ANSI standard.

Because the data management group within International Standards Organization (ISO) committees was chaired by U.S. Government funded leadership from NIST, world-wide acceptance was immediate and synchronized with the ANSI standard because of American dominance and the implied “blessing” the United States Government.

The expansion in features offering during the 1986-1997 in the area of data management was almost beyond measure. Today's ANSI SQL standard data management systems feature set for



the desktop computer was not even within the realm of contemplation in 1986 for data management systems of computers of any size, operating system or price.

In 1986, DBMSs supported only simple databases that were millions of characters in size. By 1998, DBMSs were supporting advanced data structures, embedded processes, sound, video, and graphics based databases that approach tens of Billions of characters in size. These new features are essential for modern data management environments that are distributed within and between enterprises and encompass the entire world through the Internet.

The last ANSI SQL standard, however was finished in 1992. None of today's emerging features for advanced data structures, embedded processes, sound, video, and graphics based databases are formally standardized. The ANSI standard for those new features is now in its final stages will be complete by early 1999.

It was only after 1986 and after the SQL conformance tests were set into place that most Federal agencies began the march to a single class of DBMS. That is, those DBMSs that conformed to the SQL language. Once there were conformance tests, agencies could count on their ability to define databases and data that could be shared. Conformance tests, backed up by "Conform or You Can't Sell" policy MADE all the vendors develop to the SQL standard.

Since 1986, SQL DBMS vendors have rapidly increased. Features have grown almost without measure, and prices have dropped dramatically. This has not happened, however in areas where there are NOT standards, a dominant vendor, and conformance tests enforced by a dominant buyer (i.e., the United States Federal Government). For example, where's IRDS today? Where's Ada? Where's Posix? For all three, there wasn't the three elements:

- A significant vendor community
- A voluntary produced standard
- Enforced conformance tests enforced by a dominant buyer

All three, like legs on a stool must exist for stability. If any one breaks, or is removed then the stool is at best very unstable.

4.3 The 1999 and on Era

The ANSI SQL standard to be adopted in early 1999 is truly advanced. It contains features for advanced data structures, embedded processes, sound, video, and graphics based databases. These are essential to support modern data management environments that are distributed within and between enterprises and encompass the entire world through the Internet.



Once this standard is complete in early 1999, the data management standards community will embark on the development of even more advanced features in well defined areas, called packages. The next set of ANSI standards will likely be released in sets of packages on a more regular basis rather than the “whole-sale” replacement strategy that took place in the first and second era. As new DBMSs become available during 1999 and in the next several years end users are going to be faced with selecting among many new and very sophisticated features. As different vendors bring out different collections of features according to different schedules the value of conformance tests and well defined conformance test certificates will become essential for those end-users who do not want to become locked into one vendor.

If the conformance tests are not readily available, robust, and clearly able to distinguish one DBMS from another, then end-users will gradually again fall into the one-vendor for the entire enterprise syndrome. Returned will be the days of being an “Oracle shop,” an “IBM DB2 shop,” an “Informix shop,” or a “Sybase shop.”

4.4 Role of Government in Standards

The role of government in information technology standards is in four parts:

- Laws enacted by Congress
- Executive Branch Department Programs
- Effective Oversight by Independent Technology Groups or Boards
- Conformance Test Development and Product Certification

4.4.1 Laws Enacted by Congress

Congress, through the “Books Bill” and recently through legislation passed during the 104th Congress (104-106 and 104-113) designated NIST as the lead agency within the United States Federal Government for standards and information technology improvements. [OMB119_95], [Congress_95]. All in all, Congress designated NIST as the lead agency to:

- Develop and promote interoperability policies and procedures across all government agencies,
- Represent Government (at Federal, State, and local levels) to National and International voluntary standards organizations,
- Support voluntary standards conforming, tested and certified product procurements.



4.4.2 Executive Branch Department Programs

In response to laws passed by Congress over the years, the United States Department of Commerce has long designated the NIST as the lead agency for information technology standards. Until late 1995, NIST's accomplishments were very significant. Between the mid 1960s through the mid 1990s, the quantity and positive impact of NIST's studies, reports, workshops and direct participation by staff has been great. A U.S. Government study performed by NIST in 1995 showed that due to the NIST created DBMS FIPS (Federal Information Processing Standards) there was an average \$30 Million in annual procurement savings alone to Federal agencies because of increased competitive procurements. [Computer World_9602], [TASC_95]. These savings flowed directly to Federal agencies as they are allowed to only purchase standards conforming and conformance tested DBMS products.

If a new and/or small vendor attempts to sell a DBMS to a federal agency, the agency, in its careful exercise of public trust, must determine if it can safely expend the many thousands of times the cost of the DBMS software in database application program and data development. With conformance tests and conformance test certified products, the agency can proceed safely because the DBMS applications, which are the real cost item can be portable. They can be portable when the database applications are defined by and then access through ANSI standard languages. If the database that is built is filled with data stored there through ANSI/SQL standard languages, then its data can both exported and then re-imported into databases supported by a competing vendor's SQL DBMS product.

Conformance tests and conformance test certified products are a significant contributor to fulfilling the requirements of a 1996 public law which requires both real decreasing costs and also increasing cost effectiveness in government information technology programs [Congress_96].

An Executive Order [President_96] specifically cited NIST as lead agency for developing standards and guidelines pertaining to Federal Information systems in support of the Government Information Technology Services Board that is to develop innovative technologies, standards, and practices among agencies and State and local governments and the private sector.

4.4.3 Effective Oversight by Independent Technology Groups or Boards

The National Research Council of the National Academy of Sciences was established through public law to provide independent assessment of Executive agency the performance. These boards of assessment create reports and present their findings to Congress. In the case of



information technology standards there is a special NIST Technical Panel. This NRC panel, according to interviews with its members regularly receives materials from NIST program managers and then meets with NIST at least twice per year.

Once a year the NRC produces an assessment report that is sent to Congress. The chair of the assessment board then testifies to congress and answers questions congress may have. The independence of the NRC boards is critical. According to the NRC Chairman, who is also the President of the National Academy of Sciences, Mr. Bruce Alberts, these boards must be “able to conduct our work apart from political pressures.” Mr. Alberts then states in his letter that “Our independence is precious to us to [be able to] provide the most objective science advise possible for the good of the nation.” [Alberts_97].

The role of the NRC is to conduct the high quality, comprehensive yet detailed and independent programmatic oversight and review necessary to ensure Congress that the pursued information technology standards are those that are the most efficient, effective, and with the greatest payoff.

4.4.4 Conformance Test Development and Product Certification

During the mid 1980s through the mid 1990s, the U.S. Government expended considerable sums of monies (about \$600,000 per year) to ensure that Federal agencies were procuring standards conforming products. The practical effect of that procurement rule was to open the procurement process to all those who could “prove” that they conformed to the standard. Because of the increased competition, quality and features rose, and prices fell.

Benefits to Federal agencies in areas of data standardization, standard data definition, data exchange, common computer program development, common staff training, and the like were incalculable.

5.0 Enforced Conformance Tests

In the United States today there are two different models for conformance testing. These are referred to as the Underwriters Laboratory (UL) Model and the Consumer’s Union (CU) Model. In the UL model, the vendors pay for the conformance testing. This model is held practical because vendors who want their products tested do so for several reasons:

- Significant buyers will not buy products that are not UL certified
- Insurance companies require UL certification before they will insure a company’s product against liability suits



- General feeling of safety afforded the public regarding the product

The Underwriters Laboratory organization in Chicago develops tests and tests products on a reimbursable basis. There are significant costs in developing tests and determining the criteria that define safety. Vendors bring their products for testing. The cost of the testing is designed to recoup the cost of test development, the ongoing costs of testing, and a fair rate of return. The UL model works for the electrical products industry because there are so many different products and vendors over which the testing costs can be spread. Their base of support is large and even though the vendor pays for the testing, the benefits the vendor receives from UL certification far outweighs any influence the vendor might attempt to either affect the testing process or to manipulate the test results.

The second model is the Consumers Union model. In this model, the ultimate consumer pays for the testing. Payment is in the form of donations to CU and in receipts from the various CU publications. Consumers “trust” CU because they take no advertising and because over the years CU has not been shy about its test results. Finally, CU has aggressively prosecuted companies who quote the results of the tests. Again, the CU model works because its costs are covered by a large community of consumers who subscribe to various CU publications and who make donations. Their base of support is large. CU evaluations are valued because the CU enjoys a reputation for excellence and for independence.

While there are two different conformance test models, they share these characteristics:

- A reputation for complete impartiality and independence
- A financial model that adequately supports the development of comprehensive batteries of tests
- A testing scenario that is comprehensive, cost effective and considered valid and above reproach
- A consuming public that holds the testing result certification to be of such value that the public’s purchasing decision is directly affected
- A community of buying agents that will withhold purchases of non certified products.

With respect to SQL DBMS, during the 1986 through 1997 time-frame, the United States Government, through NIST developed two major versions of standards conformance tests. The first version tested features from the 1986 and 1989 standard, and the second major version tested the fundamental set of features from the 1992 standard.



SQL DBMS vendors were quick to implement the first level of SQL/1992, that is, the entry level. The transitional, intermediate and full levels were problematic due to end-user market demand pressures for facilities that supported multi-media, objects, the SQL programming language, a call-level interface, and support for the Internet. As a result, the SQL/1999 standard has addressed these demanding new market-driven needs with a large quantity of new functions and features. As a result, the majority of SQL/1999, just as was SQL/1992 in 1992, will be largely untested.

So, while the test suite for the 1992 standard was never completed, it now has become completely out of date because of the new 1999 SQL standard which supports advanced data structures, embedded processes, sound, video, and graphics-based databases. [DAMA_1997], [Zemke_97]

As NIST produced each new release of conformance tests, the tested DBMS products improved. That is because the conformance tests become a clear and undisputed determiner of whether the DBMSs conformed to the standard. NIST, as an independent third-party honest broker used the tests to validate the ability for DBMSs to inter-operate.

Whenever NIST built a test that uncovered the fact that different DBMSs produced different results, NIST attempted to informally resolve the semantic discrepancies. For those discrepancies that were not able to be resolved, NIST formally brought the dispute to the standard's forum for resolution. This NIST role in resolving disputes prior to the "gold" release of data management system products was invaluable to the millions of DBMS end users.

NIST as the conformance test developer and conformance testing organization on behalf of the largest buying block of data management systems was performing the role that has been successfully performed by UL and CU. That is, NIST:

- Had a reputation for complete impartiality and independence
- Had the financial backing through which it adequately supported the development of comprehensive batteries of tests
- Had the technical excellence through which it developed a testing scenario that was comprehensive, cost effective and considered valid and above reproach
- Represented Government consumers, that is, Federal, State, and Local government agencies that hold through procurement regulations that made certification a prerequisite for procurement.



The value of NIST's role was significant. In the years NIST conducted tests, a NIST paid consultant's study showed that Federal agencies saved over \$30 million in procurement costs alone. That contrasts well to the \$600,000 in conformance test development and testing costs [CW_9602].

6.0 NIST Dismantlement of its Data Management Infrastructure

In November 1995, the leadership of the Computer Systems and Mathematics laboratories (subsequently merged into the now Information Technology Laboratory (ITL)) within the United States National Institute of Standards and Technology (NIST) began the dismantlement of the United States Government's data management standards infrastructure that was created and operated by NIST. NIST's exodus from its public law mandated role brought great instability as NIST had served as the third element of the successful information technology standards paradigm. That is, NIST was the provider and enforcer of conformance tests.

While it took almost 20 years for NIST to create this highly successful data management standards infrastructure, it took the NIST ITL leadership only the next six months to dismantle it. [CW_9601]. The data management infrastructure program at NIST consisted of two main efforts:

- Active participation in American and international standards forum as the data management requirements representative of U.S. Federal Agencies.
- Conformance test development and product standards conformance certification on behalf of U.S. Federal Government agency data management systems procurements.

The data management standards committee, ANSI NCITS H2 Technical Committee on Database became aware of NIST's destabilizing actions through a notice sent to its members [Gallagher_95]. Both individual members [Jacobs_95], [Shaw_95] and the committee as a whole voice significant objections [Deutsch_9602], [X3H2_96]. Finally, top executives of key data management vendors wrote NIST leadership about the effects [Haderle_95], [Arnone_95]. When these destabilizing actions became certain, Information Technology Industry Council (ITIC) to wrote the Director of NIST [ITIC_96].

The key effect of the NIST ITL dismantlement of its data management standards infrastructure has now become quite visible. By 1999, no Federal agency will be able to procure a data management system that will have undergone comprehensive standards conformance testing. Because of the actions by the leadership of the NIST ITL,



- Agencies will have to choose data management systems product by “vendor make and model” rather than open competitive procurements.
- Agencies will no longer be able to define standard data, accomplish any sophisticated data exchange, benefit from common computer program development, or common staff training.

By the Year 2000, U.S. Federal agencies will again return to being completely locked in by specific data management vendors. The only question will then be, which vendor will the agency be locked into: Oracle, IBM, or Microsoft? In the pre-1986 days, the vendors were: IBM (IMS), Cullinet (IDMS), Cincom (Total), or MRI (System 2000). Where are those vendors now, and where would the Federal Agencies be today had there not been standards conforming and conformance tested products from ANSI/SQL vendors that allowed standard data definition, data exchange, common computer program development, and common staff training?

Preventing this return to the vendor-locked, proprietary, non-tested environment is essential for competition. If end-users are vendor-locked then the vendor’s pressure to innovate is reduced, and the downward pressure on prices is lessened. The evidence of this are is clear from looking at the feature, cost, and quality improvements in word processors, spread-sheets, and operating systems during the time there was real competition versus now that there really is no competition.

It is now quite clear that all the DBMS vendors have dramatically stepping up their development of NON-STANDARD and NON-CONFORMING DBMS products. There can only be one result from this drive to proprietary products: Account-control by one or more vendors. *As recently as the September 1998 meeting of X3H2, the major DBMS vendors all stated that their companies no longer have an interest in standards conforming and tested products because NIST had terminated its conformance testing and certification programs.* A NIST representative was present in the meeting.

The lessons learned from the 1970s and 1980s is clear. Agencies were either a "System 2000" agency, or a "IDMS" agency, or an "IMS" agency. The cost of conversion from one DBMS to another was prohibitive, and the ability to accomplish data sharing was virtually nil.

The effects of NIST’s destabilizing actions were dramatically described by Mr. Lawrence L. Wills, the Director of Standards for International Business Machines Corp, Mr. Mike Saranga Senior Vice President of Informix Software, Inc., Mr. Ken Jacobs, Vice President Oracle Corporation, and Mr. Bob Epstein Executive Vice President & Cio of the Sybase, Inc., in their February 20, 1997, first ever data management industry white paper, *The Role of NIST in SQL Standardization* stated that:



The success of these standards and the industry that implements them is due in no small part to the contributions of the U.S. Federal Government. The Government's participation in the development of the standard and its support of independent testing and verification of products claiming conformance to the SQL standard have been major factors in that success.

Recently, NIST (National Institute of Standards and Technology), the Government agency most directly involved in supporting the SQL standard, announced its intent to drastically reduce its level of participation in SQL standardization efforts.

By this change, NIST leaves the largest consumer of information technology, the United States Federal Government, without an effective voice in the development of standards for database languages. Worse, it leaves the industry without an independent agent for the development of SQL validation testing capabilities. It is NIST's participation as a neutral, vendor-independent player that has been a major factor in the standard's worldwide acceptance, and has permitted the industry to grow and prosper.

Without NIST's continued participation in the development of new extensions to SQL standards, its development of SQL conformance tests, and its acting to verify conformance of SQL products to the standard, the global acceptances of SQL as the database language of choice could be in serious jeopardy. The database industry in the U.S. strongly believes that NIST's on-going participation is urgently needed to protect taxpayer's interests and to provide the independent verification of conformance that is needed worldwide.

Key members of the data management industry were not the only ones to address NIST's turn away from conformance test development and testing. Several months after receiving a presentation by the NIST ITL Director, Dr. Shukri Wakid, [Wakid_97], the Information Technology Industry Council, in a letter and white paper response on August 14, 1997 [ITIC_97] that stated:

It is not economically justifiable for individual computer manufacturers and information services vendors to develop and maintain up-to-date and comprehensive conformance test suites. Such test suites are clearly in the category of public goods. Industrial enterprises cannot justify investing in the development of conformance tests because there is no return on this investment that can be appropriated as a proprietary intellectual product. Market incentives dictate that private enterprises will not be motivated to provide resources for a full and competent conformity testing program for IT standards. Therefore, NIST should perform this task for the public good and to strengthen U. S. international competitiveness.

It is particularly important for NIST to keep the test suites up to date, accurate, and comprehensive. Without timely updating and frequent refinement, as ambiguities are identified and interpretations are made by industry consensus, test suites lose their value and effectiveness. The recently announced intention of NIST to cease updating its publicly available test suites immediately compromised the usefulness and normative value of the existing test suites.

The NIST ITL's stated reasons for eliminating its data management standards infrastructure program were mainly two: 1) budget cut-backs, and 2) turning conformance test development and product testing over to industry. [CGN_97]



The first reason one is unsupportable on its face since the savings of \$30+ million compare quite favorably to the \$600 thousand in yearly costs.

As to the second reason, since the only constituted and stated purpose for data management system conformance test development and standards conformance product certification was to assure Federal agencies that they were procuring standards conforming products, transferring the responsibility for test development and conformance testing to industry flies in the face of elementary logic.

Assuming however that NIST did receive “instructions” to turn testing over to private industry, there are only two models under which it could operate: UL and CU. Since there are so few SQL vendors the UL model will not work as there are no incentives for the vendors to pay an independent testing agency to then assert that they might not conform and thus possibly lose sales to customers. During the time NIST was testing, fees from vendors only resulted in about \$50,000 per year. That’s hardly enough to cover test development and testing.

As to the CU model, there is no information technology tradition through which an organization like CU could collect \$600,000 per year in fees from persons and organizations desiring to procure SQL compliant products.

As proof that neither the CU nor the UL economic model works for private testing of DBMSs, the NIST chosen and trained successor, the National Software Testing Laboratory, once it understood through communication with data management industry leaders, the requirements for successful conformance test development and conformance testing did not undertake test development and administration for either those parts of the SQL 1992 standard for which there are no tests nor for any of the 1500+ pages of any of the 1999 SQL standard’s features. [NSTL_97]

A key question relates to what role the NRC played as Congress’s watch dog while NIST was taking these destabilizing actions. The nature of the role ranges from unclear to suspect. At first it was clear that the NRC was unaware. In a June 1996 Email from the NRC Board of NIST Assessment Co-chair, Dr. Michael Spring, stated that any actions NIST may have made were only after intensive consultations with industry and academia, and therefore Dr. Spring “was not aware of the dismantling of the data management programs.” [Spring_96].

Dr. Ralph Roskies, the other NRC Technical panel co-chair testified to Congress in May 1996 that the NRC panels conducted detailed and case-by-case reviews of NIST programs. Dr. Roskies followed up this testimony with his FY 1997 NRC report on NIST. In this report, Dr. Roskies stated that the NRC panel had received copious documentation of the planning process and that these documents were of high quality and spoke directly to the issue [NRC_9702]. Dr. Roskies further stated that NIST had stated to the panel that the National Software Testing



Laboratory was to take over SQL testing as of July 1, 1997 [NRC_9701]. Dr. Roskies was asked about the discrepancy between his assertion to congress concerning detailed analysis and review, his reported review of copious documentation, and the assertions by the Dr. Zolandz, the Director of Boards of Assessment of NIST Programs who had stated that all NIST work was reviewed only at a high level. The question went unanswered [Roskies_97]

In contrast to Dr. Roskies testimony to Congress, Dr. Dorothy Zolandz characterized the NRC review of NIST programs as being similar to that of reviewing an art at an exhibit, that is, the painting as a whole rather than examine the individual brush strokes.

When NIST was asked, through FOIA for the copious documentation that the NRC reviewed, the response was that there was no explanatory documentation. [FOIA_9601] through [FOIA_9704].

When the Director of the NIST ITL, Dr. Shukri Wakid was asked in a letter about the dismantlement of the NIST data management program infrastructure, he justified his actions by stating that the NIST ITL's actions are regularly reviewed by both Executive and Legislative branches of the government and also by a panel of NRC scientists and engineers. [Wakid_9601], [NIST_96].

The NIST ITL Director further stated to U.S. Senator Sarbanes that the "lack of such [SQL conformance testing] activities will not impose costs and inefficiencies." [Wakid_9602]. This last statement is best countered by Mr. Steve Beckman of The Administrative Office of the U.S. Courts. Mr. Beckman stated that:

"The Administrative Office of the U.S. Courts in Washington. D.C. has issued a request for bids for relational DBMSs. it specifies that proposed products must be certified by NIST to comply with SQL standards.

"We've found the NIST test suites and certification process very valuable in helping us sort through the products out there," said Steve Beckman, chief of the Application Development division at the Administrative Office of the U.S. Courts. "If they didn't do it we'd have to do it or pay someone to do it."

Industry has reacted as well to the NIST destabilizing actions through advisories to its community of readers . [Health_96] states that NIST's abandonment "could lead to the destruction of 'plug and play' as vendors drift away from full SQL compliance." [Medicine_97] states that because of NIST's cutback that when a "chief information officer in a healthcare organization updates its computes, the 'roll-over' assures retention of basic capability, regardless of brand name change. Now all that assurance is in jeopardy."

7.0 Summary



The paradigm for successful information technology standards consists of three elements:

- American industry performing the first role by developing information technology products to form the significant market share vendor community
- ANSI performs the second role by enabling publically developed, available, and evolving standards
- The United States Government agency, NIST mandated by Congress to perform the role of developing and enforcing conformance tests through product certification.

The United States Federal Government also acted as the dominant buyer of standards conforming and certified products, thus giving the vendor community more than the necessary quantity of sales to give the standard life.

Only with robust conformance tests can agencies define data in standard ways and then share that data. Without robust conformance tests, agencies can safely buy from only one, or at most a few DBMS vendors. This will lead to a slow gradual reduction in the number of vendors.

The immediate and practical effect on Federal, State, and Local government agencies has been immediate. Shortly after NIST's discontinuance of testing, every data management vendor began to release entirely new versions of their products. These products are both non-standard and not conformance tested.

Because NIST has discontinued conformance testing of data management standards, Federal agencies are faced with a dilemma of equally unacceptable choices. They must either choose having non-standard data or having non-competitive procurements. If they choose non-standard data, then the agencies risk the same problems as the USAF. That is, the USAF spends almost \$175 million per year to overcome discordant semantics among its data systems.

Alternatively, if agencies severely restrict data management competitions to one vendor, then while they may achieve data standardization, they risk being locked into a single vendor, not being able to enjoy technological advances put forward by other vendors, and even risk their entire suite of information systems if the chosen vendor goes out of business.

The long range effect is even more devastating. Eventually, because government agencies will be completely locked into a single vendor, the vendor will then not have the incentive to innovate, improve performance, or keep prices at a competitive level. This has clearly been shown to be true in the area of operating systems. The Unix operating system vendors are continuing to innovate, improve quality and features and reduce price. Microsoft, in contrast last produced a



significantly new operating system paradigm in 1991, that is, Windows. Windows 95, while containing a significantly new presentation layer was not a new paradigm. Windows 98 is essentially the same as Windows 95 but is significantly more stable. Notwithstanding the lack of paradigm-shift innovation, Microsoft has kept its prices relatively constant despite the fact that its quantity of delivered units has increased by several thousand-fold. In contrast, computer hardware prices for components like the 3.5 inch disk drive, which has essentially had no changes over the same time period has dropped in price from about \$150 to about \$25.

The effect on American industry is also significant. With ANSI standard SQL, companies were able to exchange data between themselves and with government agencies. While enterprises will undoubtedly continue this practice, it will become significantly more expensive to do so in the future. That is because as the new SQL/1999 features are implemented it will become more and more expensive to define, build, and evolve all the data transformation and exchange routines required to service the needs of non-standard and non-conforming new features.

Increased competition produces increased features through innovation, increased quality and reduced prices. Key to increased competition is successful information technology standards that are brought about through the three elements:

- Multiple vendors within a significant market share vendor community
- ANSI standards to which all members of the significant market share vendor community conform, and
- Conformance tests to ensure that as the vendors implement continuously improving standards they are implementing their products in a standards compliant manner.



References

Reference	Date, Source and/or Author	Document Number/Title/Subject/Abstract
Alberts_97	March 30, 1997 Bruce Alberts, President of National Academy of Sciences	<u>67. Alberts (NRC Chair) Letter to Washington Post Editor.</u> This letter by Bruce Alberts, President of National Academy of Sciences, Chair of NRC regarding NRC's "Objective Scientific Research." States that committees are "independent of government involvement."
Arnone_95	October 11, 1995 Patrick Arnone, Sybase, VP & General Manager	<u>07. Sybase Letter supporting NIST's data management standards.</u> Arnone, VP from Sybase states that NIST's "testing and certification programs helped to make SQL one of the most significant software standards of modern times." Arnone then states that "Although FIPS apply only to U.S. Government procurements, they impact the commercial marketplace as well. We see requirements for NIST certified products throughout our world-wide business on a daily basis." Arnone concludes by stating that NIST should lead domestic and international de jure DBMS standardization activities, develop testing tools, advocate civilian Government requirements, represent US interests in international arenas, and carry out research to maintain technical expertise.
BusTech_9801	May 27, 1998 Mr. Joel Brinkley Business Technology, The New York Times	A key point made in the articles is that "Hewlett-Packard Co. chairman Lewis Platt said: "By now, it's over in that business. Most people find it more difficult to switch application programs than to even switch operating systems.
BusTech_9801	May 27, 1998 Mr. Joel Brinkley Business Technology, The New York Times	A key point made in the articles is that in 1994, "Word Perfect was the world's best-selling word processor, with more than half the market. Lotus 1-2-3, the venerable spreadsheet program, had a similar market share." But, by May 1998, "Dataquest, a market research firm, said that Microsoft Office now has 93 percent of the world market for the collections of business software known as suites. The other 7 percent is divided between two other suites built around former industry heavyweights. Lotus Smart Suite has 4 percent of the market and Corel Word Perfect has 3 percent."
Congress_95	December 7, 1995 House Report 104- 390	<u>09. Extracts from Report 104-390, 104th Congress, 1st Session, National Technology Transfer and Advancement Act of 1995 (PL 104-113, HR 2196, S1164), House of Representatives. Section 12. Standards Conformity, subsection 13 specifically requires NIST to coordinate Federal, State, local and private sector standards activities, and additionally states NIST's statutory mandate to act as the lead agency to ensure federal use of standards developed by</u>



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		private consensus standards organizations. Finally, the law codifies OMB Circular 119
Congress_96	January 22, 1996 Report 104-450	<u>10. Extracts from Report 104-450, 104th Congress, 2nd Session, National Defense Authorization Act for Fiscal Year 1996 (PL 104-106, S1124), Subsection D, Section 5131, authorizes NIST through the Dept of Commerce to promulgate standards and guidelines pertaining to Federal computer systems. Section 5132 states the Sense of the Congress requirement for all agencies to achieve at least a 5% decrease in information technology cost and a 5% increase in efficiency by reason of improvements in IRM by the agency.</u>
CW_9601 CW_9602 CW_9603	August 26, 1996 Gary Anthes, Reporter of Computer World	<u>53. Computer World Article, August 26, 1997.</u> "Feds to abandon SQL compliance testing." Page 32. "Without making a formal announcement, NIST has let standards groups know it won't develop test suites for advanced levels of SQL, or SQL enhancements. It also will discontinue the testing of SQL products," said Mark Skall.
CW_9602	August 26, 1996 Gary Anthes, Reporter of Computer World	<u>53. Computer World Article, August 26, 1997.</u> "Feds to abandon SQL compliance testing." Page 32. "In a study commissioned last year by NIST, TASC, Inc. in Arlington, VA found that the agency's SQL program produced a whopping 41% 'economic rate of return' on investment. As a result of the program, 'society has realized increased market competition and a lower average price for SQL products.'"
CW_9603	August 26, 1996 Gary Anthes, Reporter of Computer World	<u>53. Computer World Article, August 26, 1997.</u> "Feds to abandon SQL compliance testing." Page 32. "The Administrative Office of the U.S. Courts in Washington, D.C. has issued a request for bids for relational DBMSs. it specifies that proposed products must be certified by NIST to comply with SQL standards. "We've found the NIST test suites and certification process very valuable in helping us sort through the products out there," said Steve Beckman, chief of the Application Development division at the Administrative Office of the U.S. Courts. "If they didn't do it we'd have to do it or pay someone to do it."
DAMA_97	September 11,	<u>135. "NIST Guts Data Management Standards Infrastructure"</u>



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	1997 Michael M. Gorman	<u>Presentation to Washington, DC DAMA.</u> This presentation contains the following key sections: History of the SQL Standard, Tested Products, NIST Involvement in DM Standards, The SQL Industry, Legislative History, SQL Testing and Certification Costs & Benefits, SQL Costs–Proprietary vs Standards Based, NIST Related Events and Actions, Industry Opposition & White paper, NRC Oversight of NIST Programs, and Selecting a SQL Conformance Testing Laboratory. Inclusion of this presentation in the DAMA program was formally opposed by NIST. The complete presentation is available on the Whitemarsh website, www.wiscorp.com
Deutsch_9601	February 23, 1996 Dr. Donald Deutsch Chair of X3H2 and Manager of Strategic Planning for Sybase Corporation	<u>12. Email from Dr. Don Deutsch on NIST’s SQL Standards Role.</u> This email, from Donald Deutsch, former university professor, director of data management standards at NIST, DBMS developer, and now manager of long ranging planning at Sybase makes the following points: SQL is the most successful of all recent standards, the SQL market now exceeds \$1 billion per year, virtually all the SQL vendors are US corporations, NIST's role is critical to past, current, and future success.
Deutsch_9602	June 19, 1996 Dr. Donald Deutsch Chair of X3H2 and Manager of Strategic Planning for Sybase Corporation	<u>39. Don Deutsch on Why Industry Cares.</u> This statement from Donald Deutsch, X3H2 Chair stating why Industry Cares about NIST's Data Management Standards Program. This document identifies the items that NIST is stopping, cites the reasons why ANSI/ISO SQL is probably one of the most successful standards to date, indicates why testing and certification is essential to shared data and non-proprietary critical components. The document also describes the role played by NIST and why it was valuable. The document then identifies and briefly describes the areas that are undergoing radical change. The document then states that NIST does not consider funding the key issue, but one of policy. A Department of Defense agency offered to fund NIST but was turned down. Finally, the document poses a number of questions for NIST to answer dealing with the rationale for program of work selection, meeting industry needs, other Government agency notifications, why NIST refuses to take support from other Government agencies, and how will Government agencies procure DBMSs in the absence of conformance tests and certifications.
DMIndustry_97	April 11, 1997 Larry L. Wills,	<u>87. Industry Letter (02/20/97) and White Paper on NIST in SQL Standardization Effort.</u> The Industry Letter and White Paper discusses at great length all the salient issues surrounding NIST and



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	<p>IBM Director of Standards</p> <p>Mike Saranga, Informix Senior Vice President</p> <p>Ken Jacobs, Oracle Vice President</p> <p>Bob Epstein, Sybase Executive VP and CIO</p>	<p>data management standards. The white paper, delivered to NIST in March 1997, concludes that NIST's actions are damaging to the data management industry and to all enterprises (Government, large company, etc) that attempt to define and exchange standard data. The topics in the paper are: Status of SQL Standards, Importance of SQL Standards, NIST's Historical Role, Revolution in SQL Standards and SQL-Based Products, The Effect of NIST's Announcement, Conclusions, and Summary.</p> <p>The summary states:</p> <p>We believe that NIST's continued participation in the SQL standardization process is extremely desirable. While NIST has indicated its intent to continue participation at reduced levels and with a somewhat different focus, we believe that the following two contributions are urgent and invaluable:</p> <ol style="list-style-type: none"> 1. Provision of at least one individual contributor who is an expert in relational and object database technology, with the personal stature to effectively represent the interests of the user community in the USA and to represent USA interests internationally 2. Provision of an on-going program to develop and maintain SQL tests In addition, we believe that the choice of mechanisms for actually testing and certifying database products for conformance to the SQL standard is of great concern to the database industry. We believe that the choice must be made with input from throughout the database community, including not only NIST, but also database system vendors, the user community, and other Federal Government agencies.
FOIA_9601	<p>May 7, 1996</p> <p>Michael Gorman</p>	<p><u>17. Letter to Dept of Commerce FOIA Officer</u> This letter requests all documents that contain the results of cost-benefit studies that had presumably been conducted in support of NIST's data management standards dismantling actions.</p>
FOIA_9602	<p>June 19, 1996</p> <p>Mr. Karl E. Bell, FOIA officer of NIST</p>	<p><u>38. Letter from Karl Bell (FOIA) to Gorman.</u> Response letter from Karl Bell, FOIA Officer of Dept. of Commerce that transmitted the document, "Economic Assessment of the NIST Conformance Test Program" in response to the request for "documents that contain the results of cost-benefit studies related to data management standards."</p>
FOIA_9701	<p>June 30, 1997</p> <p>Mr. Karl E. Bell,</p>	<p><u>98. FOIA Request to Mr. Karl E. Bell, NIST.</u> This FOIA request seeks four types of documents. The first three are those review and planning papers that chronicle the decision rationale and benefit</p>



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	FOIA officer of NIST	cost reviews used by agencies within the Department of Commerce that led to the NIST data management dismantling decisions. The fourth type was for the papers given to the Technology Panel of the National Research Council during the years 1995, 1996, and 1997.
FOIA_9702	July 25, 1997 Mr. Karl E. Bell, FOIA officer of NIST	<u>101. FOIA Response from Mr. Karl E. Bell.</u> The FOIA response from Mr. Bell stated that there were no document related to the first three requests (see #98). As to the fourth request, three NRC reports were provided.
FOIA_9703	September 30, 1997 Michael M. Gorman	<u>106. FOIA Request to Karl E. Bell, NIST.</u> This two page letter requests copies of the materials that the ITL claims to have been made in the its <u>1997 Planning and Project Reports</u> . The documents would have been generated in support of NIST's very detailed criteria that are enumerated on pages 13, 14, and 15 of the <u>1997 Planning and Project Reports</u> . See #97.
FOIA_9704	December 2, 1997 Mr. Karl E. Bell, FOIA officer of NIST	<u>109. Letter to Karl Bell in Response to Bell's FOIA Response That Stated That the Original FOIA Request (see #106) Was Too Vague.</u> This letter thanks Mr. Bell for addressing the issue of specificity in the FOIA requests of 9/30/97 (see # 106) and 11/12/97 (see # 108). Bell stated that my FOIA requests were not specific. The letter states that the 6/30/97 FOIA request response stated that NIST did not have any documentation to support its decision making process. The basis of the FOIA response challenge (See #102) was NIST's own description of its planning process. The letter concludes with a request for the list of documents that NIST provided the NRC. And, given that NIST did not maintain such a list, then the letter requests the document-receipt list that the NRC must have created so that they could properly analyze all the materials that they stated that they had received.
FOIA_9705	November 25, 1997 Mr. Karl E. Bell, FOIA officer of NIST	<u>115. FOIA Response from Karl Bell (NIST FOIA Officer) to the September 30, 1997 FOIA Request.</u> This response letter provides none of the requested documentation because the original request was deemed lacking in specificity. The letter asserts that the materials must be "reasonably described," and that persons reasonably familiar with the subject must be able to find them in a reasonable amount of time. Mr. Bell therefore was unable to provide any documents "because you did not specifically describe or identify any records or documents in a manner sufficient to enable NIST personnel to locate them with a reasonable amount of effort." Mr. Bell however offers to search for such materials providing I pay for the search. The "down payment" for the search is \$790, but there is NO MAXIMUM, and if the \$790 were spent



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		then any amount over that would be invoiced.
Fortune_97	<p>May 26, 1997</p> <p>Mr. David Kirkpatrick</p> <p>Fortune Magazine, "He Wants All Your Business—and He's Starting to Get It.</p>	<p>A key point made in the article is that "One reason Gates can offer NT at such low prices is that the operating system is but the lead of a two punch strategy for capturing the corporate network market. The knockout punch is BackOffice." BackOffice, the story states contains "SQL Server, a database [management system] aimed at Oracle's estimated \$2 Billion a year flagship product, as well as at products from Informix, Sybase, and IBM."</p>
Gallaher_95	<p>May 19, 1995</p> <p>Len Gallagher, Senior Scientist of NIST for Data Management Standards</p>	<p><u>02. Email request from Len Gallagher.</u> Email request from Len Gallagher to X3H2 members soliciting opinions about NIST data management standards program.</p> <p>The Email references an X3H2 motion taken during the May 1-4, 1995 meeting that states MOTION(Pizzo, Fried, Vote: 14-0-1) that X3H2 expresses its appreciation to NIST, as an independent and unbiased agency, for their contribution to the success of the SQL standard through their role in testing and certification and our hope that NIST will participate similarly regarding SQL/CLI, SQL/PSM and other parts of SQL. Note, NIST abstained.</p> <p>The email requests that opinions regarding NIST's role in data management standards be sent to David Jefferson or Shirley Hurwitz of NIST management</p>
GCN_97	<p>April 28, 1997</p> <p>Government Computer News, Vol 16, No 10, April 28, 1997.</p>	<p><u>91. Government Computer News, Vol 16, No 10, April 28, 1997 article on NSTL Takeover of SQL Testing.</u> Private Lab to take over standards testing from NIST. This article appeared in Government Computer News, Vol 16, No 10, April 28, 1997. The article reports:</p> <ol style="list-style-type: none"> 1) That the NSTL will take over government testing of SQL as of 7/1/97. 2) Vendors will either have to rely on the NSTL or some other lab for testing and certifications. 3) NIST was pressured by budget and the White House to have industry to do its own testing. 4) The SQL tests are now part of the public domain. 5) The NIST resources that used to be assigned to SQL will be working on the Virtual Reality Modeling Language.



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		<p>NOTE: of the FIVE persons assigned to SQL, one moved to an entirely different NIST lab, one is working on a database project for another agency entirely, the third is working on security, and two others are possibly being “down-sized.”</p> <p>The NSTL wants to keep its testing costs the same as NIST. See #58 for the current NIST costs model.</p> <p>NIST cites the NRC 1995 NRC Standards, Conformity Assessment, and Trade Into the 21st Century report that said that conformance testing was getting expensive and that recommended that NIST close its test operations.</p> <p>NOTE: that’s only half of what the NRC report recommended. It ALSO recommended that NIST certify testing laboratories prior to the laboratories performing testing.</p> <p>Mark Skall is finally quoted as saying, “Vendors would like us to develop new versions of SQL tests and we will find the expertise. We will continue to send representatives to standards meetings on object-oriented issues.”</p>
Haderle_95	<p>October 11, 1995</p> <p>Donald Haderle, IBM Santa Teresa Laboratory</p>	<p><u>08. IBM Letter supporting NIST’s Data Management.</u> Haderle states that IBM's senior scientists call for NIST's continued activities in SQL standardization and testing. Haderle states that “the NIST SQL test suite is the world standard for measuring conformance to the SQL standard.” Haderle cites NIST's work with X/Open, the European Community, and G7 activities for global information infrastructure. Haderle then states that “the existence of internationally recognized conformance testing saves our industry substantial amounts of money that might otherwise be spent forcing “similar” but non-conforming software components to inter-operate.” Haderle finally states that NIST's work in data management standards “promote Department of Commerce objectives to support American industry in the international marketplace.”</p>
Health_96	<p>November 6, 1996</p> <p>Health Care Information Management Week, Vol 3, Nb: 26, 27, 28, and 29</p>	<p><u>85. Health Care Week Articles on NIST SQL Actions.</u> Four issues of Health Care Information Management Week, Vol 3, Nb: 26, 27, 28, and 29 that review the NIST shutdown of SQL testing. The newsletter states that NIST’s abandonment “could lead to the destruction of ‘plug-and-play’ as vendors drift away from full SQL compliance.” The newsletter states that the likely impact will be “higher prices for database tools and systems and massive confusion about which tools work with which databases.”</p> <p>The newsletter states that “the decision imperils U.S. dominance of</p>



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		the \$20 billion relational database industry....” The November 27 newsletter cites various healthcare industry sources that NIST’s decision may have already started to raise costs because of lowered competition.
ITIC_96	October 9, 1996 Mr. John Wilson, President of the Information Technology Industry Council	<u>130. ITIC Draft Statement of the Industry-NIST Partnership in Voluntary Standards.</u> This statement makes the following points. 1) NIST should have active participation in relevant national and international standards programs. 2) NIST’s role in the activities is recognized by Congress, most recently in the Technology Transfer Act of 1996. 3) NIST’s participation is critical in serving many public and private sector objectives including supporting national goals in leveraging US strengths in information technology to foster US competitiveness. 4) NIST should continue its work in tests suites such as the SQL test suites.
ITIC_97	August 14, 1997 Mr. Rhett Dawson, President of the Information Technology Industry Council	<u>124. Very Critical Letter & Attachment from Rhett Dawson (ITIC President) and Shukri Wakid (ITL Director).</u> The letter ranks the 8 ITL laboratories as to their relevance to the mission of the ITIC. The letter then states that the ITIC has “serious concerns about NIST’s retreat from most consensus technical standards development activities, conformance test suite development and maintenance, and governance activities of consensus standards bodies.” The letter concludes by stating that the ITIC recommend[s] that such activities be re-emphasized, even at the expense of other ITL activities which we believe can be performed by other private and public institutions.” The attachment, 8.5 pages long details the concerns the ITIC has over the programs and scope of work that are currently underway at the NIST ITL. The attachment contains a section of general principles, and then 6 pages of detailed statements and impacts that are likely because of NIST’s abandonment of its standards related activities. A complete version of the ITIC letter and attachment is available on the Whitemarsh website, www.wiscorp.com .



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Jacobs_95	September 17, 1995 Ken Jacobs, Oracle VP, and Version 8 program manager	<u>04. Email from Ken Jacobs.</u> This material about the role of NIST. Composed by Ken Jacobs, Senior VP of Oracle, Corp. Ken makes the observations that the only viable source of database standards has been X3H2, and that other groups like X/Open, OSF, OMG, SQL Access Group, and the Transaction Processing Council have all been dominated by “competitive and political factors, ... and vendor interests are more clearly protected than are users. Ken asserts that if NIST’s role is significantly reduced that “SQL implementations would diverge, vendors will make unsubstantiated claims of compliance to standards, and users will lose the ability to easily port their applications among implementations.
Market_96	May 30, 1996 X3H2 members	<u>27. ANSI/SQL, FIPS/SQL, NIST, and the SQL Marketplace.</u> This document describes the role of FIPS, the data management procurement environment before SQL conformance testing, the environment after testing, and NIST’s critical role. The document also identifies the direct SQL vendors and their annual income; the 3 rd party SQL vendors and their income level; and finally describes the major extensions to SQL that will dominate the marketplace in the early next century.
Medicine_97	April 1, 1997 Computers and Medicine, Vol 26, Number 4, April 1997	<u>86. The Computer and Medicine newsletter, Vol 26, Number 4, April 1997.</u> This article states that because of NIST’s cutback that when a “chief information officer in a healthcare organization updates its computers, the ‘roll-over’ assures retention of basic compatibility, regardless of brand name change. Now, that assurance is in critical jeopardy.” The newsletter reviews the data management industry white paper by Oracle, Informix, IBM, and Sybase that identifies all the negative aspects of the NIST data management standards dismantling actions. The newsletter makes the following points: You may not know it until its too late, but red flags flying in database management could seriously impact physicians and hospitals. The SQL “standards are the foundations of a multi-billion-dollar industry employing thousands of people. By this change, NIST leaves the largest consumer of information, the Federal Government, without an effective voice in development of standards for database languages. NIST suggests that one reason for its cutback is that object technology is overtaking the relational model for testing software.



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		The Industry position paper (see # 87) states that object database facilities are being included in SQL and so, by NIST's own statements, it should continue development of SQL tests.
NIST_96	October 1, 1996 Anne Enright Shepherd	<p><u>84. NIST SQL Fact sheet.</u> This fact sheet was sent to NIST senior management. The fact sheet reviews NIST's very valuable contributions of the past towards the SQL standard. The fact sheet states that NIST is dropping out of domestic and international data management standards bodies. The fact sheet states that NIST will not develop new tests for SQL/2 full nor any of SQL/3.</p> <p>The fact sheet states that NIST will continue testing as long as feasible, and that active search is underway for a replacement testing service. The fact sheet then asserts that NIST is complying with applicable laws because "no oversight body has objected to its moves related to data management standards."</p> <p>Finally the Fact sheet states that the NRC has assessed the NIST programs and received its support for the new direction.</p>
NRC_9701	NRC Board on Assessment of NIST Programs report to Congress	<p><u>97. 1997 Planning and Project Reports for the Information Technology Laboratory.</u> The report addresses the issues raised by the NRC Board at the September 1996 meeting. Among the many points made in the report is that NIST states that its participation is no longer needed because SQL is well established, and that "parties in the private sector [are] willing to develop new tests and [are] willing to set up a testing service. The document identifies the National Software Testing Lab (NSTL) as the lab who will take over testing.</p>
NRC_9702	December 1, 1997 Ralph Roskies University of Pittsburgh, Brian W. Kernighan, Lucent Technologies, Co-Chairs of the NRC Oversight Panel of the NIST ITL.	<p><u>114. An Assessment of the NIST Programs, FY 1997.</u> This 200+ page report contains 8 chapters and 4 appendices. Chapter 8 (27 pages) concentrates on the Information Technology Laboratory (ITL). The ITL chapter contains two sections relevant to the issue. The first is the statement that the NRC panel on page 183, stated that they had reviewed copious documentation of the planning process and that these documents were of high quality and spoke directly to the issues raised in previous assessments. In contrast to this NRC statement, NIST states that there are no planning documents related to any issue concerning data management. The second issue is that on page 198, the ITL states the conclusions of its project selection process. That is, that NIST has concluded its SQL participation, conformance test development, conformance testing. The report states additionally makes the following points: 1) that NIST will continue to send a representative to the X3H2 meetings, 2) that the National Software Testing Laboratory will start SQL testing on July 1, 1997, 3) that reactions from industry</p>



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		has been varied, and some industry representatives have expressed strong disapproval of the laboratories position. The relevant section concludes with the statement, "Nevertheless, the panel believes that NIST has properly considered the issue. This conclusion of the SQL testing program is part of and consistent with the Information Technology Laboratory's shift in focus away from traditional paper standards and the performance of conformance tests and toward work on conformance development for emerging technologies. This transition is strongly endorsed by the panel."
NSTL_97	March 24, 1997 Michael Gorman	<u>72. Gorman Letter to Mr. Ed. McLaughlin, National Software Testing Laboratory.</u> The letter and attached 5 pages of SQL Conformance Testing Laboratory Assessment Issues was sent to the NSTL. I asked them to meet with me so that I can understand how the NSTL has addressed these concerns. The list of concerns was reviewed by X3H2 at its March 1996 meeting.
OMB119_95	October 20, 1993 Executive Office of the President	<u>01. OMB Circular A-119.</u> States that: 1) standards are to be used as basis of procurement where ever possible; 2) participation in domestic and international standards organizations is encouraged; 3) agencies can provide financial support, secretarial functions, cooperative conformance testing; 4) Dept of Commerce is to establish an interagency consultative mechanism for policy implementation; 5) requires heads of agencies to designate staff, establish procedures, and coordinate standards participation.
President_96	July 16, 1996 Fed Reg, Vol 61, No 140, pages 37657-37662	<u>70. Executive Order of President for Federal Information Technology.</u> Establishes the Government Information Technology Services Board that is to develop innovative technologies, standards, and practices among agencies and State and local governments and the private sector. Cites NIST as lead agency for developing standards and guidelines pertaining to Federal Information systems.
Roskies_97	February 1, 1997 Dr Ralph Roskies, Board of NIST Assessment Panel Co-chair	<u>80. Gorman Letter to Roskies.</u> This letter to Dr. Ralph Roskies asks him to clarify the testimony he gave before Congress that " the panel which I chair conducts an annual assessment of what's going on at NIST in the two laboratories and one of the questions that we ask of NIST management every time is what is the value added of NIST. I don't think it's easy to give a set of simple rules that will allow NIST to pick projects that don't substantially overlap activities that go on in other places, but we have on a case-by-case basis an analysis every year." Dr. Roskies testimony directly contradicts the characterization of Dr. Zolandz concerning the type and level of NRC NIST oversight.
Shaw_95	September 17,	<u>03. Email from Phil Shaw.</u> This material supporting NIST's data



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	1995 Phil Shaw, Key Author of ANSI/SQL, and ANSI/NDL	management standards. Phil notes that NIST seems to intend to eliminate SQL validation by the end of 1995. Phil states that while vendors might consider the elimination of NIST activities as beneficial, he feels that “elimination or drastic reduction of NIST SQL activities could be disruptive and perhaps even disastrous to the community of SQL vendors.” Phil then provides four well thought out reasons for the statement. Phil finally provides 2 pages of candidate text for letters from Oracle to NIST management. The points made by the text include disastrous effects to 3 rd party vendors who rely on the existence of verified and conforming ANSI standard SQL, the rapid development of SQL facilities outside those contained in SQL/92, the critical role NIST has played on the national and international scene as independent, fair-minded and as a mechanism for Federal agencies to rely on a standard rather than be captive by specific DBMS vendors.
Spring_9601	June 16, 1996 Co-chair of the NRC Technology Panel University of Pittsburgh Michael Spring	<u>34. Spring Email to Gorman.</u> Email response to Michael Gorman that admits to be ignorant of NIST actions. Dr. Spring states Gorman must have seen personal correspondence with Shukri. Spring states that he has no objection that the correspondence was shared. Spring then states that all NIST program decisions were made only after intensive consultation with industry and academia. Spring then states that he is “not aware of the dismantling of the data management programs.” Spring then retrieved material from the NIST strategic plan. Then Spring states that “Far from a dismantling, I see a significant and critical component of the future of the information technology industry housed in the Lab headed by Mr. Skall.” Spring then states that he is unaware of the public law mandates that apply to data management standards. Finally, Spring includes a copy of the email that I had sent him
TASC_95	October 1, 1995 NIST via FOIA	<u>62. NIST’s 95-4 Planning Report, Economic Assessment of the NIST Conformance Test Program for Database Language SQL.</u> This report was provided, via FOIA, to Whitemarsh as the ONLY document NIST had dealing with data management studies. The document, sent to Whitemarsh on June 19, 1996, shows a 141% ROI and savings that amount to about \$36 million per year to Federal Agencies and SQL vendors. The study had 24 different questions. All the answers showed that the SQL testing environment was beneficial, but ONLY to the Federal Government customer.



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Testing_96	May 30, 1996 Michael Gorman	<u>28. SQL Testing Costs</u> . This document describes the development, administration and evolution that Agencies will incur if testing goes away. The article defines the objective of syntax and semantics testing, the quantity and development costs of the current test suite, and the ramp-up and then continuing costs for operating a test service.
Wakid_9602	June 24, 1996	<u>24. Wakid Letter to U.S. Senator Sarbanes</u> . In this letter, Dr. Wakid states that NIST is not specifically mandated to conduct standards coordination for data management and that the lack of such activities will not impose costs and inefficiencies. Assertions are in direct contradiction to public law requirements cited in #1, #6, #9, #10. Dr. Wakid further asserts direct oversight of affected areas by the NRC. The NRC's panel chair testified to Congress that detailed oversight occurred. Note: See #79 where Dr. Zolandz however states in January, 1997 that detailed oversight never occurred.
Wakid_9601	June 5, 1996 Dr. Shukri Wakid, NIST Director of the Information Technology Laboratory,	<p><u>33. Wakid Letter to Gorman</u>. Letter response to Michael Gorman's 4 pages of questions. The letter specifically avoids responding to the questions in the attachment of the May 7th letter. Dr. Wakid states that "NIST receives regular oversight from both the Executive and Legislative branches of the government..." He states that "annual budget submissions are carefully reviewed to assure that our program are carried out in a competent, cost-effective manner and that we meet our legislated responsibilities..."</p> <p>Wakid states that "NIST's laboratory programs are assessed by a panel of scientists and engineers who are appointed by the National Research Council (NRC) and are administered by the NRC's Board on Assessment of NIST programs." Dr. Wakid also states that "We continue to meet our commitments to the Federal Government, in particular for the development of standards and guidelines that assist Federal organizations in protecting their automated information assets."</p> <p>Dr. Wakid states that "We are currently focusing primarily on the critical need for tests and test methods for advanced information technologies to help producers develop better, higher quality products and to help users evaluate these products." Dr. Wakid then states that "When a standard has been adopted by industry and is implemented in the marketplace, our participation is no longer needed."</p> <p>Finally, Dr. Wakid states that "We applaud the committee's success in completing data management standards that have been widely accepted and implemented by industry. Since the standards have been successful and since our resources are very limited, we</p>



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		believe that it is time for use to conclude our participation and to focus on new areas to which we can contribute in much the same way that we contributed to X3H2.” ii
Wakid_97	April 30, 1997 Dr. Shukri Wakid, Director of the Information Technology Laboratory, NIST	<p><u>89. Wakid Presentation to Technology Program Management Committee (TPMC) of the Information Technology Industry Council.</u> These three overheads were delivered by Dr. Shukri Wakid to this management panel. The overheads attempt to convey a feeling of a “job well done.”</p> <p>Dr. Wakid stated that: 1) the development of conformance tests are complete, 2) that standards and testing is well established, 3) that the NSTL will do operational testing and certifications, 4) that conformance testing is ahead of the curve, 5) there are identified parties that will develop future SQL tests, 6) Non-NIST parties are issuing certificates, 7) operational testing should be done by NIST’s NVLAP</p> <p>It is encouraging to note that none of these statements were believed by the X3 standards management panel. The X3 standards management panel is fully aware of the actual situation at NIST.</p>
X3H2_96	December 13, 1996 X3H2	<p><u>60. X3H2 Motion On NIST’s Proper Role.</u> Motion by X3H2 within the X3H2 minutes of December, 1996 that states that X3H2 believes that NIST's three data management roles should be immediately reinstated and continued indefinitely. Passed unanimously. The text is:</p> <p>MOTION(Gorman, Zemke, Vote: Unanimous Consent) The technical committee X3H2 on Database, operating under the auspices of ANSI, is a committee of data management system vendors as well as users from industry, government, and universities. X3H2 commends the past activities of NIST because they:</p> <ol style="list-style-type: none"> 1. Represented the needs of the Federal, State, and Local government data management community, 2. Performed the role of an independent, honest-broker, ANSI standards conformance tester, and 3. Represented American interests within the world-wide data management standards community. <p>X3H2 believes that NIST's three data management roles should be immediately reinstated and continued indefinitely because:</p>



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		<ol style="list-style-type: none"> 1. The 1992 SQL standard represents only a subset of the facilities required--even today--for modern data management, 2. The data management needs of Federal, State, and Local governments must be represented as Government is one of the largest users of persistent data management, and 3. American interests require a wholly American agency to represent the United States's interests with the world-wide standards community.
Zemke_97	<p>March 5, 1997</p> <p>Fred Zemke, Manager of SQL Standards, Oracle Corporation</p>	<p>88. <u>SQL/92 Untested Features</u>. List of SQL/92 features according to the levels contained in the FIPS for SQL. All the features listed have yet to be tested by any SQL vendor. The 16 page list is very extensive. While there are tests for transitional and intermediate levels, there is no cross reference between the SQL tests and the features contained in this paper.</p>

