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Consulting Report on The NASA Technology Utilization Network System

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NASA Johnson Space Center
Information Systems Directorate
Information Technology Division

Research Institute for Computing and Information Systems
University of Houston-Clear Lake

TECHNICAL REPORT

The RICIS Concept

The University of Houston-Clear Lake established the Research Institute for Computing and Information Systems (RICIS) in 1986 to encourage the NASA Johnson Space Center (JSC) and local industry to actively support research in the computing and information sciences. As part of this endeavor, UHCL proposed a partnership with JSC to jointly define and manage an integrated program of research in advanced data processing technology needed for JSC's main missions, including administrative, engineering and science responsibilities. JSC agreed and entered into a continuing cooperative agreement with UHCL beginning in May 1986, to jointly plan and execute such research through RICIS. Additionally, under Cooperative Agreement NCC 9-16, computing and educational facilities are shared by the two institutions to conduct the research.

The UHCL/RICIS mission is to conduct, coordinate, and disseminate research and professional level education in computing and information systems to serve the needs of the government, industry, community and academia. RICIS combines resources of UHCL and its gateway affiliates to research and develop materials, prototypes and publications on topics of mutual interest to its sponsors and researchers. Within UHCL, the mission is being implemented through interdisciplinary involvement of faculty and students from each of the four schools: Business and Public Administration, Education, Human Sciences and Humanities, and Natural and Applied Sciences. RICIS also collaborates with industry in a companion program. This program is focused on serving the research and advanced development needs of industry.

Moreover, UHCL established relationships with other universities and research organizations, having common research interests, to provide additional sources of expertise to conduct needed research. For example, UHCL has entered into a special partnership with Texas A&M University to help oversee RICIS research and education programs, while other research organizations are involved via the "gateway" concept.

A major role of RICIS then is to find the best match of sponsors, researchers and research objectives to advance knowledge in the computing and information sciences. RICIS, working jointly with its sponsors, advises on research needs, recommends principals for conducting the research, provides technical and administrative support to coordinate the research and integrates technical results into the goals of UHCL, NASA/JSC and industry.

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RICIS Preface

This research was conducted under auspices of the Research Institute for Computing and Information Systems by Marjorie M.K. Hlava of Access Innovations, Incorporated at the request of Applied Expertise, Incorporated. Dr. E. T. Dickerson served as RICIS research coordinator.

Funding was provided by the Information Technology Division, Information Systems Directorate, NASA/JSC through Cooperative Agreement NCC 9-16 between the NASA Johnson Space Center and the University of Houston-Clear Lake. The NASA technical monitor for this activity was Ernest Fridge, Deputy Chief of the Software Technology Branch, Information Technology Division, Information Systems Directorate, NASA/JSC.

The views and conclusions contained in this report are those of the author and should not be interpreted as representative of the official policies, either express or implied, of UHCL, RICIS, NASA or the United States Government.

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1.0 INTRODUCTION

1.1 Identification and Scope

This consulting report is submitted at the request of Mr. James Wilson, President of Applied Expertise, Inc. This report is the result of meetings held over a 2-1/2 day period and included a site visit to Applied Expertise, Inc. on November 18, 1991 made by the consultant, Marjorie M.K. Hlava. The purpose of the site visit was to determine the effectiveness of procedures, routines, and operations presently applied to the production, development, implementation, and advancement of the NASA Technology Utilization Network System (TUNS). The fact-finding time spent onsite involved meetings, hands-on activities, and interviews with Mr. James Wilson, President of Applied Expertise, Mr. Roy Bivins, Contract Monitor, Technology Utilization Division of NASA, and Elaine McCarty, Project Manager, of ISN. All observations and comments are based on data from these visits and especially from the comments and explanations made to consultant by Mr. James Wilson.

1.2 Purpose and Objectives

The purposes of this consulting effort are:

(a.) to evaluate the existing management and production procedures and workflow as they each relate to the successful development, utilization, and implementation of the NASA TUNS database;

(b.) to identify, as requested by the NASA Project Monitor, the strengths, weaknesses, areas of bottlenecking, and previously unaddressed problem areas affecting TUNS;

(c.) to recommend changes or modifications of existing procedures as necessary in order to effect corrections for the overall benefit of NASA TUNS database production, implementation, and utilization.

(d.) to recommend the addition of alternative procedures, routines, and activities that will consolidate and facilitate the production, implementation, and utilization of the NASA TUNS database.

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2.0 CONSULTANT OBSERVATIONS

a. There is essentially no data in the database. At the time of my visit, there were approximately 1000 units and the most recent update noted was 1989.

b. Most of the good source data on technology transfer over the years has not been captured. Only the "cream of the crop" data makes it through from the SRI reviews. The rest of the technology transfer reports are not forwarded to NASA.

c. Some of that technology transfer source data might have been thrown out. Some of it, like the Dick Chapman project data from Denver Research Institute may have been discarded. IACs are not required to keep data on Benefits Transferred.

d. There seems to be no knowledge of, or procedure set up, that will allow TUNS to reach a customer or potential customer outside the government agency environment, i.e., the commercial and R&D sectors.

e. Potential customers, beyond the internal NASA users, have not been identified.

f. Five million dollars have been spent in the development of software. Software, such as Advanced Revalation or Paradox, which are available commercially, could have been purchased at minimal expense (less than $2500) to run this system. NASA's tendency is to be technology-driven and, given that tendency, it would be considered natural for hardware and software to take precedence over the data. An appropriate observation here is that, as in the shuttle launches, it is not the hardware and software but the actual launch that is important. We cannot lose sight of the real mandate by being blinded by the technology options. The real NASA-wide mandate is technology transfer to the public, as is written in the original enabling legislation. There is a monthly publication titled New Technology Reports.

g. The major problems with the database production workflow are in the areas of data collection and abstract creation. The problem is not one of timely data entry because there is no data collected to enter!

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2.0 CONSULTANT OBSERVATIONS (continued)

h. Data which is collected and reviewed is over-analyzed, weeded out, and often discarded by a select group at SRI who are essentially a peer review group and are not information transfer specialists.

i. There seems to be a lack of understanding of and/or communication about the basic procedures and activities related to successful data collection, database production, utilization, and marketing.

3.0 CONSULTANT RECOMMENDATIONS

a. The project should take a completely new approach to the data and be driven by client/potential customer requirements and needs.

1) A market study may be warranted to help establish what will be made available to whom and what distribution mechanisms to use to the best advantage.

2) A steering committee of people from business and government should be established to help in directing the program. I suggest NASA limit the steering committee to ten individuals who will have product development and marketing expertise. I suggest further that the steering committee include no NASA personnel as voting members.

b. In order to insure future funding levels, NASA TU needs to present to the broader commercial and R&D public an increased customer service orientation. A unified data presentation for all NASA text data would result in a unique and positive image.

DRAFT PAPER

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3.0 CONSULTANT RECOMMENDATIONS (continued)

b. (continued)

The present approach is a matching technology produced with the originating organization. Strictly speaking, this matching service is only the beginning of technology transfer. Customers need a one-stop shop environment, offering the entire line of available data from one easy-to-acquire package from a single or transparent and seamless consortium like an information center. Fragmenting the informative product by putting some data into Tech Briefs, some in Recon, some only as NTRs, all with different case level evaluations, some in a restricted Ada file in the basement of NASA headquarters, some online and some on paper, may help another NASA program get a reading on how things are going. It isn't the most efficient way to transfer new or old technology from NASA to the public. The public does not try hard to get information. They don't even know it exists. NASA must present it to them and, by doing so, NASA will help itself in the long run.

c. I suggest a user advisory board be established in order to obtain user input from users. This will be composed of active online searchers from major commercial users.

d. I recommend a new approach and direction in the data collection and abstract creation (editorial) tasks of the database production workflow.

The solution to the problem of acquiring source data to enter into the data files is as basic as creating proactive liaisons with all data production sites. Restrictions on data providers (such as getting their reports in, or else) don't work. Liaison is a labor-intensive activity.

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3.0 CONSULTANT RECOMMENDATIONS (continued)

d. (continued)

Proactive liaison means that personnel will make calls and visits to source sites and, if necessary, will collect source data personally. It means that NASA TU will be responsible for the creation the abstracts (or digests) of the reports, articles, or testimonials. NASA TU will be able to ensure consistency in record creation this way as well. Other organizations, such as the Electric Power Research Institute or the Gas Research Institute, use these approaches with great success. These are, admittedly, labor-intensive activities, but not much different than running Associated Press International or United Press International or the AIAA STAR or IAA on NASA Recon. Put out feelers and call regularly. It's amazing what can be learned and captured from such networks.

It is the role of the database producer (NASA TU) to create the database from disparate data, i.e., raw data, into a single searchable file for the user. Most commercial database producers (1) do not get standard format source data for input and, (2) would not use data from a source provider without editorial review. The acquired source data is usually transferred to a standard format, by the database producer's editorial staff for input and distribution. It is the job of the database producer to continually identify and re-identify, his sources, contact his sources, collect the raw data, verify the data, select the data for inclusion, abstract, index, and enter the data, and check constantly for quality and comprehensiveness of each accomplished task.

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3.0 CONSULTANT RECOMMENDATIONS (continued)

d. (continued)

NASA has spent millions trying to get their source data providers to comply with their restrictions of form/format. It is not working. It's now time to spend thousands doing it in an alternative and accepted way. Toward this goal, I have provided a narrative workflow that will help in the creation of the alternative database production procedures.

3.1 Recommended Workflow for Source Data Collection, Preparation and Input

(a.) Identification of sources

The first step is to target the materials NASA will use as source data. Compile a list of the the originators or suppliers of the targeted materials. These lists will be the first step in the task to determine from where, from whom, how much, and how often source data is available, and how it will be collected. Several collection procedures will be put in place to match different data sources and types.

(b.) Identification of contact points and person(s)

The key to collection of source data, after identifying the collection site of the raw data desired and needed, is identifying the appropriate contact person. NASA will want to identify the contact point and person within an agency or organization, with whom NASA will work, using a combination of phone calls, personal visits, faxes, etc., to insure receipt of the targeted materials.

3.1 Recommended Workflow for Source Data Collection, Preparation and Input (continued)

(b.) Identification of contact points and person(s) (continued)

This activity requires a certain amount of liaison. At the very least, phone calling is essential. A data collection survey or questionnaire, for instance, serves one purpose -- getting your questions to someone. Unless it is followed up with a phone call, NASA TU may never see it again. You may never know if it was sent to the right person or passed on to someone else for response. It is often the case that one contact person will provide more than one type of data. Often, a contact person will provide leads to other contacts for other source data, which expands NASA's original list of suppliers/originators. The database producer will not know this unless some conversation -- some personal give-and-take -- has taken place.

(c.) Making the contact

Introductory phone calls to the identified contact person will be followed, when possible, by a personal visit to the contact's workplace. It's good to have the human element involved in a cooperative working relationship. TUNS database needs will be discussed directly; sample data will be shown to illustrate how the materials contributed are adapted and used; inquiries about possible spinoff products of their data can be initiated, etc. Perhaps NASA TU will help them make contacts that you know about. If a personal site visit is not possible, then phone calls, faxes, and correspondence will be utilized liberally to attain a high level of cooperative effort.

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3.1 Recommended Workflow for Source Data Collection, Preparation and Input (continued)

(d.) Data collection

Data collection is accomplished by whatever means is most convenient for the TUNS database source materials providers. NASA sources may prefer to send the materials by US Mail (First Class, Library Rate, Parcel Post), UPS, personal pickup, on floppies, data transmission, interoffice messenger. In some cases, NASA TU may have to become a subscriber in order to receive particular source materials. Whatever methods are called for must be carried out in order to insure constant and timely input to the NASA TUNS database.

(e.) Collection inventory and control

An important phase of the data collection process is the collection control. This will involve tasks as simple as a manual library check-in/claiming procedure or as sophisticated as an online calendar and "tickler" file. In either instance, inventory logs are built of the raw source materials being collected. Logs are maintained both for those materials published or available on a regular, predicatable basis and for those materials published or available sporadically or on a random publication basis.

As source data is received within a particular period, it is noted in the log before it is passed on to an editor for verification, selection, and input. This log provides the reference point necessary for the data collection staff to perform their tasks successfully. As in the library check-in/claim system, when data is not received as expected, the data collection staff person(s) will contact their source to determine the whereabouts of the source materials. Or, in other instances, when materials have not been received from a provider over a period of time, the provider is contacted. For example, an online log will be designed to record identifying information such as the title, publication date, issue number, origin, document type, etc.

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3.1 Recommended Workflow for Source Data Collection, Preparation and Input (continued)

(e.) Collection inventory and control (continued)

The online log will also be used to track the data internally by recording the editor assigned for abstracting and indexing, the date the materials are picked up by and returned from the editor, and the date the materials are entered into the database.

In the case of electronic data a procedure will be established that will track the date of receipt and date of inclusion to the database. For instance, fields for the date of receipt and date of inclusion will be added to the electronic data as it is received by the editorial staff and then stripped before it is loaded to NASA TUNS database. Copies of the data will be kept as backup, retaining those fields for inventory and reporting purposes.

Each of the tasks described above, (a., b., c., d., and e.), must be reviewed and refined periodically. These are not one-time or short-term activities. Each task is equally important. Fulltime staff must be dedicated to these tasks.

(f.) Editorial and data preparation

As all data is received and logged in, the materials will be separated according to publication, document type, editorial requirements, and editor assigned. The source data is logged out as picked up by the assigned editor. A range of numbers is provided and from these a unique identification number (accession number) is assigned to each piece of data to be included in the database.

The database editorial and data entry services necesssary for the production and maintenance of the NASA TUNS database will be performed by dedicated editorial and data entry staffs. Editors' tasks will include all indexing, coding, abstracting, vocabulary control, and vocabulary development. Completed work will be checked routinely and regularly by a project manager or senior editor to insure quality of abstracting, indexing, and coding.

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3.1 Recommended Workflow for Source Data Collection, Preparation and Input (continued)

(f.) Editorial and data preparation (continued)

The project manager and editors will spend part of their working day proofreading for keying accuracy. While proofing for typos, the content of abstracts and correctness of indexing and coding will also be checked. (Editors will not proof their own work.) It is an essential activity to guarantee the ongoing quality of the TUNS database and a major function in early identification of problem areas, errors or omissions before the data is loaded to the database. All levels of the group need to keep their focus on the goal -- high quality data. They must all have regular review functions. It also helps, when installing innovation into the process, if all levels are aware of the current practices. Further, it prevents "editorial drift" within the project.

As the editors complete their tasks, the data, ready now for input, is logged out of editorial and into the data entry stream. As data is picked up for keying, it is logged out. All data entry will be done in the appropriate format for loading to the TUNS database. Database format accuracy will be insured by designing input screens, virtually eliminating errors of omission and incorrect placement of data.

(g.) Input of source data to the TUNS database

The data entry staff will log out the data as it is picked up for keying. Manual input to the TUNS database will be done in the required format. Accuracy of the keying format will be insured by designing input screens, virtually eliminating errors of omission and incorrect placement of data. Screens will be designed for input of types of source data; i.e., fulltext, abstracted/indexed, digests, bibliographic and/or document/report/publication type. All keyed data will be checked by using spellcheckers as well as by proofreading.

3.1 Recommended Workflow for Source Data Collection, Preparation and Input (continued)

(g.) Input of source data to the TUNS database (continued)

Source data received in electronic format will have to be converted to the TUNS database format and load specifications. This will require that a program be written that will convert the data that is received in various electronic formats. Electronic data might require online tagging and coding before input to the database. (Online tagging and coding are editorial functions.) Electronic source data will also be proofread for accuracy and content before uploading to the database.

After the conversion program is run against any electronic source data and before uploading to the TUNS database, format accuracy of 100 percent will be guaranteed with the use of an algorithm written expressly for the database specifications. The combination of format checking, proofreading and spellchecking will insure that all data uploaded to the TUNS database will be highly accurate, quality data.

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4.0 CONCLUSIONS

a. The changes and corrections recommended herein to the production, implementation, and utilization of the NASA TUNS database are vital if NASA TU is to achieve the effective, efficient, accessible, and useable technology transfer. Therefore, I strongly recommend that these alternative procedures, routines, and activities be considered and adopted by the NASA Technology Utilization Network System (TUNS).

b. The implementation of these changes should be coordinated by a single management plan. This plan should include a process for determining the feasibility of a market study as well as for the development of a steering committee and user advisory board.

c. A comprehensive information managment plan must be developed which will outline the specifications and requirements of the NASA TUNS project. This plan also must insure NASA TU of timely distribution of quality information which will raise the credibility and value of the TUNS database to NASA and to its users.