

(NASA-CR-190169) REPOSITORY-BASED SOFTWARE  
ENGINEERING (RBSE) PROGRAM Final Report  
(Research Inst. for Computing and  
Information Systems) 10 p

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# ***Repository-Based Software Engineering Program (RBSE)***

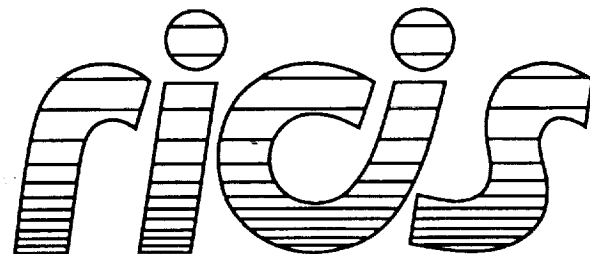
## ***FINAL REPORT***

**Applied Expertise, Inc.**

**January 7, 1992**

**Cooperative Agreement NCC 9-16  
Research Activity No. IM.17**

**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***

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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.

***Repository-Based Software  
Engineering Program (RBSE)***

***FINAL REPORT***

## Preface

This research was conducted under auspices of the Research Institute for Computing and Information Systems by Applied Expertise, Inc. Dr. Charles McKay served as RICIS research coordinator.

Funding has been provided by the 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 M. Fridge III, 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 NASA or the United States Government.

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Summary: Applied Expertise, Inc. (AE) has been under contract to the University of Houston, Clear Lake, since March 1, 1990. During this time AE has provided support to program managers at both Level 1 and Level 3 and to the program's Chief Scientist.

AE has delivered critical support in areas specified in its statement of work: client/customer liaison, research representation/outreach and program management support. Significant accomplishments include the following:

### **Program Management Support**

In addition to providing rapid response to program management requests, AE has sought to provide proactive, long-term analyses that served to keep RBSE focused on a set of defined goals and objectives, established a framework for demonstrating the program's value and provided vision for future directions.

- Improved management control of program expenditures and activities.
  - Saved \$250,000 through significant analysis of AdaNET ADP acquisition alternatives in the fall of 1990.
  - Participated in the review and improvement of the Program Management Plan.
  - Developed program evaluation criteria.
  - Encouraged management to define a focus or niche that established the uniqueness of the RBSE program and how it fits with other government reuse efforts.
  - Participated in briefings to NASA HQ management.
- Coordinated evaluations.
  - Developed briefing materials and draft agenda for formal program review.
  - Wrote program review summaries.
  - Tracked program review action items.
- Drafted responses to congressional inquiries. In one case, the language of the response was adapted into law.
- Developed preliminary concept for integration of AdaNET and the Technology Utilization Network System.

### **Liaison/Research Representation**

Our criteria for selecting meetings and organizations to target reflect our overall approach. Rather than choosing standard, well-attended events and well-known groups, we recommend events to our customer that most efficiently promote RBSE goals. These recommendations are based on the following:

1. Participation by potential AdaNET customers and sponsors, particularly those interested in safety-critical systems.
2. Cost.
3. Potential impact in promoting software engineering/reuse.
4. The degree to which we can provide significant leadership.
5. Potential for identifying the needs of AdaNET customers.

Our activities under this UHCL contract serve to illustrate how AE's approach has been applied:

- Establishment of potentially high-impact customer/collaborator relationships.
  - At the American Society for Quality Control conference in October 1991, AE identified important potential clients in Bell Communications Research, Boeing Commercial Airlines, the ASQC Software Standards Committee, and Varian Medical Equipment.
  - AE identified NASA Code Q as a potential collaborator and held discussions with key executives, laying the groundwork for future efforts.
- Leadership in the Reuse Library Interoperability Group. AE staff serve as Technical Committee Vice Chair and Secretary and as Chair of the Metrics Subcommittee (TC4). AE also drafted a problem statement for the RIG and has participated in efforts to expand the visibility and membership of the group.
- Leadership in the DOD System Acquisition and Software Reuse Working Group. AE participated in the "Barriers and Incentives" task group, developed a work process that was presented by the conference chair and used by all five task groups, and developed a problem statement for the task group.
- Reports on research and programs directly relevant to RBSE goals and efforts. For instance, AE produced a report analyzing the impacts to program management, RBSE and economic competitiveness of the Software Engineering Institute's updated Capability Maturity Model and its Technology Transition Plan.
- Establishment of RBSE Chief Scientist as reviewer of Bell Canada's "Capability Assessment Methodology."

### **Deliveries**

AE has delivered more than 90 products, including summaries of meetings, trips and contacts, and special reports and papers (see Attachment A).

- Among its eight meeting summaries, AE delivered detailed reports on RIG meetings and on the first workshop held by the DOD Systems Acquisition and Software Reuse Working Group.

- Nine contact summaries included reports of discussions held with key people in software reuse and quality. These included talks with Jim Hess, special assistant for software to the Secretary of the Army, Don Sova of NASA Code Q, and many members of ASQC and its Software Standards Committee.
- Special reports and reviews included reviews of AdaNET acquisition plans, of the Program Management Plan and Concept Document, a report on SEI's Capability Maturity Model and a presentation of suggested program evaluation criteria.
- AE also provided more than 60 copies of briefings, articles, research papers, memos and standards relevant to the program. Examples of these include:
  - Draft report of the Joint Logistics Commanders' San Antonio I Reusability Panel
  - Draft of the ASSET Library Open Architecture Framework (ALOAF)
  - RAASP Library Usage Metrics
  - Briefings by Paul Strassmann
  - NASA software document standards and guidance
  - Bell Canada's Capability Assessment Methodology

## **Conclusion**

Applied Expertise, Inc. has consistently sought to identify opportunities for liaison and program management support that provide the highest possible impact with use of the fewest possible resources. Not only has the company targeted key individuals and organizations with the greatest potential for a positive impact on RBSE, it has sought to package the information gained in these liaison efforts into clear, concise reports that would offer the greatest utility to the Program Manager and the Chief Scientist. Attachment A includes a list of these deliverables, which AE has made during the period of contract performance.

**Documents Delivered**  
*to the*  
**Repository Based Software Engineering Program**  
*Under*  
Subcontract No. 064  
*by*  
**Applied Expertise, Inc.**

March 1990 - December 1991

<b>Document Number</b>	<b>Date of Event</b>	<b>Description</b>
AE.9004.a	4/90	"Review of AdaNet Plans (Internal Document: Table of Contents only)"
AE.9008.a	8/2/90	"ADP Acquisition Planning for an Operational AdaNET"
AE.9008.b	8/2/91	"AdaNET Messaging Study: Status Report"
AE.9102.a	2/13/91	Executive Summary and Minutes: "AdaNET Program Meeting"
<b>AE.9102.b*</b>	2/91	Monthly Progress Report – February
AE.9103.a	3/21-22/91	"AdaNET Operations Review Meeting"
	Attach A	Minutes: "AdaNET Site Visit Review Summary"
	Attach B	Attendees/Organization Identification
	Attach C	Independent Technology Transfer Review Team Report on AdaNET Site Operation
AE.9103.b	3/4/91	"AdaNET Concept Document & Program Management Plan: Focused Ada Research Comments"
<b>AE 9103.c</b>	3/91	Monthly Progress Report – March
AE.9104.a	4/91	"AdaNET Program Criteria" (Preliminary Discussion Draft)
<b>AE 9104.b</b>	4/91	Monthly Progress Report – April
AE.9105.a	5/3/91	Meeting Summary: "Reuse Library Interoperability Group"
	Attach A	"Charter of Reuse Library Interoperability Group"
	Attach B	RIG Meeting Attendance List
	Attach C	"Draft Report of the Joint Logistics Commanders' San Antonio I Software Reusability Panel"
	Attach D	Unique Problems - Work Areas for RIG
	6/3/91	RICIS Document Distribution Index

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\* Document numbers listed in boldface type have been delivered since July 15, 1991



<b>Document Number</b>	<b>Date of Event</b>	<b>Description</b>
<b>AE.9105.b</b>	5/91	Monthly Progress Report – May
AE.9106.c	6/14/91	Meeting Summary: "Reuse Library Interoperability Group, IBM - Gaithersburg"
	Attach A	Meeting Attendance List
	Attach B	"The Information Resource Dictionary System"
	Attach C	"STARS Asset Library, Open-Arch Framework Asset Interchange Specification"
	Attach D	Report of J. Moore RIG Meeting
AE.9106.b	6/17-22/91	Contact Summary Report: SIGAda/Washington Ada Symposium
	Attach A	Berry, Ron - "SIDPERS-3, Metrics for Competitiveness"
	Attach B	Medley, John - "Total Quality Management Through Ada"
	Attach C	Mosemann, Lloyd - "Ada: Vital to the Industrial Base"
	Attach D	Call for Participation, DoD System Acquisition and Software Reuse Workshop"
	6/91	Monthly Progress Report
AE.9107.d	7/11/91	Draft: "Reuse Library Interoperability Group (RIG) Problem Statement"
AE.9107.e	7/12/91	Items of Interest
	Encl 1	Infospan - "IRDS Repository Primer"
	Encl 2	Infospan - "ANSI/FIPS 156 Information Resource Dictionary System"
<b>AE.9107.g</b>	7/16-17/91	Trip Report: "Travel to Houston"
AE.9107.b	7/22/91	Meeting Summary: "Reuse Library Interoperability Group"
AE.9107.c	7/31/91	RAASP Library Usage Metrics
AE.9107.a	7/91	Monthly Progress Report
<b>AE.9108.b</b>	8/1-2/91	AdaNET Program Review
AE.9108.a	8/6/91	ADAJug Workshop: Contact Summary Report
AE.9110.b	8/27-29/91	Contact Summary Report: "SEI Affiliates Symposium"
	Encl 1	Analysis: "Report on SEI Affiliates Symposium"
<b>AE.9108.c</b>	8/91	Monthly Progress Report – August
AE.9110.a	9/3-4/91	Meeting Summary: "Reuse Library Interoperability Group"
<b>AE.9109.a</b>	9/16/91	McKay: Items of Interest
	Encl 1	"Software Technology Transition"
	Encl 2	Material from TC1-Presentation & Draft Report by Barry E. Jacobs (Software Kits)

<b>Document Number</b>	<b>Date of Event</b>	<b>Description</b>
	Encl 3	"Ada Language Poses Threat to MoD Security" (5-23-91), Body of Report Prepared for Ken Rowe
<b>AE.9109.b</b>	9/91	Monthly Progress Report – September
<b>AE.9110.c</b>	10/91	Monthly Progress Report – October
<b>AE.9110.d</b>	10/6-9/91	Contact Summary Report: "American Society for Quality Control, International Conference on Software Quality"
	Encl 1	"Software Quality Assurance Standards" - SofTech, Inc.
	Encl 2	"A Multi-Dimensional Index for Software Quality"
	Encl 3	"The Applicability of TQM to Software Development"
<b>AE.9110.e</b>	10/15/91	McKay Memo: Airlines Electronic Engineering Committee
<b>AE.9110.f</b>	10/17/91	Dickerson - Re: Conversation with Senate Appropriations Subcommittee
<b>AE.9110.g</b>	10/22-25/91	Trip Report: "TRI ADA '91"
<b>AE.9110.h</b>	10/29-30/91	"October Reuse Library Interoperability Working Group Meeting"
<b>AE.9111.a</b>	11/4/91	McKay - Preliminary Draft - "Criteria for Reuse Library"
<b>AE.9111.b</b>	11/5/91	McKay: Strassman's Briefing
<b>AE.9111.c</b>	11/5-7/91	Meeting Report: "DoD System Acquisition and Software Reuse"
	Encl 1	"The Business Issues Associated with Software Reuse"
	Encl 2	"DoD System Acquisition and Software Reuse"
	Encl 3	List of participants
	Encl 4	Pre-RFP and Source Selection Group Document 11-7-91
	Encl 5	"Managerial Aspects of Software Reuse" IDA Symposium
	Encl 6	"System Acquisition Plan (US Army)"
<b>AE.9111.d</b>	11/11/91	R. Braun: ASQC "Electronic Bulletin "Board Review
<b>AE.9111.e</b>	11/11/91	McKay: 10/29/91 RIG Meeting and January CIM Meeting
<b>AE.9111.f</b>	11/19/91	Response to Requested Material from McKay
<b>AE.9111.g</b>	11/21/91	Meeting Report: "Don Sova"
<b>AE.9111.h</b>	11/22/91	McKay: 3 Enclosures, including Bell Document
	Encl 1	"Bell's Canada's Capability Assessment Methodology for Telcom Software Systems"
	Encl 2	Contact Summary Report: "ASQC International Conference on Software Quality"
	Encl 3	"Information Technology Trends and Policy in the EC"
<b>AE.9111.i</b>	11/22/91	McKay Re: "Preliminary Draft of Bell's Compatibility Assessment Methodology"

<b>Document Number</b>	<b>Date of Event</b>	<b>Description</b>
<b>AE.9111.j</b>	11/22/91	MountainNET Ltr: NASA Documents
	Encl 1	"NASA's Software Documentation Standard"
	Encl 2	"NASA Software Assurance Guidebook"
	Encl 3	"NASA Quality Assurance Audit GuideBook"
<b>AE.9111.k</b>	11/91	Monthly Progress Report
<b>AE.9112.a</b>	12/11/91	McKay Fax Re: Federal Open Systems Conference
<b>AE.9112.b</b>	12/11/91	Fax to McKay Re: Meeting with Pat Schuler/LARC
<b>AE.9112.c</b>	12/16/91	McKay: Response to Review RBSE Program Brochure
<b>AE.9112.d</b>	12/20/91	McKay Fax Re: APEX Working Group
<b>AE.9112.e</b>	12/30/91	
	Encl 1	"Asset Library Open Architecture Framework (ALOAF) Draft"
	Encl 2	"STARS Catalog"
	Encl 3	"DoD - Human Computer Interface Style Guide"
	Encl 4	"Requirements for Inter Software Communications for the Common ATCCS Support Software"
	Encl 5	Airlines Electronic Engineering Committee's Electronic Library Systems Subcommittee Report
<b>AE.9112.f</b>	12/18/91	Contact Summary: "Meeting with Jim Hess"
<b>AE.9112.g</b>	12/3-5/91	Meeting Summary: "NASA Goddard SEL Workshop/STARS '91"
<b>AE.9112.h</b>	12/91	Final Report
	Attach A	"List of Delivered Documents"