

# Directory of Industry and University Collaborations with a Focus on Software Engineering Education and Training, Version 6

Kathy Beckman, Computer Data Systems, Inc.  
*November 1997*

SPECIAL REPORT  
CMU/SEI-97-SR-018

**Special Report**  
CMU/SEI-97-SR-018

November 1997

Directory of Industry and  
University Collaborations with a Focus on Software  
Engineering Education and Training, Version 6



---

---

---

---

Kathy Beckman, Computer Data Systems, Inc.

Community Sector

Unlimited distribution subject to the copyright

**Software Engineering Institute**  
Carnegie Mellon University  
Pittsburgh, PA 15213

This report was prepared for the

SEI Joint Program Office  
HQ ESC/AXS  
5 Eglin Street  
Hanscom AFB, MA 01731-2116

The ideas and findings in this report should not be construed as an official DoD position. It is published in the interest of scientific and technical information exchange.

FOR THE COMMANDER

(signature on file)

Jay Alonis, Lt Col, USAF

SEI Joint Program Office

This work is sponsored by the U.S. Department of Defense.

Copyright © 1997 by Carnegie Mellon University.

Permission to reproduce this document and to prepare derivative works from this document for internal use is granted, provided the copyright and "No Warranty" statements are included with all reproductions and derivative works.

Requests for permission to reproduce this document or to prepare derivative works of this document for external and commercial use should be addressed to the SEI Licensing Agent.

#### NO WARRANTY

THIS CARNEGIE MELLON UNIVERSITY AND SOFTWARE ENGINEERING INSTITUTE MATERIAL IS FURNISHED ON AN "AS-IS" BASIS. CARNEGIE MELLON UNIVERSITY MAKES NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, AS TO ANY MATTER INCLUDING, BUT NOT LIMITED TO, WARRANTY OF FITNESS FOR PURPOSE OR MERCHANTABILITY, EXCLUSIVITY, OR RESULTS OBTAINED FROM USE OF THE MATERIAL. CARNEGIE MELLON UNIVERSITY DOES NOT MAKE ANY WARRANTY OF ANY KIND WITH RESPECT TO FREEDOM FROM PATENT, TRADEMARK, OR COPYRIGHT INFRINGEMENT.

This work was created in the performance of Federal Government Contract Number F19628-95-C-0003 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center. The Government of the United States has a royalty-free government-purpose license to use, duplicate, or disclose the work, in whole or in part and in any manner, and to have or permit others to do so, for government purposes pursuant to the copyright license under the clause at 52.227-7013.

This document is available through SAIC/ASSET: 1350 Earl L. Core Road; PO Box 3305; Morgantown, West Virginia 26505 / Phone: (304) 284-9000 / FAX: (304) 284-9001 / World Wide Web: <http://www.asset.com/SEI.html> / e-mail: [sei@asset.com](mailto:sei@asset.com).

Copies of this document are available through the National Technical Information Service (NTIS). For information on ordering, please contact NTIS directly: National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161. Phone: (703) 487-4600.

This document is also available through the Defense Technical Information Center (DTIC). DTIC provides access to and transfer of scientific and technical information for DoD personnel, DoD contractors and potential contractors, and other U.S. Government agency personnel and their contractors. To obtain a copy, please contact DTIC directly: Defense Technical Information Center / Attn: BRR / 8725 John J. Kingman Road / Suite 0944 / Ft. Belvoir, VA 22060-6218. Phone: (703) 767-8274 or toll-free in the U.S. 1-800 225-3842).

Use of any trademarks in this report is not intended in any way to infringe on the rights of the trademark holder.



## Table of Contents

1. Introduction .....	1
2. Geographical Data.....	3
2.1 United States of America.....	3
2.2 Australia .....	4
2.3 Canada.....	4
3. Information on Collaborative Efforts.....	5
Alliance for Higher Education .....	5
American University.....	6
Applied Information Management (AIM) Institute.....	8
California State University, Long Beach Software Engineering Forum for Training .....	10
Computer Applications and Software Engineering (CASE) Center at Syracuse University.....	11
Consortium for Graduate Education in Software Engineering (ConGESE) .....	12
Consortium for Software Engineering Research (CSER) .....	14
D.C. SPIN Training Group .....	15
Embry-Riddle Aeronautical University Software Center .....	16
Florida Atlantic University .....	18
Quebec Master's Program in Software Engineering.....	20
Research Institute for Computing and Information Systems (RICIS).....	21
Software Engineering Research Centre (SERC).....	23
Software Industry Coalition.....	24
Software Productivity Centre Inc. (SPC).....	25
Software Quality Institute .....	26
Software Technology Centre.....	28
Texas Tech University .....	30

The University of British Columbia .....	32
University of California, Santa Cruz .....	34
University of Maryland University College .....	36
The University of Southern California Center for Software Engineering .....	38
University of South Florida .....	40
The University of Texas at Austin.....	42
Bibliography .....	45

# Directory of Industry and University Collaborations with a Focus on Software Engineering Education and Training, Version 6

**Abstract:** This directory describes 24 formal collaborative efforts to promote software engineering education and training activities among industry organizations (including government) and universities in the United States, Canada, and Australia. These collaborations vary in their organizational structure and types of services offered. All attempt to bridge the gap between industry needs and academic software engineering education and training offerings. Readers can use this directory to find collaborations that match their software engineering education and training needs and that are located within their geographic area.

## 1. Introduction

Universities and industry collaborate in many different ways. For purposes of this directory, an industry/university collaboration is a formal, joint effort by a university (or universities) and a business or government organization(s), where each party provides specified products and services to achieve common goals. Examples of collaboration included in this directory are:

- University collaborates with industry or government to develop and deliver courses (credit or non-credit) at an industry or government site.
- University and industry organization(s) collaborate to market and deliver public and/or customer site software engineering training.
- University/universities develop and deliver a certificate or degree program for an industry/government organization or group of organizations, guided by an Industry Advisory Board or equivalent.
- A university, or center affiliated with a university, provides software engineering education and training activities (classes, seminars, forums, conferences) to members for an annual membership fee, guided by an Industry Advisory Board or equivalent.
- In collaboration with university and industry participants, a non-profit organization (e.g., a Software Process Improvement Network) organizes software engineering education and training activities.

There are many other industry/university interactions not considered collaborations for purposes of this directory. These include:

- Individual employee takes university courses reimbursed by the employer.
- Students do “real world” work for industry as their course projects.
- Industry funds summer internships for faculty or students.

- University hires adjunct faculty from industry or government organizations.

This directory contains information on 24 formal collaborative efforts to promote software engineering education and training, usually within a specific geographic area. It allows the reader to locate an existing group with which to interact as a potential member, supporting university, or commercial provider of training services. The directory provides brief descriptions of currently identified collaborations: their goals, organization, membership, software engineering education and training activities, and points of contact.

The groups described vary in their organizational structure and in the type of services they provide, but all groups have active university and industry representation. Some groups merely share information and experience; others offer software engineering classes to members and non-members for a fee. Obtaining cost-effective education on timely software engineering topics, designed to specification, and delivered locally is often difficult for a single organization, but when organizations pool resources and share classroom seats, costs go down. A nearby university typically serves as the group facilitator and coordinates class offerings. These offerings may be for university credit, be part of a certificate program, or carry Continuing Education Units (CEUs).

For a software organization, the directory points to geographically convenient collaborations. If none are available locally, the descriptions of existing collaborations may serve as a model for the formation of a local group. The more established groups and their identified Points of Contact can serve as models to emerging groups, providing examples of goals, organization structure, charters, fee arrangements, and other pertinent information.

For colleges and universities, the directory highlights a potential business opportunity and a way to become more involved in the local industrial and government community. The points of contact from universities are experts in techniques for organizing local efforts.

For training providers, the directory can serve as a pointer to potential new client bases.

A short bibliography points the reader to background material on software engineering curricula, coalitions in other countries, Software Process Improvement Networks (SPINs), and the Capability Maturity Model<sup>SM</sup> (CMM<sup>®</sup>) for Software (developed by the Software Engineering Institute [SEI]), and its key process areas (KPA). These topics are relevant to the discussion of the collaborations' goals.

---

SM Capability Maturity Model is a service mark of Carnegie Mellon University.

® Registered in the U.S. Patent and Trademark Office.



## **2. Geographical Data**

The following lists the location of the university and industry collaborations described in this directory.

### **2.1 United States of America**

#### **California**

California State University, Long Beach Software Engineering Forum for Training (page 10)

Software Industry Coalition (page 24)

University of California, Santa Cruz (page 34)

University of Southern California Center for Software Engineering (page 38)

#### **District of Columbia**

American University (page 6)

D.C. SPIN Training Group (page 15)

#### **Florida**

Embry-Riddle Aeronautical University Software Center (page 16)

Florida Atlantic University (page 18)

University of South Florida (page 40)

#### **Maryland**

University of Maryland University College (page 36)

#### **Nebraska**

Applied Information Management (AIM) Institute (page 8)

#### **New York**

Computer Applications and Software Engineering (CASE) Center at Syracuse University (page 11)

#### **Texas**

Alliance for Higher Education (page 5)

Research Institute for Computing and Information System (RICIS) (page 21)

Software Quality Institute (page 26)

Texas Tech University (page 30)

University of Texas at Austin (page 42)

## **2.2 Australia**

### **Melbourne**

Software Engineering Research Centre (SERC) (page 23)

## **2.3 Canada**

### **British Columbia**

Software Productivity Centre (page 25)

The University of British Columbia Certificate in Software Engineering (page 32)

### **Ontario**

Consortium for Graduate Education in Software Engineering (ConGESE) (page 12)

Consortium for Software Engineering Research (CSER) (page 14)

### **Quebec**

Quebec Master's Program in Software Engineering (page 20)

### **Saskatchewan**

Software Technology Centre (page 28)

### **3. Information on Collaborative Efforts**

#### **Alliance for Higher Education Dallas, Texas (U.S.A.)**

The Alliance for Higher Education creates partnerships between academic and corporate communities to respond to the educational demands of business, industry, and government and to facilitate cooperative activities. It began its mission in 1967 with The Association for Graduate Education and Research (TAGER) television network, which brings higher education to the workplace. The Dallas chapter of the Software Process Improvement Network (SPIN), in conjunction with the Association for Software Engineering Excellence (ASEE), is working to provide software engineering education over the TAGER network.

#### **Organization**

The Alliance for Higher Education is a not-for-profit, non-government agency. It is directed by a board of trustees. Presidents and chancellors of member academic institutions provide direction through the Council of Presidents.

#### **Membership**

There are three categories of membership:

1. Principal participants are colleges and universities, currently numbering about 30.
2. Associate participants are institutions, agencies, or companies that are substantial users of Alliance services.
3. Service subscribers participate in Alliance services.

All membership categories have a membership approval process. There is a fee structure for membership.

#### **Software Engineering Education and Training Activities**

Influenced by both the Dallas SPIN and SEI curriculum guidelines, Southern Methodist University, Texas Christian University, and The University of Texas at Arlington offer graduate courses in software engineering over the TAGER network. The Alliance produces a course catalog.

#### **Point of Contact for Further Information**

Dr. Harvey Stone  
Directory for Network Programming and Operations  
17103 Preston Road  
Lock Box 107, Suite 250

Dallas, Texas 74248-1373  
Phone: 972 / 713-8170  
Fax: 972 / 713-8209  
Email: harveys@alliance.edu.org  
Web Address: n/a

## **American University Washington, D.C. (U.S.A.)**

American University in Washington, DC, in cooperation with the Center for Systems Management (CSM) in San Jose, CA, offers a Graduate Certificate program in Systems and Project Management (SPM). This collaboration began in January 1996. The SPM Certificate program addresses current and emerging project and management issues related to the orderly and controlled analysis, design, development, implementation, operation, maintenance, and replacement of systems of all types. The courses involved are focused on those organizational functions and processes usually thought of as management; planning, organizing, controlling, training, budgeting, and business administration, supplemented with those functions that are traditionally considered as technological; process improvement; system economics; human factors; telecommunications; systems analysis and design; and legal and ethical issues. The concepts of process maturity and continuous process improvement have been infused into the entire curriculum.

The certificate curriculum is centered around four CSM-developed courses designed for software development and maintenance project managers and team members and includes a selection of courses from the university's Department of Computer Science and Information Systems (CSIS), and the Kogod College of Business Administration. The program provides 15 graduate level credits and a Certificate of Systems and Project Management for students who successfully complete the program. This includes three required and two elective courses of three credit hours each. All of the courses are taught by full-time or adjunct faculty of AU. Non-credit offerings with a certificate of completion are also available. In addition to the SPM Certificate, the university offers graduate certificates in Information Systems, Computer Science, and Information Resource Management. Special one or two-day training sessions covering specialized aspects of the subjects listed above are also made available through this cooperative program. These are delivered by CSMAU faculty members as special assignments. Such courses have been presented in Europe, in the Far East, and South America in the past year.

### **Organization**

This cooperative venture is governed by a joint Memorandum of Understanding that defines the roles and relationships of the parties involved: two elements of American University, the *College of Arts and Sciences, Department of Computer Science and Information Systems and the Kogod College of Business Administration*; and the *Center for Systems Management*. Under this agreement, all course offerings are arranged through the university

with CSM providing the CSM courses under contract. All instructors are full- or part-time university faculty. The program is managed by the Department of Computer Science and Information Systems.

## **Membership**

American University is an independent, coeducational university with more than 11,000 students enrolled in undergraduate, master's, doctoral, and professional degree programs. The University provides many different types of adult and continuing education programs designed for the working professional. The Center for Systems Management, located in San Jose, California, is a training and mentoring organization of experienced project managers. CSM provides courses in Project Management, System Engineering, Software Process Improvement, Project Business Management, and Integrated Product Teams to government agencies and project-dependent companies.

Participants in the Graduate Certificate program are funded typically by their organizations. Organizations that have participated in the program include Lucent Corporation sites in New Jersey, Georgia, and Missouri, and the Defense Intelligence Agency in Washington, DC. Participation with AT&T in Virginia and with a training consortium of high-tech companies in Northern Virginia is currently being negotiated.

## **Software Engineering Education and Training Activities**

The program is offered at client sites and on campus to individuals and to groups from corporations, government agencies, and other organizations. Courses are typically presented in a compressed format (i.e., five full days of instruction for a three- credit course, all in one week or over three weekends). Admission to this program is limited to students with experience that demonstrates a foundation of basic knowledge of systems and project principles and practices. This experience may include course work or work experience obtained within the past seven year period prior to admission to the program. One- or two-day training sessions are offered by CSM on request.

## **Point of Contact for Further Information**

William R. Flury  
Department of Computer Science and Information Systems  
American University  
4400 Massachusetts Avenue, NW  
Washington, DC 20016-8116  
Voice: 202-885-3138  
Fax: 301-229-8549  
e-mail: [wflury@american.edu](mailto:wflury@american.edu)  
Web Address: <http://www.cas.american.edu/csis.html>

## **Applied Information Management (AIM) Institute Omaha, Nebraska (U.S.A.)**

The AIM Institute is a membership organization promoting business growth related to information technology. The mission of the AIM Institute is to provide information technology leadership to the greater Nebraska community by focusing and coordinating the resources of its educational, governmental, and private business partners.

### **Organization**

It is increasingly evident that the economic health of a firm, industry, state, region, or even an entire economy is dependent upon information technology strategies. In the coming era, networking and other information technologies that connect individuals and firms into local, regional, national, and international markets will be essential to sound economic growth and development.

Equally important is the development of an intellectual infrastructure to prepare the knowledge workers of tomorrow. More important than additional fiber optics is an understanding of access techniques and available opportunities.

The Omaha community, seeking insight into how to maintain and strengthen the city and state business environment, commissioned several studies during the 1989-1991 period. All of these studies documented the need to bring focus to the area's information infrastructure.

The Omaha business community, with the full cooperation of the educational and government sectors, decided to create an institute to help make Omaha "one of a handful of preeminent national information centers." Thus the AIM Institute was created to improve Omaha's already enviable position as a world communication leader.

The vision, agenda, and direction for each of the primary activities of AIM are developed and refined through continual interaction with business, technology, and academic leaders. Among the services provided by AIM are continuing education opportunities, support for academic curriculum development, employment services, facilitation of cooperative industry-university-applied research, and assistance with new business development.

### **Membership**

The AIM membership categories are corporate, educational, and other. For a list of current members, see the members' Worldwide Web page located at

<http://www.omaha.org/members.htm>

The entire community profits as AIM members achieve common objectives. Corporate contribution is evolving into a benefit-based membership, providing direct value or service

to the member, while strengthening the Nebraska information technology environment. Specific benefits to AIM members are

- discounts on continuing education
- access to relevant college accredited courses
- reduced out-of-state travel
- increased staff preparedness, improved staff retention
- student and faculty internship placement
- employee recruitment assistance
- participation in setting AIM direction
- post-secondary education support

Corporate memberships are available, ranging from \$1,000 to \$25,000 annually. New members are always welcome. Funding is provided through annual memberships, grants, and fees from seminars. Opportunities for state, federal, and private funding are continuously explored.

### **Software Engineering Education and Training Activities**

AIM supports education in information technology through

- continuing education, consisting of seminars and training courses discussing telecommunications, computer issues, business processes, and other topics. These programs maintain and improve the skill level of the workforce.
- curriculum development, supporting colleges in the development of curricula addressing emerging communication and information technology issues to better prepare students for the workplace. Through forums for business and academia to exchange ideas, educators develop a greater understanding of business needs, and firms gain insight from faculty.

### **Point of Contact for Further Information**

Robert E. Sweeney  
Executive Director  
Applied Information Management (AIM) Institute  
1314 Douglas On-the-Mall  
Omaha, NE 68102  
Phone: 402 / 422-2343  
Fax: 402 / 422-4104  
Email: [rsweeney@omaha.org](mailto:rsweeney@omaha.org)  
Web Address: <http://www.omaha.org>

## **California State University, Long Beach Software Engineering Forum for Training Long Beach, California (U.S.A.)**

Formed in September 1993, the California State University, Long Beach (CSULB) Software Engineering Forum for Training (SEFT) is a training partnership among companies in the Long Beach, Los Angeles, and Orange County areas. The CSULB SEFT provides high-quality, cost-effective, tailored training in software engineering process improvement and management practices to employees of member companies. Membership in the consortium provides the opportunity to influence and guide the training curriculum.

### **Organization**

The SEFT has an advisory executive board and a technical committee composed of member and CSULB representatives. The Executive Board is the policy-making body, and the Technical Committee develops curricula and assists the board. The SEFT is administered by University College and Extension Services and has a charter and documented operating plan.

### **Membership**

Members of the SEFT include the Boeing Company, Northrop Grumman Corporation, and TRW. Funding of SEFT is provided through the sale of annual memberships. Membership fees are applied directly to the training that companies receive. Members have seats on the Executive Board and the Technical Committee, priority access to training at a reduced membership rate, and direct input into the selection of course topics, curriculum, and schedule.

### **Software Engineering Education and Training Activities**

Following a thorough needs assessment, course topics and objectives are identified, and detailed course outlines are reviewed, modified, or written. Potential instructors are solicited to begin customization of courses. SEFT works with training providers and faculty from the Computer Engineering and Computer Science Department on campus to design and develop curriculum.

Courses cover subject areas related to software process improvement, for example, computer-aided software engineering tools, software configuration management, software metrics, software risk management, software testing, and ISO 9000. Courses are open to the public. University College and Extension Services has extensive mechanisms, such as videoconferencing and web technology, for delivering distance education.



## **Point of Contact for Further Information**

Sheneui Sloan  
Program Director, SEFT  
University College and Extension Services  
California State University, Long Beach  
3515 Harbor Blvd.  
Costa Mesa, CA 92626  
Phone: 714 / 825-3787  
Fax: 714 / 825-3788  
Email: [scsloan@uces.csulb.edu](mailto:scsloan@uces.csulb.edu)  
Web Address: <http://www.uces.csulb.edu/seft>

## **Computer Applications and Software Engineering (CASE) Center at Syracuse University Syracuse, New York (U.S.A.)**

The CASE Center at Syracuse University is one of New York State's original Centers for Advanced Technology (CATs). Initiated in 1983, the CAT program represents a creative partnership among universities, industry, and government designed to accelerate the development of commercially relevant technologies. Key goals are increased industrial productivity, a strengthened technological infrastructure, and more effective technology transfer--all helping to spur economic growth.

### **Organization**

The CASE Center is managed by its director, Robert R. Birge, and its managing director, Eugene Woodcock. Faculty researchers, university administrators, and CASE staff assist the directors with industrial liaison, technology transfer, and outreach programs. More than 60 faculty members from a dozen academic departments and campus organizations are affiliated with the center. The CASE Center's research program emphasizes four major technical areas: high performance distributed computing systems, information systems design, optical and molecular computing, and applied computing. Each area involves the development and enhancement of computer software. Information systems design focuses specifically on developing tools and methods for improving the quality of software through such techniques as software metrics and formal methods, object-oriented methods, neural networks, associative processing, and parallel software. The center operates several specialized laboratories, including the Software Engineering Lab, Open Systems Cluster, and ATM Distributed Computing Lab, that support research, technology transfer, and advanced training activities. Research results are disseminated through conferences, workshops, seminars, demonstrations, and special events. Publications include technical reports, a newsletter, and informational materials.

## **Membership**

In addition to federal grants and seed funding from the New York State Science and Technology Foundation, the CASE Center has received funding from over 120 companies, universities, and government organizations, the majority of them operating within New York. The center conducts joint research with industry and other outside sponsors. The center also provides technical consulting, access to computer facilities and special information systems, laboratory interactions, and specific technical services.

## **Software Engineering Education and Training Activities**

The CASE Center offers a variety of educational opportunities for both college students and corporate personnel. Dozens of qualified graduate students are supported on research assistantships every year, and company employees enrolled in graduate degree programs participate frequently in collaborative research with CASE faculty. To introduce the most recent scientific advances to the commercial sector, the center regularly sponsors short courses, tutorials, and other technical sessions targeted to business and industry. Laboratories provide hands-on training and practical applications of theoretical concepts.

## **Point of Contact for Further Information**

Eugene F. Woodcock  
Managing Director, CASE Center  
2-212 Center for Science & Technology  
Syracuse University  
Syracuse, New York 13244-4100  
Phone: 315 / 443-1060  
Fax: 315 / 443-4745  
Email: [gene@cat.syr.edu](mailto:gene@cat.syr.edu)  
Web Address: <http://www.cat.syr.edu>

## **Consortium for Graduate Education in Software Engineering (ConGESE)**

### **Ottawa, Ontario (Canada)**

ConGESE provides education specially structured for software professionals in Ontario industries, leading to a master's degree in computer science, with an emphasis in software engineering. Each of six participating universities offers courses in this program. The courses are typically offered on-site with cooperating industrial sponsors and are designed for the working professional, who might otherwise find it difficult to attend regular, on-campus graduate programs. ConGESE is responsible for maintaining the curriculum and administering the program and course delivery. Degree-granting rights rest with the participating universities.

## **Organization**

ConGESE is governed by a committee structure composed of the Executive Board, Academic Steering Committee, and Industry Steering Committee. Curriculum issues are handled by the Curriculum Committee. Additionally there is a Technology and Continuing Education Committee and a Promotion and Funding Committee. Committee responsibilities are shared across the participating universities and companies.

## **Membership**

The universities participating in ConGESE are all those that grant Ph.D. degrees in computer science in Ontario:

- Carleton University
- Queen's University
- University of Ottawa
- University of Toronto
- University of Western Ontario
- University of Waterloo

Industrial participation started with substantial support from the IBM Toronto Laboratory and Bell Northern Research Ltd. The ConGESE program is financially supported by the Information Technology Research Centre, an Ontario Centre of Excellence.

## **Software Engineering Education and Training Activities**

Four areas make up the technical core of software engineering courses:

1. requirements and specification
2. architecture and design
3. reuse and maintenance
4. verification and testing

Other areas round out the coverage of software engineering:

- application classes and support software technology
- management of people, products, projects, and processes

## **Point of Contact for Further Information**

Dr. W. Morven Gentleman, Head  
Software Engineering Laboratory  
Institute for Information Technology  
National Research Council  
Montreal Road, Bldg. M-50  
Ottawa, Ontario  
Canada K1A 0R6

Phone: 613 / 993-3857

Fax: 613 / 952-7151

Email: gentleman@iit.nrc.ca

Web Address: <http://www.turing.toronto.edu/homes/congese>

## **Consortium for Software Engineering Research (CSER) Ottawa, Ontario (Canada)**

Formed in March 1996, the Consortium for Software Engineering Research (CSER), is a not-for-profit partnership between Canadian industrial and university members together with the National Research Council, Canada. The industry-directed research program will seek to improve and expand the methodologies, tools, and techniques used to construct, deploy support for and evolve software; and to improve the quality of software, increase productivity, and manage the costs. A crucial and immediately realizable benefit will be a greater appreciation among the university community of key software engineering problems experienced by industry and the context relevant to evaluating proposed solutions, including industrial-strength tools, mega-line proprietary code bases, field feedback data, and constraints such as "best solution by fixed date" instead of "best solution possible." This hopefully will lead to more relevant and timely educational programs in Software Engineering at Canadian universities.

### **Organization**

CSER is governed by the board of directors, which is composed of industry and academic representatives, with industrial voting majority. The research work is grouped into themes, which in turn are each led by a theme steering committee, again composed of researchers from industry, government, and academia. The initial research theme is "Empirical Evolution of Legacy Code to Modern Architectures." The membership is expected to grow to up to three themes by 1998. The interaction between theme projects and the promulgation of the research results will be stimulated by the creation of a demonstration center at the Institute for Information Technology of the National Research Council.

### **Membership**

Current members of the CSER include Centre for Advanced Studies IBM Canada (Toronto), Nortel Technology (Ottawa), Object Technology Inc. (Ottawa), Mitel Corporation (Ottawa), and Bell Canada (Montreal) working together with researchers from the University of Toronto University of Victoria, University of Waterloo, Acadia University, University of Montreal, and University of Ottawa. The research is funded by direct contribution of industrial partners and grants from NSERC (Natural Sciences and Engineering Research Council) Canada's largest research-granting council.

## **Software Engineering Education and Training Activities**

CSEER does not offer courses. However, demonstrable evidence of impact on educational activities in software engineering in the universities (e.g., case studies and influence on course material) is a condition of the funding.

### **Points of Contact for further information**

Dr. Jacob Slonim  
Head of Research,  
Centre for Advanced Studies  
Dept. 834 IBM Canada Laboratories  
Phone: 416 / 448-2245  
Fax: 416 / 448-2859  
Email: JSLOINIM@TOROLAB2.VNET.IBM.COM  
Web Address: n/a

Dr. W. Morven Gentleman, Head  
Software Engineering Group  
Institute for Information Technology National Research Council, Canada  
Building M-50, Montreal Road  
Ottawa, Ontario  
CANADA K1A 0R6  
Phone: 613 / 991-6973  
Fax: 613 / 952-7151  
Email: gentleman@iit.nrc.ca  
Web Address: n/a

## **D.C. SPIN Training Group Washington, D.C. (U.S.A.)**

The Washington, D.C., Software Process Improvement Network (SPIN) started a training group in early 1993. This special interest group meets monthly (usually the third Thursday night of the month) from September through June. Networking begins at 6:30 PM with a light dinner, followed by a speaker and information sharing from 7:00-8:00 PM.

### **Organization**

The D.C. SPIN Training Group has drafted a charter that includes both training and education goals. At the moment, the organization is run by a loose association of volunteers. Meetings usually feature speakers who share information about their organizations' training programs, recap pertinent presentations from national conferences, or describe available training. Traditionally, the Software Engineering Institute (SEI) provides a speaker for the September SPIN DC meeting to kick off the year's activities.

## **Membership**

There are approximately 110 members drawn from the D.C. SPIN. There is no membership fee. Attendance at meetings ranges from 10 to 15 people. Individuals may request that they be added to the training group mailing list to receive announcements and minutes of meetings.

## **Software Engineering Education and Training Activities**

To date, the D.C. SPIN Training Group has not offered any classes to its members. It did, however, send students to a pilot offering of an SEI course.

## **Point of Contact for Further Information**

Claire Lohr  
President, Lohr Systems  
P.O. Box 2998  
Reston, VA 20195  
Phone: 703 / 391-9007  
Fax: 703 / 391-9635  
Email: lohrrsys@erols.com  
Web Address: n/a

## **Embry-Riddle Aeronautical University Software Center Daytona Beach, Florida (U.S.A.)**

The Embry-Riddle Aeronautical University (ERAU) Software Center is an umbrella organization encompassing software engineering education and research activities. The center serves as a research and learning laboratory, combining applied research in software engineering and advanced practices in software engineering education. The objectives of the center are

- to provide an experiential learning environment for software engineering students that prepares them for the industrial needs of their future employers
- to conduct research that contributes to the advancement of software engineering practices

## **Organization**

The center is an arm of the ERAU Computer Science Department. An industry advisory board provides guidance to the department with regard to curriculum and research activities.

## **Membership**

The center works in collaboration with the Software Engineering Institute (SEI) for its "Doing Quality Work" initiative and with the Motorola Paging Group to establish the practice of the Personal Software Process<sup>SM</sup> (PSP<sup>SM</sup>). Both efforts promote the PSP, which is aimed at helping software engineers perform their work better by following a defined individual process.

## **Software Engineering Education and Training Activities**

The application domain of software engineering education at ERAU is aviation and aerospace. The department offers two degree programs: a bachelor's degree in computer science with a strong emphasis on software engineering and a master's degree in software engineering. The Master of Software Engineering program includes a choice of one of two areas of specialization: real-time systems and software process. The PSP course is required in both areas of specialization. It teaches a new and more disciplined way to practice software engineering at an individual level.

During the 1995-96 academic year, the Computer Science Department experimented with a new approach to teaching its first two courses in the undergraduate curriculum. Called "Doing Quality Work," the new approach is a joint effort between the computer science faculty and Watts Humphrey of the Software Engineering Institute (SEI). Practices of top software development organizations are integrated into the software engineering students' earliest courses. In Computer Science I, ten 15- to 20-minute lectures on time management, scheduling, and planning are introduced. The students are required to keep a software engineer's notebook containing time logs and scheduling and planning documents. In the following term, 10 additional short sessions are introduced in Computer Science II. The additional sessions of both courses focus on software defect management.

A collaborative project is underway between the Motorola Paging Group and ERAU to insert PSP practices into the Motorola Paging Group's software development process. The elements of the cooperative effort are training, tracking, coaching, and community building. The purpose of the work is to demonstrate quantitatively the benefits of practicing the PSP in an industrial setting.

---

SM Personal Software Process is a service mark of Carnegie Mellon University.

SM PSP is a service mark of Carnegie Mellon University.

## **Point of Contact for Further Information**

Iraj Hirmanpour, Chair  
Computer Science Department  
Embry-Riddle Aeronautical University  
600 S. Clyde Morris Blvd.  
Daytona Beach, FL 32114-3900  
Phone: 904 / 226-6690  
Fax: 904 / 226-6678  
Email: iraj@db.erau.edu  
Web Address: <http://www.db.erau.edu>

## **Florida Atlantic University Boca Raton, Florida (U.S.A.)**

The Florida Atlantic University (FAU) Computer Science and Engineering (CS&E) Department and members of its Industry Advisory Committee recognized a need to establish an extensive graduate education effort in software engineering. Through a combination of video presentations produced by the Software Engineering Institute (SEI) and FAU-produced live lectures, a series of six graduate-level software engineering courses was offered consecutively at six university and industry sites in southeast Florida during 1990 and 1991, and in a limited fashion until April 1993 [Coulter 94]. The courses were fully funded by the participating industries. On January 16, 1992, 59 students were awarded certificates in software engineering for successfully completing at least 5 of the 6 courses. By the spring of 1993 term, over 250 students had taken at least one course

Since this successful program, FAU has expanded its internal offerings through the statewide Florida Engineering Educational Delivery System (FEEDS). Through FEEDS, courses are offered remotely by videotape and live broadcast, and locally in standard lecture format, to subscribing sites and on-campus students. Beginning in 1995, the FAU CS&E Department approved and implemented a software engineering option within its existing master's programs. Many of the courses are offered through FEEDS.

### **Organization**

The FAU CS&E Department formed the Industry Advisory Committee to help the department identify and meet the needs of the large computing-based industry in southeast Florida. During the advisory committee's initial meetings, the need for extensive graduate software engineering courses for employees quickly emerged as the top issue. While FAU offered software engineering courses as part of its graduate programs, it was not prepared to offer the variety and number of courses that were needed immediately without more financial assistance and faculty. FAU contracted with the SEI to obtain a set of video-based courses to be delivered by FAU faculty.



## **Membership**

Nine research and development firms having headquarters or major plants in southeast Florida were invited to join the FAU CS&E Department Industry Advisory Committee: Bendix King, Encore Computer Corporation, Harris, IBM, Modular Computer Systems, Motorola, Siemens Stronberg-Carlson, Racal-Milgo, and United Technologies. These companies fully funded the courses taught between 1990 and 1993 in the graduate software engineering education program.

## **Software Engineering Education and Training Activities**

The courses taught between 1990 and 1993 in association with the SEI were Software Project Management, Software Verification and Validation, Software Design, Software Creation and Maintenance, Software Specification, and Software Systems.

During the 1996-97 academic year, FAU offered these courses: Software Engineering, Object-Oriented Software Design, Formal Specification Methods, Software Engineering Measurements, Real-Time Software, Systematic Software Reuse, and Software Process Improvement to employees of companies including Harris, IBM, Motorola, Racal-Datacom, Siemens, Pratt and Whitney, Encore, Allied Signal, and Sensormatic.

FAU now offers a software engineering graduate specialty track in the MCS and MSCS programs. Students must take at least two courses from each of the groups shown below, as well as additional course and thesis work.

### Group 1: Fundamentals

- Object-Oriented Software Design
- Formal Aspects of Computer Science and Engineering
- Software Testing
- Software Requirements Engineering

### Group 2: Development

- User Interface Design
- Computer-Aided Software Engineering
- Formal Methods
- Advanced Topics in Object-Oriented Design

### Group 3: Quantitative and Experimental

- Software Engineering Measurements
- Software Reliability Engineering
- Model-Based Simulation
- Computer Performance Modeling

## **Point of Contact for Further Information**

Neal S. Coulter  
Computer Science and Engineering Department  
College of Engineering/Florida Atlantic University  
P. O. Box 3091  
Boca Raton, Florida 33431  
Phone: 407 / 367-3983  
Fax: 407 / 367-2800  
Email: [neal@cse.fau.edu](mailto:neal@cse.fau.edu)  
Web Address: <http://www.fau.edu>

## **Quebec Master's Program in Software Engineering Montreal, Canada**

The Quebec software engineering program was designed based on the needs expressed by leading software industries in Quebec. This program leads to a master's degree in computer engineering or computer science, with an emphasis in software engineering. Seven participating schools or universities offer courses in this program.

### **Organization**

The educational partner at each school designates a professor specialized in software engineering to coordinate the program at that school. This professor represents the school on a coordination committee that determines the courses to be offered in the program, student admission requirements, and the criteria for granting degrees. The coordination committee establishes the membership of a business and industry committee that advises on the applicability of the program to members' working environments and guides the evolution of the program.

### **Membership**

The educational partners participating in the master's program in software engineering in Quebec are

- L'Ecole Polytechnique de Montreal
- L'Ecole de Technologie Superieure
- L'Institut National de Recherche Scientifique
- L'Universite Concordia
- L'Universite Sherbrooke
- L'Universite du Quebec a Montreal
- L'Universite Laval

## **Software Engineering Education and Training Activities**

To complete the program, the student must earn 45 credit units, equally distributed over

- a foundations module
- an area of specialization
- an integrated learning experience composed of courses, an optional case study, and a project requiring at least 27 hours per week. The courses focus on topics such as data representation, expert systems and artificial intelligence, system security, parallel systems, and object-oriented approaches.

### **Point of Contact for Further Information**

M. Pierre N. Robillard  
L'ecole Polytechnique de Montreal  
Campus de L'Universite de Montreal  
2900 Chemin Edouard-Montpetit  
Case postale 6079, succursale Centre-ville  
Montreal, Canada, H3C 3A7  
Phone: 514 / 340-4238  
Fax: 514 / 340-3240  
Email: [robillard@rgl.polymtl.ca](mailto:robillard@rgl.polymtl.ca)  
Web Address: <http://www.polymtl.ca>

## **Research Institute for Computing and Information Systems (RICIS) Houston, Texas (U.S.A.)**

The mission of RICIS is to provide a setting for interdisciplinary research coalitions to explore computing technology and corresponding implications for an information-driven civilization. RICIS provides the research evaluation and advocacy needed to build coalitions and partnerships to match new and promising technologies with challenging problems dealing with complex, computing-based systems for the benefit of the university, NASA, and the general public.

Emphasized research areas include software reuse, group decision support methodology, mission- and safety-critical systems, and medical imaging. New projects are being formed in digital libraries, environmental computing, and network information resources. Special emphasis is placed on the design and execution of symposia, projects, and interchanges to facilitate technology transfer among RICIS participants.

### **Organization**

The University of Houston at Clear Lake (UHCL) established RICIS in 1986 to encourage the NASA Johnson Space Center (JSC) and local industry to actively support research in computing and information systems. A cooperative agreement between UHCL and NASA/JSC provides for sharing personnel and computing and educational facilities. The

RICIS Program Office in the School of Natural and Applied Sciences manages funding from various sources, primarily from NASA under the cooperative agreement. The overall organization is that of collaborative projects within the broad research areas mentioned.

## **Membership**

RICIS encourages faculty participation across UHCL schools: Natural and Applied Sciences, Business and Public Administration, Human Sciences and Humanities, and Education. A gateway concept expands the local expertise on targeted problems to include vendors, other universities, and other research organizations. Fees are charged only for direct participation in projects.

## **Software Engineering Education and Training Activities**

Courses and special events are organized in conjunction with the UHCL Professional and Continuing Education unit. A Master of Software Engineering degree program and a Master of Computer Engineering degree program are offered. An undergraduate degree in computer systems engineering, a blend of software engineering and computer engineering, was approved by the Texas Higher Education Coordinating Board in 1996. This will provide students with the opportunity to take a single track at the undergraduate level leading to a Master of Software Engineering or a Master of Computer Engineering.

## **Points of Contact for Further Information**

Dr. Charles McKay, Director, RICIS  
University of Houston-Clear Lake  
2700 Bay Area Blvd.  
Box 384  
Houston, TX 77058-1098  
Phone: 713 / 283-3703  
Fax: 713 / 283-3810  
Email: [cmckay@rbse.jsc.nasa.gov](mailto:cmckay@rbse.jsc.nasa.gov)  
Web Address: n/a

E.T. Dickerson, RICIS Program Manager  
University of Houston-Clear Lake  
2700 Bay Area Blvd.  
Box 384  
Houston, TX 77058-1098  
Phone: 713 / 283-3809  
Fax: 713 / 283-3810  
Email: [etd@ricis.cl.uh.edu](mailto:etd@ricis.cl.uh.edu)  
Web Address: <http://rbse.jsc.nasa.gov>

## **Software Engineering Research Centre (SERC) Melbourne, Australia**

The centre was founded in mid-1994 by the two major universities, the Royal Melbourne Institute of Technology (RMIT) and the University of Melbourne, with core funding from Ericsson Australia (EPA). In the contract between the three stakeholders, the objectives include fundamental research into telecommunications-related software and the transfer of the research results to industry. The transfer includes reports, prototype products, and training.

### **Organization**

The centre is formally a joint research centre between the two universities, with administrative support provided by RMIT. The research and technical direction is provided by a steering committee chaired by the EPA director of development, with the dean of applied science, RMIT, and the dean of engineering, University of Melbourne being the primary members.

The structure of the steering committee is set by the SERC contract, with these three designated representatives, plus four additional members invited by the three permanent members. Currently the four additional members are the director of SERC, two associate deans, and a senior development manager from EPA. The committee formally reviews the SERC work program twice a year, with a formal written report being submitted to the committee. The committee meets every two months to give ongoing supervision to the centre's projects, including the development of educational programs.

### **Membership**

Not applicable.

### **Software Engineering Education and Training Activities**

A primary focus for the software engineering research of the SERC is the functional programming paradigm, and the realization of this paradigm using the Ericsson-developed Erlang environment.

This environment is now incorporated in the Open Telecommunications Platform (OTP), the new standard for developments by Ericsson. As a result, the SERC has the role of developing and delivering courses on OTP and Erlang both to Ericsson and to other groups that wish to work with Ericsson. The mandate covers Australia and New Zealand, and the courses are typically two to three days duration, depending on the background of the participants. The courses include design techniques as well as programming techniques, reflecting the totally different paradigm that is followed.

## **Point of Contact for Further Information**

Professor Fergus O'Brien, Director  
SERC  
723 Swanston Street, Melbourne  
Vic 3053 Australia  
Phone: +61 3 9282 2472  
Fax: +61 3 9282 2444  
Email: fob@serc.mit.edu.au  
Web Address: <http://www.serc.mit.edu.au>

## **Software Industry Coalition Santa Clara, California (U.S.A.)**

Established in the spring of 1993, the Software Industry Coalition is a non-profit, mutual benefit corporation dedicated to improving the effectiveness of the software industry's relationships, workforce, processes, and products. The mission of the Software Industry Coalition is to identify significant software industry issues, act as a catalyst in resolving those issues, and present a coordinated industry voice.

### **Organization**

The Software Industry Coalition is led by its board of directors, which is composed of member representatives and is managed by a small executive staff. Coalition members and staff have identified projects and working groups that are of interest, for example

- The Software Skills Upgrade Project (SSkillsUP) is designed to create a software-competent workforce that is supported and trained through extensive partnerships among industry, educational organizations, and government.
- The Software Process Group shares best practices in software development process.
- The Information Systems Group shares best practices in information systems management.
- The coalition has researched and published the Software Creator's Profiler as a tool for managers, human resources professionals, and software professionals to assess the skills and training requirements for any software creator's job. This is an ongoing project examining the underlying skills required of software creators.
- The coalition cosponsored- a labor market study of employment practices for software creators. The study shows the systemic relationships among employers, educators, and career facilitators.
- The Intellectual Property Committee provides forums to educate members on the consequences of legislative activity and assist in developing a consensus on the issues.

## **Membership**

Members reflect the diversity of the software industry: independent software vendors, government laboratories, universities and colleges, and computer manufacturers. Membership fees support the work of the projects.

## **Software Engineering Education and Training Activities**

In collaboration with universities, consultants, and corporate education teams, the Software Industry Coalition develops focused, timely, and effective technical education and training programs that ensure the implementation of sound product development and management processes. Success is measured in part by the development and delivery of multiple workshops, courses, and curricula to meet the identified needs of the industry on an ongoing basis.

## **Point of Contact for Further Information**

Kaye Caldwell, President  
Software Industry Coalition  
1072 S. De Anza Blvd.  
Suite A107-372  
San Jose, CA 95129  
Phone: 408 / 479-8794  
Fax: 408 / 479-9247  
Email: [kcaldwell@softwareindustry.org](mailto:kcaldwell@softwareindustry.org)  
Web Address: <http://softwareindustry.org/coalition>

## **Software Productivity Centre Inc. (SPC) Vancouver, British Columbia (Canada)**

The Software Productivity Centre, Inc. (SPC) is a technical resource centre for software developers. Collaborating with software organizations around the world, the SPC focuses on finding solutions to the problems and challenges faced by software development companies. The SPC provides training, technical services, consulting, and products to meet the needs of the industry.

## **Organization**

Since its establishment in 1992, the SPC has grown to include over 140 member companies in Canada, the U.S. and internationally and currently employs 10 full-time staff and several contractors.

## **Membership**

The SPC has corporate members from the Canadian and international software development community, representing over 5,000 software professionals.

Members receive the SPC Update, a quarterly newsletter that includes current industry issues, member profiles, details on upcoming SPC events, and information on software engineering trends throughout the world. All member companies are listed on the centre's Web site, and links are provided to members' Web sites. Senior software engineers are assigned as account managers to each member company and provide technical information and advice.

SPC services include software process assessments to facilitate productivity and quality improvement. The SPC software engineering products include tools that support the improvement of productivity and better control of the development process. The family of tools includes development documentation templates, which fully satisfy requirements for CMM Levels 2 and 3, ISO 9001-compliant templates, a software metrics tool, and a self-assessment tool.

### **Software Engineering Education and Training Activities**

The main focus of the SPC is to supply practical assistance to software developers. A library of 24 modular software engineering courses offers specialized training for companies wanting a selection of courses to suit their current and future needs. Courseware topics include Process Improvement, Project Management, Quality Assurance and Testing, Configuration Management, Requirements Specification and Analysis, ISO 9000, and so forth. The SPC also presents seminars featuring international and local industry experts, which focus on technology-specific issues and practices. The SPC presents approximately 20 tutorials per year.

The newest course of the SPC is the Personal Software Process (PSP), a unique adaptation of the original format proposed by Watts Humphrey.

### **Point of Contact for Further Information**

Wolfgang B. Strigel, President  
SPC Software Productivity Centre Inc.  
460 – 1122 Mainland St.  
Vancouver, BC  
Canada V6B 5L1  
Phone: 604 / 662-8181, ext. 101  
Fax: 604 / 689-0141  
Email: strigel@spc.ca  
Web Address: n/a

### **Software Quality Institute Austin, Texas (U.S.A.)**

The Software Quality Institute (SQI) is a multidisciplinary partnership between The University of Texas at Austin (UT-Austin) and the software and information systems



organizations in Texas. Its mission is to inform and educate software producers and software users at the local, state, and national levels about issues vital to the production and application of high-quality software. The SQI draws upon the wealth of research and expertise available at UT-Austin as well as from a large pool of outstanding talent from industry and government. The SQI is a unit within the College of Engineering at UT-Austin.

## **Organization**

The SQI is guided by an advisory group of 28 representatives from industry and government who ensure that SQI activities meet industry needs, including program development and curriculum selection. Subcommittees oversee other SQI activities: publication of Software Quality Matters, a quarterly newsletter; Austin Software Executives' Group (ASEG) which brings the key officers of small companies together to discuss business issues; the Austin Software Process Improvement Network (A-SPIN) which sponsors monthly meetings for developers and managers; SQI certificate programs on software project management and human interface design and development; the annual SQI Symposium and other special conferences.

The SQI is a resource recovery program that receives funding from registration fees. Training is offered through public programs, courses that are taught on-site, and conferences. Programs currently underway include a 14-month Software Project Management Certificate Program, one- to three-day seminars, and the SQI Symposium on Software Reliability Engineering (April 1, 1997). A new certificate program will begin in the Spring of 1997 titled "Human Interface Design and Development."

## **Membership**

Not applicable.

## **Software Engineering Education and Training Activities**

SQI programs are offered to professionals on a non-credit basis, and topics are selected according to assessments. Proposals are solicited from potential instructors. Subject areas include software project management, risk management, in-process inspections, testing, human-computer interfaces, process, configuration management, and related topics.

## **Point of Contact for Further Information**

Joanne Click, Director  
Software Quality Institute  
The University of Texas at Austin  
PRC MER R9800  
Austin, Texas 78712-1080  
Phone: 512 / 471-4875  
Fax: 512 / 471-4824  
Email: [click@sqi.utexas.edu](mailto:click@sqi.utexas.edu)  
Web Address: <http://www.utexas.edu/coe/sqi>

## **Software Technology Centre Regina, Saskatchewan (Canada)**

The Software Technology Centre (STC) is an industry-led, strategic alliance with post-secondary educational institutions and the Saskatchewan and Canadian governments. Established in December 1993, the STC is a not-for-profit corporation whose mission is to assist the software community to be globally competitive, with the goal of stimulating the development of a strong private sector. To fulfill this mission and to meet members' and stakeholders' needs, the STC offers services in professional development, information collection and dissemination, strategic development, and software quality improvement. STC services complement, and do not compete with, industry.

The STC goal is to become a provincially recognized information technology centre with international linkages. It acts as a catalyst to assist members and stakeholders in global competitiveness; to deliver quality services to meet customers' evolving needs; to advocate the value of information technology; and to transfer world-class, state-of-the-art information technology knowledge, including software engineering principles and practices, to other economic sectors.

The STC provides

- executive seminars, for example, on the implementation of process improvement
- software management programs, with a focus on process improvement and modern methods of defining and managing software development projects
- emerging technology programs
- network communications programs

### **Organization**

The STC is led by a board of directors that is chaired and controlled by industry. Educational institutions and governments have seats on the board. Some notable STC founding members are Information Systems Management (ISM) Corporation (a subsidiary of IBM), CDSL Canada, Saskatchewan Telecommunications, and SED Systems. They are joined by about 30 other organizations, many of whom are local small-to-medium-sized information technology firms. In addition to these individual member organizations, two other major associations have joined the STC: the Software Development Association of Saskatchewan, which has over 50 small firms as members; and the two Canadian Information Processing Society chapters in Saskatchewan, consisting of over 300 information technology practitioners. The STC has a strong educational base; the University of Regina and the University of Saskatchewan are full members.

The STC has formed a number of Canadian and international strategic alliances which contribute significantly to its ability to serve the needs of its members.

- The Software Process Improvement and Capability Determination (SPICE) Program, of which the STC is a member, is under the auspices of the International Standards Organization. With participants from about 20 countries, the SPICE Program focuses on making software process improvement methods more widely used. The STC will coordinate the SPICE trials in the Canadian Prairie region.
- The European Software Institute (ESI), with which the STC has a formal cooperation agreement, provides the STC with the means to learn from major software engineering programs in the European Union. The ESI, located in Bilbao, Spain, is the major software engineering centre of the European Union.
- The Information Technology Association of Canada (ITAC), of which the STC is a regional affiliate, is the major national information technology association in Canada. The STC is the only member of the ITAC board of directors representing the Canadian Prairie region.

The centre consists of a small professional staff, which is routinely supplemented by contracted, private sector, and educational institution staff.

### **Membership**

Annual membership fees entitle members to directly influence STC strategy, to receive discounts on services, and to benefit from synergy with other members. Members are always given priority access to services. Close, ongoing dialogue with members and clients is a key element in STC operations. These exchanges help the STC define its current and planned service offerings and to ensure that the STC continually meets the emerging needs of the software and information technology community.

### **Software Engineering Education and Training Activities**

STC professional development programs emphasize solutions to the unique needs of two major organizational groups: MIS in-house organizations in both the private and public sector and small-to-medium enterprises who are primarily software developers and system providers. The STC chooses its courses using the guidance of an advisory committee drawn from the software community. Key programs to be offered in 1996 include courses on executive-level awareness, software engineering, object-oriented methodologies, databases, and client-server networks. The STC is committed to the effective development and use of distance training technologies and methodologies.

### **Point of Contact for Further Information**

Jane Hogan  
Software Technology Centre  
Two Research Drive  
Regina, Saskatchewan  
Canada S4S 7H9  
Phone: 306 / 791-9112  
Fax: 306 / 347-3322  
Email: [jhogan@softech.ca](mailto:jhogan@softech.ca)  
Web Address: <http://www.softech.ca/>

## **Texas Tech University Lubbock, Texas (U.S.A.)**

Beginning in 1990, Texas Tech University has had a Master's of Systems Engineering Program at its main campus in Lubbock, Texas. This program is intended for companies who wish to train existing employees as systems engineers.

Each of the eight student classes which have had at least one year of the program have taken a software engineering course. The goal of this course is to give the student a perspective of the software engineering required of a system engineer.

### **Organization**

The industrial employees have undergraduate backgrounds in either an engineering discipline or computer science. These students come to Texas Tech for two summers (for four weeks each summer in two two-week increments) and have intensive instruction of nine hours of graduate courses each summer. (The other 18 hours in the 36-hour credit program are achieved in various ways, usually involving taking courses at Texas Tech or elsewhere during the fall and spring semesters.)

Funding comes from the industrial organizations (on a per-student basis), who also supply members for an Industry Advisory Board which provides input. The program itself is administered by faculty of the College of Engineering at Texas Tech.

### **Membership**

From its inception, Texas Instruments and Raytheon E-Systems, both of Dallas, Texas, have sent a total of 12 new students per year to the systems engineering program. The divisions of both companies develop embedded systems, mostly for the U.S. Department of Defense. Both of these divisions have been at the Software Engineering Institute (SEI) Capability Maturity Model (CMM) level 3 or higher. (In fact, one recent student in the systems engineering program was in charge of the team that prepared materials for the last SEI/CMM evaluation of Raytheon E-Systems.)

### **Software Engineering Education and Training Activities**

Courses offered include

- Ada and Object-Oriented Programming (for classes entering in 1990 and 1991)
- Software Engineering Systems (for classes entering in 1992-94)
- Principles of Software Development Systems (for classes entering in 1995-97)

Currently, the courses are taught as software engineering courses dealing with theory more than practice. (That is, they are not project courses.) Among the subjects covered are a survey of software engineering topics (especially those subjects that are somewhat different than for other engineering fields), the Capability Maturity Model, and a detailed case study from one of the participating companies, focusing on both process and product issues.

Prerequisites: BS in engineering or computer science, work experience in those fields

Delivery method: classroom

Credits: three hours of graduate credit

Degree requirements: Required course for the Master's of Systems Engineering degree

Source of Instructors: Texas Tech University

Source of Students: Texas Instruments (Dallas) and Raytheon E-Systems (Dallas)

**Points of Contact for Further Information:**

(Entire Systems Engineering Program)

Edgar O'Hair  
Professor  
Department of Electrical Engineering Texas Tech University  
Lubbock, TX 79409-3102  
Phone: 806 / 742-3533  
Fax:  
Email: [edgaro@coe2.coe.ttu.edu](mailto:edgaro@coe2.coe.ttu.edu)  
Web Address: n/a

(Software Engineering Component of Program)

Donald J. Bagert  
Associate Professor  
Department of Computer Science  
Texas Tech University  
Lubbock, TX 79409-3104  
Phone: (806) 742-1189  
Fax: (806) 742-3519  
Email: [bagert@ttu.edu](mailto:bagert@ttu.edu)  
Web Address: n/a

## **The University of British Columbia Vancouver, British Columbia (Canada)**

Introduced in September 1995, the Certificate in Software Engineering Program at the University of British Columbia (UBC) is designed to serve the professional development needs of information systems and software professionals in British Columbia and beyond. The program was developed with the input of local and provincial industry and includes partnerships in curriculum development and teaching expertise.

### **Organization**

The growing need for professional development in the software engineering field led to the development of a proposal in September 1994 for a Certificate in Software Engineering. Consequently, Continuing Studies at the UBC founded an advisory committee with representatives from relevant academic units and industry representatives:

- Centre for Integrated Computer Systems Research (UBC)
- Continuing Studies (UBC)
- Continuing and Distance Education for Engineering and Architecture (UBC)
- Department of Computer Science (UBC)
- Department of Electrical Engineering (UBC)
- Hughes Aircraft of Canada Ltd.
- Newnes Machines Limited
- Software Productivity Centre

With the guidance of the advisory committee, a needs and demand assessment was conducted, including interviews with local industry representatives, the distribution of surveys to prospective students, and research into existing programs and curricula. The majority of courses for the program are new offerings, but some current offerings of the Software Productivity Centre have also been incorporated into the program. The program is administered by UBC Continuing Studies.

### **Membership**

The Certificate in Software Engineering Program is offered in a format compatible with the needs of local industry and will eventually serve the needs of companies located outside the Vancouver area. The program is also open to individuals who are currently employed in the software industry as well as those who may be seeking a change of career. Applicants to the program who do not have prior knowledge in programming, formal mathematical methods, and computer systems are required to complete prerequisite courses.

## **Software Engineering Education and Training Activities**

The program requires a minimum of 102 hours from the following core courses:

- An Introduction to Software Engineering (6 hours)
- The Software Engineering Process (18 hours)
- Requirements Analysis and Specification (18 hours)
- Software Architecture and Iterative Development Process (12 hours)
- System/Software Testing (12 hours)
- Software Project Management (12 hours)
- Software Engineering Team Project (24 hours)

The program requires a minimum of 48 hours from the following elective courses:

- Software Quality Assurance (12 hours)
- Software Configuration Management (6 hours)
- Computer-Human Interface Design and Implementation (12 hours)
- Object-Oriented Methods (12 hours)
- Information Engineering and Database Systems (12 hours)
- Comparative Programming Languages (9 hours)
- Real-Time Systems (6 hours)
- Advanced Topics (6 hours)

### **Points of Contact for Further Information**

Jane Hutton  
Director, Career and Corporate Division  
Continuing Studies  
The University of British Columbia  
5997 Iona Drive  
Vancouver, B.C.  
Canada V6T 1Z1  
Phone: 604 / 822-1430  
Fax: 604 / 822-1499  
Email: [jane.hutton@ubc.ca](mailto:jane.hutton@ubc.ca)  
Web Address: <http://www.cstudies.ubc.ca/softeng>

Peter Moroney  
Program Design Consultant  
Continuing Studies  
The University of British Columbia  
5997 Iona Drive

Vancouver, B.C.  
Canada, V6T 1Z1  
Phone: 604 / 822-1434  
Fax: 604 / 822-1499  
Email: peter.moroney@ubc.ca  
Web Address: <http://www.cstudies.ubc.ca/softeng>

## **University of California, Santa Cruz Santa Cruz, California (U.S.A.)**

The University of California, Santa Cruz (UCSC) is located within close proximity to Silicon Valley, one of the world's foremost centers of the computer industry. A growing local computer industry, centered in Santa Cruz and Scotts Valley, provides further opportunities for our students. The Departments of Computer Engineering and Computer Science, at the Jack Baskin School of Engineering at the UCSC, and the local computer industry recognize a need to provide effective graduate education in the area of software engineering. Local industry provides the "real-world" problems, and university faculty weave a discussion of these problems into the graduate software engineering curriculum. Whenever possible, graduate student researchers, under the supervision of university faculty, are funded by industry to continue the work started by the class.

In addition, the UCSC Extension program in Santa Clara offers many continuing education and certificate programs in the area of software engineering. A sample of their programs includes

- Certificate in Unix and C Programming
- Certificate in Multimedia Engineering and Programming
- Certificate in Software Engineering
- Certificate in Object-Oriented Programming
- Professional Sequence Award in Microsoft Windows Programming
- Professional Sequence Award in Database Systems and Concepts.

The UCSC Extension program offers many other related programs. Many of these programs include short courses which could serve the needs of software professionals who live outside this region.

### **Organization**

Computer Engineering and Computer Science are academic departments offering both undergraduate and graduate degree programs. The UCSC Extension program offers continuing education programs for professional development. Both the on-campus programs (through the Computer Engineering and the Computer Science Departments) and the UCSC Extension programs hire software engineering experts as lecturers in our programs to bring an industrial perspective to our software engineering curriculum. In



addition to teaching for us, these lecturers serve as liaisons between the UCSC and the local computer industry. One example of this collaboration is that local software companies have supported graduate students to extend projects that were started in the graduate software engineering courses.

### **Membership**

Each year, industry projects are sought for our software engineering courses. Sponsors are also solicited for the graduates of the class. Previous sponsors have included IBM, Santa Teresa Laboratory, and the Santa Cruz Operation, Inc.

### **Software Engineering Education and Training Activities**

Students can take software engineering courses by enrolling through the UCSC Extension program or as matriculated graduate students of the UCSC.

### **Point of Contact for Further Information**

For on-campus programs:

Dr. Linda Werner  
Lecturer, Computer Engineering  
Applied Science 225  
University of California, Santa Cruz  
Santa Cruz, CA 95064  
Phone: 408 / 459-4953  
Fax: 408 / 459-4829  
Email: linda@cse.ucsc.edu  
Web Address: n/a

Nancy Furber, Administrative Manager Computer Engineering Department  
Applied Science 225  
University of California, Santa Cruz  
Santa Cruz, CA 95064  
Phone: 408 / 459-5071  
Fax: 408 / 459-4829  
Email: furber@cse.ucsc.edu  
Web Address: n/a

For programs run by the UCSC Extension program:

Web Address: <http://www.ucsc-extension.edu>

## **University of Maryland University College College Park, Maryland (U.S.A.)**

University of Maryland University College (UMUC) in College Park, MD, in partnership with Computer Data Systems, Inc. (CDSI), Rockville, MD, offers a Capability Maturity Model (CMM) Level 2 Software Process Management training course. This one-week course introduces software managers, software technical team leaders, and members of Software Engineering Process Groups to the CMM Level 2 software processes they need to apply to their software development and maintenance projects to improve their projects' maturity.

### **Organization**

The partnership began in 1994 when CDSI contracted with UMUC for training course evaluation and certification services of the internal CMM Level 2 training program of CDSI. In 1996, UMUC and CDSI signed a Memorandum of Understanding to market and deliver CMM Level 2 Software Process Management training in the state of Maryland, the mid-Atlantic region, and nationwide.

The partnership is administered by a Joint Administrative Group (JAG) with representatives from UMUC and CDSI. The JAG develops operating procedures, resolves issues, and acts as the Change Control Board for the program. Each partner has specific roles. UMUC is responsible for marketing and promotional activities, program logistics and facilities, student registration services, Continuing Education Unit (CEU) certification, and assistance to CDSI in program design and review, instructor assignment, and course evaluation. CDSI is responsible for instructors, training materials, and 30 days of follow on telephone assistance to all students who complete training. UMUC awards participants four CEUs upon course completion.

### **Membership**

Through its Professional Development Office, UMUC offers customized credit and noncredit education and training programs to businesses, nonprofit organizations, and public agencies in a variety of fields, including technology, finance, management, and environmental and hazardous materials management. Founded in 1947 with headquarters in College Park, Maryland, UMUC is one of the world's preeminent institutions of higher education for adults in the workforce.

Computer Data Systems, Inc., a publicly-owned company founded in 1968, serves government, defense, and commercial customers with broad-based professional and technical services, including software development, software maintenance, and systems integration services. CDSI initiated its CMM-based Software Process Improvement Program in 1993 and has developed and delivered the CMM Level 2 Software Process Management training course to 500 software managers nationwide since 1994. Individuals and/or their organizations fund their enrollment in the CMM Level 2 Software Process Management training course offered by UMUC and CDSI.

### **Software Engineering Education and Training Activities**

Training is offered three times a year at UMUC facilities in College Park, Rockville, and Waldorf, MD and can also be provided on customer sites. CDSI provides the course materials, which include a software project case study, workshop exercises, and CMM Level 2 process templates. The training course consists of seven modules:

- Overview of Software Process Improvement
- Requirements Management
- Software Project Planning
- Software Project Tracking and Oversight
- Software Quality Assurance
- Software Configuration Management
- Software Subcontract Management.

The training approach is practical. All instructors are software engineering practitioners with experience in managing software development, maintenance, and integration projects on multiple platforms. Instructors share their experience in implementing CMM Level 2 key process areas in real-world settings. Throughout the week, instructors facilitate team workshops to help students apply process management skills immediately. Students leave training with a package of CMM-compliant Level 2 process templates they can tailor to their organizations.

### **Points of Contact for Further Information**

Patricia Spencer, Director  
Professional and Workforce Development  
University of Maryland University College  
Professional Development  
University Boulevard at Adelphi Road  
College Park, MD 20742-1663  
Phone: 301 / 985 7644  
Fax: 301 / 985 7887  
Email: [pspencer@polaris.umuc.edu](mailto:pspencer@polaris.umuc.edu)  
Web Address: n/a

Kathy Beckman, Training Manager  
Computer Data Systems, Inc.  
One Curie Court  
Rockville, MD 20850  
Phone: 301 / 921-7027  
Fax: 301 / 921-1004  
Email: Kathy.Beckman@cdsi.com  
Web Address: <http://www.cdsi.com>

## **The University of Southern California Center for Software Engineering Los Angeles, California (U.S.A.)**

The University of Southern California (USC) Center for Software Engineering (CSE) was formed to develop more mature software engineering organizations to meet the demand for complex software systems of the future. Its bottom-line objective is to improve the long-range state of software engineering practice by catalyzing a new generation of software engineering courseware and delivery capabilities. Its 10-year strategy for achieving this objective involves a combination of sustained programs in software engineering education, research, and technology transition (see the Prospectus for the USC CSE affiliates Program, January 1996).

### **Organization**

The USC CSE takes a multifaceted approach to improving the state of software engineering practices. It performs necessary gap-filling research in such areas as knowledge-based software engineering, environments, processes, architectures, and economics. In the fall of 1993, it initiated an MS in computer science with a software engineering specialization. It has plans to develop textbooks, videos, computer models, games, tools, exercises, and role-model artifacts for training the next generation of software engineers. The USC CSE has an affiliates program with an active affiliates Steering Committee. The CSE director is part of the USC Computer Science Department; the center principals include USC professors in electrical engineering and business, and professors at the USC Information Sciences Institute.

## **Membership**

Industry and government affiliates are a key aspect of the CSE. Through payment of an annual membership fee, affiliates acquire a seat on the affiliates Steering Committee. Center personnel provide an annual one-day visit to the affiliate organization, involving a professor and an agenda of the affiliate's choice. Affiliates participate in focused workshops, executive software seminars, an annual software engineering conference, and monthly Software Process Improvement Network (SPIN) meetings in collaboration with the University of California at Irvine. Affiliates receive prototype tools for experimentation, technical reports, and exploratory videos and courseware. There are currently 29 affiliate organizations.

## **Software Engineering Education and Training Activities**

While the center does not produce courses specifically for affiliates, member organizations benefit from annual one-day USC professor lectures and visits to the affiliate's organization. Periodic focused workshops provide the opportunity for technical interchange among professors, researchers, and practitioners. Most of the software engineering MS courses are offered on a regional interactive television network; some of the courses are also offered nationally by the National Technological University.

## **Point of Contact for Further Information**

Barry Boehm  
Director, USC Center for Software Engineering  
Computer Science Department  
University of Southern California  
Los Angeles, CA 90089-0781  
Phone: 213 / 740-8163  
Fax: 213 / 740-4927  
Email: boehm@usc.edu  
Web Address: <http://sunset.usc.edu/index.html>

## **University of South Florida Tampa, Florida (U.S.A.)**

The University of South Florida (USF) Information Systems and Decision Sciences (IS/DS) Department and members of its industry advisory board have recognized the critical need for skilled software engineers in the Tampa Bay area. In response, the IS/DS Department has expanded its curriculum offerings to include sequences of advanced courses on Information Systems Analysis and Design, Software Development, Database Systems, and Telecommunications at both the undergraduate and graduate degree levels. These courses are designed to present state-of-the-art theories, practices, and tools for the application of information technology to real problems in business and industry. Based on industry demand, the IS/DS Department offers a MS degree in Management Information Systems (MS/MIS). Seventy students are currently enrolled in this degree program.

Several exciting research projects are underway at USF with strong technology transfer and education connections in the Tampa Bay area:

- We support a strong program of research and education on Cleanroom software engineering methods. Cleanroom is a theory-based, team-oriented process for on-schedule development and certification of ultra-high reliability software systems with improved productivity. Our system and software development courses highlight Cleanroom theories and methods.
- We are constructing a data warehouse on community health indicators in cooperation with the USF College of Public Health. Data mining may lead to new insights for improving health outcomes throughout the State of Florida.
- In cooperation with the Software Engineering Institute (SEI), we are evaluating an exciting new model of technology diffusion in industry. The Personal Software Process (PSP) is being studied as an example of an important technology in the model.

Our goal is to provide effective education opportunities for students in information systems and technology, and an innovative technology transfer program for local industry via process consultation, tailored training, and demonstration projects.

### **Organization**

The Institute for Information Systems Management (IISM) has been established as a partnership between business, industry, government, and higher education in the Tampa Bay area. Its mission is to establish a major center for research, education, and professional networking in order to help technical organizations succeed in the fast-moving information age. The institute presents numerous seminars, workshops, and discussion sessions on important issues in the information systems field. Applied research is funded on topics of interest to its corporate affiliates. The IISM provides a vital link between the business/industrial community and the IS/DS program at the USF.

## **Membership**

IISM members include the following firms:

- Arthur Andersen
- Andersen Consulting
- Barnett Technologies
- Citicorp
- Florida Power
- Great Western
- GTE Data Services
- Price Waterhouse
- Salomon Brothers
- Time Warner Customer Service
- Tropicana
- USAA

## **Software Engineering Education and Training Activities**

Academic courses are offered at the University of South Florida on its main campus in Tampa and on its satellite campuses in St. Petersburg, Sarasota, and Lakeland. Degrees in Management Information Systems are offered at the BS, MS, MBA, and PhD levels. Many students are full-time employees from area corporations who are enrolled in part-time educational programs. The IS/DS Department also offers professional development courses on technical topics, such as UNIX System Programming, Web Publishing, JAVA and C++ Programming, Client-Server Computing, and Cleanroom Software Engineering. Tailored industrial training and professional consultation are offered at sponsor sites.

## **Point of Contact for Further Information**

Dr. Alan R. Hevner  
Salomon Brothers/HRCP Chair of Distributed Technology  
Information Systems and Decision Sciences Department  
College of Business Administration  
University of South Florida  
4202 E. Fowler Ave., CIS 1040  
Tampa, FL 33620-7800  
Phone: 813 / 974-6753  
Fax: 813 / 974-6749  
Email: [ahevner@bsn01.usf.edu](mailto:ahevner@bsn01.usf.edu)  
Web Address: <http://www.coba.usf.edu>

## **The University of Texas at Austin Austin, Texas (U.S.A.)**

The Option II MSE in Software Engineering at The University of Texas at Austin (UT-Austin) is a two-calendar-year program that is offered as a specially scheduled option by the Department of Electrical and Computer Engineering in the College of Engineering at the UT-Austin. Introduced in January 1996, the program is designed to allow practicing professionals the opportunity to obtain an advanced degree while maintaining full-time employment.

### **Organization**

A survey of software executives who sit on the Departmental Visiting Committee of the Department of Electrical and Computer Engineering at the UT-Austin was conducted to determine curriculum content and format.

The program is organized around four basic formats: two intensive Software Engineering Seminars that meet for one week each year immediately preceding the start of the academic year; eight software engineering courses that meet once monthly (all day Friday and Saturday) with two courses a semester for four semesters; two summer courses that involve independent research projects; and the writing of a Master's Report. Candidates for this program should hold a BS degree in Electrical Engineering, Computer Engineering, Computer Science, or the equivalent.

### **Membership**

Not applicable.

### **Software Engineering Education and Training Activities**

The goal of the curriculum is to teach material on software engineering, with an emphasis on the design and analysis of software systems and on the management of software projects. The UT-Austin requires at least 33 credit hours for a master's degree with a report. The curriculum includes

- Analysis and Architectures of Software Systems: Programming
- Fundamentals for Software Engineers
- Domain Specific Software Architectures
- Advanced Topics I on Software Engineering
- Verification and Validation of Software
- Large Software/Hardware Communication Systems
- Programming Languages and Applications
- Methodologies for Hardware/Software Codesign
- Advanced Topics II on Software Engineering



- Systems Engineering Program Management and Evaluation
- Distributed Software Systems
- Master's Report

### **Point of Contact for Further Information**

Joanne Click  
Coordinator, Option II MSE in Software Engineering  
The University of Texas at Austin  
PRC MER R9800  
Austin, TX 78712-1080  
Phone: 512 / 471-4875  
Fax: 512 / 471-4824  
Email: [click@sqj.utexas.edu](mailto:click@sqj.utexas.edu)  
Web Address: <http://www.utexas.edu/coe/sqi>



# Bibliography

- [Amar 94] Amar, Bernard; Benoit, Yves; Guyard, Jacques; & Jacquot, Jean-Pierre. "Implication of Practitioners in a Post-graduate Curriculum," *Software Engineering Education*, 251-261. *Lecture Notes in Computer Science (750)*, (Jorge L. Diaz-Herrera, Ed.). *Proceedings of SEI Conference on Software Engineering Education*, San Antonio, Texas, January 5-7, 1994. Berlin, Heidelberg: Springer-Verlag, 1994.
- [Baird 96] Baird, Dawna M. *Software Process Improvement Network (SPIN) Directory*. Pittsburgh, Pa.: Software Engineering Institute, Carnegie Mellon University, March 1996.
- Web Address: <http://www.sei.cmu.edu/participation/spins.html>
- [Beckman 97] Beckman, Kathy; Coulter, Neal; Khajenoori, Soheil; & Mead, Nancy R. "Industry/University Collaboration: Closing the Gap Between Industry and Academia." Accepted for publication in the November, 1997 issue of *IEEE Software*.
- [Carpenter 95] Carpenter, Maribeth B. & Hallman, Harvey K. *Training Guidelines: Purchasing Training for a Software Organization* (CMU/SEI-95-TR-010, ADA304091). Pittsburgh, Pa.: Software Engineering Institute, Carnegie Mellon University, December 1995.
- Web Address:  
<http://www.sei.cmu.edu/products/publications/95.reports/95.tr.010.html>
- [Coulter 94] Coulter, N. & Dammann, J. "Current Practices, Culture Changes, and Software Engineering Education." *Computer Science Education* 5, 2 (1994): 211-227.
- [Ford 91] Ford, Gary. *1991 SEI Report on Graduate Software Engineering Education* (CMU/SEI-91-TR-2, ADA236340). Pittsburgh, Pa.: Software Engineering Institute, Carnegie Mellon University, 1991.
- Web Address:  
<http://www.sei.cmu.edu/products/publications/91.reports/91.tr.002.html>

- [Fowler 90] Fowler, Priscilla & Rifkin, Stan. "Appendix E: Training and Education," 117-120. *Software Engineering Process Group Guide* (CMU/SEI-90-TR-24, ADA235784). Pittsburgh, Pa.: Software Engineering Institute, Carnegie Mellon University, September 1990.
- Web Address:  
<http://www.sei.cmu.edu/products/publications/90.reports/90.tr.024.html>
- [Haikala 92] Haikala, Ilkka J. & Marijarvi, Jukka. "(Continuing) Education of Software Professionals," *Software Engineering Education*, 180-193. *Lecture Notes in Computer Science* (640), (Carol Sledge, Ed.). *Proceedings of SEI Conference on Software Engineering Education*, San Diego, Ca., October 5-7, 1992. Berlin, Heidelberg: Springer-Verlag, 1992.
- [Hirmanpour 96] Hirmanpour, Iraj; Ceberio, Anna; & Khajenoori, Soheil. "An Industry/Academic Partnership That Worked: An In-Progress Report," 234-246. *Proceedings of the 9th Conference on Software Engineering Education*. Daytona Beach, Fla., April 21-24, 1996. Los Alamitos, Ca: IEEE Computer Society, 1996.
- [Mann 91] Mann, P.; Mason, A.; & Norris, M.T. "Industrial Training for Software Engineers," *Software Engineering Education*, 99-113. *Lecture Notes in Computer Science* (536), (J. E. Tomayko, Ed.). *Proceedings of SEI Conference on Software Engineering Education*, Pittsburgh, Pa., October 7-8, 1991. Berlin, Heidelberg: Springer-Verlag, 1991.
- [Mead 97] Mead, Nancy R.; Beckman, Kathy; Coulter, Neal; Khajenoori, Soheil; & Carter, David. Panel: "Industry-University Partnerships: The Wave of the Future?" 214-218. *Proceedings of the 10th Conference on Software Engineering Education & Training*. Virginia Beach, Va., April 13-16, 1997. Los Alamitos, Ca: IEEE Computer Society Press, 1997.
- [Paulk 95] Paulk, M.C.; Weber, C.V.; Curtis, B.; & Chrissis, M.B. *The Capability Maturity Model for Software: Guidelines for Improving the Software Process*. Reading, Mass.: Addison-Wesley Publishing Company, 1995.
- [Sloan 96] Sloan, Sheneui C. "Industry and University Partnership Through Consortia," 221-228. *Proceedings of the 9th Conference on Software Engineering Education*. Daytona Beach, Fla., April 21-24, 1996. Los Alamitos, Ca: IEEE Computer Society, 1996.

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

<b>1. AGENCY USE ONLY (LEAVE BLANK)</b>		<b>2. REPORT DATE</b> November 1997	<b>3. REPORT TYPE AND DATES COVERED</b> Final	
<b>4. TITLE AND SUBTITLE</b> Directory of Industry and University Collaborations with a Focus on Software Engineering Education and Training, Version 6			<b>5. FUNDING NUMBERS</b> C — F19628-95-C-0003	
<b>6. AUTHOR(S)</b> Kathy Beckman				
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> Software Engineering Institute Carnegie Mellon University Pittsburgh, PA 15213			<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b> CMU/SEI-97-SR-018	
<b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> HQ ESC/AXS 5 Eglin Street Hanscom AFB, MA 01731-2116			<b>10. SPONSORING/MONITORING AGENCY REPORT NUMBER</b>	
<b>11. SUPPLEMENTARY NOTES</b>				
<b>12.A DISTRIBUTION/AVAILABILITY STATEMENT</b> Unclassified/Unlimited, DTIC, NTIS			<b>12.B DISTRIBUTION CODE</b>	
<b>13. ABSTRACT (MAXIMUM 200 WORDS)</b> This directory describes 24 formal collaborative efforts to promote software engineering education and training activities among industry organizations (including government) and universities in the United States, Canada, and Australia. These collaborations vary in their organizational structure and types of services offered. All attempt to bridge the gap between industry needs and academic software engineering education and training offerings. Readers can use this directory to find collaborations that match their software engineering education and training needs and that are located within their geographic area.				
<b>14. SUBJECT TERMS</b> software engineering, directories, education		<b>15. NUMBER OF PAGES</b> 46 pp.		
		<b>16. PRICE CODE</b>		
<b>17. SECURITY CLASSIFICATION OF REPORT</b> UNCLASSIFIED	<b>18. SECURITY CLASSIFICATION OF THIS PAGE</b> UNCLASSIFIED	<b>19. SECURITY CLASSIFICATION OF ABSTRACT</b> UNCLASSIFIED	<b>20. LIMITATION OF ABSTRACT</b> UL	