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Dr R W Witty

National Programmes

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KEYWORD: SEGN 68 National Programmes

(see next page)

1.   INTRODUCTION

At the 8th International Conference on Software Engineering a Panel Session was held on various National Programmes. RWW gave a short talk on the Alvey Software Engineering Programme. The National Programmes represented together with their start dates were as follows:

(1)   MCC, USA, September '83.

(2)   ESPRIT, Europe, April '83.

(3)   Alvey, UK, July '83.

(4)   SEI, USA, December '84.

(5)   SPC, USA, September '85.

(6)   Sigma, Japan, October '85.

(7)   ITI, Singapore, 4Q '85.

2.   MCC

Les Belady of MCC was the session chairman and gave the first talk on MCC's Software Engineering Programme. This is aimed at producing tools and methods to enable an order of magnitude increase in productivity and quality of software production. A nice joke about such objectives is whether the base of the exponent is binary or decimal? The MCC project is called 'Leonardo' which is an environment for the professional programmer rather than the amateur or the end user. It is aimed at building target systems which are distributed parallel complex systems. It is an eight year project.

3.   SEI

SEI stands for the Software Engineering Institute now set up at Carnegie Mellon University as part of the DoD programme. The new head of SEI is called Dr John Manley. SEI currently has five main projects.

(1)   Software factory workshop.

(2)   Showcase environment.

(3)   Evaluation of Ada environments.

(4)   Software Engineering curricula.

(5)   Software licencing.

The last project on software licencing is an interesting development. SEI's mission is to do technology transfer primarily into the DoD defence contractors. Manley has already put in place a team of lawyers to look at the legal issues surrounding software. These issues include embargos, intellectual property rights, Cocom regulations, copyright etc. I think it is a very interesting development that the Software Engineering Institute is taking such a high profile, hard nosed, approach to licencing. Licencing and other such issues was one of the things raised in the Department of Commerce's recommendations when it looked at the future of the American industry so I think we should keep our eye very closely on this development.

John Manley has invited David Talbot to visit SEI in October.

SEI has initially got five year funding but some of their strategic goals require 10 to 15 year planning so they have a fairly long term view of the situation. A more detailed document on SEI is on circulation.

4. SPC

SPC stands for the Software Productivity Centre. This is a new consortium of industrial companies. It consists of 15 companies in the aerospace and DoD contractor business. Its objective is to develop software engineering techniques for embedded mission critical software. Their technical programme is concentrating on

(1) Reusability

(2) Prototyping

(3) IKBS for Software Engineering.

The other part of its mission is to do technology transfer. This means into the SPC by going out into the world and getting technology from elsewhere, in particular the SEI and the STARS programmes and technology transfer out into the member companies. They are keen to develop metrics to evaluate the effectiveness of their work. The SPC is situated in Fairfax County, Virginia.

5. SIGMA

Sigma begins in October '85 and runs initially for 5 years. Kashida described Sigma as NOT a research programme but a project to build a REAL system. He saw it as a Value Added Network to do software development and productivity improvement. It consists of

(1) A UNIX based software development environment.

(2) A national public network for information exchange.

Kashida actually used the words 'UNIX is the Common Base'.

Kashida saw the current Japanese UNIX network as being weak but after the Sigma project they will have connected together all of the computer manufacturers, all of the software houses and all of the research communities with this Value Added Network.

There will be some Sigma centres in which there will be on display standard models of the environment; databases of tools and components; and the control of the electronic mail system.

I had a great sense of deja vu when listening to the technical description of the Sigma project. Perhaps I should take it as a complement.

6.   ITI

ITI is a new initiative from Singapore to 'drive Singapore into the information technology age'. The ITI is primarily a technology transfer and exploitation mechanism rather than a long term research programme. Its objective is to exploit information technology and speed up the exploitation of IT in Singapore. It will be concentrating on IKBS office systems and CAD for software engineering.

The talk by Mr Lim was full of humour and oriental wisdom. One example is as follows. 'The bitterness of poor quality lingers on after the sweetness of meeting the delivery date fades.' It is an interesting insight into the oriental belief that quality is infinitely more important than productivity. ITI intends to build a multi MMI (ie mouse, voice, vision etc) workstation to support their initiative.

We have a more detailed document on circulation about the ITI.

7.   APPENDICES

(1) Appended are the abstracts of the talks about the National Programmes. Belady edited them heavily so they are written in Polish-American not necessarily English.

(2) Cards of various people of interest.

NEW SOFTWARE ENGINEERING PROGRAMS – WORLDWIDE

Laszlo A. Belady
Microelectronics and Computer Technology Corporation (MCC), U.S.

Abstract

As the growth in value and importance of the software component in virtually all industrial products accelerates, the efficiency with which software is constructed, and its quality, become vital for the entire industry -- high technology or not. In response, new concentrated efforts have been recently created in Europe, Asia, North and South America, established and owned by private enterprise or government. It seems that these institutes, or programs within new institutes, place themselves between academic research and advanced development, and plan significant experimental work.

The panel will examine the strategies and planned approaches of eight such programs. Brief descriptions of some of them follow.

Software Engineering Institute, U.S.
(Nico Habermann)

The Software Engineering Institute (SEI) is a federally funded research and development center established as an integral part of Carnegie–Mellon University. The SEI's objective is to accelerate the transition of modern software engineering technology from the research environment into practice. The general approach of the SEI is to make the software production process technology–intensive rather than labor–intensive. The SEI does not let contracts, but interacts with government, industry and academia through its affiliate programs. Most of the work in the SEI is organized in the form of team projects whose participants stay together for periods of 18 months to two years.

The work of the SEI is performed in the public domain. A target staff of 250 professionals enables the SEI to produce demonstration systems and prototypes that can be turned into products by industry. The output of the SEI is software that enhances the production of software rather than specific application software.

The six long range programs for the SEI are:

> *Technology Identification & Assessment;*
> *The Nature of Technology Transition;*
> *Education;*
> *Reusability and Automation;*
> *System Design, Construction and Integration;*
> *Reasoning about the Software Engineering Processes.*

The SEI has been in existence since January, 1985. Six projects will start during the first year to produce immediate results:

Technology Assessment, which collects a variety of programming environments available on various hardware;

Software Licensing, which attempts to analyze the problems of individual and corporate rights to software;

The Software Engineering Curriculum, which is a joint effort by representatives of many universities, coordinated by the SEI, to design a coherent set of courses for a masters program;

The Showcase Environment, which demonstrates how existing tools can be integrated into a coherent programming environment;

Evaluation of Ada Environments, which is providing an overview of various Ada environments with their pros and cons;

Software Factory Workshop, which organizes a series of workshops in order to refine our understanding of software engineering and the software production process.

Joint Software Engineering Program – Singapore
(Lim Swee Say)

The JSEP undertakes applied research and uses the Civil Service including the Ministry of Defense as a test bed to experiment with emerging technologies and applications. JSEP engages the services of overseas experts to introduce technology in Singapore. The current focus is on a Computer Aided Software Development (CASD) with the following capabilities:

a.   computer aided tools integrated on a software development workstation (SDW) so that it will be feasible to plan, analyze, design, program, test and implement application systems in a paperless manner.

b.   processing of natural languages and automation of some of the technical activities in the lifecycle.

In software engineering, five long–term research topics have been identified so far. These are *Systems Development Methodology, Analyst Workstation, Application Generator, Software Metrics,* and *Quality Assurance.*

JSEP currently has a staff of 36 professionals. The staff is expanding and projected to reach 80 persons in the next five years. Besides the full–time researchers in JSEP, the National Computer Board (NCB) and the Systems and Computers Organization presently employ more than 500 computer professionals to help automate the Civil Service. It is projected that the contribution by the part–time researchers will increase from the present level of 15 man–years to 40 man–years annually by 1989.

In summary, the national goal is to become the software centre of Southeast Asia in the 1990's with research focus and application interests in software engineering, integrated office systems, and artificial intelligence, using the Civil Service as a test bed and with helping hands from overseas experts. We hope to achieve our goals and be able to contribute to the international software engineering community in the future.

The ESPRIT Program, EEC
(John Elmore)

The European Strategic Program for Research and Development in Information Technology (ESPRIT) is an important element in the European economic community's (EEC) economic strategy aimed at insuring that together with national programs within the currently ten member states, the community's IT (information technology) industry applies the technology to achieve competitiveness in the international market. ESPRIT is a ten-year program collaborative, precompetitive research and development in IT. The program which commenced in 1984 supports collaborative projects involving industry, research institutions and universities, thus encouraging the definition and use as common standards within the communities and rapid technology transfer from laboratories into the industrial environment.

The ESPRIT program covers precompetitive research and development in five key areas:

> *Advanced Microelectronics;*
> *Software Technology;*
> *Advanced Information Processing;*
> *Office Systems;*
> *Computer Integrated Manufactured Office Systems.*

By the end of 1985 the majority of the work covered by the program will be underway. The *Software Technology Program* is addressing the very real need for improvement in software development technology and software products policy and reliability by supporting R&D in development environment and the integration of advanced product development methods, tools and project management aids. The projects are aimed at the whole of the product lifecycle – from the capture of user requirements through to and on conclusion of products enhancement and support. The Software Technology Program is designed through the connection of technical standards and strong industrial collaboration to support the creation of a strong software industry in the community. The work covers:

Development of Integrated Project Support Environment – the earliest to mature providing a portable common tool interface based on UNIX Systems V;

A number of formal design techniques;

Support for various phases of the development process including support for fast prototyping;

Specification, development and support of reusability of software components.

The emphasis this year within the software technology area is to improve the industrialization of these environments, methods and tools. The aim is to achieve a marked improvement in the development and quality of software products within a three to four year timeframe.

Software Productivity Consortium (SPC), U.S.
(W. M. Murray)

The *Software Productivity Consortium* is being established to provide a solution to the high cost of software development for imbedded mission-critical systems. SPC's member companies include a large number of the major U.S. defense contractors. SPC's initial research will focus on software reusability, software prototyping and knowledge engineering for systems development. The SPC will be established as a stand-alone research activity being funded on an equal basis by its member companies. A key criteria for the success of the SPC is the ability to transition the development activities of the consortium back to the member companies.

The MCC Software Technology Program, U. S.
(Les Belady)

The *Microelectronics and Computer Technology Corporation (MCC)* is an industry consortium formed and owned by private companies (currently 21) to conduct long-range research and develop computer technology in four major areas. MCC has a research program to address each such area. One of those programs, the *Software Technology Program,* was given the mission:

· to develop technology that will dramatically improve productivity of software systems engineering and the quality of the resulting systems, and

· to transfer the technology to the companies that are sponsoring the Program.

These activities, which are to take place over the next several years, are to provide technology for the development of systems in the 1990s.

Because it was chartered with *long-range* research, the Program wanted to choose a high-risk, but potentially high-payoff approach. Also, the Program did not want to duplicate efforts occurring elsewhere. Thus, the Program concentrates on *large-scale* development characterized increasingly with the construction of distributed, parallel, real time constrained systems, in which many individuals are engaged over a period of years.

The Program is focusing on the massive computer aiding of the "front-end" of the development process. In other words, the Program is looking for ways to assist the developer with the understanding of the problem to be solved, the formulation of the problem's requirements, and the creation of high-level design

The Program is addressing the front-end issue that is fundamental to the development of large software systems, i.e., *exploration* – the identification of alternate designs and their acceptance or rejection, based on the expected systemwide consequences of design choices. How can, for instance, a designer visualize not only the structure of a design, but also the dynamic behavior of that design? How can knowledge gained during the design process be captured for future reuse?

The other major area being addressed by the Program involves the role of teams in software development. As opposed to assuming that teams are inefficient, and that the goal of research should be to reduce development efforts to as few people as possible, the Software Technology Program is trying to identify the *strengths* of teams and how those strengths can best be exploited.

The intermediate goal of the Program is the development of a framework for team design and the tools to assist each team member with design. Eventually, the framework and the tools, plus research imported from outside the Program will be integrated into a prototype development environment called *Leonardo*†. The Program will transfer interim versions of tools and of *Leonardo* to pilot projects within the participating companies.

The Alvey Software Engineering Programme
(R. W. Witty)

Since 1983 this is a five year, national programme of Advanced Information Technology Research, within the Alvey Directorate which has a strategy encompassing four main research areas:

1. Intelligent Knowledge Based Systems
2. MMI
3. VLSI
4. Software Engineering.

The Software Engineering Programme develops new tools and methods to facilitate the production of high quality, cost effective software. It has three parallel sub programmes (*Innovation, Integration* and *Exploitation*) acting as a pipeline of continuous activity.

Three specific areas of activity are: *Formal Methods, Reliability* and *Associated Metrics*, and the possible application of advanced knowledge based techniques to software production.

Of the formal applications, we have approved some 48 and these, plus our 'infrastructure' costs have committed 52% of our available budget. Our pipeline of proposals under formal consideration, together with those in an early stage of discussion, should lead to a commitment by the end of the second full year of the program of some 80% of our total budget, which is in line with our financial plan and identified as an important target in our contribution to the Annual Report published last November.

The largest of our currently committed projects are the two First Generation Integrated Project Support Environments (IPSEs) – *Aspect* led by SDL and *Eclipse* led by SSL – both of which are key elements in our integration strategy. In addition to being in part competitive and in part complementary both provide a helpful focus for a number of our more specialized tool-making projects and we expect that in principle the tools from these projects will be capable of integration in one or more of the IPSEs via the tool interfaces that both the IPSE projects are committed to publish.

A start has also been made to progress our plans for the Second Generation IPSE. A project that commenced as a collaborative arrangement between ICL and STC and involving a number of distinguished consultants has now completed a report on Requirements for Advanced Support Environments. Currently discussions have commenced with the nucleus of a consortium expected to play a major part in in Second Generation activities.

The Alvey Programme strives to encourage and maintain links with other national programs and has a special liaison with the ESPRIT Program.

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† Leonardo is a trademark of the Microelectronics and Computer Technology Corporation. The name is from Da Vinci, who was an artist, a designer, an engineer, and perhaps the last great polyhistor.

In addition to the information exchange and awareness activities we will also build up a number of evaluation experiments. Our major IPSE projects already have a limited number of 'definitive' users who will act as evaluators. We will aim to extend these numbers to capture a better spread of application and organizational environments.

Sigma Project, Japan
(K. Kishida)

Sigma is a government supported project, to establish a nationwide computer network. This network will connect the major software houses, service bureaus and large computer users, to support application software development.

The network will have several service centers to develop and distribute software tools and a standard environment based on UNIX, to the participants of the network. Within the framework of this program, emphasis is on advanced development, with a starting date in the Fall of 1985, and a duration of 5 years, concluding with the operation of the network.

Software Plant Project (SPP) – Brazil
(Fuad Gattaz Sobrinho)

The objective of the *Software Plant Project (SPP)* is to endow Brazil with a structure for the industrial production of software that will allow the country to achieve software quality and productivity levels which are competitive in the international markets.

The software industrial product is meant to be a system of programs that meets previously established criteria relative to functional and engineering attributes. It is produced by standardized production structure by a technical and managerial organization set up for the development and evolution of software products in the most systematic and automatic manner allowed by current technology.

This mission shall be carried out through the establishment of the Software Plant, which shall be the national basis for the development of software production technology and for its transfer to the Brazilian software industry.

Lim Swee Say
Divisional Director
Information Technology

NCB

NATIONAL COMPUTER BOARD
5, Portsdown Road (Off Ayer Rajah Road), Singapore 0513
Telephone: 4757088 • Telex: NCB RS 38610
Contact Telephone: 4791211 Ext. 3205

MCC
MICROELECTRONICS AND
COMPUTER TECHNOLOGY
CORPORATION

LASZLO A. (LES) BELADY
Vice President & Program Director
Software Technology Program

3430 RESEARCH BLVD.
ECHELON BUILDING #1, SUITE 200
AUSTIN, TEXAS 78759
512-343-0860, 512-834-3356

Belady @ MCC

Carnegie-Mellon University

Pittsburgh, Pennsylvania 15213
(412) 578-7716

John H. Manley
Director
Software Engineering Institute
ARPANET: manley@CMU-SEI