SCIENCE AND ENGINEERING RESEARCH COUNCIL
RUTHERFORD APPLETON LABORATORY

INFORMATICS DIVISION

SOFTWARE ENGINEERING GROUP NOTE 138

issued by
ACARD WG on SE   R W Witty
Notes for G Holmes speech to Alvey 86 Conference   26 June 1986

DISTRIBUTION: R W Witty
                     D E Talbot
                     G Holmes (via courier)
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ADVISORY COUNCIL FOR APPLIED RESEARCH

AND DEVELOPMENT

SOFTWARE: A VITAL KEY TO UK COMPETITIVENESS

SLIDE 1 : INTRODUCTION

Good afternoon, Minister, Ladies and Gentlemen.

ACARD, the Advisory Council for Applied Research and Development, advises the Government on applied research, design and development and the application of research and technology, together with the coordination of these activities with basic research. Its current chairman is Sir Francis Tombs, and the other members of the Council include senior industrialists, chairmen and technical directors of major companies, distinguished academics and other leaders in the field.

The attention of ACARD was drawn to the possibility that the UK was failing to develop and apply software sufficiently rapidly and widely in all industries. A related possibility was that the UK was failing to win its expected share of the world market for software.

An ACARD Working Group was therefore set up in January 1985 to investigate these concerns, under the chairmanship of Mr J Coplin, Director of Design, Rolls Royce Ltd. Our report was published on 16 June 1986.

SOFTWARE IS IMPORTANT AND

CRUCIAL TO THE UK ECONOMY

SLIDE 2 : SOFTWARE CRUCIAL

World wide, the manufacturing and service industries are increasing their competitiveness by accelerating their use of computer software in end products, manufacturing processes and customer services. UK manufacturing and service industries can regain and enhance their competitiveness by applying software more widely. To apply software effectively, the UK industries require a better understanding of the nature and power of software; this understanding can only be achieved through increased in-service education and training. More knowledgeable manufacturing and service industries will be more able to pull through and take up new ideas from the supply side, which itself needs strengthening educationally.

WORLD MARKET FOR SOFTWARE

$40 billion in 1985

30% growth rate

UK is 5%

UK firms supply 2-3%

The software supply industry operates in a world market worth some $40 billion per annum, with a soaring growth rate of around 30% per annum. The UK domestic market is 5% of the world total. UK suppliers hold 2-3% of the world market. This share consists of about half of the UK domestic market plus only 0.5% of the rest of the world market. Many new UK software companies have been created in the last twenty years. Several have grown rapidly, at around 20-30% per annum, which compares very favourably with other UK industrial sectors.

In spite of this relative success, the major UK software companies are much smaller than their major overseas competitors. For instance, in America, EDS has a turnover of $3000 million; in France Cap Gemini Sogeti has a turnover of F.Fr 2000 Million, two thirds of which is generated outside France, by a staff of 6,000 people.

Thus, in a period of rapid world market growth, the challenge facing the UK software industry is how to win a greater market share and build a firmer foundation from which to survive and prosper during the 'shake out' phase of market development which is now dawning.

UK TRADE BALANCE DEFICIT

1983 IT Total Deficit - £1 billion

1990 IT Total Deficit - £9 billion

1990 Software only   - £2 billion

THE RESULT

Increasing dependance on foreign suppliers for key computing power

The UK balance of payments deficit for IT (including software) was £928 million in 1983 and is predicted to worsen to £9 billion by the early 1990s, of which software will contribute a £2 billion deficit. At today's prices, a £2 billion deficit would be the second largest figure after vehicle imports.

Almost every aspect of business in the UK is subject to international competition. IT has intensified this competition. There is no escape from this competitive pressure. UK industry must enthusiastically and skilfully exploit the opportunities that IT offers or the UK economy will suffer.

The UK economy is dependent on IT and IT is dependent on software. Therefore software is critical to the economy.

UK software companies are growing at around 20% pa which is below the world rate of 30-40%. Thus the balance of payments deficit is going to increase if UK industry generally takes up IT at the rate required to remain competitive in world markets. This will result in the UK becoming dependent on overseas software suppliers, just as we are already dependent on American hardware suppliers.

TECHNOLOGY IS IMPORTANT

BUT NOT THE WHOLE SOLUTION

ACARD RECOMMENDATIONS

TRAINING

APPLICATION

EXPLOITATION

SLIDE 5 : RECOMMENDATIONS

The widespread application of soundly engineered software can enhance the overall financial performance of the United Kingdom. To maximise this potential companies, government departments and educational establishments need clear visibility of the broad picture. Thus informed about national targets, and the general direction to be taken, they can then strive to achieve the overall targets by mutually coordinated actions.

We recommend the formation of an expert body, provisionally called STARTING (Software Technology and Applications Review Team of Industry and Government), to monitor the implementation of our recommendations and their effectiveness in use against the targets we have set. STARTING's main function is to hold an annual, large scale, formal review meeting to consider a performance report of software users, appliers and suppliers. ACARD requires an annual summary report from STARTING in order to monitor the effectiveness of the STARTING mechanism and the progress towards its targets.

MAIN RECOMMENDATIONS

Our main recommendations for Industry are:

*   In-service training initiative for all users, appliers and suppliers

*   Increased application of software to improve the competitiveness of the manufacturing and service industries.

*   Marketing initiative for UK software products and services

Our main recommendation for Government is the formulation and implementation of a long term plan for inter-departmental cooperation on:

*   Public purchasing to exercise demand side leadership

*   A new technology transfer initiative (BASSMATT)

*   Better R&D planning

*   In-service training initiative

TRAINING

Awareness to Encourage Adoption

Continuous, In-Service Education

New Curriculum for Professional
Qualifications

<u>SLIDE 6 : TRAINING</u>

The key to UK success in Information Technology is the appropriate and effective professional education of all who engage in it - from directors and managers, through systems analysts and programmers to marketing and sales staff.

A noticeable problem in the IT industry is the low relevant educational attainment of many practitioners. Even those with appropriate qualifications have little incentive or opportunity to keep abreast of the subject. Furthermore, the effectiveness of those qualified may be inhibited by the lack of education of their colleagues and of those occupying more senior positions.

This problem has been recognised and measures have been taken to enable the UK educational establishment, in the long term, to meet the increasing needs of industry for staff trained in software technology and usage.

UK industry cannot afford to wait complacently for these recent changes in education to take effect. Industry must take responsibility for meeting its immediate needs. At present, UK industry makes insufficient investment in training those staff involved with software. Lack of training investment is blamed upon rapid obsolescence of training, perception of low cost effectiveness

of training, high rates of staff wastage and those firms who "feed off" the training investments of others. Without the increased competence, effectiveness and productivity which training can provide, UK industry will find itself increasingly unable to deliver the software which it needs to compete.

We recommend that all sectors of industry using software increase their provision for in service training to meet the following annual targets:

*   Directors, executives and senior managers receive one week of technical training.

*   Managers receive two weeks of technical training.

*   Technical IT staff receive three weeks of technical training; one week of business and marketing training.

We need to establish the principle that every responsible professional in IT will expect to supplement his formal education in software engineering more than once in his career. IBM probably is the most successful IT company in the world. Their investment in in-service education and training is outstanding at around $1000 million per annum. Employees are required to undertake several weeks annual training, no matter what their position in the company. IBM has

implemented a policy, laid down some five years ago, that every programmer and manager of programmers should attend between two and six weeks of in-service education in the formal methods of software engineering. It is difficult to believe that a considerable part of IBM's success is unrelated to their commitment to in-service education.

Establishing curricula for an in-service educational programme of wide scope is not simple. The curricula must be accepted by all concerned as being technically robust and having long term viability. We believe that the IEE and the BCS have expertise in establishing professional education schemes and will be able to accredit acceptable curricula. In-service education also would gain considerable prestige if it were acceptable as credit for traditional qualifications from professional and educational establishments. We recommend, therefore, that this be one of the goals for those establishing the programme.

APPLICATIONS

Structural Proposals for:

*   Supplier-User Collaboration

*   Better Competitive Edge

*   Better International Marketing

SLIDE 7 : APPLICATIONS

In contrast to the technically competent base of indigenous software suppliers, UK industry has been slow to apply software to its business activities. Consequently, industry has lost considerable opportunity to enhance its competitiveness. As long as UK software efforts are led by suppliers, industry cannot realise the full benefits of IT. Industry must take steps to ensure that it is able to take advantage of software technology by applying it appropriately.

There is a close dependency between suppliers and users of software. Without the timely availability of suitable and cost effective applications software, many users will be unable to compete. Without user demand, software suppliers will not produce suitable products and, ultimately, will not prosper. It is unfortunate that UK software suppliers do not have effective collaboration with an indigenous, world ranked computer hardware industry. This means that they are not in the best position to offer new and timely software products based on new hardware. UK users are unable to capitalise on new hardware developments unless they turn to foreign software suppliers. Consequently, UK suppliers are in an inherently unfavourable competitive position. Because of this, application of software in specialist domains is particularly important to the health of UK software suppliers as well as users.

<u>We recommend</u> that the application of software by industry be accelerated. We believe that the following measures will be effective:

*   In-service training will greatly assist the circulation of ideas and help create a dynamic climate of software application; a major goal of the training programme should be a substantial increase in the number of computer literate technologists who are capable of applying IT in their specialist knowledge domains.

*   Increasing the rate of technology transfer and feedback between users and suppliers; this will be the task of the BASSMATT organisation.

Marketing

The marketing of UK software products and services is in urgent need of revitalisation. The success of some UK companies should not be depreciated, but such success often is related to exploitation of limited home market niches. Given the high technical competence and strong historical position of UK software suppliers, the present performance is disappointing. The increasing penetration of the UK home market by foreign suppliers is reason for extreme disquiet now that software is a vital part of the industrial fabric of the UK.
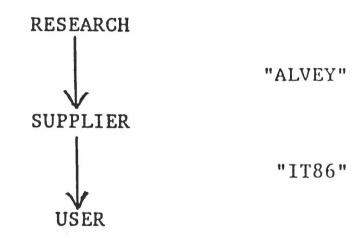
We have observed several problems:

*   Comparatively healthy growth of some UK software suppliers obscures the fact that, overall, suppliers are losing international and home market share.

*   The level of commitment and investment in marketing by UK companies falls far short of that of competitors.

*   The UK has a poor image internationally.

As software becomes more of a commodity, both the cost and importance of marketing will increase. The problems of marketing software cannot be solved easily but the rewards are high if they can be. The initiative must come from the software suppliers themselves but Government must show moral and financial commitment, as well.

TECHNOLOGY PLANNING

"STARTS" - APPLYING AVAILABLE TECHNOLOGY

Collaboration Chain

RESEARCH

$\downarrow$

"ALVEY"

SUPPLIER

"IT86"

$\downarrow$

USER

LONG TERM REQUIREMENTS PLANNING

SLIDE 8 : TECHNOLOGY PLANNING

Through the effects of public purchasing, education and public funded R&D; through law and policy making, and through the growing dependence of public administration and national defence on IT - we see that SOFTWARE affects, and is affected by, virtually every Government Department.

This breadth of involvement causes significant interdependencies amongst the policies and actions of the individual Government Departments which we feel now requires greater coordination based on a consistent, long term strategy.

DEMAND SIDE

We recommend that all Government Departments use their purchasing power to foster the development of new applications ideas and product innovation, as well as encouraging the first use of new methods, skills, tools and training by both users and suppliers.

Public purchasers should stimulate UK software exports by ensuring that public requirements specifications encourage the development of software which can be subsequently sold directly, or easily adapted for sale, in export markets.

We are impressed by the work of the STARTS Public Purchasers Group. We would like to see its role and resources increased to enable STARTS to lead the implementation these demand side recommendations.

TECHNOLOGY TRANSFER

The UK often fails to transfer promising public funded research results into commercial exploitation because no single Government Department can 'champion' a good idea through from the research stage all the way to commercial demonstrator.

The USA and Japan have active technology transfer policies and programmers, such as the $20M/yr Software Engineering Institute, to span this development gap and to promulgate new ideas.

We recommend that the UK undertakes a technology transfer initiative, in the fields of software applications and software engineering, lead by a new institute, provisionally called BASSMATT, to be a focus and catalyst for evaluating and spreading new ideas between the user and supplier communities.

RESEARCH AND DEVELOPMENT

In the UK, public funded Research is the main source of new technology.

Individual Government Departmental budgets are too small to compete with the massive Government funded R&D programmes of the USA and Japan. Only by interdepartmental cooperation, and informed selectivity, can the UK keep pace with our international rivals.

We therefore recommend the coordination of departmental activities, according to a long term strategy, to avoid the discontinuities in policies and funding of R&D which result when new programmes are started without adequate preparation, or when existing programmes are terminated too soon to allow commercial exploitation to occur. Discontinuities cause the UK to lose staff, new products and market opportunities.

We recommend the continuation of Alvey-style collaboration but are worried that the cessation of Alvey funding this year for new projects, with no alternative in sight, is going to cause a serious discontinuity in the UK's R&D effort with damaging effects to the UK IT industry and our research capability.

We therefore hope for a speedy response to the 'what happens now that Alvey has stopped funding?' question.

CONCLUSION

Adoption of ACARD Recommendations

..... good chances of success

Failure to act... £10 billion deficit in IT

£2 billion in Software alone

SLIDE 9 : CONCLUSION

To grasp the opportunity to increase the UK's competitiveness, and to reduce the predicted serious balance of payments deficit requires cooperation between industry, academia and government to develop market better products and services.

The increased use of software is a vital ingredient to achieving these goals.

To successfully exploit software requires a more knowledgeable and skilled workforce and administration.

Thus the need for an increase in regular in-service education and training, at all levels, is we feel, our most important recommendation.

Failure to regularly train staff and develop new software applications will cost the UK dearly. However, the ACARD report is not another 'doom and gloom' message. We can succeed in increasing UK competitiveness through training and the wider application of innovative software, but success will only come if we take positive action now to increase our level of effort and commitment.

Thank you.