IfM

UNIVERSITY OF CAMBRIDGE

Technology Management

Quarterly newsletter of the Centre for Technology Management (CTM)

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New technologies – threat or opportunity?

Emerging technologies in fields as diverse as biosensors, nano-scale materials and computer science have the potential to create exciting new products. At the same time they pose disturbing challenges to our society – distinguishing between threat and opportunity can be difficult until the wider impact of the new science and technology is fully understood.

In addition to explaining the range of these technologies, this year's Symposium provided workshop, case study and plenary sessions that enabled delegates to explore the implications for their own businesses.

The workshops, which drew on recent research at CTM and other leading centres, proved especially popular. The opportunity to discuss other delegates' experience was appreciated and provided some real insights.

Several corporations contributed company examples, including BAE SYSTEMS. Their experience contrasted with the issues facing other companies in fast moving

10th annual CTM Technology Management Symposium, Downing College, Cambridge, 29-30 September

sectors such as motorsport (F1 McLaren) and automation for the pharmaceutical industry (The Automation Partnership). Authoritative presentations on policy issues for the UK were given by Sir Keith O'Nions, Director General of the Research Councils (*pictured top right*) and Allan Mayo of the DTI, who is leading the development of a technology strategy for the UK.

Speaking at the dinner in Queens' College, Professor Sir Richard Friend drew on his experience of transferring early-stage technology (semi-conducting polymers) from the Cavendish Laboratory into two start-up companies in Cambridge.

Dr Simon Waddington, of PolyTechnos Venture-Partners described the factors and conditions

that venture capitalists consider when making their funding decisions in relation to these risky emerging technologies.

The programme included stimulating contributions from Professor Chris Lowe, Director of the Institute of Biotechnology; Dr Derek McAuley of the Intel Research Lab and Professor Mark Welland, Director of the Nanosience Centre. A summary of these and other Symposium presentations will be sent to delegates shortly and are available to CTM members on request, as part of the full Symposium proceedings.

The Symposium closed with a review of the progress made in the field of technology management since the first Symposium, 10 years ago. CTM has made significant contributions to understanding and practice in technology management processes, planning techniques and roadmapping and, more recently, in innovation and entrepreneurship.

However, the critical question now is – what are the major concerns for technology managers in the future?

The delegates concluded that the

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An innovative approach to research…

In 2001, 15 Innovative Manufacturing Research Centres (IMRCs) were set up across the UK to improve the focus and strategic direction of manufacturing research. The IMRCs were set up by the Engineering and Physical Science Research Council (EPSRC) with the aim of integrating engineering and management perspectives. Perhaps most importantly, they are intended to provide stable funding for five years, reduce bureaucracy, ensure researcher stability and encourage a departure from traditional thinking.

Technology intelligence

At the IfM, the **Management of Manufacturing and Technology** IMRC is about to enter its fourth year. A key benefit has been the ability to identify and finance a number of smaller projects, which would not have been appropriate under the EPSRC's traditional funding mechanisms. Examples include the ***Technology intelligence*** project which has produced an exciting approach to help companies prepare for the opportunities and threats presented by new technologies. GKN is the project's main collaborator. It has been instrumental in ensuring the practical relevance and usefulness of the project outputs. For more information contact Noordin Shehabuddeen (ntmhs2@eng.cam.ac.uk).

The ***Managing rapid distributed innovation*** project has been exploring new paradigms in product development, with Philips as a key partner. The project is exploring the opportunities presented by services in product development, alongside the complexities of optimising such distributed systems. Contact Pete Fraser for further information (pvf20@eng.cam.ac.uk).

Early-stage technology

Tim Minshall has recently started work exploring ***Alliance-based business models for early-stage technology ventures,*** with some exciting preliminary findings. Numerous other CTM projects have also been funded and four major new projects are just beginning. Of specific interest to CTM members is the ***Business appraisal of technology potentials*** project, which is finding practical ways of valuing new technology. A number of companies have already expressed an interest, including BAE SYSTEMS, Philips, GKN and Rolls-Royce.

Production technologies

Also at the IfM is the **Next Generation Manufacturing** IMRC, which is exploring a range of radical new production technologies, focusing on bio, micro and rapid manufacturing. The next stage of funding is imminent and this will provide the opportunity to explore synergies between the production and management themes.

For more information about the IMRC or specific projects visit the website: www.ifm.eng.cam.ac.uk/imrc or contact James Moultrie (jm329@eng.cam.ac.uk).

Welcome to our new visitors and students…

Dr Nares Damrongchai is currently a policy researcher at the APEC Center for Technology Foresight, based in Bangkok. His research at CTM will involve technology roadmapping of biofuels at the regional level.

André Leme Fleury will be with CTM until May 2005 working on a project concerning software development processes and strategic objectives. He is visiting from São Paulo University as part of his PhD studies.

Professor Hirohide Haga, Academic Visitor from Doshisha University, Japan is interested in the history and development of networks, human aspects of innovation and technology management education for engineers.

Dr Emre Kazancioglu has joined IfM as a Research Associate. His current research focuses on strategic analysis and decision-making, using a wide array of cognitive and quantitative tools. He will take a broad view of modeling across the IMRC projects.

Charles Romito has worked in continental Europe in R&D project management and in the regulation of telecommunications at national, continental and international levels. His research here will look at methods to predict the future value of technologies.

Ajay Vohora has joined CTM to study for a PhD. His interests include venture capital, IP commercialisation and technology entrepreneurship and technology management. Ajay has an Executive Diploma from Massachusetts Institute of Technology and has also worked for IBM and Microsoft.

Education, education, education...

CTM's teaching and training activities continue to grow. This year the Centre will be contributing to a wide range of programmes for groups from within the University of Cambridge and from industry.

Modules for Cambridge University students

- *Engineering Department 4th year modules:* CTM delivers modules on 'Management of technology' (designed to provide knowledge of the tools used by companies to develop and bring technologies to market) and 'Technological innovation: research and practice' (analyses the ways in which technologies and industries emerge and mature). Together, these modules now attract over 100 students.
- *Engineering Department 1st and 2nd year courses:* CTM contributes to courses including 'Taking technology to market'. Targeted at 2nd year students, this course introduces the basics of technology management within a manufacturing context. 'Engineer in society' is a compulsory course for 1st year engineers to which CTM is providing input to raise awareness of the ways in which innovation works.
- *Manufacturing Engineering Tripos:* CTM provides technology management input for a number of modules of this 3rd and 4th year programme. It combines a thorough theoretical basis with the chance to put ideas into practice in industry.
- *Masters' programmes:* CTM delivers a range of modules on technology management issues to Masters' programmes including the Manufacturing Leaders' Programme (MLP), Advanced Course in Design, Manufacture and Management (ACDMM) and MPhil in Technology Policy.

Modules for industrial/external groups

- *Chevening Technology Enterprise Scholarship:* Following the success of this joint LBS/Imperial College/Cambridge programme for non-EU researchers, this year's programme has doubled in size with over 100 participants.
- *Rolls-Royce MSc in Operations Excellence*: Last year's contribution from CTM to this Cranfield University programme was well received and plans are now underway for CTM's input next summer.
- *EITIM Forum*: This executive education programme will be held for the first time in January 2005, in the South of France. (www.eitim.org).
- *Training courses and workshops:* CTM now runs a programme of popular evening and one or two-day programmes on specific topics for industry including Technology Roadmapping, Make versus Buy and New Product Introduction.

For more information on CTM's teaching programmes, please contact David Probert (drp@eng.cam.ac.uk) or see www.ifm.eng.cam.ac.uk/ctm

Design publications

Design and innovation have been themes of many of CTM's most recent publications. From a design perspective, James Moultrie and Nathan Crilly (from the Engineering Design Centre) have sought to understand how consumers respond to a product's form.

They have developed a comprehensive framework of factors which has subsequently been used to explore the way in which industrial designers and their commissioning companies collaborate to produce products. This work has also contributed to the development of a 'Design Audit', that enables companies to assess the qualities of their products and the effectiveness of their design process (www.ifm.eng.cam.ac.uk/service/books).

Another study explores the new phenomenon of the 'Organisational Innovation Laboratory'. It has resulted in some interesting findings about the role, design and underlying theory of these spaces.

Recent publications on design and innovation are:

- *Seeing things: response to the visual domain in product design*
- *Understanding product appearance: cognitive and emotional response to product visual form*
- *The role of designer-client communication in determining product appearance and consumer response*
- *Development of a design audit to encourage the adoption of 'good design' practices in SMEs: a product and process perspective*
- *The organisational innovation laboratory*

Abstracts of papers can be found at: www.ifm.eng.cam.ac.uk/ctm/publications

For full copies of the papers, please contact the respective authors or email: ctm-enquiries@eng.cam.ac.uk.

Spin-out companies

CTM researchers have also contributed to a new report on university spin-out businesses. The report, entitled 'University spin-out companies: Starting to fill the evidence gap', attempts to understand the different ways in which the performance of spin-outs could be measured.

This work builds on earlier CTM research by Céline Druilhe and Elizabeth Garnsey. The topic of university spin-outs is now being taken forward by two other CTM researchers, Rob Valli and Ajay Vohora. For further information contact Tim Minshall (thwm100@eng.cam.ac.uk).

Technology management research at Cambridge

- Good design practice
- New product introduction collaboration
- Strategic technology management
- R&D project selection
- Software sourcing in manufacturing
- Product planning
- Technology change
- Technology management: a process approach
- Technology selection
- Technology evolution in hi-tech firms
- Innovation management in hi-tech firms
- Technology management in software production
- Strategic make-or-buy decisions
- Industrial make-or-buy decisions
- Sustainability and knowledge management
- Technology valuation
- Technology foresight
- Technology intelligence

Conference report

The Portland International Conference on Management of Engineering and Technology (PICMET), 31 July - 4 August, Seoul, South Korea

This conference was held outside the USA for the first time this year. It was well attended, with more that 350 participants from all over the world, with South East Asia particularly well represented.

As usual, the conference was very well organised, with a wide range of keynotes, papers, tutorials and workshops.

Themes included technology management frameworks, strategic management of technology, science and technology policy, global technology management, R&D management, innovation management, disruptive technologies, e-business, information and knowledge management, technology planning and forecasting, evaluation and assessment, acquisition, diffusion, marketing, transfer, education and decision making.

CTM was represented by Rob Phaal and Scott Wilson. Scott presented a paper entitled *Regenerating breakthrough product innovation in the UK telecoms sector: a resource-based perspective*, while Rob gave a keynote presentation and tutorial on the Cambridge roadmapping programme.

Next year PICMET will return to Portland Oregon (www.picmet.org). Also in 2005 is the International Association for Technology Management (IAMOT) conference, to be held in Vienna in May (www.iamot.org).

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top three issues facing them for the future are:

- Technology convergence – how emerging technologies in the fields of biotech, nanotech, ICT, materials and energy may converge to generate new products
- Determining the future worth of emerging technologies – robust tools for planning under uncertainty
- New business models for the 21st century – collaborations and networks

All this provides a challenging but fascinating basis for future research and practice – and also an exciting prospect for next year's Symposium, planned for 28-29 September 2005.

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Diary www.ifm.eng.cam.ac.uk/ctm/events

Nov		
17	*Product end-of-life management*	One day workshop Cambridge
30	*Early warning systems for technology-intensive companies*	Evening workshop Cambridge
Dec		
9	*Regenerating innovation: Rekindling the creative spark in established organisations*	Half-day workshop Cambridge