

Technology Management

Quarterly newsletter of the Centre for Technology Management

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UNIVERSITY OF
CAMBRIDGE

Designing the products of the future

How do you design products for people when they don't know they want them?

This question was highlighted at a CTM forum: "The challenge of product innovation: future products in an uncertain world", held in Cambridge earlier this year. The forum explored some of the key issues involved in the development of innovative new products, including:

- innovation strategy
- the role of industrial design
- development partnerships

The keynote presentation was given by Irene McWilliam, Director of Design R&D at Philips Design. She described Philips' vision of the products of the future as people-driven, rather than technology-driven, with useability of prime importance.

One feature of this would be what she termed 'ambient intelligence', in which everyday objects would have embedded intelligence and a much less complex user interface. The home of the future, she suggested, will *appear* more like a home of the past than one of today, with new technology hidden away inside household products.

New product ideas, she said, already include 'wearable electronics' - clothes with embedded communication and entertainment systems, to enable people to keep in touch with each other.



This jacket contains a fully integrated communications and music system with wires concealed throughout the garment. Photo: Levi Strauss

Current and future research

The radical new technology envisaged by Philips raises the question of how you assess demand for a market that does not yet exist. These and other issues discussed at the forum, may yield interesting research opportunities, building on past and current work conducted by the Centre in the field of new product introduction. Two of the Centre's current projects in this area focus on good design practice and new product collaborations.

Good design practice

The Good Design Practice project is a collaboration with the Royal College of Art's Industrial Design Engineering group. We have been working alongside companies developing new products, both observing how the task is approached and contributing knowledge and practice where appropriate. One outcome has been the development of a Design Improvement Framework which can be used by companies to assess their designs and to guide

improvement. This approach will be presented both in a forthcoming workbook and at an industrial workshop.

NPI collaborations

Many NPI projects involve development partnerships where specialist design and development skills are contributed by a third party. Managing this relationship presents a considerable challenge and the collaborations project is developing tools and guidelines to assist in managing the process. These include a simple collaboration checklist and a more detailed self-assessment procedure.

Key issues include: system architecture and design modularity, confidence in partner capability, risk management and a flexible approach to collaboration management - anticipating that things won't always go exactly to plan. Further work will explore the use of the checklist and self-assessment procedure in the context of live development projects.

Further information on NPI projects is obtainable from Pete Fraser (pvf20@eng.cam.ac.uk).

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Grant for software sourcing project

The CTM has been awarded £374,000 from the Engineering and Physical Sciences Research Council to develop ways to improve software sourcing decisions. The three year, two-person project aims to provide practical processes and tools to help managers in this area, building on the work of David Probert, Laura Canez and Ken Platts on make-or-buy decisions in traditional manufacturing.

Embedded software

The project will focus on embedded software, recognising that the software contained in products represents an increasing source of cost and risk for manufacturers. Examples of such products include engines, fridges, washing machines and security systems.

Complex choices

Manufacturers must choose either to invest in the skills and resources needed to design these software-dependent systems, and to support them over a potentially long lifecycle, or to buy one or both of these from outside. These choices are complex and require the balancing of heterogeneous factors such as the availability of skilled labour, the potential for obsolescence in components and uncertainties in relationships with suppliers.

A further consideration is whether it is more cost-effective to buy in at one stage of the system's lifecycle, such as design, yet invest in an internal infrastructure for other stages, such as for operational support and version changes.

Company support

The companies currently supporting the project are Philips, Pi Research, Spectronic Unicam, Walden Precision Apparatus and AND Software, but other companies interested in this research are very welcome to join.

Other research

Other software-related work under way within CTM and the Institute includes a two year collaborative project on software development processes funded by Marconi and research in the area of e-manufacturing.

If you are interested in our software work, please contact Francis Hunt (fhh10@cam.ac.uk, 01223 339816).

Evening workshops focus on making the most of technology

CTM organised three evening workshops on the theme: *Making the most of technological assets* between February and April 2001. Each workshop consisted of two or three presentations and provided good discussion and networking opportunities.

The new product goldmine – innovation without re-invention

This workshop explored the concepts of product platforms, modularity and how to make use of existing knowledge. The speakers were Dr Francis Hunt (CTM) and Arland Shawe-Taylor (Technical Director, Alto-Qualcast, Bosch).

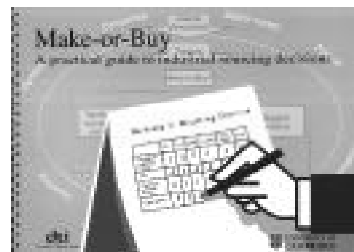
Creating value from technology – people, process and products

The second workshop explored the integration of technology into products and services. The speakers were Dr Rob Phaal (CTM) and Dr Rick Mitchell (Domino Printing Sciences).

The challenge of technology change

The final workshop considered how the evolution of markets and technologies influences strategic planning and the difficulties of combining this with the troubleshooting skills needed for implementation. The speakers were Dr Elizabeth Garnsey (CTM and St. John's Innovation Centre), Dr Tim Minshall (Cambridge Entrepreneurs) and Alan Barrell (NW Brown Capital Partners Ltd).

Make-or-Buy workbook on sale



'Make-or-Buy: A practical guide to industrial sourcing decisions' is now available from the Institute for Manufacturing, price £39. An output from our recently completed project, the book gives a complete 'how-to' guide to industrial make-or-buy decisions. Further details and copies of the workbook can be obtained from the Institute's Industry Links Unit, email: ifm-enquiries@eng.cam.ac.uk.

Upgrading the London Underground

Investment, innovation and integration will be the key to ensuring the Public-Private Partnership delivers major improvements to the tube network of London, says John Batchelor, Technology Strategy Manager at Infraco Sub-Surface Ltd. Here he describes the part his company will play in the modernisation plans.

It is estimated that London Underground (LUL) needs between £7 billion and £8 billion worth of investment over the next 15 years to ensure it is modern, efficient, safe and comfortable for passengers. Infraco Sub-Surface Limited is one of the three Infrastructure companies (or Infracos) that have been set up as wholly owned subsidiaries of LUL to deliver these improvements. It is planned that the Infracos will eventually be owned

by private sector consortia. These consortia will borrow or provide the necessary money to fund the massive upgrade programmes while in return being paid for system capability, availability and ambience over a long term (30 year) service contract.

The ability to integrate new technology with our legacy systems will be fundamental to Infraco Sub-Surface delivering the service levels required in the PPP contract. Understanding the potential risks versus the business benefits of using newer technologies needs careful planning and analysis. Our major challenge is to renew or upgrade large sections of the network while having minimal effect on the operating railway. It is also imperative that no reduction in system availability results from



An artists impression of a possible train of the future

'bedding in' of any new systems installed.

Infraco Sub-Surface approached the Centre for Technology Management for help with the tools and process development needed to support this kind of decision making and strategy development. Technology Planning is being actively supported using Technology Roadmapping - helping us to develop, understand and communicate the business issues, interfaces and strategies for the key systems. Two roadmaps have been completed with more planned.

I look forward to hearing and sharing experiences with others about the use of technology management tools to support basic strategic planning.

*John Batchelor
(john.batchelor@infracossl.com)*

Management of Technology - conference report

The 10th International Conference on Management of Technology (IAMOT 2001) was held in March in the Swiss town of Lausanne.

Interesting insights from the conference included Rupert Gasser of Nestle identifying the shortage of skilled and knowledgeable people as the key factor limiting their current growth.

Quality of life

Tarek Khalil, IAMOT president, said that the traditional wealth creation goal of technology management needed to be extended to include quality of life issues and to take account of the

growing technological imbalance both within and between countries. Effective methods of collaboration and business ethics are areas where research is needed.

Software

Fred Betz of the University of Maryland claimed that pieces of software were 'atomic', so incremental improvements did not occur. Hence there was no linear portion on the software technology S curve and different technology management approaches are needed.

Blue skies research

Markus Bayegan of ABB emphasised the need to tie R&D to market benefit, whereas Harry Moustapha highlighted the need to also have a corner for blue skies research - the search for 'unobtainium'.

Andre Kudelski of the Kudelski group pointed out that 'too early'

could be as bad as 'too late' when bringing a product to market.

CTM presented five papers:

Structuring a systematic approach to technology management: concepts and practice (David Probert)

Innovation strategies within the pharmaceutical industry: success factors for pioneers and late entrants (Scott Wilson)

Structuring the process of technology selection (Noordin Shehabuddeen)

Technology scanning process: an exploration of influencing factors (Noordin Shehabuddeen)

Technology re-use: developing a practical approach to making the most of your technological assets (Francis Hunt)

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 management competences
- Strategic make-or-buy
- Industrial make-or-buy decisions
- Sustainability and knowledge management
- Engineering re-use
- Technology foresight

Events

Innovative printing technologies – the Cambridge connection (joint event with the Engineering Council)

The recent meeting of the Technology Management Network on 25 April at Domino Printing Sciences, near Cambridge, provided an opportunity for academics and industrialists to learn and exchange experience in the area of printing technologies. In addition, it was a chance to consider the technology management issues involved in developing, adopting and exploiting new technologies for business benefit.

The day consisted of a series of plenary presentations and discussion sessions. These included insights from a range of local firms

including established companies who are pushing the boundaries of printing technologies such as Domino and Xaar.

This was complemented by views from a newly founded firm, Plastic Logic, which is printing polymer transistor circuits and from GlaxoSmithKline, on how advances in printing technologies will affect the bottom line of large companies.

The next Network event will be held in Cambridge on 20 September and will pick up on key issues in technology management. For general details of the Network please see <http://www-mmd.eng.cam.ac.uk/ctm/Network.html>

Collaboration and ownership in the digital economy

This interesting 2-day conference on creativity, intellectual property and open source software development ideas was held in April at Queen's College, Cambridge. The speakers included leading academics in law and anthropology, the head of the Free Software Foundation

(free as in 'unchained' rather than gratis), intellectual property lawyers and the head of human genetic sequence analysis at the Sanger Centre. This wide cross-section led to heated and interesting discussions. Further details, including an audio archive of the presentations can be found at: <http://www.ArtsOnline.com/code/index.html>

Technology Management Symposium

This year's Technology Management Symposium is on 12-13 July. Addressing the issues of entrepreneurship, innovation and growth, it promises to be a very stimulating event.

The brochure and booking form are enclosed with this newsletter. Each CTM member company is entitled to one free place.

Annual Centre meeting

A reminder that the annual meeting of Centre members is on the afternoon and evening of Tuesday 15 May.

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Diary

May

15th	CTM Annual Review Meeting	Cambridge
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July

12 -13th	7th Annual Technology Management Symposium <i>Entrepreneurship, Innovation and Growth</i>	Cambridge
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September

20th	Network Forum	Cambridge
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