Technology Management

Quarterly newsletter of the Centre for Technology Management

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UNIVERSITY OF CAMBRIDGE

Praise for strategy project

A CTM project on strategic technology management has won high praise from the Government's funding body, the Engineering and Physical Sciences Research Council.

The assessors described the research as "original" and "of high quality", producing findings which "will be of great impact and useful reference for a number of companies".

The Strategic Technology Management (STM) project studied ways of ensuring a company's technology resources are linked to its business objectives. The CTM team (with industrial support from Domino Printing Sciences, BAE SYSTEMS and Federal Mogul) devised several practical tools for companies to use:

'Fast-start' technology roadmapping

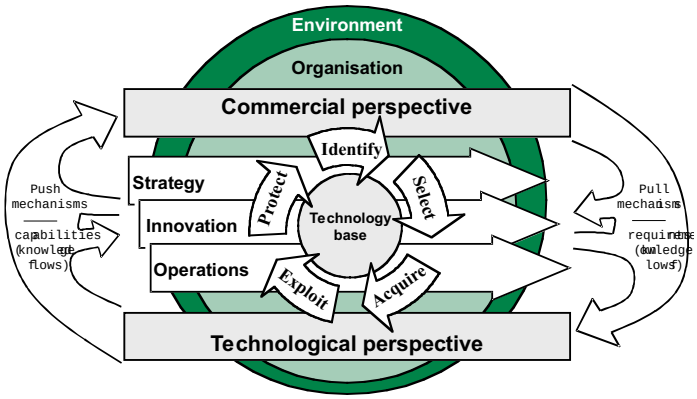
A process for supporting strategic technology planning was developed, based on the technology roadmapping approach. A 'how to' guide (T-Plan) was published by the Institute for Manufacturing in November 2001.

A technology management tool catalogue

This was developed to provide a broad resource for supporting technology management in a firm, and technology roadmapping in particular. The catalogue (T-Cat) is available to Members on the Centre for Technology Management web site.

A high-level conceptual framework

The framework (see figure) supports strategic technology management and planning and is founded on systems and resource-based theory.



The STM project has led to a number of continuing activities, mainly in the area of technology roadmapping. CTM is facilitating a Technology Roadmapping User Group, which meets twice a year to share experiences. There is considerable industrial interest in the approach, and the Centre has facilitated a number of roadmapping start-up processes in companies, supported by a series of training courses. Rob Phaal is currently managing the Foresight Vehicle technology roadmapping project for the Department of Trade and Industry, exploring the technology requirements for the road transport system of the future. An ongoing collaboration with the Learning Trust, an organisation based in Los Angeles, is supporting the commercialisation of both T-Plan and T-Cat.

Chief Scientific adviser to speak at CTM Symposium

The Government's Chief Scientific Adviser, Professor David King will give the keynote presentation at the Technology Management Symposium in July. This year's event will focus on the cooperative exploitation of innovative technologies, exploring new business models that are emerging to generate and exploit technology, minimising risks and maximising returns.

Other speakers will include David Pulling, Head of Corporate Planning at GKN and Donncha Scollard, Director of Unilever's Digital Futures Lab.

Case studies

Further presentations by industrialists and academics will be combined with case study sessions and workshops on technology roadmapping, product development collaborations and strategic alliances.

Contents

How to succeed with product development collaborations

Product development is inherently a collaborative activity, involving both internal groups and external partners. Nowadays, few firms have all the skills and resources to develop technologically complex products entirely in-house. Increasingly, companies choose to concentrate on core technologies and opt to collaborate with others to gain access to complementary skills and resources.

The management of design and development collaborations has been the focus of a recently completed project which explores how companies might best form and manage successful collaborative relationships.

Engineering focus

Traditionally, supplier management has been a Purchasing responsibility with adversarial or price-based deals the norm. Design chain relationships tend to be more collaborative with an Engineering focus and a 'win:win' rationale.

However, because product development is an uncertain process such collaborations present their own particular challenges.

Negotiation

One issue is how much time and effort to spend in negotiating formal contracts, before getting started.

The research found that watertight legal documents did not necessarily form the best working basis and taking a legalistic, adversarial approach was not always the solution when problems cropped up - instead, successful resolution was often achieved by negotiation.

In fact some companies had collaborated well for 10 years or more without any written contracts.

A key issue is how much time and effort to spend on formal contracts...

	Level 1	Level 2	Level 3	Level 4
Collaboration strategy *"Conscious choice between internal or external sources of design and development expertise"*	*(Not) invented here!*	*Occasional ad-hoc partnering*	*Established partners*	*Regular review of competences*
Structured development process *"A clear and well documented process to deliver new products to market"*	*No formal NPI process*	*A process exists but...*	*Process used and understood*	*Continuous NPI improvement*
System design and task partitioning *"Design to enable separate development and facilitate integration of modules."*	*Interfaces not well defined*	*Intuitively consider modularity*	*Formal configuration planning*	*Conscious simultaneous design*
Partner selection *"Ensuring that partners have adequate capabilities and resources."*	*Cross fingers and hold breath*	*Word of mouth*	*Review of technical capability*	*Broad assessment of capabilties*
Getting started *"Resources committed, with a clear definition of roles and responsibilities."*	*"But we've already started!"*	*Is this a good deal?*	*Agreement in place*	*All ground rules agreed and communicated*
Partnership management *"Well defined and effective communication paths with regular and open reviews of progress."*	*"I thought you were doing that"*	*Managed but not championed*	*Collaboration champions*	*Frequent and open communication*
Partnership development *"Building a climate of trust and confidence, with the development of a dependable relationship."*	*"I'll be glad when this project's over"*	*Better the devil you know...*	*Good working relationship*	*On-going, mutually beneficial*

The framework for a Collaboration Maturity Audit, describing good, and not-so-good, practice. It presents four maturity levels for seven key areas.

One of the outputs of the project is a workbook which aims to raise the awareness of collaboration issues and provide support in improving the success of product development collaborations.

Workbook

The workbook helps companies to review their approach to collaborative development and provides support for those with little or no experience in managing collaborative projects. Two primary tools are provided. The 'Collaboration maturity audit' provides a framework for self-assessment and discussion by describing good practice (and not-so-good practice).

It presents four maturity levels for seven key collaborative process areas: collaboration strategy, structured development process, system design and task partitioning, partner selection, partnership formation, partnership management and partnership development.

A 'Collaboration life-cycle analysis' tool facilitates the planning or review of a specific collaborative project by supporting a structured walkthrough to identify critical issues which might have an adverse effect on the project if not specifically managed.

The workbook also contains some useful background material and a collaboration checklist of 25 key points to consider when embarking on a collaborative project.

For more information about this project, please get in touch with Pete Fraser: pvf20@eng.cam.ac.uk

Research Centres combine to study high-tech ventures

CTM has recently started to collaborate with a leading international research group, the Centre for Technology and Innovation Management (CeTIM), based in Munich and Rotterdam.

CeTIM operates as a virtual organisation and provides a global network. It offers independent, high quality research and life-long learning support in the field of technology and innovation management. CeTIM has developed a research programme focused on the management of rapidly growing high-tech businesses, especially in the information and communication, aerospace and biotech industries. It is headed by Professor Bernhard Katzy and affiliated to the Aerospace faculty of the University Bw in Munich and the Rotterdam School of Management. Marcel Dissel has been visiting Cambridge on behalf of CeTIM.

At present, the two Centres are exploring opportunities in the European Union Research and Development programme. A first joint proposal has been submitted that aims to develop a strategic roadmap for future research topics in the field of "venture coaching". Venture coaching supports the professional management of high-tech ventures helping to turn new technologies into growing businesses.

CTM and CeTIM jointly co-ordinate a pan-European network of interested parties, including Ernst & Young, Intel Capital, European Space Agency, McKenna Group, VentureOne, Silicon Valley Bank, Europe Unlimited and some leading academic institutions such as IMD Lausanne, Sophia Antipolis and ETH Zürich.

IfM's new quarterly journal

The Institute's new quarterly publication Cambridge Manufacturing Review rolled off the presses in February, with 2500 copies distributed to senior industrialists, policy makers and others with an interest in manufacturing.

As well as providing a window on the work of the Institute, it will offer insights into topical industrial issues, new developments and manufacturing success stories.

The first issue included articles on why manufacturing is vital to ARM - even though the company does not 'make' anything - and how a 'people-centred' approach has helped Jaguar to achieve a fourfold increase in output in the last 10 years.

Forum looks at new ideas emerging in relation to software

Two increasingly important topics for many companies are 'embedded' and 'open-source' software. The embedded software market is expanding rapidly, with about 100 embedded processors produced for every PC-based processor. Meanwhile, open source software is receiving heavy investment from many large companies such as IBM and HP.

Two of CTM's current research projects are focused on these areas: an EPSRC funded study looking at sourcing decisions for embedded software; and a Marconi funded project investigating the issues of 'open source philosophy' from a company perspective. A Technology Management Network Forum was held in Cambridge on 20 March, on the theme of *Emerging business models for software development and sourcing.*

John Halfpenny, Director of Embedded Software at ARM, told the Forum how his company adds value to 3rd party generic implementations of algorithms for tasks such as MP3 compression. ARM acquires the source code, optimises it for ARM hardware and makes it suitable for commercial use, developing appropriate test suites before re-licensing it to a third party. He revealed how this 3-way business model requires close attention to partner relationships and legal matters such as warranties and indemnities.

Stephen Flowers, from the Centre for Complex Product Systems, a joint venture between the universities of Sussex and Brighton, described the trend towards using 'advisors' for complex IT projects. Companies who have refocused their businesses around their 'core' competencies use these advisors to provide the areas of expertise they now lack. He highlighted the problems that can arise in such cases. Of particular note were the increasingly complex communications between the customer and supplier; and the risks involved in using advisors who may have short-term, and sometimes conflicting, interests.

The Centre also reported the latest findings from its research projects, setting the scene for small group discussions. One discussion point was the disruption that attention to legal matters can cause to projects! A summary of the event is available on our new web site, designed for anyone interested in embedded software sourcing:

http://www-mmd.eng.cam.ac.uk/ctm/software_sourcing/

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

Event round-up

Open source software workshop

A workshop on Open Source Software Development was hosted by the University of Newcastle on 25 and 26 February. Francis Hunt presented a paper co-written with Paul Johnson of Marconi analysing data on the popularity of approximately 30,000 open source projects. The paper reveals that the projects are distributed according to a power law, with approximately 10 projects receiving over 100,000 downloads a month, 100 projects receiving over 10,000 downloads a month, and so on. The power law breaks down below 100 monthly downloads, suggesting a minimum activity threshold for open source projects to be healthy.

Other interesting talks at the workshop included Peter Neumann on building dependable systems from unreliable components; Douglas Maughan on the wide range of open source projects being funded by DARPA; Nicolas Pettiaux promoting open source in e-government from the European Commission's viewpoint and Christian Reis presenting the surprisingly sophisticated software engineering process tools used by the Mozilla web browser project. The proceedings are available online at http://www.dirc.org.uk/events/ossdw/OSSDW-Proceedings-Final.pdf

NPI Club tackles software issues

Software development and quality management were two of the topics covered at recent meetings of CTM's New Product Introduction (NPI) Club. The group continues to meet every six weeks to discuss new product introduction issues in an informal setting.

User requirements for software can often be difficult to determine, so the traditional 'waterfall' design process is giving way to incremental or 'spiral' approaches. These provide early visibility of progress and facilitate user feedback. Rigorous testing remains a challenge, particularly with dynamic applications. Open source software development presents an intriguing new paradigm which has already resulted in the creation of the Linux operating system.

Future meetings will cover benchmarking and metrics, prototyping and how to encourage creativity. If you would like further information about the NPI Club please get in touch with Pete Fraser: pvf20@eng.cam.ac.uk

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Diary

May		
15th	*Adding value to your product through embedded software*	Evening Workshop Cambridge
June		
12th	*Prototyping*	NPI Club Cambridge
19th	*Planning your route to success*	Evening Workshop Cambridge
(This workshop will be repeated on 25th June in Peterborough)		
July		
11th -12th	*Creating & capturing value: 21st Century Technology Collaborations*	Cambridge Technology Management Symposium
17th	*Encouraging creativity*	NPI Club Cambridge