Technology Management

UNIVERSITY OF CAMBRIDGE

February 1998

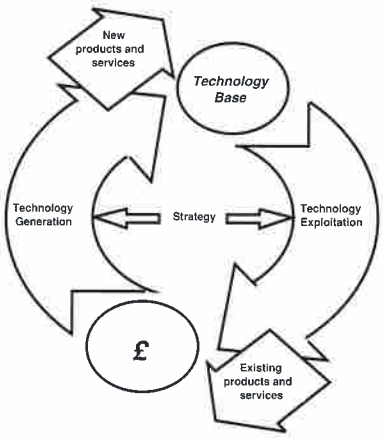
Editorial

It will soon be one year since the foundation of the Centre, and we are taking stock ready for the annual meeting in the evening of 30th April. At the meeting we shall review progress in developing Centre activities, and look forward to a useful discussion with members about preferences and priorities for the future. In the meantime the research portfolio continues to grow.

Our next major piece of research in technology management starts on 1st April. This project is 'Strategic Technology Management: Linking Technology Resources to Company Objectives'. Our company partners on the project are BAe Military Aircraft Division, GEC Marconi Avionics, T&N Technology, and Domino Printing Sciences, who are all Centre members. In addition we expect Pilkington Optronics to support the project and provide access for case study work. We aim to develop a number of practical technology management tools, and our Forum on April 30th will be an early step in defining requirements.

In addition we recently started a new EPSRC funded project 'Industrial Make or Buy Decisions', which takes forward some of our existing work in this area. Laura Canez has joined the Centre as the Industrial Research Fellow on this project, and company support comes from Kenwood, Rolls Royce and Philips. The recently circulated opportunity for a Technology Management Fellowship based in the Centre has also generated a good response, so perhaps this is an area where we could offer other collaborative opportunities in future.

Our Foresight workshop in January, in collaboration with the DTI (see report on back page) also provided useful insight into future technology management requirements. These ideas, together with the ongoing discussion with Centre members, will provide the basis of prioritising the future research agenda. Also for the DTI, we are preparing a short awareness booklet setting out the key ideas in technology management and the basis of a process approach. Our proposal to the EPSRC for a wider technology management network is under review as I write, and should this be accepted, will be another very valuable source of leading practice and research benefiting Centre members.



DTI Booklet: Getting Value from Technology

This year's Industrial Symposium, on 9th/10th July, will also major on the issues of future technology management, picking up the themes of foresight, sustainability and knowledge management. Authoritative keynote speakers from industry have agreed to address these three topics, and from an academic perspective Professor Tom Allen from MIT will take a view over the historical developments in technology management leading to some personal views of the future agenda. Altogether it promises to be a very stimulating two days, with the emphasis this year on industrial case experience. We are currently organising the parallel case sessions around the three themes, and would welcome any ideas for presentations which Centre members might like to make. The Symposium will finish with workshop sessions, preselected by the participants who wish to attend, designed to explore some of the current topics of importance in practice and research. A further design criteria for this year's Symposium has been to include a little more of the Cambridge environment, and the Symposium dinner will be held in one of the colleges.

Enclosed in the newsletter is a list of our recent journal, conference and working papers, please contact Sarah if you would like copies. This fourth edition of our newsletter comes to you in the new University 'house style' - we believe it gives improved clarity of presentation and would welcome your comments. Meanwhile we look forward to meeting together for the annual meeting and developing future plans to take advantage of the many exciting possibilities open to us.

David Probert

Contents

Developing Dinosaurs

Dr Rick Mitchell is group Technical and Quality Director of Domino Printing Sciences plc. Dr Mitchell presents an article describing the importance of future technology scanning to a business which already has a portfolio of successful current products.

Introduction

Most people think about dinosaurs as examples of failure. Well, they died out, didn't they? What we tend to forget is that they were hugely successful before that, dominating the ecology of the globe for well over 200 million years until an asteroid impact wiped them out 65 million years ago. The mammals that replaced them have had a much shorter innings; and for all our cleverness, mankind has managed only a fraction of one percent of the dinosaurs' reign. The dinosaurs were not a static breed, of course, but one that changed and evolved constantly to adapt to changing opportunities. This adaptability gave them great success, but there was a limit to what they could do and when that limit was breached, they died out.

The success and demise of the dinosaurs carries lessons for everyone involved in Product Development.

Technology

The end that overtook them reminds us that all technologies, like dinosaurs, have their limits and stand at risk of being overtaken by a newer technology with new capabilities that the older technology cannot match. This is a risk at any time but it is greater when the environment changes. The asteroid impact that finished the dinosaurs created a different environment in which the mammals had the competitive edge. In business much less dramatic changes such as a shift of buying patterns, can have the same effect of giving an advantage to a different product or a different technology.

Product Innovation

R.N Foster, in his well-known book "Innovation: the Attacker's Advantage" (Summit Books 1986) points out that all technologies have intrinsic limits to performance beyond which they cannot progress. In the early days of a technology, investment in R&D will yield useful improvements in performance but as the intrinsic limits are approached, further investment gives smaller returns. If the market demands still higher performance the technology is vulnerable to being overtaken by some new approach that does not have the same limits; and it may be that literally no amount of effort or investment can save it. Then inexorably Sail gives way to Steam, Valves to Transistors, Propeller aircraft to Jets, Vinyl discs to CDs .

The eclipse of the dinosaurs reminds us that part of the task of R&D must always be to understand the vulnerabilities of one's technology. This means to know its limits, how close you are to them and whether they do or do not encompass what the market may need. If the limits lie beyond what the market needs then you are safe - at least until the environment changes. But if not, then you must look vigorously for that competitive alternative with the extra capability that could eventually displace you. It may be a small and insignificant beast but if it's warm blooded and the world is getting colder it may be your demise.

Lessons to Learn

The lesson to be learned from the end of the dinosaurs is important but so, equally, is the lesson of their stupendous success. They ruled the world for eons by keeping the same basic physiology but adapting it appropriately to the changing times. It was only when the environment changed dramatically that this tactic finally failed them. The lesson for the R&D practitioner is to "stick to the knitting" as long as possible. It is always tempting to feel that dramatic "break-through" change is the only way to gain competitive advantage but it simply isn't. The bankruptcy archives are full of companies that were seduced by the drama of launching the "silver-bullet" product that would astonish everyone and make the competition roll over and play dead. These companies saved up their improvement ideas for the big launch and then found that the radical new product had unexpected flaws, or was so late that it was no longer quite what was needed.

Steady, continuous, improvement lacks drama but delivers benefits earlier and more reliably. Our friends in the Far East have taught us the virtues of incremental improvement (Kaizen) in manufacturing processes, and the same approach works with products and technologies. At least until we hit up against the fundamental limits of our technologies; then, Evolution has to give place to Revolution.

Conclusion

The rise and fall of the Dinosaurs can be an inspiration and a warning for technologists. We can give our products a long and profitable run by emulating their adaptive success. But at the same time we must be constantly scanning the world (as they could not) to spot the looming changes in our environment that may alter the market's needs; and to find the competitive technologies that could benefit. Then we must have the courage to accept that sometimes really radical change is the only option for survival.

Sounds like a good theme for a film. I wonder if Steven Spielberg would be interested?

Rick Mitchell,
Domino Printing Sciences

Conference Report

7th International Forum on Technology Management

Kyoto, 3-7 November 1997

The forum was arranged by the JUPITER Consortium and Tokyo University. The Cambridge team presented a panel session and attended a wide range of paper sessions, including Knowledge Management and Sustainability streams.

Tools and Techniques for Technology Management: Practice and Theory

The aim of the interactive panel session was to explore the range of practical tools and techniques available for the management of technology, together with the extent to which these are supported by theory and/or industry. An introduction by Mike Gregory was followed by the presentation of several papers to stimulate discussion. The Cambridge papers were "Developing a Tool for the Relative Valuation of R&D Programmes" - written jointly with BAe and "Linking Technology to the Market: A top-down appraisal within a multi-business organisation" - written jointly with GEC-Marconi. The third presentation was made by Professor Hiro Negishi of Canon Inc. - "Technical Innovation and its possible Impact on Technical Education".

In the general discussion, key questions raised included "How to foster innovation?" , "How to think more widely than just the firm?" and "How to address the needs of smaller companies?". The requirement for tools and techniques was confirmed, and generic rather than company specific tools were preferred. It was felt that the 'models' embodied in tools are often simplified and not necessarily appropriate. One example of a good tool in current use mentioned during the discussion was the Philips Technology Product-Market Road Mapping technique. This can be found in Groenveld, P. (1997) "Roadmapping Integrates Business and Technology", Research Technology Management, 40(5), pp. 48-55.

Clare Paterson & Rob Phaal, University of Cambridge

Sustainability

The Conference encouraged a modern and practical view of sustainability which goes beyond traditional environmental concerns. Sustainability is increasingly important in the design and operation of manufacturing systems not only to ensure that such systems are ecologically friendly but that they are sustainable in business and social terms. This broader view of sustainability moves the topic into the main stream of planning and management concerns. Enterprises need to be sustainable in social, market and business terms as well as being market responsive and new approaches are needed to capture these considerations in the normal course of business.

These important issues go well beyond just "greening up" and concern the way we design, manufacture and organise ourselves in a more economical and imaginative way. Two speakers covered the issues at policy and company levels: "Designing the Sustainable Enterprise: a New Challenge for Industry Managers" by Jacqueline Aloisi de Larderel, Director of the UN Environment Programme and "Sony's Commitment to Environmental Ideals" by Hiroyuki Tada, Sony Corporation.

Ms Larderel pointed out the lack of practical tools for companies to tackle sustainability issues in manufacturing and Mr Tada indicated that, though Sony was well advanced, more work was needed to embed sustainability ideas in everyone's thinking.

Mike Gregory, University of Cambridge

Knowledge Management

Katsuhiro Umemoto introduced a very important theme with his paper "A Theory of Organisational Knowledge Creation". He was building on Nonaka and Takeuchi's book "The Knowledge Creating Company", which itself is an important work redeveloping an articulateness about the development and internalisation of understanding as tacit knowledge, about its further externalisation and development across a team and about developing the appropriate managerial skills to recognise and do this. Nonaka and Takeuchi's work, taken with Eraut's "Developing Professional Knowledge and Competence", which is again very clear about the development of internal understanding, provides a very powerful springboard for starting to understand this area.

Adjacent to Umemoto's paper was Angela Dumas' "Participating in Totemic Techniques - Metaphor and Tacit Knowledge", which was also looking at the guided use of metaphor (visual metaphors, although they could have been musical, or taste metaphors) to develop understanding about existing and intended company characteristics - things about company culture which are important, and are felt, but are hard to capture in words. Designers like myself familiar with the perceptive and communicative skills of industrial designers always wonder why others don't learn to use metaphors more fluently.

Other very interesting papers gave some perceptive cross-cultural insights. Cotrim's paper on the huge transition facing the company committed to developing Sao Paulo's sanitation system, "Integrated System of Technology Management for a Basic Sanitation Company" was one. Another was Shaw's "Co-operation Between the West and Russian and Ukrainian Aerospace Industries".

Jim Platts, University of Cambridge

Centre for Technology Management news

Foresight Workshop: Management of Technology

An important element of foresight is to encourage companies to invest and grow - to take the long term strategic view, and a broad view of their obligations. To be successful in the next millennium, modern companies must succeed in new markets with new products.

Our foresight workshop held on 22nd January was very successful and well received by the DTI, OST and EPSRC representatives.

The event was well attended by Centre members, and also attracted significant new interest from people and companies with whom we had not previously worked.

Key Findings

Two discussion sessions were held during the workshop. The first was to find out what companies perceived to be the benefits of a foresight strategy, what foresight practices companies were currently undertaking and what had been the impact on them of the national Foresight programme.

The key findings were that there was a general lack of awareness of foresight practice and the national programme in particular. This was particularly evident amongst smaller companies. Some companies had undertaken useful foresight type work but in general this was not well organised nor comprehensive.

The second discussion aimed to identify what companies thought should be done in the future. The need for practical guidance and dissemination, particularly for smaller companies, was evident. There was a requirement to develop tools, metrics and benchmarking techniques which would help companies assess and improve their own foresight practice.

Conclusions

The Foresight message was not being effectively transferred to UK industry and in particular to smaller companies. It was felt a new way of taking this message forward was required. An integrated system of support which made effective use of academic centres, facilitators and government support was required.

The current and future research programme of the Centre is geared towards addressing technology foresight issues. We plan to play a key role in developing tools for the national Foresight programme.

Tony Venus
University of Cambridge

Quarterly Diary

Date	*Time*	*Type*	*Subject*
March 19th	5 pm	CTM Workshop	Project Planning
April 16th	5 pm	CTM Workshop	Business and Product Planning
April 30th	10 am	Day Forum	Designing Practical Technology Management Tools
May 21st	5 pm	CTM Workshop	Competences

Future Diary Date

July 9 - 10th Fourth Annual Industrial Symposium
Managing the Technology of the Future:
Foresight, Sustainability and Knowledge Management

For further information please contact:

Sarah Spong
Centre for Technology Management
Manufacturing & Management Division
Department of Engineering
University of Cambridge
Mill Lane, Cambridge CB2 1RX
England, UK.
Tel: +44 (0)1223 337085
Fax: +44 (0)1223 338076
email:sas30@eng.cam.ac.uk