TEPI: A Novel Solution to ICT Technology Road Mapping

Dr Mark O'Dell
Mr Christopher Allinson
Mr Nigel Evans

Technology Analysts Group
B009 Woodward Building
QinetiQ
Malvern
United Kingdom

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UK MOD's Technology Tracking Requirement

The UK Ministry of Defence (MOD) is increasingly exploiting Commercial off The Shelf (COTS) technologies

Particularly from the ICT domain

- It is more cost effective – saving time and money
- It takes advantage of the huge amounts of R&D being undertaken by the commercial sector

For example:

MOD spend:	£450 million pa on all aspects of research (non-nuclear)
Microsoft spends:	£800 million solely on software R&D

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UK MOD's Technology Tracking Requirement

MOD therefore requires:

- to be kept aware of current and likely future trends and developments in the commercial ICT area
- to know if these COTS technologies will perform effectively in deployed military environments

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...meeting this requirement

QinetiQ Information Communications Technology (ICT) Tracking Capability

Tracks and assesses ICT from global industry, academia and other military organisations for the UK MOD

Budget: Approx £400k per annum

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Technology Tracking Coverage

Physical layer	Software technologies	Systems level technologies
User Interface technologies		
Networks, Communications and Distributed Systems		
Display technologies	AI technologies	Systems methodology and architectures
Mobile computing devices	Information/knowledge management	Systems integration
Information storage technologies		Systems security
Next generation computing		

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Current Outputs

ET-TIPS Technology Briefings* :

15-20 page documents accessible to layperson. These cover prospective ICT likely to impact MOD's business

Recent titles: Web Services, Social Software and Laser Communications

ET-TIPS Emerging Trends* :

20-25 page documents also accessible to the layperson. These report on trends and new directions in the ICT industry that are pertinent to MOD and its business

Technology assessments :

50+ pages. Formal in-depth technical reports on ICT technologies

Example titles: Emerging HCI, Software agents, Information visualisation

* Readership of over 1000 MOD staff

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Benefits

- Improved awareness among MOD decision makers of current and emerging ICT and trends
- Improved understanding of the potential impact particular ICT can have on MOD’s organisation and business
- Informed procurement of ICT and greater awareness of the opportunities for technology insertion

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Technology ‘Prediction’ Requirements

MOD also has the following additional requirements:

- detailed predictions of future developments and trends in the ICT field
- an awareness of the timescales of prospective COTS ICT in terms of refresh and obsolescence in relation to their own C2 Systems lifetimes
- early warning of potential technology solutions and threats looking out to 2015 and beyond

These requirements were not being addressed by the current ICT tracking programme

QinetiQ was therefore asked to look for a means of addressing these requirements

It was decided that the logical vehicle to provide this level of prediction would be:

Technology Road Maps

A technology road map represents the predicted development of a technology or a group of technologies as it matures from research to a commercially available product

Conventional Technology Road Maps

- Generally measure technology progress against time
- Often resemble a Gantt Chart
- Attach specific times to technology progress

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Drawbacks

Conventional road maps were found to be unsuitable for road mapping the dynamic and uncertain area of ICT

A review of a number of conventional techniques highlighted:

- Their inability to capture uncertainty as to when a technology will be ready for exploitation
- Failure to adequately show commercial factors such as market penetration

Addressing Uncertainty

- ICT products develop in ways that are not totally predictable
- Predictions such as “this technology will be commercially available by third quarter 2010” fail to take this into account

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Considering the Commercial Factors

The development of ICT is affected by such non-technical factors as:

- Displacement of other technology
- ‘Killer’ applications
- Hype and hype backlash cycles
- Fashion
- Crossing the ‘Chasm’

These are usually ignored by conventional technology road maps

We have developed a range of techniques to predict COTS market take-up

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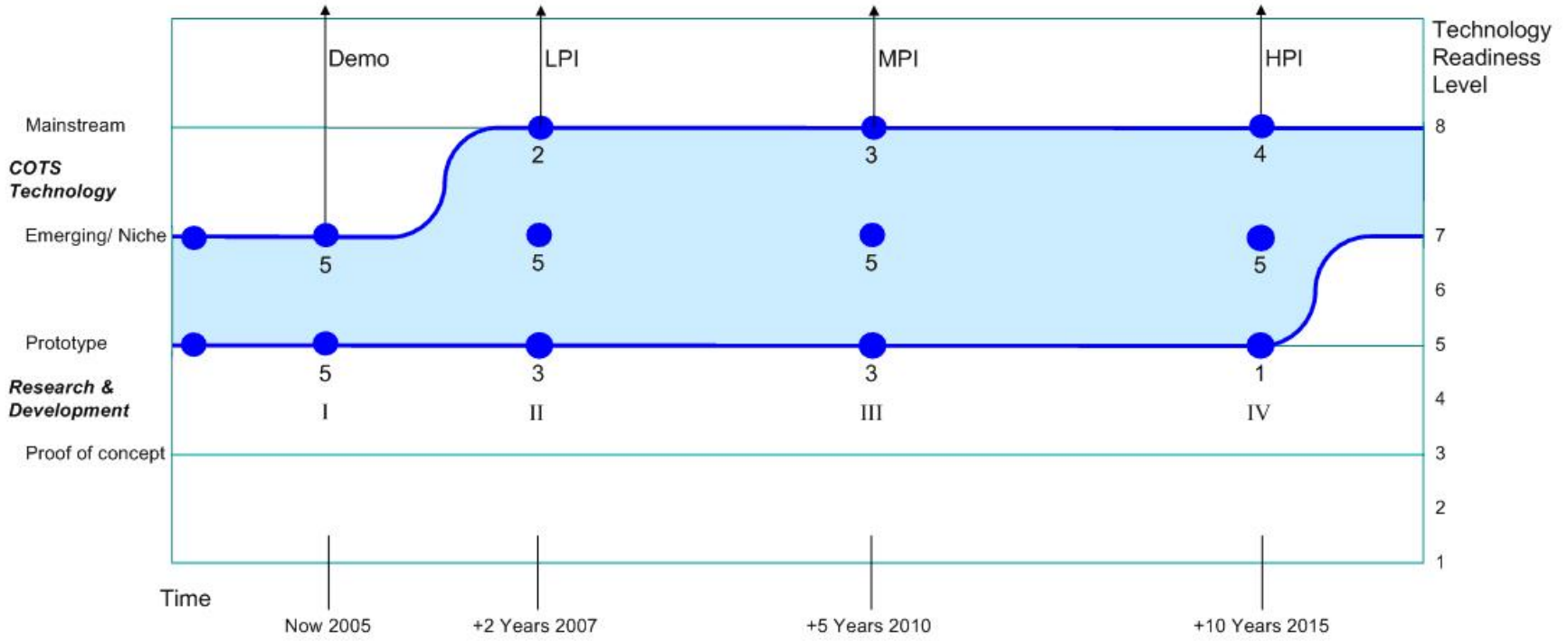
The QinetiQ TEPI Roadmap

- The shortcomings in conventional technology road mapping techniques led to the development of the TEPI (Technology Exploitation Probability Index)
- The TEPI seeks to address the uncertainty and market volatility of the ICT domain through the use of ‘windows of opportunity’ and probability indices

TEPI Road Map Example



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TEPI Guide Sheet Example

Desktop Autostereoscopic 3D Displays

Description:

Desktop autostereoscopic displays are one form of 3D display technology where the user sees a 3D image without the need for glasses or any other device. There are several different kinds of autostereoscopic 3D displays and the displays covered by this roadmap are desktop models constructed out of LCD panels. Using a variety of different optical techniques (lenticular lenses, parallax barriers, multiple LCDs, etc) a slightly different image is sent to each eye, resulting in the user seeing a 3D image without the need for special glasses.
The images for each eye converge on a certain location known as a 'sweet spot'. For the user to see this 3D image they must position their head in this sweet spot, which is typically only a few cm across. To allow the user to move around many displays now include a built-in head tracker. The tracker determines the position of the user's head and constantly alters the two images to ensure that the sweet spot moves as the user moves their head.

Key Technical Issues:
The underlying LCD technologies currently run at resolutions that are perfectly adequate for 2D use. When displaying 3D images using this technology, the resolution of the 3D image is half that of the display. This makes the resulting 3D images of a significantly lower quality. At present, most of these displays only produce one sweet spot, and due to the small size of this spot, only one person at a time can use one of these displays. Some displays offer multiple sweet spots, but doubling the number of spots again halves the resolution of the 3D image, further reducing quality. With the head tracking displays the presence of other people nearby can confuse the tracker, resulting in the loss of the 3D image. Some of the displays with head trackers have moving parts that are susceptible to damage by vibrations and impacts.

Potential Uses for MOD:

These displays are ideally suited to the display of GIS information and will certainly prove useful for mission rehearsal applications by enabling mission fly-throughs.

Disruptive Technologies/Wildcards:

Volumetric displays, Holographic displays.

Key stages:

I - Currently several large manufacturing companies such as LG and Philips are developing prototype versions of this technology. Other manufacturers (Sharp, SeeReal, Dimension Technologies), are selling commercially available products, although these are aimed at niche markets and have achieved little in the way of mainstream market penetration.

II - Within two years several companies, such as Sharp, with support from the 3DConsortium will probably make an attempt to push this technology into mainstream use. There is a fairly low chance of success at this point, although it should not be ruled out. The niche markets for this technology will still be strong, but fewer companies will be undertaking R&D.

IIII - Within five years it should be clearer as to whether or not the attempted push towards the mainstream was a success. In the event of failure, this technology will still be strong in niche markets but will still not have achieved mainstream success. There will be a fair chance that another push into the mainstream will be planned for the future. As before, the niche markets are still likely to be strong and a further reduction in the number of companies undertaking R&D is likely to have occurred.

IV - By ten years, if necessary, another attempt at gaining widespread market success is likely to have been made. This attempt is more likely to succeed due to improvements in technologies such as the resolution of the LCD displays. Even if this attempt fails, the niche market for this technology will still be strong; however, it is now unlikely that there will be any companies involved in just research of this technology.

Recommendations:

This technology is mature enough to demonstrate at this time. We would not recommend planning to insert this technology within the next few years as it is unlikely to be mature enough. However, we would recommend planning to insert this technology within 10 years.

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The Future

It is planned to further develop the TEPI roadmap and add it as the technology dimension into views of MOD's CCII capability, equipment lines and research programme

It is anticipated that the TEPI will play an integral part in alerting MOD to potential ICT technology solutions and threats to 2015 and beyond

This will support future proofing and timely technology insertion to meet MOD's current and future capability needs

Questions?

Contact details:

Dr Mark O’Dell

+44 (0) 1684 897270 maodell@QinetiQ.com

Mr Nigel Evans

+44 (0) 1684 895114 nevans@QinetiQ.com