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Developing competencies to take emerging technologies to market

An Exploratory Study

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November 2010

EXECUTIVE SUMMARY

A key challenge for the UK is how to convert emerging technologies into value adding products and services, and then establish a significant and sustainable position in the market. This can only happen with the help of people. So, if we can improve the capability of people to do this, then the greater the chance that new technologies will emerge and make significant economic contributions.

To establish the major challenges in taking an emerging technology to market and what competencies were needed to tackle them, literature was reviewed, people were interviewed who had been directly involved and events were attended. The findings indicate that the most important aspects were associated with the market including finding a route to market, developing a sustainable business model and developing the market. This was followed by the strength of the leadership and management, and thirdly by the ability to quickly develop a working prototype and scale up to economic manufacture. Many more competencies were identified but these underpinned those mentioned above.

Competency frameworks were identified as an established tool that could be of significant help in mapping out the competencies people need. A competency framework was developed that covered the breadth of competencies required to take an emerging technology to market. This now needs further refinement and testing to ensure that it becomes a useful tool.

People with the right mix of competencies for taking emerging technologies to market appear to be in short supply. As a wide range of people and organisations are involved, from recent graduates to researchers to senior executives, and from universities to start-ups to major corporations, a broad review of training and development needs was carried out. There is a growing recognition of the need to introduce more entrepreneurship, creativity and innovation into both the undergraduate and graduate student curriculum. Some universities are further advanced than others in implementing this.

Ten recommendations are made which include the design, development and delivery of training and development opportunities to fill key gaps. Five aspects being taken forward are
1. the development of a Graduate Development Programme for SME's
2. the development of Intellectual Property training at Cambridge University,
3. the provision of clearer signposting to industry of opportunities to work with students at University of Cambridge
4. the development of business courses for PhD students
5. the further development of the competency framework to make a useable tool with a supporting website.

There has been good progress in all areas, however some further funding is now required to enable the work to be completed.

ACKNOWLEDGEMENTS

Contents

1. Introduction

This exploratory study was carried out during the academic year 2007 – 2008. It's overarching purpose being to shape the research agenda and identify delivery and practice issues. On completion of this study four areas of work were identified for further work which has been ongoing since October 2008. A summary of progress to date is reported later in section 7. This report was initially prepared during the summer of 2009 to summarise the key elements of the study and resulting actions for those people who had contributed to the work. Having received a favourable response to this report it was decided to update and publish the study so that it may be of use to others.

1.1 Background

A key challenge for the UK is how to convert emerging technologies into value adding products and processes, and then establish a significant and sustainable position in the market. An essential ingredient in this process is people, both as individuals and teams. So the rationale behind this project is that if we can improve the capability of people to develop value adding products, processes and services and to take them to the markets, then there is a greater chance that more of these technologies will emerge and make significant economic contributions. It is important to note that that these capabilities should not be developed at the expense of the technology competence of the company which is a proven source of sustainable competitive advantage.

A person's/ team's capability is improved through both formal and informal training and development. So, by identifying training and development needs and ways they can be met we will be able to provide the range and type of opportunities required. It is then, of course, up to the organisation and individuals to make the most of these opportunities.

1.2 Purpose

The purpose of this project was:
- to identify training and development needs of those involved in taking emerging technologies to market,
- to develop a training needs and gap analysis tool and
- to propose how these training and development needs can be met by tailoring existing University of Cambridge programmes and proposing new ones.

1.3 Scope

This project looked at the business training and development needs up to the stage when 1st generation technology products and processes are established in the market and the business is sustainable and growing. The timing and offering associated with 2nd generation products is recognised as a major issue but is outside the scope of this report.

The focus has been on the training and development needs of science, technology and engineering students, graduates (both new and old), as these are the people most likely to have a significant impact on taking an emerging technology to market.

We will consider emerging technologies i.e. ones that are new to the markets. These technologies may have been known about for many years but have not been viable, ready for market or lacked appropriate market opportunities to date.

1.4 Study programme

The study was approached in three ways:
- Reviewing literature – including looking at cases of how emerging technologies have been taken to market
- Interviewing people who have taken technologies to market, or been involved in the support of taking technologies to market e.g. VC's
- Attending relevant conferences and seminars

It should be noted that companies taking emerging technologies to market were not interviewed directly. Instead we sought the views of those who would have the benefit of hindsight i.e. people who had already been directly involved and those, such as investors who were actively involved in supporting such ventures. The rationale being those currently involved would be time poor and less likely to have a balanced perspective.

A pragmatic approach was adopted. Where there were recent and reliable reports or surveys addressing issues to be researched this was the primary source of data. Where there was less data, interviews and case research was undertaken. Appendix 2 provides a listing of people interviewed, Appendix 3 provides a listing of events attended.

1.5 Report Structure

The report is structured to guide the reader firstly through the key issues associated with competencies and competency frameworks (section 2), followed by the findings on what competencies were needed to take emerging technologies to market (section 3). A competency framework is then proposed (in section 4).

The next section (section 5) looks at supply issues, where there are competency gaps for the types of people typically involved in taking emerging technologies to market and how these gaps might be filled. Recommendations are made in section 6 and those selected for further work and the progress to date is detailed in section 7.

2. Competencies

2.1 Overview

Organisations need people who have the right competencies to undertake the tasks necessary for their business. So an organisation's training and development needs are directly related to its competency needs. To be competent at a task a person needs the knowledge, skills and experience to carry it out. All three elements are important. Let us take the analogy of golf. Someone with basic knowledge of how to play golf and the challenges presented by different courses and prevailing weather, will not be competent at even a basic level if they do not have any playing skills or experience. To increase competence they would undertake training to develop basic skills and then gain experience of putting these into practice. To increase levels of competence further, progressive levels of training and development would be required.

Having people with the right competencies was recognised by those interviewed and in the literature as crucial to the success of taking a technology to market. Some fundamental questions regarding competencies for organisations include:
1. What does the organisation need now and in the future?
2. What do we currently have access to?
3. How does 2. (above) relate to what the organisations needs now and in the future?
4. How do we fill any gaps? Is there an available supply?
5. What investment in terms of time and money will it need?
6. How do we assess whether this investment has been worthwhile?

These questions are common for any resources needed by a company e.g. buildings and equipment. However the situation with competencies is more complex because they are not material items and are held by the individual.
- People are not owned by the company and may leave the company by giving the required contractual notice or not be available due to circumstances outside the control of the company e.g. illness, family issues. Therefore the company can lose a competence it needs
- "If you don't use it you lose it" – competencies decay with time if they are not used. Some are easier than others to restore
- Competency can be difficult to measure. What people say they can do and can actually do in practice may vary. Returning to the golf analogy, you could only truly analyse a person's competence by watching them play
- An individual's performance can be variable e.g. due to the impact of varying levels of tiredness or stress
- People may have different competency levels even with identical training and development opportunities
- Some competencies are dependent on, or overlap, with other competencies e.g. negotiation and communication

2.2 How can competence needs be identified and anticipated?

Identifying and anticipating training needs can be difficult for individuals and organisations if they don't relate it to what they are doing, the issues they are facing and plans for the future.

As competency needs vary with the tasks, it is logical to identify the tasks that need to take place first and then identify the competencies required. This is the typical process used to recruit someone, firstly a job specification is prepared detailing the tasks associated with the job, and then a list of knowledge, skills and experience is developed to describe the person to be identified.

So a fundamental element of identifying and anticipating competency needs is planning ahead. This enables an understanding of the tasks ahead, when they are likely to take place, and the level of challenge they present. Thus it is important for an organisation to have an appropriate planning process that considers competence implications. This planning should be scrutinised by the organisation's Board. The input of a well chosen chairperson and non-executive directors can be valuable in identifying and anticipating future competencies. It is recognised how difficult this can be for a business working with emerging technologies. Plans can change frequently to respond to evolving market and technological developments.

"PLANS ARE USELESS BUT PLANNING IS ESSENTIAL"
US President Dwight Eisenhower

Common processes used to identify and anticipate future competency needs for individuals is a discussion with a manager or mentor. The degree of effectiveness of this process is dependent on the knowledge, skills and experience of this person and the amount of effort they put into this process. Line managers are often busy people and they typically welcome effective tools or processes that make this task easier e.g. competency frameworks.

Some recurring comments from the interviews, on the theme of identifying and anticipating competency needs, are that both individuals and organisations
- must be able to realistically assess what they are capable of doing and ask for help / find someone who can to do tasks that they can't do.
- must keep an open mind, be willing to find out more and consider unfamiliar ways of doing things as it is not possible to judge the value of a new skill or method unless you know something about it.

2.3 The use of competencies in companies

The Competency Framework is a tool that emerged in the 1980's and is now widely used in companies (CIPD 2008). In the Chartered Institute of Personnel and Development's 2007 Annual Report on Learning and Development (CIPD 2007) the use of competency frameworks was reviewed. In a sample of 663

organisations, 26% of which were SME's, 60% of organisations had one in place and 48% of those who didn't, intended to introduce one. These frameworks capture the key competencies that organisations, departments and individuals need. They can be quite straight forward (a couple of pages) and focus on core behavioural competencies e.g. communication, team working or more extensive and also incorporate 'technical' competencies. Examples of 'technical' competencies are marketing and finance i.e. those that can be more readily taught. Typically, more focus is put on behavioural competencies as these are the differentiating competencies in terms of a person's performance.

The CIPD survey results support the views of those interviewed that competency frameworks are a useful tool with multiple purposes. The survey found the main use of competency frameworks was as follows:

REASON	%
Underpins performance reviews/appraisals	56
Greater employee effectiveness	47
Greater organisational effectiveness	44
More effective training needs analysis	36
More effective career development	36
More effective recruitment	28
Greater customer satisfaction	26
Better job design	19
Other	3

Base 338   Source: CIPD 2007 Annual Report on Learning & Development
Table 1: Use of Competency Frameworks

So from this it could be reasoned that a competency framework for an organisation focussed on taking an emerging technology to market could be advantageous as it would have the potential to help them in a number of ways.

So why doesn't such a framework exist? The researcher suggests two fundamental, but linked reasons. First and foremost a competency framework has to be appropriate for the organisation. If the organisation's circumstances / operations change e.g. due to rapid market growth, then the competency framework may have to change. When taking an emerging technology to market, circumstances can change rapidly, making a competency framework obsolete. The second reason is that, according to the CIPD survey, the majority of frameworks (85%) were designed in-house or in-house with consultants. With companies taking emerging technologies to market being typically time poor, there is little resource or priority for undertaking such a task.

The key messages from the research on competency frameworks were that if one could be developed as a useful tool for identifying and anticipating taking emerging technologies to market, it must be straightforward, easy to use and must be capable of change to reflect an organisation's business situation.

3. Competencies for taking emerging technology based products and services to market

3.1 What competencies are needed?

This will depend on the activities to be undertaken. So by understanding what these activities are, the business challenge they are addressing and the associated business conditions, key competencies can be identified.

To understand what these activities might be, academic literature was reviewed, interviews were held with people who have either taken technologies to market or been involved in the support of taking technologies to market, e.g. VC's and academics active in this area, and, a number of events were attended to listen to relevant speakers. See Appendices 2 and 3. During interviews further questions were asked to identify the type of person that typically performed well so that key individual attributes could be identified. The most common responses are listed below in no particular order.

What are the key challenges and barriers to taking an emerging technology to market?
- Opportunity recognition and evaluation
- Finance: cash flow management, raising finance
- Finding the route to market
- Business strategy and business model development
- Product manufacture
- Managing risk and uncertainty
- IP management & strategy
- Recruiting & managing people
- Keeping the organisation lean and adaptable
- Working in partnerships / alliances
- Managing relationships

What type of people are needed?   People who;
- can operate effectively in both technology and business worlds
- have real business experience – sales, finance, management
- can really understand a market and industry
- know what they don't know
- can think strategically
- can identify and manage risk
- can solve complex problems
- can operate in an uncertain, changing environment
- can negotiate and influence
- have excellent communication skills
- have good project management skills

There was a wide diversity of competency needs. Some were linked to the development of the technology itself and the difficulties of making something that had not been made before. However, when asked about what makes the key difference in terms of success, technology issues were rarely stated, it was competencies in management and leadership, finance, market development and sales, as well as personal characteristics such as action orientation, flexibility and determination. This may be a reflection that often new technologies emerge from research activities where people are less likely to have developed high levels of competence in areas such as finance, market development and sales due to limited opportunities to experience these roles.

3.2 How can we usefully differentiate competency needs for emerging technologies?

Five broad areas of competency needs are proposed.

1. Fundamental behavioural traits and skills
These are the key behaviour traits and skills needed for an emerging technology venture. From the interviews there was broad agreement on what these might be and they are shown below in Table 2.

Fundamental Behaviour Traits	Fundamental skills
Determination	Communication
Action/goal Orientated	Networking
Self Motivated	Problem Solving
Focused and Disciplined	Influencing
Integrity	Creativity
Open and Honest	Strategic Thinking
Positive Outlook	Team Building and Team Working
Resilience	Planning & Organisation
Flexibility and Adaptability	Leadership
Tolerance of Uncertainty	Negotiation

Table 2. Fundamental behavioural traits and skills

2. Core business competencies
These are the core business competencies, common to most business, that are needed to be successful e.g. finance, marketing, sales, project management, and innovation.

3. Ability to apply competencies effectively in a real business environment
Real experience of working in a commercial environment including direct contact with parties external to an organisation e.g. customers, collaborators, suppliers was seen as crucial to develop commercial acumen and business language skills and should be encouraged even for those predominantly in research.

Other key business experience for taking an emerging technology to market was managing people, managing money, managing new technology product development and working in relevant market sectors.

4. Technology Business and Knowledge Transfer competencies

Working with a science or technology business adds an additional set of needs over the core business competencies described above in 2. These will include managing technology development, intellectual property management and collaborating with others to develop product offerings.

5. Competencies directly related to taking emerging technologies to market

For a new emerging technology, there are typically all the needs of a technology business and, in addition, those related to market development, finding a route to market and developing a sustainable and profitable business model. These will include supply chain development needs and the development of an economic manufacturing route and strategy.

So how do these relate to one another? In terms of numbers of people needing these skills and the general sequence in which it would be logical to acquire them, as one set typically build on another, this can be visually represented as a layered pyramid. Shown in Figure 1 below.
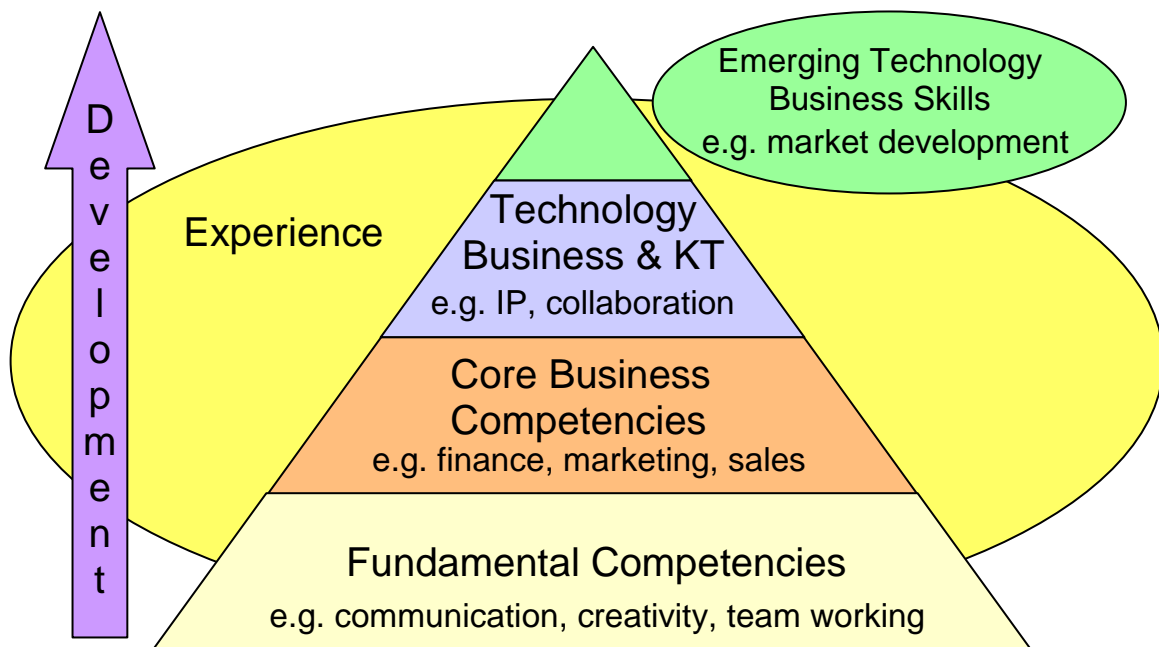

Figure 1. Skill development and availability.

The general consensus, from the interviews, was that taking an emerging technology to market is one of the most difficult things to do. Competencies and experience in a number of key fields are required, as well as a good deal of hard

work and serendipity. So when an emerging technology is ready to be exploited, it is no wonder that an individual or, more likely a team, who already have core business skills as well as experience of operating in an emerging technology based company are sought.

There was strong agreement that to be successful in this area there must be a team of people with the right portfolio of competencies, motivation and experience to drive the business forward. Thus team building / working and communication skills are some of the highest needed skills especially in the early stages. Other crucial aspects were the need to be flexible to adapt to changing business challenges and to know what you could and couldn't do.

So the recipe for a greater chance of success in taking an emerging technology to market was not uniform, it varied with each case dependent on factors such as the stage of technology and market development and resources available.

3.3 What are the most important aspects to taking an emerging technology to market?

During the research a sense of what was most important was sought and where there were perceived gaps. There was a close correlation between the two, probably because the lack of competency made it important in the first place.

The consensus was that the most critical activities, when working with an emerging technology, were associated with the market – finding and evaluating opportunities, finding a route to market (market entry strategy), developing a sustainable business model and developing the market and supply chain.

The second most critical aspect was that of leadership and management. There was a very strong belief, particularly from the investor community, that a Class A Management Team with a Class C technology was far more likely to succeed than a Class C Management Team with a Class A technology - although there is always a preference for both being Class A!

The third most critical competency area was the development of a working prototype and the scale up to economic manufacturing for the new technology.

Finance - cash flow management and raising finance	Having the right team with the right incentives
IP management & strategy	Recruiting & managing people
Project management linked to new product development	How to work in partnerships / alliances
Managing relationships	B2B Sales & Marketing
Negotiation	Managing risk and uncertainty
Communication	Planning and prioritising activities

Table 3: Other frequently cited/observed aspects

4. A competency framework for taking emerging technology based products and services to market.

As presented in section 2.3, competency frameworks are a useful tool for identifying and anticipating competency needs as well as a whole range of other Human Resource Management related activities.

It terms of a competency framework for taking emerging technologies to market, the issue was designing a framework that could capture the breadth of competencies needed, whilst keeping it easy to use and making it adaptable to different business circumstances. To tackle the issue of the breadth of potential competencies needed for taking an emerging technology to market they were separated into six broad categories;

1. Leadership and Management
2. Resources – procuring and managing resources from money to people,
3. Business Development – active engagement with the markets
4. Product and Service – specification, prototyping, manufacture etc.
5. Market – opportunity identification and evaluation, market strategy etc.
6. Technology – technology evaluation, development, IP management etc.

Of course each of these categories is interrelated and success will depend on how the whole links together. Put into visual format the following diagram, Figure 4, was developed and is called the 'Fruit Bowl' model. This is the combination of key elements of other existing models including the Value Chain (Porter 1985) and 'Characterising High-Tech Market Environments' model (Mohr et al. 2005).
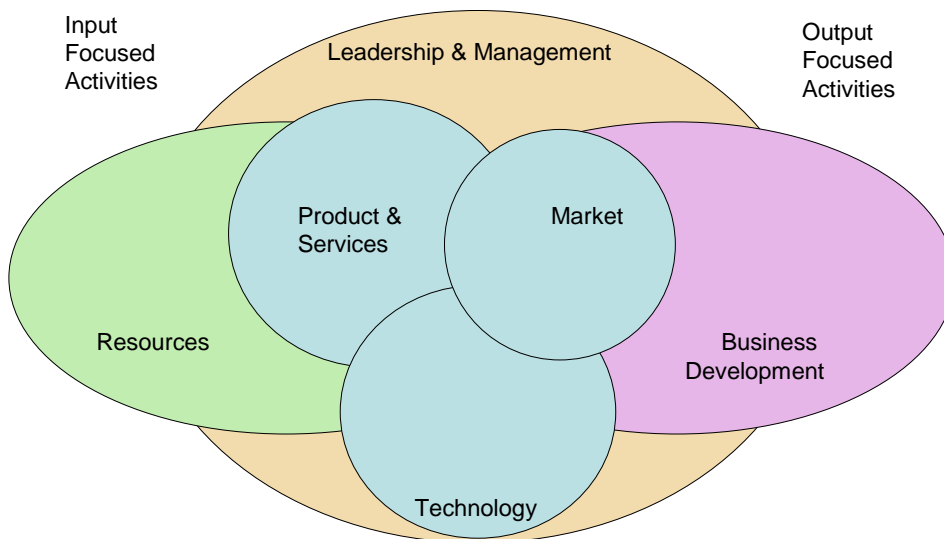

Figure 4: The FRUIT BOWL Model

The concept of strong leadership and management to hold everything together was a reflection of those interviewed and thus appropriate it should make up the fruit bowl itself. If visualised in 3-D it can be imagined that this is an array that can be changed, but all parts are reliant on each other, if the whole is to stay together.

To tackle the issue of making the Competency Framework adaptable to different business stages and circumstances the competencies were also captured by key challenges. Taking the example of the Product and Services competency map, shown in Figure 3 overleaf, you can see the key challenges are presented in the left hand column and ordered by time. So, by identifying the current challenge faced in this area the future challenges can be anticipated. The competencies associated with meeting a challenge are then listed in the other columns. For two of the areas, 'product and services' and 'technology', a key issue identified was that ventures were often too internally focussed and increased vigilance of the external environment could improve the chances of success. So two columns have been used to enable the competencies to be differentiated.

The 'leadership and management' and 'resources' sections have been mapped in a more general way as the key challenges here were more dependent on the type of organisation, its stage of development and size.

A full copy of the Competency Framework is shown in Appendix 1.

Further work developing and testing this map needs to take place in conjunction with potential users. This would include,

- Linking the Leadership and Management and Resource sections of the framework to key challenges if seen to be appropriate
- Identifying which competencies are more critical than others (needed at a higher level) when tacking a challenge
- Providing clear explanations of the competencies in the map to reduce problems with interpretation
- Testing the map's usability – can an organisation readily identify the competencies it needs?
- Exploring user friendly mechanisms for making this available for use and the feedback of comments

The key to being able to use the map is having an understanding of what activities the venture should be focussing on. It is proposed that planning tools for taking technologies to market be investigated to see if they can be linked to the competency map e.g. technology and value roadmapping.

PRODUCT & SERVCIES Challenges and competencies	Inward focused competencies	Externally focused competencies
Product / Service Specification **Challenge:** to have a clearly defined product specification that is linked to clearly articulated customer benefits	• Taking onboard key customer feedback / market insight and developing a list of customer benefits prioritized by value to customer. • Defining unique selling proposition • Product/service offer development • Product/service specification: functionality, quality, safety etc. • Defining this generation product vs. next generation product	• Understanding and anticipating customer needs and what they value • Working with lead customers • Complementary services, products, processes, systems etc. what are needed / desirable
Prototype Product / Service Development **Challenge:** to move from technology to working prototype in the shortest practical time	• Product development project management • Design for manufacture • Embedding Software if appropriate • Prototype testing	• Collecting Customer Insight • Adding further value for customers • Design for adding value/ optimal functionality
Product / Service Manufacture **Challenge:** to have a reliable, commercially viable process for manufacturing the emerging technology product	• Product Manufacture Design & Development • Manufacturing cost analysis • Manufacturing process specification • Manufacturing Strategy – make or buy, location, level of fixed costs, flexibility • Transition Manufacturing & Scale up • Manufacturing process / product testing • Manufacturing management	• Sub-contracting • Working with manufacturers • Working with manufacturing equipment designers / manufacturers
Product Strategy **Challenge:** to have a product strategy that enables the emerging technology to be leveraged effectively, whilst retaining the flexibility to adapt to changing customer needs.	• Product Architecture: Modularity, platform, derivatives • Product IP protection, management • Product Service Support • Future Product Development – Next Generations	• Understanding / eliciting new customer needs, product uses • Planning New Product / Next Generation Product offerings • Customer service requirements

FIGURE 3. Product and Services Competency Map

5. Finding people with the competencies that are needed.

Taking emerging technologies to market can involve a wide range of people from recent graduates to researchers to senior executives working in many organisations including universities, start-ups and major corporations. These people, typically from science, technology and engineering disciplines, are those most likely to have a significant impact in taking an emerging technology to market.

It has been widely recognised that highly skilled graduates and researchers are key to UK economic development in the knowledge based economy. There have been many recent and influential reports including the Warry report, 'Increasing the Economic Impact of the Research Councils', the Leitch Review of Skills and Lord Sainsbury's report 'Race to the Top'. The Leitch Review's assessment was that "one of the most powerful levers for improving productivity will be higher level skills …such as MBA's and PhD's …as they are 'key drivers of innovation, entrepreneurship, management, leadership and research and development critical to a high skills, high performance economy".

A common issue from discussions was that finding people with the right competencies was difficult – many investors and CEO's network extensively partly for that reason. So if supply is short, what can be done to increase this? What are the key competency gaps and how can they be addressed.

5.1 Increasing the supply

To consider this we need to look back at Figure 1 on page 8. If we are going to increase the supply of people then we need to develop more people with a wider breadth and depth of competencies. Of course there is a limit to this, as people cannot become experts in every possible discipline, so there has to be a balance between breadth and having a depth of competence in certain areas. The key to making this work is having people with the skills to work effectively with others such that the team / organisation has the right level of competence overall and an appropriate level of experience.

This should make self development and people development skills such as coaching and mentoring some of the most important skills needed.

So there needs to be further and better opportunities for developing competencies at all levels of the pyramid in Figure 1 and for the range of people involved in taking technologies to market.

5.2 What are the key competency gaps and how can they be addressed.

Let us consider some different groups of people in turn.

For Graduates:

There have been reports by The Council for Industry and Higher Education (Archer and Davison 2008) and also, more specifically for engineers (RAE 2007), which have reviewed industry needs in terms of graduate competencies and where they perceive there to be gaps. There are many common findings. Of key importance is the need for graduates to have a deep subject specific understanding coupled with critical thinking skills and the ability to apply this in practice. For engineering graduates real work experience was seen as key to demonstrating whether they could apply their knowledge to real work situations.

When looking at other generic skill needs, communication and team-working skills came top in both the above reports, followed by planning and organisation, literacy (writing), numeracy and analysis and decision making skills. When looking more specifically at engineers' additional requirements were creativity and innovation skills and some business awareness, in particular: understanding how a business works, the importance of the customer and a basic understanding of project management. Other points to note from the report are that companies that operated globally really valued international work experience and that company size had little bearing on the top 10 most important skills and capabilities required.

So where are the gaps? The largest gaps as identified by Archer and Davison in the capabilities of new graduates were commercial awareness, analysis and decision making, communication skills, literacy (writing), planning and organisation skills, personal development skills as well as relevant work experience, passion and confidence. This was reinforced by the findings of the primary research in this project with commercial awareness, communication skills and planning and organisational skills being key gap areas.

This presents a number of challenges to the higher education sector and particularly to those directing science, technology and engineering courses; how do we add new content such as commercial awareness, creativity and innovation?, how do we build and embed skills training into our programmes whilst still delivering our core disciplines? Ultimately the universities that succeed will attract more students because their graduates will be more employable and thus sought after.

There are a number of ways that these competencies can be developed both within and outside of the curriculum. Outside via clubs, societies e.g. business plan competitions and other multi-disciplinary opportunities such as i-Teams (www.iteamsonline.org) offered to graduate students at the University of Cambridge. In terms of within the curriculum examples of how this can be done

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include; introducing new business modules, projects related to real industry based problems and the use of computer based business game simulations - couple this with team working and presentation skills and students can be developing several competencies at the same time.

On leaving university, many graduates look to the relevant professional institution for guidance and will be keen to pursue those opportunities that will enable them to gain chartered status. A key element is developing further skills and the business awareness necessary to be fully effective in their jobs. Some companies have graduate development programmes to facilitate this but many don't, in particular SME's. It is one of the recommendations in the RAE Report, that there is a need to provide graduate development schemes. In the Cambridge area there are many SME's working in high technology and emerging technology sectors so there is potentially a big demand for a locally based graduate development programme and this opportunity should be evaluated and, if appropriate, pursued.

Another option for graduates wanting to develop higher levels of business competencies before entering the world of work would be to take a Masters programme and there are many that deliver general management training e.g. MPhil in Management at University of Cambridge or deliver management/business training relevant to their disciplines e.g. MEng which are often four year undergraduate programmes. With the introduction and subsequent increase in tuition fees as well as the additional cost of studying for a Masters qualification independent of their first degree this is becoming an ever more costly option and less accessible for a growing number of UK students.

For Post Graduates
In the recent report 'What do PhD's Do?' (Haynes and Metcalfe 2007) it is reported that on completion around 41% go into research posts with 25% being post-doc positions in academia. The second most popular (but now declining) destination at 23% is the manufacturing sector and the third most popular destination at around 18% is the Finance, Business and IT sectors. Thus with the majority of PhD graduates leaving academia it is vital that they develop the competencies identified in the previous section for graduates.

Following the Warry Report in 2006 the UK Research Council has called for more employability skills, such as entrepreneurship and knowledge transfer as well as skills for interdisciplinary working. In the above mentioned report there is an identified need for the development of innovation, creativity, enterprise and career management skills.

For Researchers and Academics
Following a PhD, 25% of successful candidates will pursue a post doctoral research post. Formal recognition that this group should be supported in career development came with the Research Careers Concordat in 1996. Building on

this, and containing a set of principles with explanation of how to embed them, a new Concordat was issued in June 2008. However, it is still very much the responsibility of researchers to take responsibility for their careers and it may be some time before the support processes are fully established.

A post doctoral researcher is more likely to be involved in taking emerging technologies to market than a PhD candidate. If involved, their training and development needs will include those in the business development arena e.g. market research, opportunity identification and evaluation, product/process innovation and development, business case development, IP management etc. Suitable opportunities need to be provided to address these needs.

Real business experience was cited by many of those interviewed as lacking amongst academics. There are opportunities to develop experience which may need both more promotion and encouragement within academic institutions to increase uptake.

Academics in most institutions have the opportunity to attend short courses in a number of areas related to specific skills and longer programmes on management and leadership skills when a position of managerial responsibility is taken. However there is typically a poor uptake by academic staff on skills courses for a number of reasons varying from negative perceptions of staff development courses, not actively managing their personal development, to not having the time to do it. This is not helped when there are limited staff development processes in place and progression/reward is predominantly related to research output.

For Scientists and Engineers
It is common for people to switch career tracks and sometimes more than once in their career. For many employed in science / technology roles this is a transition into commercial or management roles. This could be done for a number of reasons e.g. to achieve progression or take on a new challenge. However, an excellent scientist/engineer does not necessarily make an excellent or even adequate manager as different competences are needed. So there is a need for training linked to appropriate experience to facilitate the transition from one role to another.

There are a number of Masters Programmes targeted at those wanting to transition between technical and business management / commercial roles. At Cambridge these range from MBA's to MPhil programmes such as the MPhil in Micro and Nano-technology Enterprise. An alternative is the progressive development of competencies through a mix of courses, on the job learning opportunities and coaching/mentoring.

In terms of competencies for technology based businesses key gaps were found in this areas of,

- IP management and strategy
- managing relationships
- coping with risk and uncertainty for new technology based projects
- preparing proposals – looking at the breadth and depth of information required by investors to enable them to make an investment decision and venture leaders to assess the viability of their proposals. This would also include business valuation and financial projections

In terms of competencies for taking emerging technologies to market key gaps were found in this areas of,
- market strategy and business planning with the objective being to define a route to market along with a sustainable business model
- market development covering market related networking, to getting access to and influencing key decision makers, to building and developing relationships with potential customers and then interpreting the information to provide meaningful input into market strategy.
- leading and managing emerging technology businesses covering the key elements from team development, to how to keep agile and adapt to changing circumstance, to anticipating competency needs

5.3 Training and Development Delivery

A further area of research was trends and preferences for training and development delivery. The Chartered Institute of Personnel and Development (CIPD) has been monitoring this via their annual Learning and Development surveys, which have been taking place for nine years. Their research has illustrated the shift in focus from instructor-led training activities towards a greater use of work-based methods that encourage and support individuals to learn.

Table 4: Use of Training and Development Methods

	Frequently Used %	Occasionally Used %
On the job training	81	17
In-house programmes	60	30
Instructor led training – off job	43	35
External conferences, events	37	45
Formal education courses	34	47
Coaching by Line Manger	30	46
Internal events	18	45
E-Learning	14	34

Source: CIPD 2007 Annual Report on Learning and Development

In 2003 the CIPD published results of research undertaken by the University of Bath team (Stewart 2003) as part of the CIPD People and Performance study. This study considered smaller 'knowledge-intensive firms'. The key findings were

- an unquestionable shift from training to learning,
- more emphasis on individual responsibility for learning
- formal, internal instructor-led training was not seen as important
- there was usually a very strong link between learning and knowledge development
- group and team learning was pervasive.
- mentoring and coaching were used extensively, as were developmental assignments designed to stretch the individual.
- consideration was given to the provision of time to learn and, in at least one case, the opportunity to acquire new knowledge was given as a reward for effective performance.

These findings are particularly pertinent to this project as it is knowledge intensive firms that are likely to be involved in taking technologies to market. This indicates that any new training and development opportunities should be designed and delivered in ways to support learning. Further evidence supporting the above findings came from interviews and the recent experience at IfM in delivering training to industry.

Training and delivery preferences and opinions of those involved in taking emerging technologies to market were also sought,
- given peoples busy schedules it is best to do training in small chunks. The size of chunk to vary depending on subject and access to training by the individuals attending
- courses should be targeted at market sectors/industries so that people learn new knowledge and skills in the context of their business and meet people facing similar challenges
- given the changing challenges of taking technologies to market there was a need for quick access to training / information that can help
- people learn much from others attending courses – attention should be paid to attracting cohorts that will provide good learning opportunities
- people don't value what they don't know so it is wise to include some free taster sessions for new / unfamiliar subject areas
- market sector networks are very valuable and well used for emerging technology markets e.g. KTN Photonics and Electronics, Cambridge Wireless. These provide good forums for delivering training to / introducing people to key competences
- some skills/subjects were best taught by practitioners and not academics.
- courses needed to be priced to enable access by SME's and start-ups
- given the lack of time for off-the-job training and development when taking a technology to market it is much better that people are fully trained and have the right experience in the first place!
- training people as a group, linked to tackling a real work issue, is a very practical, popular and effective way of helping people learn

5.4 Implications

The training and development methodology will have to change to reflect the subject being taught, the resources available, the number of participants and the specific needs of the customer.

Preferred methods would be some combination of on the job training, formal training courses, either internal or external, with some form of coaching or mentoring. These would ideally be delivered in short digestible chunks at times convenient to the client.

One method, not well used by industry, and probably not so suited to dealing with the complexities and interactions when taking technologies to market, is e-learning. It can be a useful tool for learning some basics in a subject and has the advantages of flexibility and people learning at a distance. It is liked by some trainers due to its potential to be easily scalable. However it is not likely to be a preferred learning method in this context.

New learning opportunities will have to be carefully designed and may involve working in collaboration with clients, practitioners and external speakers to deliver a good learning experience. This could include delivering aspects of internally run company training programmes, running sector specific training sessions in conjunction with sector networks and delivering new courses in novel ways to address the needs of specific clients e.g. SME's and the academic research community.

Whatever activities an organisation is involved in, it is its culture that will have a significant impact on learning, training and development. This will include the degree to which it is a 'learning organisation' i.e. tolerates mistakes as long as people learn by them, the degree to which it is acceptable to admit what you don't know or can't do, the level of investment made in developing people in terms of both time and money and the range of opportunities available for individuals to learn.

6. Recommendations

1. Science, Technology and Engineering Undergraduate Courses need to respond to industry needs and include new subjects such as creativity and innovation and build fundamental skills training and development opportunities into their programmes. Skills training should run throughout degree programmes so that skills are embedded and progressively developed.

2. Post-graduate studies need to adopt a skills agenda – for PhD students this could be via an expanded, more business orientated transferrable skills training.

3. Further extra-curricular opportunities for enterprise skills development should be developed for both undergraduates and graduate students.

4. More work on real problems should be integrated into degree programmes which will require improving relevant industry/ academia relationships.

5. More opportunities should be provided for students, researchers and academics to gain relevant business experience in industry.

6. A graduate development programmes for SME's should be developed and delivered on a local basis to develop business competencies.

7. New learning opportunities to be developed to tackle gap areas in technology business competence such as IP management, managing relationships, managing risk and uncertainty, as well as business valuation and financial projections.

8. New learning opportunities to be developed to support key emerging technology competencies of finding a route to market, market development and leading and managing an emerging technology company.

9. Further development of the competency framework for taking emerging technologies to market to be undertaken to refine it into a user friendly and valuable tool for businesses.

10. A website be designed and developed to contain the competency framework and links to appropriate training and development opportunities to support the needs of those taking emerging technologies to market.

7. Further Work

The key areas of work from October 2008 to date are:
1. The development of an SME Graduate Development Scheme
2. The understanding of IP training needs at the University of Cambridge and the delivery of a learning opportunity to address them.
3. The capture of existing industry/university student project opportunities and presenting them in a user friendly way for business.
4. The development of business courses for PhD students
5. Refinement and further development of the Competency Framework

Progress to date:

1. Detailed proposals for an engaging Graduate Development Programme were developed and well received by the SME community in the Cambridge area. Detailed discussions with this community revealed a strong preference for a programme to be accredited. Work continues to develop a robust business model, course content and associated documentation required for accreditation approval. Further funding will be required to establish the course but it is anticipated that the course be self sustaining within a couple of years of starting, currently planned to be during the academic year 2011 – 2012.

2. The IP training needs of the University of Cambridge have been mapped and a new course is under development for graduate students and early stage career research staff. This course combines knowledge of IP policy, and practice and links it to the practical activities that the researchers are involved in. It is planned to pilot this course in 2011.

3. A new webpage called 'working with students' has been designed for the main University of Cambridge website which will enable a business to view the range of opportunities available to them. One set of opportunities relates to students undertaking projects for companies as part of their academic studies. A simple mechanism has been designed that will enable companies to be directed to the most likely of the University of Cambridge Departments to meet their needs. The new web page will be operational early 2011.

4. A series of 1 day business courses for PhD students are being developed. This starts with a commercial awareness course, (already successfully run three times), followed by a 'working in a business' course and then a 'managing a business' course, due to be piloted in first quarter of 2011. Each course uses engaging, interactive teaching methods to bring the

learning to life. A further one day course on Innovation and Creativity has also been developed and is due to be piloted in February 2011.

5. Planning the development of the competency framework has identified that further funding will be required to produce a practical and useful tool for smaller companies. This task will be greater than originally envisaged but there is considerable support from report contributors for this work to be carried out. The additional funding will enable the framework to be refined, embodied in appropriate software for an intuitive, on-line format and tested with companies for ease of use and level of insight achieved. Funding in the region of 100k is envisaged as being necessary and potential sources are being investigated.

APPENDIX 1: Preliminary Competency Map for further development
TAKING EMERGING TECHNOLOGIES TO MARKET

1. Leadership and Management

2. Resources

3. Business Development

4. Product and Services

5. Market

6. Technology

See section 4 of this report for more details on how this framework was derived.

Further development needed to refine content, format, accessibility, links and additional competency description.

Goal: To develop a practical, user friendly tool.

Please forward any comments to Judith on jks45@eng.cam.ac.uk

1. Leadership and Management

Level	Management	Leadership
Individual	• Planning and Organisation • Presentation • Prioritisation • Task / Time management • Stress Management	• Setting and achieving SMART goals • Personal Development Planning • Self Directed Learning • Self Reflection
Team	• Communication • Task – Definition, objective setting, milestones etc. • Process – how to achieve above. • Roles / Responsibilities • Negotiation	• Communication • Team Building & Development • Performance monitoring • Team Values / Way of working • Conflict resolution
Managerial *For those with Line Management responsibility*	• Communication • Motivation / Empowerment • Delegation • Developing People • Holding People Accountable • Appropriate and flexible structures / systems • Negotiation • Decision Making	• Communication • Culture / Learning Environment • Organisational Fit / Context • Planning • Performance monitoring • Anticipation of competency needs • Aligning right skills / people to business need
Organisation *For those with responsibility for a section/ department/ division/ organisation*	• Communication • Effective and clear decision making • Agile Structures/ Processes / Systems • Management of resources/capability i.e. money, people, infrastructure, facilities - prioritisation • Operational Effectiveness • Stakeholder Management • Negotiation • Risk Management	• Communication • Mission / Vision / Purpose • Business goals, objectives, imperatives • Integrated Business Strategy • Culture / Values • Developing organisational capability • Planning / Performance Monitoring • Making Sense of the 'outside' – uncertain, rapidly changing environment • Influencing and Relationship Development

2. Resources

Resource Type	Procurement	Management
Finance	• Financial Projection • Business Valuation • Due Diligence • Risk and uncertainty identification & evaluation • Communication skills – presentation / written • Grant / Bid Preparation • Sources of and access to Finance	• Cash Flow Management • Management Accounting • Financial Accounting • Financial Reporting • Finance Strategy
People	• Attracting / Finding high capability people • Contract – terms and conditions • Knowledge of Employment Law • Assessing individual capabilities • Negotiation • Employ / Sub-contract decisions	See Leadership and Management Sheet plus • Competency need identification, now and future • Evaluating people you have access to • Differentiating core and non-core competencies • Building core competencies • Knowledge of Employment Law • Reward • Retaining key people / skills / knowledge
Facilities & Systems **e.g. offices, labs, equipment, vehicles**	• Negotiation • Making lease or buy decisions • Identifying suitable facilities / systems	• Maintenance / Routine Testing • Health and Safety
Inputs e.g. raw materials, consumables etc.	• Negotiation • Identifying/evaluating suitable suppliers	• Relationship Management • Quality Management

3. Business Development

	Competencies Required
Market Development **Challenge:** To actively engage in developing a market for the emerging technology that will provide business opportunities and help address common issues	• Market related networking • Collaboration to address common problems / issues • Influencing • Interacting with KTN / other sector networks
Supply Chain Development **Challenge:** To develop a supply chain for the emerging technology product/service that will enable delivery to customers	• Influencing • Relationship Building
Partnerships/Alliances **Challenge:** To find appropriate companies to partner/venture with and then make the relationship and venture work effectively.	• Networking • Managing Relationships & Expectations • Negotiation • Legal / Working agreements
Marketing **Challenge:** To market the product / service cost effectively using a well executed and integrated marketing plan.	• Marketing Planning • Marketing Communication • Brand management • Promotion • Accessing and managing channels • Product / service pricing • Product packaging / presentation
Sales **Challenge:** To get traction in sales and develop an effective sales process	• Listening & relaying customer feedback • Customer Relationship Management • Identify Prospects, Decision Makers, Influencers, Buyers • Getting an opportunity and making a pitch • Negotiating /Closing Sales • Contract Development and Management • Sales Team / Process Development

4. Product and Services

	Inward focus	External Focus
Product / Service Specification **Challenge:** to have a clearly defined product specification that is linked to clearly articulated customer benefits	• Taking onboard key customer feedback / market insight and developing a list of customer benefits prioritized by value to customer. • Defining unique selling proposition • Product/service offer development • Product/service specification: functionality, quality, safety etc. • Defining this generation product vs. next generation product	• Understanding and anticipating customer needs and what they value • Working with lead customers • Complementary services, products, processes, systems etc. what are needed / desirable
Prototype Product / Service Development **Challenge:** to move from technology to working prototype in the shortest practical time	• Product development project management • Design for manufacture • Embedding Software if appropriate • Prototype testing	• Collecting Customer Insight • Adding further value for customers • Design for adding value/ optimal functionality
Product / Service Manufacture **Challenge:** to have a reliable, commercially viable process for manufacturing the emerging technology product	• Product Manufacture Design & Development • Manufacturing cost analysis • Manufacturing process specification • Manufacturing Strategy – make or buy, location, level of fixed costs, flexibility • Transition Manufacturing & Scale up • Manufacturing process / product testing • Manufacturing management	• Sub-contracting • Working with manufacturers • Working with manufacturing equipment designers / manufacturers
Product Strategy **Challenge:** to have a product strategy that enables the emerging technology to be leveraged effectively, whilst retaining the flexibility to adapt to changing customer needs.	• Product Architecture: Modularity, platform, derivatives • Product IP protection, management • Product Service Support • Future Product Development – Next Generations	• Understanding / eliciting new customer needs, product uses • Planning New Product / Next Generation Product offerings • Customer service requirements

5. Market

Opportunities **Challenge:** To identify opportunities that have the potential to deliver significant returns then prioritise them starting with one/s that can be realised in the shortest term with minimal risk.	• Opportunity identification / recognition • Opportunity evaluation • Opportunity prioritisation
Market Understanding **Challenge:** Develop an in depth understanding of the markets where there are and are likely to be significant opportunities for the emerging technology product / service**.**	• Market Research • Networking • Market Intelligence • Market Analysis; stage of development, market sectors, segments, niches, channels, supply chains, type of competition, no. of players, size, value. • Competitor Analysis • Macro Environment Analysis • Customer Analysis; Who are my potential customers? What benefits will my technology deliver • Market monitoring
Market Strategy & Business Planning **Challenge:** Develop a market strategy that provides a route to market and a sustainable business model with the flexibility to deal with anticipated constraints, hurdles and issues.	• USP /Value proposition definition • Defining customer problems, needs and expectations • Integrated Market / Technology / Product / Resources Strategy • Business model development • Technology Road-mapping • Market/Value Chain Development Strategy • Route to market analysis & strategy • Business Planning • Risk Management

6. Technology

	Inward Focus	**External Focus**
Technology Development **Challenge:** To develop the technology in the shortest practical time with minimal resources	• Complex problem solving • Creative problem solving • Technology Development Project Management • Programme Management • Killing projects • Predicting / Managing Risk and Uncertainty • Linking pace of development to predicted demand/timing of opportunity	• Technology / Competitor intelligence
Technology **Challenge:** To develop excellent and unique IP.	• Leading–edge technology know-how in emerging technology field. • Identifying complimentary technologies required to support leading–edge technology • Assessing stage of technology development / time to market	• Technology Intelligence: What other technologies are we competing with? • Competitor Intelligence: Who else is developing technology in this field? • Technology Evaluation: E.g. platform / component? Incremental / Radical innovation? • Technology Trends
IP **Challenge:** To enable you to extract value from your IP.	• Protection e.g. patent • Portfolio Management • IP Strategy	• Patent searching • Freedom to operate • Technology Valuation • Licensing your IP • Licensing IP from others
Macro/Industry Issues **Challenge:** To understand the wider implications of the emerging technology		• Are there regulatory issues re. technology • Are there ethical or social issues re. technology • Are standards required – will dominant technology win?

APPENDIX 2: Research Interviews Listing

Interviewees are grouped but not listed in any particular order. A + denotes more than one discussion.

IfM Staff & PhD Students

David Probert	Supervising PI – several individual and group meetings
Tim Minshall	Supervising PI – several individual and group meetings
Eoin O'Sullivan	20th March 2008
Sirirat Lim	20th March 2008
Rob Phaal	16th April 2008 +
Paul Heffernan	19th June 2008
Elizabeth Garnsey	24th June 2008 +
Sarah Lubik	26th June 2008
Claire Barlow	18th July 2008 +
Eric Stam	June 2008
Letizia Mortara	Several Meetings
Rick Mitchell	9th July 2008
Val Thorn	June 2008

Cambridge Academic Staff

Richard Barker	JBS Supervising PI – individual and group meetings	
Jochen Runde	JBS Supervising PI – individual and group meetings	
Alan Hughes	Centre for Business Research	9th October 2007
Bill Milne	CAPE	7th September 2007
Richard Prager	Engineering Department	17th June 2008
David Cardwell	Engineering Department	17th July 2008
Richard Friend	Cavendish Laboratory	6th November 2007
Ian White	School of Technology	28th Sept 2007
Andrea Mina	Judge Business School	17th April 2008
Shima Barakat	Centre for Entrepreneurial Learning	17th April 2008 +
Jo Mills	Centre for Entrepreneurial Learning	12th Aug 2008

Non Cambridge: Academic Staff

Lynn Shepherd	Manchester Science Enterprise Centre	2nd April 2008
Martin Henery	Manchester Science Enterprise Centre	2nd April 2008
Zella King	Reading University	23rd April 2008
Tom Hyclak	Lehigh University, USA	25th April 2008 +
Mark Leslie	Stanford University, USA	29th April 2008

University of Cambridge Staff/Related Staff

Richard Jennings	Cambridge Enterprise	11th Sept 2007
Alice Nelson	Transferrable Skills	25th April 2008
Lorraine Baker	Graduate Skills	8th July 2008

Judy Swan   Judge Business School   6th May 2008 +
Peter Templeton   CMIL   Several Meetings

Training Suppliers
Simon Pratten   Tristart Ltd   11th April 2008 +
Maxine Ficarra   Praxis   25th June 2008
Bella Connolly   The Learning Collaboration   4th July 2008
John Leach   Winning Solutions   3rd April 2008

Business
Sami Abdel-Malek   Unilever   3rd July 2008
Miles Eddowes   Unilever   26th September 2008
Lesley Bowen   British Nuclear Fuels plc   12th August 2008
Peter Woodland   Alps   19th September 2008

Investors
Mark Rahn   Enterprise Ventures   3rd April 2008
David McMeekin   London Technology Fund   8th May 2008
David Connell   2nd July 2008

Intermediaries
Philip Ternouth   The Council for Industry and Higher Education 3rd April 2008
Keith Herrmann   The Council for Industry and Higher Education 9th Sept 2008
Matt Schofield   London Technology Network   22nd May 2008
Soraya Jones   Cambridge Wireless   23rd June 2008 +
Jeff Solomon   ERBI   11th Mar 2008
Jon Treanor   Conduit Partners Ltd   23rd Apr 2008
Rosco Paterson   IoD et al   23rd May 2008
Chris Williams   UKDL KTN   16th July 2008
Cathy Williams   UKDL KTN   16th July 2008
Cathy Curling   Technology Consultant   19th Oct 2007

CIKC Staff
Terry Clapp   Several Meetings
Mark Leadbeater   Several Meetings

APPENDIX 3: Event attendance listing with relevant speakers.

Eighth Cambridge Enterprise Conference: Growing Big Gorillas
5th September 2007, Churchill College, Cambridge
Relevant Speakers:
Mike Lynch, CEO, Autonomy
Amar Bhide, Professor of Business, Columbia University
David Gill, Tim Minshall and Martin Rigby
Lake Falconer, Corporate Finance Partner, PEM
Arnoud de Meyer, Professor and Director of Judge Business School
Bill Boyle, co-founder Owlstone

CMI - Role of Universities in Regional Development and Growth
12th October 2007, Robinson College, Cambridge
Relevant Speakers:
Michael Kitson, Director, Programme for Regional Innovation
Pete Tyler, Dept of Land Economy, University of Cambridge
Christie Baxter, Department of Urban and Social Planning, MIT
Jamie Merrick, Director of Sustainable Communities, EEDA
William Guenther, President, Mass Insight Corporation
David Secher, CE, N8 Research Partnership
Philip Ternouth, Associate Director, CIHE
Steve Battersby, Philips Research Laboratories

UKDL KTN: Grand Challenges for Emerging Technologies in Displays
31st January 2008, The Moller Centre, Cambridge
Relevant Speakers
Mark Fihn, Veritas et Visus
Stuart Evans – Plastic Logic
George Whitehead – NESTA
Nick Appleyard – Technology Strategy Board
Nicholas Guernion – EPSRC
Mark Rahn – Enterprise Ventures Ltd

CMI - Achieving the Knowledge Economy: Management and Policy in Graduate Education,
10th March 2008, Moller Centre, Cambridge
Relevant Speakers:
Jochen Runde, Director of Programmes, Judge Business School
Dan Roos, Professor, MIT
William Neale, European Commission
Claudio Marinelli, Nokia Research Centre

UKBI – The British Education System: Developing More than just students
30th April, Aston University, Birmingham

Relevant Speakers:
Judy Scully, INDEX Innovation Voucher Scheme
Rob Grant, Director of Curriculum, Walsall College

Institute for Manufacturing – Technology Enterprise Group Seminars
20th May 2008, Doug Richards – Angel Investors
26th Feb 2008, Julian Frankish and David Storey – "Do Entrepreneurs Learn?"
4th Dec 2007, Robert Sansom – "What makes a successful (Cambridge) start-up?"
8th Dec 2007, Tommaso Minola – "Who's going to provide the funding for high tech startups"

Unilever – R&D Academy - Open Innovation Foundation
July 3rd 2008, Kettering, Northamptonshire
Relevant Speakers:
Graham Cross, Miles Eddowes, Gerard Blom, Mike Shaw and Sami Abdel-Malek
Many thanks to Unilever for the invitation to attend.

University of Cambridge - Skilled: Cambridge approached to skills training for early career researchers
10th July 2008, Robinson College, Cambridge
Relevant Speakers:
Rodney Day, EE UKGRAD Hub
David Sargan, University of Cambridge

Cambridge Wireless Event: When Lawyers Add Value Not Cost
10th July 2008, CSR, Churchill House, Cambridge Business Park
Relevant Speakers:
Chris Edwards, VP Legal, CSR
Nigel Swycher, Head of Technology, Olswang
Alasdair Balfour, Competition Partner, Olswang
John Melotte, Regional Director, Corum Group
Andrew Peddie, Corporate Partner, Olswang
Jeremy Phillips, IP Consultant, Olswang
Many thanks to Cambridge Wireless for the opportunity to attend.

IEEC – International Entrepreneurship Educators Conference – Fit for the Future
9th &10th September 2008, Canary Wharf
Relevant Speakers:
Karen Wilson, Kauffman Senior Fellow
Simone Baldassarri, Enterprise Directorate, European Commission
Astrid Berg, Director, NIRAS, Denmark
Theresa Crowley, NESTA

Paul Hannon, NCGE
Keith Herrmann, CIHE
Denis J Garand, Laval University, Canada
Richard Williams, Pro Vice-Chancellor, University of Leeds
Tony Mendes, University of Illinois, USA
John Law, British Council
David Gibson, Queens University, Belfast
Richard Tunstall, University of Glamorgan

'Helping you build your business - Fuelling early-stage technology growth'
24th September 2008: Cambridge Wireless Event
Relevant Speakers:
Jack Lang, Entrepreneur in Residence, Judge Business School
Andrey Kessel, Partner, Amadeus Capital Partners
Ebrahim Bushehri, CEO, Lime Microsystems
Graham Pink, VP of Engineering, Cambridge Silicon Radio
David Knights, Agilent Technologies
John Cooling, Microlease
Phil O'Donovan, Twelve Winds, Co-Founder of CSR plc
Many thanks to Cambridge Wireless for the opportunity to attend.

14th Cambridge Technology Management Symposium,
25th & 26th September 2008, Downing College, Cambridge
Relevant Speakers:
Henning Sirringhaus, Chief Scientist, Plastic Logic
Ray Edgson, Chief Technology Officer, Cambridge Consultants
John Bessant, Chair in Innovation Management, Imperial College
Allyson Reed, Director Strategy and Communications, TSB
Mike Hield, Chief Executive, IXC UK
Jeremy Watson, Director, Arup

APPENDIX 4: Key References

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