

ICT Incubators on Science Parks – A Time for Creativity

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Summary

There is a real prospect that future growth in ICT business – a sector that has dominated demand for technology incubators in the developed world - will not return to the double-digit growth seen in the 1980s and 1990s. The reasons for this and the implications for technology incubators are analysed. The paper also looks forward to the key drivers for change in the ICT sector that could be expected to generate new clients for technology incubators in useful numbers and suggests that fostering creativity and innovation in niche fast moving sectors is a primary goal for ICT technology incubators so as to position their Science Parks for the new generations of technology led business start ups.

The Background

Many of the developed world countries, including most of Europe and the USA have developed incubation environments to a level of between 2 and 10 incubators per million of population as shown in Figure 1. (Compared to China with about 0.36 and India 0.03 incubators per million population). A significant proportion of these incubators, as much as 75% in some countries, are either stand alone technology incubators or technology incubators associated with science and technology parks.

There are several common themes linking the developed world's policy drivers, investment profiles in technology incubators and the nature of the demand for space in the technology incubators.

Key Policy drivers

The key public sector policy driver for the creation and support of business incubators in Europe and N. America is undoubtedly the interest that governments have in increasing the numbers of high tech businesses because of the higher added value employment opportunities they bring. This is often seen as an area where developed world economies can effectively compete against developing economies – at least for the time being. Secondary policy drivers derived from the first include:

- Increasing the rate of transfer of research results from University and public laboratories into spin-out businesses
- Increasing / improving the formation rate of sustainable high growth businesses

Technology Incubator Investment profile

The growth of the technology incubation industry in Europe has been largely driven by the public sector with city, regional and national government bodies all active, particularly from the mid 1980s through to the late 1990s. Private sector investment is generally low. In the USA there has been a greater diversity of investors with philanthropic investment alongside public sector and some private sector investment. The private sector everywhere in the developed world was also briefly engaged in investing in “internet incubators” during the late 1990s. This was a highly prevalent phenomenon in the USA from the mid 1990s that came later in Europe. However, this type of investment disappeared rapidly with the bursting of the dot-com bubble and was shown to be unsustainable.

Incubator Demand profile

In the early to mid 1980s businesses exploiting the then new microprocessor technologies whether in PC computers, specialist industrial controls, embedded processors and programmable controllers were everywhere. Then the shake out began and the byword for success shifted from hardware to software. Even some of the larger more successful hardware vendors such as Prime Computers and HP started buying up software businesses as they sought to take the heat out of the competition they faced in the hardware market. By the mid 1990s consolidation in the PC areas was largely complete and most specialist and embedded processor businesses followed as they were squeezed out by the low cost of computing at one end of the market and the new microchip design houses that evolved to deliver the chips at heart of the mobile telecoms businesses and many other “intelligent” devices – but still the demand for software was insatiable. The rapidly increasing power of processors and the falling unit costs of computing enabled increasingly complex, versatile and easier to use software packages to be developed and run on computers.

The boom of enterprise resource planning and control software that started from word-processing and spreadsheets and continued into CAD/CAM, ERP and eventually CRM as well as specialist software applications, continued up to 2000. While there has been considerable consolidation in software development since then, nevertheless it continues to be an active area for new ICT start-ups but the game has shifted. Outsourcing to developing economies of large programming projects is now commonplace providing significant cost saving opportunities for software houses in the developed world. In addition, during the build up to the dot-com era the Internet created a medium that caused programmer entrepreneurs to move across to website design and development. With an incredibly low entry cost and skill requirements way below that of the machine code and assembler programmers of the early microprocessor systems it was entrepreneur “heaven” and they entered the market in droves. This all coincided with a massive investment by Telcos in the capacity to carry the new internet traffic together with investor appetite to take a stake in the new emerging “clicks” based businesses emerging onto the world wide web.

It is little surprise that all this change and innovation over a relatively short period gave rise to myriads of ICT start-ups throughout Europe and N. America. Therefore it is hardly surprising that ICT based business has been a dominant theme in technology incubators with most general technology incubators having more than 50% of their clients in this category.

During the 1990s there was also a growth of life science / biotechnology based businesses but mostly these were accommodated in specialist bio-incubators. Up to the late 1990s they experienced only modest growth by comparison with the ICT intensive incubators and even in the first six years of the new century there has probably been greater investment in ICT dominated incubators rather than the specialist bio-med incubators.

The Challenge

Technology Incubators in the developed world now face a serious challenge, particularly where their density is high with say more than 10 incubators per million population. The challenge comes from the fact that ICT, which has been the key sector fuelling the growth of technology incubators and science parks, may have reached the limits of the extent of national GDP it can reasonably be expected to account for. In the UK, for example, between 1980 and 2000, ICT business activity grew from under 1% of GDP to just over 4% of GDP with double-digit rates of growth in most years as shown in Figure 2. At this point there has been a levelling off of growth.

The levelling off started with the bursting of the “dotcom – bubble”. However, this was more than a much-needed correction to over-enthusiastic and ill-informed investment decisions

from the major western capital markets. It also coincided with a re-think by businesses and consumers about the value of ICT services in delivering productivity gains in the case of businesses, and utility in the case of consumers. After a pause from 2001 to 2003 both types of buyer came back into the market but there is no hint that their purchasing decisions are going to drive the types of double-digit growth that the ICT industry saw in the 80s and 90s. Thus, there is a plausible scenario which says that in future the growth of the ICT sector in the developed world may more or less match the growth of the economies in which they operate i.e. about 2 – 5% pa. There may be exceptions such as Finland where the economy is largely driven by technology, particularly mobile technology, where there is still some international room for growth.

A second phenomenon occurring in the industry is the increasing maturity of some of its sub-sectors. Hardware is now the province of a few major manufacturers whether it is PCs, hard-drives, mobile handsets etc. Similarly, standard software packages, IT Services and Outsourcing are being provided by fewer and larger businesses. These segments of the IT industry are under increasing cost pressure with opportunities for new SME businesses being confined to serving other SMEs or supplying niche services to the larger companies if for no other reason than that the cost of entry to the mature segments of the industry is now prohibitive. It is no coincidence that when IBM came to sell its PC manufacturing business the only buyer at a sensible price was from China's Lenovo - with its significant cost advantages for large scale manufacturing.

Looking Forward

If this were the whole story then the prospect for technology incubators would be problematical as they face a protracted slow down in the rate of growth of one of their key client sectors as a result of maturing markets and technologies. Entrepreneurs, by their nature, are highly responsive to market changes and are far less likely to enter markets where they see limited growth and limited profit margins.

However, there some drivers that should see a continuing stream of ICT based innovations for many decades to come, these include:

- Moore's Law continues to apply, which is driving up the amount of raw computing power available per \$ - which in turn enables more useful / user friendly systems to be offered to the market
- The increasing convergence of IT, telecommunications, the internet and other media technologies together with the deregulation of traditional telecoms suppliers is providing new market opportunities for value added services
- Ideas emerging from the labs of Universities and elsewhere providing step-change technologies providing either new platform technologies or ways of doing the previously "impossible"
- The Internet and mobile media providing new ways for conducting business, entertaining and communicating etc.

So where are the growth opportunities in ICT?

Deloitte (the international audit and consultancy firm) predict for 2007 some of the following trends where there will be opportunities for profit growth in the ICT sector:

Broadband Appliances

The PC has become a bottleneck to Internet adoption and use. Telecomms businesses might try introducing a range of devices, each for a specific use and in most cases wirelessly mobile. Opportunities abound for portable internet radio receivers, shopping terminals, handheld

encyclopaedias, video security etc. Often each application will work best when provided with a non-qwerty interface designed to facilitate the particular application e.g. the click wheel of some MP3 players works far better than a keyboard.

Mobile Video – but not TV

The Mobile medium is interactive while TV is passive so TV on the mobile is not seen as a significant market. But as cameras on mobile phones increase in capacity and resolution, displaying their output on other media could considerably enhance the video captured by them. Simple upload systems with just one click, via internet or otherwise need to be built into mobiles and tariffs need to change to make upload cost acceptable to mobile users.

The Connectivity Chasm

Connectivity is a major driver of economic progress and personal productivity. However, free public WiFi broadband for all is not the answer if users cannot afford the PC to connect. Sustainable approaches need to be devised and implemented. Ideas such as co-ownership amongst several or a small community allows the benefits and costs of connectivity to be shared. This is particularly pertinent in developing economies.

The Hidden Costs of Storage

Although the costs of digital storage devices continue to fall the other costs of holding data are increasing with technologies for virus protection, backups, recovery services and the physical costs of keeping electronic racks cooled, fire protected and secure all rising. ICT business will need to find optimum configurations of new and older generation technologies for long and short-term secure data storage for their customers bearing in mind that today only 10% of electronic information is held digitally with over 90% still retained on magnetic media.

Business and Biometrics

Identity and security of personal information and property and access to it can best be safeguarding if use of biometric data becomes accepted. No doubt as soon as biometric security starts to enter the market seriously there will be technological attempts to subvert it. However, standardised biometric techniques would provide large market opportunities for solution providers and advantages to both individuals and businesses alike.

These are only a few examples drawn from a much longer list drawn up by Deloitte in their Technology Media and Telecommunications Predictions 2007⁽¹⁾.

The problem with these predictions is that they are mostly short-term opportunities and any ICT business that is not already heavily engaged with the relevant sector and technologies stands little chance of securing a strong position in the market. Furthermore, few technology incubators have the expertise to help their clients to step into these areas from a standing start. It is not so much that there is a high cost of entry, but such is the pace of change there is a substantial premium for the know-how / experience to be able to enter the market at the scale necessary to compete.

Action Opportunities for ICT Incubators Managements

How then can an STP / Technology Incubator best help its SME ICT clients, particularly those that are now caught in the maturing parts of the industry and who do not have the scale to become a market leader?

What we can be sure of is that the evolution of ICT in addition to having some of the short-term trends described above is moving to become increasingly pervasive in every aspect of human life, whether at work, at home or at leisure. All that can be said is that digital information, communication, controls, entertainment all appear to be becoming more and more central to everyday life, making everything happen more easily and more quickly. It seems unlikely that this revolution in our lives has reached its peak yet. We are still a long way from the type of utility levels that we know these systems should be able to give us one day.

Whether creativity and innovation in these areas will cause the growth of the ICT industry to rise significantly above the level they have achieved today as a percentage of GDP in the economies of the developed world is a matter of judgement. Nevertheless, the challenge for STP technology incubators is to provide an environment which helps their clients to move into the areas which are neither linked to a short-term trend (if their client is not already engaged) nor places them into the mature sectors (unless of course they have a new business model that will become the next industry standard).

Conceptually, we could describe some possible action areas for STP managements, such as:

- Recognise the fast moving areas of the industry and the convergence of technologies and encourage entrepreneurs to think creatively in these areas.
- Work with Universities to identify the “step change” technologies that can offer technology “leapfrog” opportunities that will be disruptive but potentially highly profitable.
- Looking at models of creativity that rely more heavily on the cross fertilisation of ideas that comes from bringing together several organisations with different skills and perspectives.

What would these action look like? There are many possibilities but this paper will identify just two models that have been proven to work in the UK context and may well work elsewhere.

Mediated Networks for Creativity

In a mediated network the STP acts as an honest broker bringing together a small group of 5 to 10 ICT business - all with an interest in diversifying their customer base. The businesses are likely to be competitors at some level but should have some complementary skills. The process of mediating the group helps them to overcome the competitive instincts and takes them through the steps of:

- Identifying common business interests and problems
- Establishing areas for mutual cooperation
- Identifying new business opportunities that are possible only from pooling their skills
- Creating an agenda for action designed to deliver the identified business activity.

In this process a few of the original participants may drop out but the remaining businesses will be motivated to go forward to create the business opportunities that they have together identified. In recent work of this kind at the University of Warwick Science Park nine micro clusters of ICT SMEs were established involving over 90 SMEs. At the beginning the micro-clusters operated completely autonomously but after several months cross over activity started between the groups creating genuine clustering behaviour which lead to more business activity for the group members. Some, but not all of the groups went into creativity mode and

sought to develop new technology ideas to help them to diversify away from their existing mature sector.

For example, a group of Computer Games businesses addressed the prospect of applying their skills to developing “serious games” for healthcare training. The group’s mediator introduced into the group the chairman of a regional primary healthcare trust who helped them to understand where virtual training systems could have large cost savings to the multi million pound training budget of his Healthcare Trust alone. The ICT companies were then in a position of understanding the market opportunity and what it would take to get into the market. The group then went into creativity mode with their mediator exploring how they might establish a presence in the “serious games” market. One of the businesses found a quick win that soon added substantial new turnover and other businesses in the group are developing products for the healthcare training market.

Centres of applied technology excellence

It is often difficult for technology start ups and SMEs to talk directly to the academic departments of Universities. There are simply too many differences of perception, timescales and priority in most cases. Over the last 5 – 10 years in the UK, special funding from the UK government and from regional development agencies has permitted universities to establish operations in specific areas of technology to act as interface technology transfer units between business and academics. However, most of these units are small and can only service, in-depth, a modest number of clients each year.

The experience of the University of Warwick Science Park is that these units are of limited value in assisting new start and early stage technology businesses. In the highly complex world of technology these small university units tend not have enough depth or breadth of knowledge to solve the technology innovation problems of most clients. However, at the University of Warwick there has been one notable exception and that is the Warwick Manufacturing Group. This group has about 300 professional staff and covers many aspects of technology relating to industry. The whole group is dedicated to working with business at all levels. When the Science Park takes a business to meet this group we can usually identify an individual who not only understands the technology but also the market and who is able to move the thinking of the client company forward very quickly, identifying the best type of technology solution.

This experience has led the regional economic development agency covering the area where the University of Warwick Science Park is located to plan much larger technology transfer units with different specialisms. Three of the largest projects now under construction include:

- The Digital Laboratory that will be resourced at over €70 million for the first 5 years. This centre of technology excellence is an offshoot of Warwick Manufacturing Group and will concentrate on two areas of digital applications:
 - Medical technologies for imaging, tele-medicine and hospital healthcare generally. In this area the Warwick Manufacturing Group will be collaborating with the Warwick Medical School and the nearby recently built, state-of-the-art, super Hospital
 - Digital technologies in the production industries
- The Advanced Construction Technologies UK Lab with resourcing of €40 million over 5 years that is led by Coventry University. This centre will employ virtual reality technology to help businesses in trialling and developing new construction methods, systems, materials and technologies in a virtual world before testing on-site. Thus, the facility will offer large cost savings to companies developing new products and services for the construction industry.

- The Health Design and Technology Institute, resourced at €60 million over 5 years and also operated by Coventry University will concentrate on healthcare technologies for patients with chronic conditions living at home.

Another initiative for a substantial centres of excellence is being planned in the field of sustainability / environmental technology.

All these Centres of excellence are of a scale that enables them to have both depth and breadth of competence, and so will be able to handle enquiries from most businesses interested in the specialist areas of the centre. The expectation is that the creative environment of these centres will help many more businesses to develop technologies for new markets and this will put ICT businesses within the region in a position of competitive advantage.

Conclusions and Summary

ICT businesses are historically one the largest client business sectors of technology incubators. However the industry is increasingly becoming a less intensive user of property, particularly in the segments of the industry that are now regarded as mature. Technology Incubators need to concentrate on the front line of ICT where there is rapid change in the market place, convergence of technology and where premium value pricing for well-differentiated offerings are still possible.

However, many of the obvious areas for ICT innovation are well recognised and entrepreneurs and SMEs need to be already engaged in the relevant markets and technologies if they are to stand any chance of competing, such is the pace of change.

Technology Incubators need to be able to help entrepreneurs who are do not have this leading-edge market and technology experience to leapfrog beyond the obvious opportunities to “safer” market opportunities. Two ways of achieving this are either through mediated small business clusters or technology transfer units operated by the local knowledge base. Technology Incubators can establish mediated small clusters to unlock the creative potential of SMEs and start ups by bringing together complementary businesses and guiding them towards ideas which collectively (but not individually) they have the ability to develop and deliver. However, establishing effective technology transfer units at a university to serve as a seed bed for creativity depends on the experience of each university, their policies towards business and enterprise and the resources available to them for this type of work. At present the UK and much of Europe has too many small and relatively weak technology transfer projects. Experience shows that larger better resourced projects stand better chance of providing the creative eco-system that businesses need today as they seek to exploit niche markets and identify new markets.

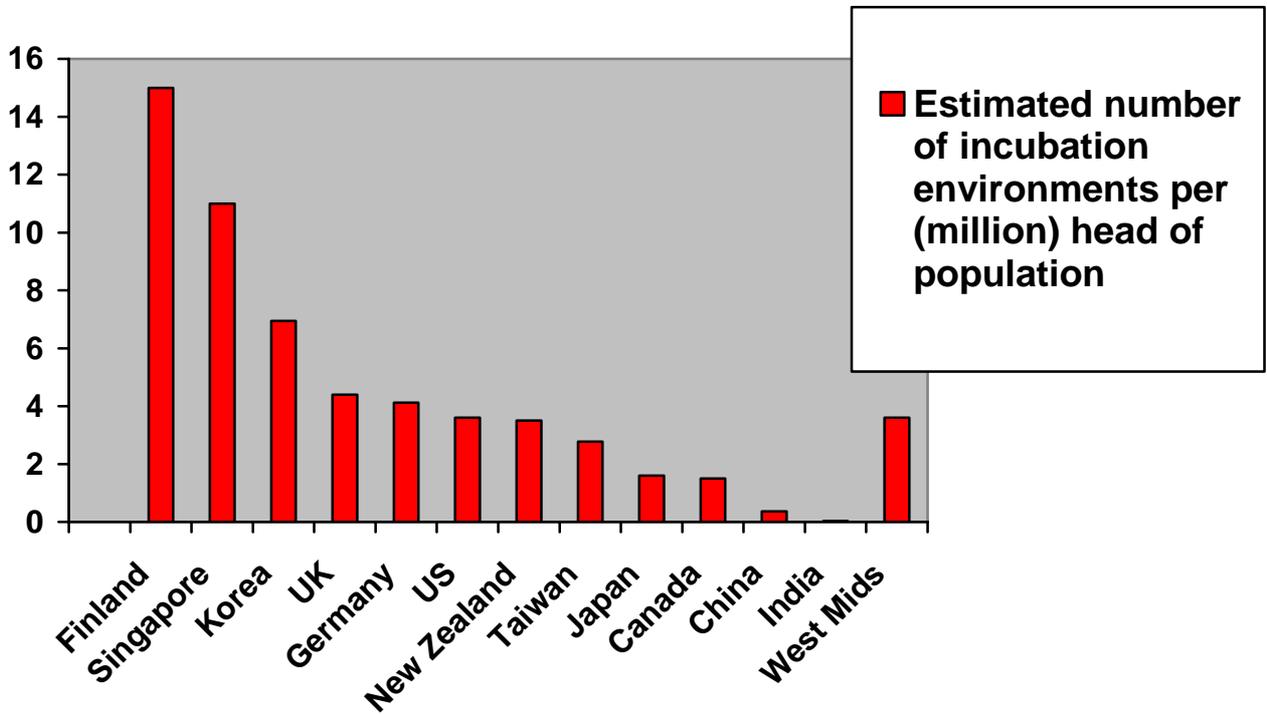
References

- (1) Three titles by Deloitte under the general heading of “TMT Trends 2007” (a) Technology Predictions, (b) Media Predictions (c) Telecommunications Predictions, all January 2007. Available as downloads from www.deloitte.com

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Figure 1 International Comparison of the Density of Business Incubation Environments



Courtesy of UKBI, 2006

Figure 2 The Growth and Maturing of the ICT Industry in the UK

Courtesy of Ovum Consulting, London, UK, 2006

