Report for UNESCO on the Proposal for a Pilot Science Park in Egypt

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This report has been supported by a UNESCO programme that has included a series of workshops in Southern Africa, West Asia and East Asia with the intention of developing technical assistance for developing science and technology parks. The first pilot project is focusing on this process in Egypt.

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EXECUTIVE SUMMARY

1 Many developing countries have recognised the need to adopt a long term economic strategy that shifts some of its focus to developing a more extensive knowledge based economy.

2 To achieve this requires planning at a national level in order to create the right environment in which to integrate the supply of knowledge that derives from investment of national resources in science, technology and education, with demand and to stimulate business and government to utilise the knowledge output and drive this up the commercial value chain.

3 Building a knowledge based economy requires both a relevant supply of technology and demand for this from industry and other customers including government. In some countries there are weaknesses on both sides of this supply and demand relationship as well as at the interface between the two.

4 It is now widely understood that the greatest chance of success in developing these connections on a broad front needs the cooperation between the three stakeholder groups of government, higher education and business.

5 The experience of many countries, whether they are either developed or still in an early stage of development, is that these links are difficult to establish and sustain.

6 In some cases, where there is a long tradition of innovation the relationship between knowledge production and demand for this is market driven. Demand from business creates the necessary links across which to transfer relevant knowledge that in turns generates innovation. However, where these linkages do not exist there is no doubt that to start this process it has to be policy driven through a political will to create the right social, technology and business related policies to foster collaboration.

7 One strategy adopted to create better connections between business and higher education has been to develop science and technology parks.

8 This report touches on some of the issues relating to strengthening both the supply and demand side of the activities necessary for building a knowledge economy and the way these relate to the development of science and technology parks.

9 Currently there are over 500 projects in the world that would fall into this category although not all are called science and technology parks. Other descriptions range from research parks, through science and technology parks to science cities. There are differences between these projects but in essence they serve a single purpose which is to drive technology up the value chain and extract wealth from putting technology led products and services into the market place.

10 International experience is that central government support for science and technology parks is critically important to their successful promotion in developing countries because this ensures funding, greater likelihood of securing planning permission (zoning approval), appropriate investment in national and regional innovation strategies, international promotion and longer term strategic support; however, it is also clear that the real strength of these
projects comes from the way central government stimulates local efforts for knowledge based economic development. There should be a strong ‘do-it-yourself’ dimension to technology policy that provides a stimulus for a bottom up efforts at the local level.

11 Evidence from international experience shows that the most successful science and technology parks are those which capitalize on existing locational factors which influence the capacity for generation of knowledge capital, the capacity to actively engage with this output and the creation of new technology and products (includes services) that find a market. To do this requires scientific and technological competence, relevant social and human capital that can exploit this, markets for the outputs and the right physical facilities in which these linkages can be fostered and developed.

12 Important physical factors in starting this cycle of generation are the role of a high-grade university, the location of a variety of research facilities, the attractiveness of the area to highly-qualified workers and entrepreneurs as a place to live and work and easy access to major cities by an efficient transportation network.

13 Many countries use the development of science and technology parks to create, support and strength both the physical factors and the linkages between business and higher education.

14 In addition many countries have supported these parks by importing wider National Innovation Systems (NISs) or Knowledge Based Industrial strategies (KBIs) into a local context.

15 If these strategies have not already been developed in a country it is suggested that it may be helpful for these to be formulated through a Knowledge Based Industry Strategy and associated National Innovation System which then provide a framework for creating a potential investment opportunities for both universities, the private sector and for medium term regional planning.

16 An effective way in developing a local dimension to these national strategies is through the development and implementation of Regional Innovation Strategies (RIS). It has been found that RISs are an important strategic factor in achieving decentralization and creating a better balance of development between a capital city area and other local regions.

17 The RIS model stresses indirect support to the business environment including the formation of networks and the coordinating of extensive systematic industrial development by the economic agents in a region.

18 Many countries have also put in place coordinating organization such as Regional Development Agencies (RDA) for deploying these RISs and helping to development local industry.

19 Where appropriate science and technology parks can fulfil a core of role in implementing these RISs as they are designed to offer a ‘one stop shop’ for high-tech firms or small and medium sized enterprises (SMEs) by providing access to major support activities to help them with their innovative industrial activities,
The optimal set of components for successful science and technology parks include, as a central component, a university or research centre that provides both the necessary qualified staff and the basic R&D, accommodation for commercial activities, access to technical facilities and support services which focus on giving commercial advice to the companies that locate on the site.

In some instances where university facilities are not close enough to where a science and technology park is being planned an alternative has been to locate a research institute on the site as an initial focal point for R&D which can then be developed into a stronger network with other universities and research centres in the region. However, it is also important that in creating these links production capacity is also developed and protected.

International experience has also shown that the presence of pre-incubation and more importantly full incubation are important facilities on science and technology parks.

Providing accommodation for companies that grow on site is also highly desirable because retaining ‘home grown’ companies not only helps to build clusters of technology based companies that can network in order to refine technologies and business models but it also helps build the right services that in turn can be delivered to them in an economical way as they are concentrated on a single site.

Sites that can be reserved for larger buildings are also important as these provide larger companies with opportunities for investment.

The Korean experience is that to be most effective, links between R&D and production need to developed, or where they already exist, strengthened. It is suggested that ideally to provide for this, all science and technology parks should be developed in locations where there is also easy access to high quality, technology ‘friendly’ industrial space.

In a wider urban planning context it is important that consideration is given to developing a high quality environment in order to improve recruitment and retention of the necessary high-qualified workers and entrepreneurs that are attracted to the site.

The current policy framework in Egypt, which also has ministerial support, is favourable for the creation of a number of science and technology parks. That is, there is a fund to support technology transfer, there is a commitment by government to support a range of emerging important areas of scientific research, and a commitment by government to help to modernise the Egyptian industrial base.

Additional factors that support the proposals are high numbers of graduates, recognition that there is a need for change, and an emerging interest by business in establishing higher value products and services that will help them to modernise and find new markets.

A number of early science and technology park initiatives are already underway in Egypt and there is also some longer term planning taking place for others that will build on the initial experience of the earlier projects. These projects are being led by central government.
30 It is suggested that the science and technology park development programme in Egypt should emphasize links between research and production. One strategy to achieve this is to locate high-tech industrial parks next to the proposed science and technology parks so that the option exists to first attract industrial plants to create an agglomeration of industrial activities. It is therefore recommended that this strategy is adopted for the development of the initial science and technology parks in Egypt. This is suggested because of the need to create industrial activity as a pre-cursor to high-tech development.

31 The most advanced of the current science and technology parks in Egypt is the Mubarak City of Science and Technology (MuCSAT) in the Arab El Bourg region.

32 MuCSAT is comprised currently of a number of research institutes that focus on specific technologies and there are others being planned that will increase the supply side of the science and technology in subjects that have commercial potential.

33 Along side these there are plans to continue to develop the site with the other components which make up a science and technology park.

34 The design of most traditional science and technology parks provides for pre and full incubation of both spin out and start up companies, 'grow on' space and sites for larger buildings to accommodate the growth of home grown companies and those that are attracted to the site as inward investors. It is suggested that this pattern is adopted by MuCSAT.

35 It is suggested that the proposed business incubation services should provide technical assistance including supervising and consulting activities to cover the various request from SMEs in MuCSAT and its catchment area.

36 It is also suggested that, intellectual property ownership policies and technology transfer strategies with associated policies and management teams are developed and deployed for universities in Egypt. If not already in place these should be introduced as pilot programmes in universities that are being used as locations for the initial science park programmes.

37 Experience has shown that these management structures are valuable where universities do not have a strong tradition of supporting the commercialisation of technology.

38 Strategies should include those for funding technology transfer programmes in universities, reviewing contracts of academic staff to ensure that there is sufficient flexibility in these to enable these members of staff to engage with and in commercial activities associated with innovation and audits of research in universities to establish the extent of any technologies that have commercial potential.

39 A number of programmes in, for example, Korea and the UK have been developed in stimulate demand by industry for knowledge through which to increase innovation by industry and support industrial development. If such programmes are thought to be of interest it is suggested that these might be reviewed and if appropriate might be deployed in a relevant form in an
Egyptian context. Specific details are not set out in this report as these are quite detailed and would need careful review before they could be made ‘portable’ to other economies.

40 The extent of subsidies for businesses that undergo incubation varies significantly between different countries in which science and technology parks operate. The greater the subsidy the greater likelihood of funding technologies that may fail in a commercial context unless the system for managing these investments is based on similar criteria as those adopted by commercial money.

41 It is suggested that those involved in the management of science and technology parks should have commercial and either scientific or technological experience as this can prove valuable in managing business formation and growth. For information there is significant valuable and relevant experience in the equity finance sector.

42 To give confidence to business that locating on a science and technology park, these projects need to be managed in a business like manner.
1. SECTION ONE - INTRODUCTION

Work programme

1.1. This report has been prepared to provide an international view about science parks through which to provide some technical assistance to the Ministry of Higher Education and State Ministry of Scientific Research as part of the national strategy and business plan for the developing science and technology parks in Egypt.

1.2. To provide this assistance UNESCO, through its Science Policy and Sustainable Development Division, Natural Sciences Sector and its Office in Cairo, set up a project team made up of two international partners Professor Deog Song Oh from Korea and Dr Malcolm Parry from the UK under the guidance of Dr Yoslan Nur from the UNESCO Headquarters in Paris. Their respective biographical details of the two international partners are set out in Appendix 1.

1.3. The project involved visits to the cities of Cairo and Arab El Borg which is part of Mubarak City that is associated with the City of Alexandria. The visits took place between the 21 and 25 July 2007.

1.4. Details of key individuals with whom meetings were held in developing this report are noted in Appendix 2.

1.5. In preparing this report visits were made to the following organisations:

- The Ministry of Higher Education and State for Scientific Research
- Smart Village, Desert Road, 6 October City
- The National Research Centre Cairo
- Cairo University
- MuCSAT, Borg El Arab, Mubarak City
- Some of the Board of Trustees of the MuCSAT
- The Industrial Development Authority - Cairo

1.6. The visits and meetings provided information which has been used to set out a framework for continuing to discuss the project and on which to base a series of draft proposals for further discussion and development.

1.7. In order to provide technical assistance the report both describes what has become accepted as best practice in planning, developing and managing science and technology parks and considers the science and technology parks that are either being developed or being planned in Egypt against this background.

1.8. The report is not intended as a template for what should be done but is intended to put an international perspective of science and technology parks which can then be interpreted on a national basis to suit local culture and business practices. However, it is suggested that any cultural perspective that tries to focus the activities on science and technology parks on scientific endeavour without a clear market focus should be avoided.
2. SECTION TWO – REVIEW: SCIENCE AND TECHNOLOGY PARK DEVELOPMENT

Science and technology parks as instruments of economic development and regional innovation.

2.1. Today there are record numbers of graduates leaving universities and these individuals compete in a labour market that does not always provides employment at a level that takes full advantage of their talent and skills.

2.2. In Egypt there are reported to be some 14.5 million students at universities. This indicates a very high level of investment in developing a skills base in the country. However, it also poses the important question of what infrastructure and support is necessary to build on the potential of this young talent?

2.3. In addition global competition is starting to strain many economies as they compete with other countries for market share in the traditional industrial sectors in which they have operated.

2.4. To counter this it is widely recognised that one of the strategies to improve competitiveness is to develop a knowledge based industrial and economic base.

2.5. The structure of a knowledge based economy is founded on effective connections between knowledge capital that comes out of competence in science, technology and engineering activities and its exploitation through innovation.

2.6. This can operate at two levels. The first is an attempt to attract inward investment such as a branch plant of a large corporation which may bring with it new technology and the second is to try to build locally based businesses from its indigenous science base. The evidence from a number of countries is that the connection that is formed between a branch plant and a locality is often tenuous and easily broken whereas the relationship between a locally based business that derives from local scientific or technological competence is more sustainable.

2.7. The foundation of the latter process already exists through the traditional role of universities which has been to uncover new knowledge through research and pass this on to new generations through teaching. However, it has now been recognised by many universities that although these activities are critically important, their contribution to economic development are not sufficient to keep pace with changes in the world economy and they need to bring into play new ways to influence economic development.

2.8. Having said that it is clear that universities are not able to do this alone. The consensus today is that, to be most effective, government and business must engage with this modernisation process.

2.9. Strategies to accelerate this process at national government level include those that are focussed on altering the fiscal, social and technology base in a country to make them more amenable to change in order to support the performance of the knowledge based industry. In the case of the ‘technology’
2.10. Over the last 50 years a number of projects have been developed with the specific intention of building an economic base on the output of scientific, technological and advanced engineering activities. However, more recently the objectives of some of these projects have been extended to create higher level employment opportunities for graduate and post graduates.

2.11. A simple review of these projects suggests that they can be classified in a number of categories. At the most strategic level a number of countries have established large scale ‘science’ city developments that are focused on supporting wealth creation from science and technology or advances in these activities. Another term that has been used to describe these projects are technopoles or technopolis. Projects that fall into this category can be found in Russia, South Korea, Japan, France and possibly China. In addition there is a large number of projects that are based on significantly lower levels of investment and include science and technology parks, research parks, science parks, technology parks and incubators.

2.12. In some cases these projects focus on single technologies while others have a more open policy and cater for a wider range of technologies.

2.13. This report is mainly focussed on developing science and technology parks for Egypt but does touch on other larger projects and the role these can play in economic development. It is suggested the wider issues associated with these larger projects may have some relevance in considering science and technology parks in a broader national context.

2.14. It is generally accepted that science and technology parks can assist in the transfer of technology from academia to industry through consultancy, research contacts, informal contacts and the formation of spin-off companies.

2.15. The main contributions to technology transfer by science and technology parks arise from their proximity to higher education institutions (HEIs) or centres of research and the encouragement of contacts between the management of firms on these parks and academics.

2.16. These factors are favourable to the establishment of informal networks, the more effective use of the physical facilities of HEIs and the encouragement of spin-off firms in which academics move into the industrial sector. In this way the experience of academic institutions can be brought to bear on industrial operations at close range and effectively.

2.17. An additional dimension provided by science and technology parks in the context of the formation and growth of academic spin-off firms is the moral support offered to the scientific entrepreneur in the change from a research or academic environment to an industrial one.

2.18. This support is often delivered on science and technology parks through incubator/innovation centres designed to provide small units of accommodation with shared services and business advice. This advice comes in a number of forms which includes mentoring, that is provided at no
cost, coaching which may be paid for, and through investment which also bring with it business experience.

2.19. By these means, the process of spin-off can be encouraged and made more certain, thereby adding to the local industrial structure both quantitatively (although initially the effect will be small) and in terms of diversity of technology, which will in the long run be an important factor in regional innovation.

2.20. These benefits have been acknowledged in Egypt with both new policy frameworks being promulgated and expanded investment in science and technology. Examples of particular technologies being included are some associated with energy and desalination, and advanced materials and it is understood that additional technologies that have either strategic global value or local impact are also under consideration.

2.21. However, it is suggested that in the initial stages of development the science and technology park projects in Egypt should take a broad a view as possible of the technology based companies that they support and accommodate. Too restrictive an approach does not always provide for the full range of entrepreneurs that these sites attract.

2.22. On a broader basis many regional governments or their agents are putting regional innovation strategies in place that are aimed at drawing business and universities closer together.

2.23. At a local level the real focus has been on ways universities can contribute to the knowledge based industry programmes.

2.24. It is important that these threads are worked together in a coherent set of investments and programmes that are aimed at:

- Improving the quality and relevance of research outputs.
- Making business more open to work with these results.
- Bringing up the competence level of graduates so they can help industrial companies absorb technologies that drive quality and efficiency.
- Improving access to universities so they are more responsive to the needs of business.

2.25. However, technology and knowledge transfer is an extensive subject in itself as it involves both change in management structures and cultural change within universities.

2.26. Experience has shown that without the capacity to engage in business in a legitimate way many university staff feel that there is no incentive to pursue this kind of activity. It is recommended that if this is a constraint, legislation should be introduced to enable universities and their staff to invest or take a position in businesses while retaining their university roles or being allowed the freedom to move between these sectors.

2.27. Where this has already happened a number of strategies have been adopted to do this. Examples include:
• Establishing research institutes that focus on commercial and industrial problems or topics of research that have strategic national importance. This has the added benefit of helping contain the costs of research for industry as many of these institutes also receive public funds.

• Altering the range of subjects and courses that are taught in universities to make them more relevant to a modern economy.

• Putting in place management structures in universities that enable their staff and students to take an active role in supporting community and business development. There has been a legal requirement for this to happen in the UK since 1997.

• Creating internal management structures in universities that have the designated task of identifying science and technology that has commercial potential and pushing this towards exploitation by either licensing any patents or by creating a commercial vehicle for exploitation. Many universities have created industrial liaison offices to help to professionalize these links with the community, manage research outputs from their research base and put this into the commercial domain. Themes for these groups include for example: commercialisation and entrepreneurship, regional economic development, research grants, and knowledge transfer strategies.

• Creating science and technology parks associated with specific host universities.

2.28. In the latter case there is evidence\(^1\) that science and technology parks are effective in supporting innovation; however, their greatest impact is when they operate in environments that provide the right social, business and technology conditions to effect good connections between knowledge capital and the organisations (companies) that can exploit this.

**Trends of science and technology park development in a global context**

2.29. There are over 500 operational science and technology parks in some 50 countries in North and South America, West and Eastern Europe, the Asia Pacific region and more recently in Western Asia.

2.30. Among these are locally led projects that are initiatives which have been promoted and developed by universities or other centres of research while others, which are also referred to as a technopolis or technopole, are where civic authorities either at a national or city level have put in place planning policies and support strategies which favour the development of technology based industries that have the capacity to innovate. The policies to help to achieve this relate to both the development of technology competence as well as appropriately qualified human capital.

2.31. Empirical evidence has identified four ways in which science and technology parks can boost local economic development and increase local innovative capacity, these are:

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1. \(^1\) UKSPA 2003, Evaluation of the past and future economic contribution of the UK Science Park Movement. Published by UKSPA in conjunction with the Small Business Service.
• Encouraging and facilitating the formation and growth of new businesses based upon the research knowledge and expertise available within a HEI or other centre of research. The existence of a technopolis, in particular a science and technology park, near an HEI encourages researchers to consider the commercial exploitation of their research and offers them a location amenable to this process. Science and technology parks can also play an important role in complementing regional business activities both promoting the establishment of new businesses.

• Acting as a catalyst for change in a region. They often provide new sources of employment in an area of traditional industry and help to change the image of the area by demonstrating that it can create, attract and support high-tech industry. This effect may extend beyond the science park because of the opportunities created for existing suppliers to become subcontractors to the new companies, thus widening the benefits and introducing these suppliers to new technologies and skills.

• Acting as a mechanism to upgrade technological sophistication and added value to existing industry by providing a location where technical support can be given to local firms which manufacture and market products.

• Providing infrastructure, particularly where this is part of a technopole, to support technology-led economic development. In high-tech endeavours, the main resource is highly skilled personnel. To support these individuals the quality of life has become a major competitive dimension in regional development strategies related to high-tech centre development, and high-tech industries have tended to establish themselves in areas offering a high quality environment in order to attract and retain these skilled individuals. Therefore, when setting up a science and technology park, active policies to improve the quality of life are important. As part of such a strategy, an attractive community including quality housing and cultural facilities should be considered as part of a science park project to help draw skilled engineers and scientists from major cities or foreign countries.

2.32. More specific to Western Asia and North Africa, Iran has over 15 sites that are being developed as science and technology parks, the Gulf States of Qatar and Dubai have projects, Saudi Arabia has already begun the development of the Dharan Technovalley associated with King Faisal University of Minerals and Petroleum, there is an ICT Centre now coming on stream in Riyadh and King Saud University in the same city has been granted funds to develop a 120 hectare site, known as KSSP, on its campus. It is understood that in North Africa Algeria has already established a small centre and the Nigerian government is planning a major investment. It is clear that the number of science and technology parks is rising steadily with the recognition of the value of these sites as instruments of economic development.
2.33. There are a number of definitions that have been set out for these projects by such organisations as the UK Science Park Association’s (UKSPA)\(^2\), the American Association known as AURP\(^3\), and the International Science Park Association (IASP). Successively each of these is more inclusive and explicit over the kinds of projects that qualify as science and technology parks\(^4\).

2.34. It may be of interest to know that very recently the benefit of these projects has prompted organisations such as the European Commission to recognise and promote science and technology parks as facilities that help to create ‘Research Intensive Clusters’ in order to improve regional economic performance. A report by the Commission is anticipated in late 2007.

\(^2\) The definition of a science park now used by the UKSPA is:

A science park is a business support and technology transfer initiative that:

- Encourages and supports the start-up and incubation of innovation-led, high-growth, knowledge-based businesses.
- Has formal and operational links with centres of knowledge creation such as universities, higher education institutes and research organisations.

\(^3\) The AURP's definition is as follows:

- They are master planned property and buildings designed primarily for private/public research and development facilities, high technology and science based companies, and support services.
  
  There is:
  
  - A contractual, formal or operational relationship with one or more science/research institutions of higher education.
  
  - A role in promoting the university's research and development through industry partnerships, assisting in the growth of new ventures and promoting economic development.
  
  - A role in aiding the transfer of technology and business skills between university and industry teams.
  
  - A role in promoting technology-led economic development for the community or region.

\(^4\) A science park is an organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a science park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities. IASP’s definition also goes on to say that the expression “science park” may be replaced in this definition by the expressions “technology park”, “technopole” or “research park”
Comparison of international experience

2.35. There are important differences in the motivation for establishing science and technology parks, although their development has occurred in the context of the economic and social changes that have taken place since the 1970s-1980s.

2.36. Examples of these differences are that most science and technology parks (STPs) in Europe particularly in the UK and Germany have been motivated by the need for HEIs to transfer technology to SMEs but in contrast in Japan and Korea, the need for decentralization from major cities was the crucial factor behind their equivalent technopolis programmes.

2.37. The development of European science and technology parks has tended to grow out of locally-based considerations, while East Asian STPs have traditionally been developed to meet national and regional policy needs.

2.38. There are both similarities and differences between the establishment of science and technology parks in the UK and Germany. In both countries, policy has emphasized the importance of technology transfer programmes directed at SMEs because they are seen as playing an important part in local economic development. Many universities have also developed spin-off activities and closer links with industry.

2.39. In contrast, Japanese and Korean approaches are dominated by pressure towards regional decentralization in countries where congestion, the deterioration of the living environment and spiralling land prices in the major cities have become a threat to future economic development. In Korea, however, a strong drive by central government inspired by the experience of other countries like the US and Japan, together with past success in new town development and the relocation of government R&D centres from the capital region, led to the establishment of technopoles.

2.40. These contrasting approaches in European and East Asian countries in terms of the development of STPs are an influence on the main objectives for these developments.

2.41. The UK and German approaches are usually characterized by small scale property-led development within the existing urban framework. To ensure that successful companies remained integrated in the existing network, science and technology parks provide appropriate resources in the immediate vicinity. The siting of UK science and technology parks adjacent to universities was seen as a way of improving the exploitation of academic research and encouraging academic entrepreneurship. Later science and technology parks were enthusiastically taken up by local authorities as a means of boosting local economies, but the university-led basic R&D activities remained as a main concern.

2.42. Japan and Korea’s technopolis programmes for technology park development are part of comprehensive urban development plans which involve the creation of new settlements complete with research parks, new universities, technology centres, housing and urban facilities. From the outset the new town model was very much in the mind of the planners who also saw
the programme as an instrument for promoting the decentralization of activities from major metropolitan areas.

2.43. Industrial and technological development: the main thrust of the Japanese and Korean technology park has been to promote manufacturing production, whereas science and technology parks in the UK and Germany are primarily concerned with commercialising research and development activities in order to influence the further development of their knowledge economies.

2.44. Other more detailed local difference are also apparent; for example in the UK those parks, which define themselves essentially as research parks, explicitly exclude manufacturing activities from their premises, while German and all other UK science and technology parks permit light industries where they relate to the translation of scientific knowledge into new products.

2.45. To maximize the opportunities for technology transfer in local areas, each Japanese technology park has an incubator which has much in common with the innovation centres in Germany and with some science and research parks in the UK.

2.46. Korea’s programme of local high-tech industrial parks is intended to be more production oriented through attracting high-tech firms to remedy the poor base of high technology industries in many localities. In Korea, however, there are few opportunities for technology transfer between incoming branch and factories and local industries, since the establishment of SMEs is not encouraged through incubation policies.

2.47. Public sector involvement for regional economic growth: the role of government and the local authorities varies substantially between the science park development approach. In the UK and Germany there has been no direct intervention from central government to promote and the proliferation of parks reflects local rather than national efforts.

2.48. Most UK science and technology parks are partnerships involving a higher education institution, a local authority and some financial institutions. In Germany, on the other hand, local authorities (city government) are the main sponsors for the development of science and technology parks, and there is only limited university involvement except for a few establishments on university campuses. An example of such a park is the Dortmund Technology Park.

2.49. Central government has been fundamental to the development in Korea and Japan. The science cities in both countries were established through central government initiatives. The real strength of the programme lies in the ways in which central government has stimulated local efforts. In both countries the central government has been critical in shaping the proposals submitted for designation and it has also been closely involved in monitoring the implementation of the technopolis programme. However, there is a strong ‘do it yourself’ dimension to technology policy that provides a stimulus for bottom up efforts at the local level.

2.50. Experience suggests that despite these definitions there are still many that misunderstand these projects. The most common misconception is that they are locations where the primary purpose is to continue to invest in science and
technology rather than locations where the intention is both to build companies that are attempting to commercialise the output from research and development and draw entrepreneurs out of existing businesses who have new technology based business ideas that they want to develop and they need a base and support to do this effectively. Care should be taken to ensure that this commercial focus is not lost and the wrong focus is adopted.

National policy framework: science park development in a regional innovation system (RIS)

2.51. Taking a broad overview of the drivers for science and technology parks it is apparent that they fall into two categories.

2.52. The first are parks that are fortunate in that they have been established in locations where there is a significant market demand to sustain them. The second category is those where they have been developed a response to a national policy such as a KBI strategy or NIS.

2.53. Since the start of the industrialisation of society drawing up and implementing science and technology policies including those for innovation has been positioned as a major duty of modern states. Especially, in more technologically developed societies in which technologies infiltrated into daily life, it is impossible to ignore the influence of science and technology policies initiated by states because of the social changes these produce.

2.54. To grow and develop a modern technology based society which can be aligned with other knowledge based economies, it is important to manage and control technologies with accuracy, i.e. technology governance, that is sufficiently flexible to be able to change as new technologies with commercial potential emerge on the global scene.

2.55. One of the most widely held views is that appropriate national and regional innovation policies are important in supporting innovation but it is also clear that these need to able to be adjusted to deal with economic trends in the global context of knowledge based economy.

2.56. Experience has shown that in many countries science and technology parks and technopoles have become important components of national and regional innovation policies by providing an institutional framework to support innovation models in a region or a state.

2.57. In creating this framework it is important that the relationship between any national and regional innovation strategy should provide support for decentralization by allowing for a balance of development between a capital city area and its local regions. To do this it is suggested that the following pattern should be considered.

- National government should try to build an initial Knowledge Based Industry strategy that can then be translated into a National Innovation System (NIS) that has strategies which support the regional innovation capability.
- The Regional Innovation Systems (RISs) that flow from a NIS should encourage a working relationship between government, academia, industry, the mass media and non government organisations (NGOs) which encourage regionally derived development based on innovation.
• To be most successful it is suggested that effective networking is encouraged between the various local actors of RIS and innovation competence is encouraged on a region wide basis.

• The development of science and technology parks provides an opportunity to centralise the resources for supporting technology transfer and innovation in a single location which makes them easily accessible to the businesses that they are trying to support. This has been likened to a 'one stop shop' for business in a similar way to the benefit for shoppers of the 'shopping mall'.

2.58. Although it is a sweeping generalisation there is some evidence that most science and technology parks in developing economies are policy driven. Where this is the case these tend to be positioned in policy terms within regional innovation strategies which are focussed on building scientific and skills competence as a first stage.

2.59. There is some evidence that mistakes have been made in adopting this strategy; however, experience has also shown that these are avoidable by ensuring parks are not focussed on ‘big science’ but are aimed more at exploitation of science. This requires closer connections between researchers, entrepreneurs and the market place and a mutual understanding of the competence of the scientific base, the needs of industry and business models for commercialisation of these ideas.

2.60. Egypt may have already developed a national Knowledge Based Industry (KBI) strategy to encourage the knowledge economy and to enhance its efforts in scientific research and development to underpin its future competitive advantage. If this does exist it would useful to relate this strategy to the development of the science and technology park initiative. In parallel a NIS at national level and RIS at local level can be prepared.

2.61. Examples of where these strategies can benefits national economies include:

• Helping to develop a ‘foresight programme’ which serves as a basis for developing a knowledge based industrial sector.

• Encouraging equity finance to develop specialisms associated with sectors that fall within national strategies and systems that in turn assist with creating and developing spin out companies. Very often these finance initiatives have to be supported through a public – private partnership as the sums required by early stage companies are too small for commercial operated funds.

• Provide new research and development incentives which are aimed at encouraging Egyptian firms to undertake R&D. This would include both tax credits and government R&D grants to companies. This may add momentum to the development of research institutes on the proposed science and technology parks.

• Introduce effective policies to enhance KBI and NIS foundations for teaching and research programmes within universities by giving them a framework within which to develop programmes that might be relevant to these national policies.
2.62. Discussions with the Assistant Minister of Higher Education and State Ministry for Scientific Research Dr Maged Al-Sherbiny indicated that national policy environment in Egypt is currently very positive towards the provision of science and technology parks because it is recognised that they contribute to the acceleration of the momentum behind the priority knowledge based sectors.

2.63. The science park development programme in Egypt needs to emphasize links between research and production. To achieve this it is suggested that high-tech industrial parks should be developed next to the proposed science and technology parks in order to attract industrial plants to create an agglomeration of industrial activities. This strategy helps to build a parallel base of industrial capabilities that can interact with the technology developments on the science and technology park. In turn these technology developments need to be supported by incubation facilities for SMEs.

2.64. Clusters provide benefits for the companies involved, which include risk sharing in the innovation process, the creation of an appropriate skills base to support the cluster and access to more effective supply chains. Strategic investment in relevant technologies can be a valuable way of seeding a cluster and science and technology parks can provide the infrastructure to support this.

2.65. In addition to promoting and developing science and technology parks there is an expectation that universities alter their management structures to both improve the way that they develop, protect and capitalise their intellectual property and the way they manage their interface with business.

2.66. The principles that support science and technology parks, from the perspective of driving technology up the value chain are that they are locations which:

- Give the companies that occupy these sites prestige in the market place by sending a signal to their customer base that they are concerned with innovation.
- Help with recruitment and retention of staff: evidence from a UK study in 2003 has shown that companies on science and technology parks when compared with matched companies not on parks employ more and better qualified staff.
- Encourage collaboration between companies on the site and the host institution in order to facilitate more effectively technology transfer.
- Offer occupiers the ability to grow a business and do this from one location: to provide for this the master planning of a site is critically important.

The support mechanism can be recommended for the start ups from R&D centres or HEI’s in Egypt. The international experiences should be taken into consideration to be integrated with Egyptian Science Park Development.

RIS model with a science and technology park for promoting regional innovation and economic development

2.67. The regional innovation system (RIS) can develop an environment which can encourage local industry with the formation of a technology cluster and the
networks which are necessary for the process. With the focus on the production system, the basic model of the regional innovation system coordinates human resources and technology in the area of technology development and provides financial resources and know-how (management and information) to facilitate business support.

2.68. The basic resource, which is necessary for the building of regional innovation systems, is the ability to network and collaborate among resources of human capital, technologies, financial sources, know-how and infrastructure.

2.69. The RIS model stresses indirect support to the business environment including the formation of networks and emphasizes an institutional framework for planning and coordinating extensive systematic industrial development by the economic agents in the region.

2.70. As a coordinating organization for the development of local industry, one strategy that has been adopted in many countries is the creation of Regional Development Agencies (RDAs) which provide the mechanism for assembling the core components of the region and coordinating the development of the network.

2.71. The regional innovation system pulls together community resources such as human capital, technologies, financial resources, know-how, and the international network to increase the frequency of innovation by narrowing the barriers between technology development production systems and business support.

2.72. The centre of the regional innovation systems in Egypt is the strategy of using technology commercialization to connect innovation with commercialization rapidly.

2.73. From this perspective, the regional innovation system (RIS) as a basic strategy for promoting regional innovation and technology-led economic development can have an impact on the structure (function), activities and networking of a science and technology development through the significant and mutual linkage in Egypt.
2.74. The model for building a Regional Innovation System based on science and technology parks is characterised in Figure 1. This characterises the components that need to be interconnected to be most effective Figure 1.

Stakeholders and objectives

2.75. A brief review of the organisations involved in the development of science and technology parks indicates that there are up to four major stakeholders in these projects. These include:

- The host organisation, which is the source of technology and may include a university, government laboratory, public or private research institutes.
- National, regional and local government, as well as other public sector organisations that include regional development agencies.
- The owners, managers and employees of tenant companies on science and technology parks and those in their respective supply chains.
- Private investors, whether they are involved in financing the park or tenant companies through equity finance.

2.76. Part of the successful development of science and technology parks is to create a management structure where these partners can operate together to their mutual advantage by fulfilling their respective objectives.

2.77. Details for possible objectives of stakeholders for these science and technology parks are noted in Appendix 3.

2.78. The breadth, and in some cases diversity of the interests of these partners is such that there is no doubt that the management of the different aims and objectives requires a formal structure to be considered when a science park is being planned. It is suggested that the stakeholders and their particular objectives for a park are clearly set out as a point of reference against which
to assess progress, make investments, and manage resources. In addition this framework can also be used for conflict resolution between partners should that be necessary in the future. Details of the general experience of governance of parks are noted in a later part of this report.

2.79. In addition to helping to shape a business plan the defined objectives for any park will have an important influence on the physical development of a site. To bring a park to market requires a clear understanding of the product for both those designing the park as well as potential customers.

2.80. Issues of concern that need to be resolved in an explicit way so that is more certainty for customers includes for example:

- Are they able to grow on the site if they are successful?
- Will they be permitted to extend into limited manufacturing if they go beyond the research phase and require modern production facilities? i.e., what are the use criteria?
- What is the length of any contract that they will have to sign to remain on the site?
- What guarantees are there that the park will be maintained as a ‘science and technology park’?

2.81. Tenant companies that are parts of larger corporations generally are also concerned with the quality and extent of the supply of qualified staff for their business which means that there is a need for local higher education facilities need to be responsive to this need.

2.82. The issues of concern for hosts and investors other than tenant companies include what kinds of management structures are required to interface with the companies that are either established on the site or attracted to the site, structures.

2.83. What services are required to support business development? Companies in the pre and full incubation programme are normally most concerned about access to finance at the early stage of development and as they move from the research phase of development they become very concerned about access to customers.

2.84. As well as the different approaches to property development funding there are also different ways of providing help for the park itself and for the tenant firms.

2.85. The UK approach is focused on support for innovation, particularly for SMEs, whereas German STPs benefit from a range of financial support for everything from start-up costs to on-going operational subsidies, such as subsidising the rents of tenant firms or charging the innovation centre itself a low rent because regional support is used to subsidise the building.

2.86. The Japanese government has provided financial assistance for the development of technopoles, by subsidising frontier-type R&D, providing industrial relocation incentives and other urban facilities necessary to attract companies to these new locations. In addition, Japanese technopoles provide support for the development of an information network and a Technology
Promotion Centre for better communication between researchers in order to achieve a critical mass of research activity.

2.87. In contrast, Korea’s technopoles have focused on giving relocation promotion incentives for firms and subsidising spin-offs from R&D centres.

**Business sector views**

2.88. It is not uncommon the views held by industry of higher education is that current levels of research competences are low and there is a lack of a culture of excellence in universities. It is important that, if this perception is commonly held, the higher education sector should address this by developing a range of strategies to link with industrial companies at a number of levels.

2.89. The formation of science / industry councils can provide an interface that brings the two sides together. Through such an approach the potential interest in universities can help to change attitudes and demonstrate that applied local research and development work has reached a sufficient level of excellence to be competitive at a world level. An implication of this continuing strategy is that the main need for technology development in business is the availability of engineering skills to aid absorption of external technologies rather than the development of research competences. Experience suggests that too heavy an emphasis on academic research will prove a disincentive to partnership with business.

2.90. The development of science and technology parks need to be approached in a business like manner which more matches business practices in the commercial sector than those adopted in universities. It is suggested that to do this a separate legal entity should be established for managing science and technology parks and the legal entity should behave like a business.

2.91. Such a step would be seen as an important signal that these parks are open for business and willing to develop a suitable culture in their operations. As such these centres are more likely to receive a positive response from business than would be forthcoming if they seek to develop within the university culture.

2.92. It is suggested that business should be encouraged to engage in the pre and full incubation programme. To achieve this many parks invite local based companies that can provide tenant companies with guidance on accountancy, legal aspects of business particularly the management of intellectual property, marketing, financial modelling, public relations, recruitment, sales, human resources and leadership.

**The nature of companies on science and technology parks**

2.93. In any analysis about the performance of science and technology parks it is important to consider the types of companies that they attract and the activities in which these companies engage.

2.94. It is important to recognise that science and technology parks as a fundamental position are concerned with supporting companies that are focussed on making money out of technology. This is in direct contrast to a
commonly held view that these locations are about investing in science and technology solely to widen the boundaries of knowledge.

2.95. It is also important to recognise that not all of tenant companies need to be involved in high technology. There is a very clear place for companies that are actively engaged in using existing technology platforms to exploit new market opportunities.

2.96. To put this into context science and technology parks are locations which support companies that are engaged in the spectrum of activities. These range, for example, from research, development, design, business development, general business activities necessary to support the commercialisation of science and technology, through to low volume, high value manufacturing activities.

2.97. Some of these companies will be product based; however, some operate as consultants and others move between the two types of activities as they fund their technological development through consultancy.

2.98. It is also important to recognise that companies move through cycles in which their expenditure on R&D may be high in the initial phase of development and this may decrease as a product goes through a prototyping or pilot plant stage and as production emerges as a main thrust of their business R&D spend falls to a low level. Of course to remain competitive it is important that these companies continue to work through this cycle to continually innovate.

2.99. The value of consultants should not be underestimated as in many instances these companies act as agents of change within large companies in a region and help them to innovate.

2.100. Taking these broad based examples a review of tenants on many parks will show that they can accommodate:

- Small specialised parts of large companies that want to form closer links with a particular group in a science park’s host organisation. These are not normally found unless the host organisation has a specific activity that is important to a large corporation.

- Companies that have spun out of the park’s host organisation: these may be involved in a wide range of technologies.

- Companies that are drawn in from the wider business community to develop new ideas. Most companies on European science and technology parks are in this category and are usually headed by an entrepreneur who is very familiar with an existing market or is working on an emerging market because they are familiar with a trend that is driving these new market opportunities.

- Companies that already exist but recognise the commercial value that comes from the image and addition to their reputation by locating on a park. Locating on a park can help with recruitment and retention.

- Technical consultants that are highly specialised and work in advanced areas of technology.

- High value low volume manufacturers.
2.101. Some of these companies are concerned with developing their own proprietary technology, other merge technologies with their own and in some cases companies support new products with existing technological platforms. Experience also indicates that parks also successfully support consultancies which in turn operate in the wider business community and have a beneficial impact on the technological and commercial performance of their clients.

2.102. This breadth of activities has meant that many parks have adopted strategies to assist in tenant screening that ensure that the primary objectives of these parks are not lost to common place business and commerce and a focus on driving the development of technology business is retained. It is recommended that the screening procedure is all business plans for science and technology parks.

2.103. The value of recognising the spectrum of different activities and sizes of companies and other organisations that might be attracted to a park provides important market information that can inform the physical planning of these sites.

2.104. The broad and extensive experience of people that operate science and technology parks is that these developments attract a wide range of companies from a variety of origins.

2.105. Examples include university or research institutes: where this is the case the science or technology might be an innovative product or service, be supported by intellectual property, be the basis of a technical consultancy or scientific service, or be an idea that is not able to be protected by any form of design registration or patent.

2.106. To support this process it is usual to have in place management structure that supports a business development group that can not only provide business development advice but also assist with providing or securing some form of early stage funding. Such funds might include proof of concept or market research support.

2.107. Part of the work of the administration of a science and technology park is to not only create the structures to support identifying science and technology that has commercial potential but also creating the appropriate business support structure that helps to focus on the potential market for the innovation.

2.108. A number of studies have shown that the majority of companies that locate on science and technology parks are looking for a competitive advantage that will assist with their development. Experience of those actively engaged in developing and operating these sites is that these parks help tenant companies: become immersed in a technology environment that can provide technical assistance if needs be; develop links with other companies on these sites and from this build consortia or exchange technology, skills and ideas; find appropriate accommodation and support services to match their needs at the various stages of their development; and giving them credibility and profile which can assist in their marketing and recruitment activities.

2.109. To protect this ‘brand value’ it is important that applicants are carefully screened; however, it is highly recommended that there is strong input from
business in this selection process to ensure that the cultural values of the research community are not adopted to the exclusion of commercial criteria. Selection should take into consideration the type of activity and the degree of innovative thinking, the qualifications and experience of the main promoters as well normal business based criteria of distance to market for the companies revenue generating activities, the supported needed to reach the market, competition, barriers to entry and the business systems they need to move out of deficit.

2.110. Those involved in the development and operation of science and technology parks must recognise that the many different types of company have different motivations for wanting to interact with universities. Details of these companies and the kinds of characteristics they display in relation to creating links with research institutes and universities are noted in Appendix 3.

2.111. Those involved in the development and operation of science and technology parks must recognise that the many different types of company have different motivations for wanting to interact with universities. Details of these companies and the kinds of characteristics they display in relation to creating links with research institutes and universities are noted in Appendix 4.

2.112. It is suggested that to create links with these companies there is appropriate training provided for those already involved in technological capability development and providing scientific and technology services.

**Incubation programmes**

2.113. Incubation programmes rely heavily on early stage funding. The experience of those involved in the science park movement is that there is a significant funding gap which exists between funded research through which ideas that have commercial potential are gestated and the either revenue generation or an exit from the company by acquisition.

2.114. A number of ideas have been developed to bridge this gap. It is suggested that to assist the incubation process a series of early stage grants followed by matched funding programmes are put in place to support this process.

2.115. Experience has shown that the release of funds to early stage companies should be phased to meet milestones in performance and care should be taken to adopt best practice for this aspect of company development.

2.116. The emergence of a range of small and medium sized enterprises (SMEs) that are commercialising science and technology has prompted the need for longer term equity finance programmes. It is recommended that MuCSAT take an active role in developing an equity finance network that can be accessed to raise funds to support new commercially viable science and technology based businesses.

2.117. Experience of incubation has been gained at the ICT incubator in Smart Village. It is suggested that a small network is created across the various incubator programmes in Egypt to spread best practice.

2.118. One of the key issues that face many science and technology parks in developing countries are constraints on universities that prevent them
investing in companies that are formed to exploit the commercial potential of a
science or technology that has been developed in their own laboratories.

2.119. To overcome these difficulties many countries have adjusted their legislative
framework to enable this kind of investment. However, it is important to
recognise that these investments carry risk, which suggests that these should
be approached in the same manner as that of commercial equity funders,
such as business angels and venture capitalists.

2.120. Many pre-incubation programmes have set up websites that provide criteria
that they adopt when recruiting potential ‘incubatees’. Details of the advice
given by the Surrey Enterprise Hub on the Surrey Research Park are noted in
Appendix 5.

**Methods of creating and exercising selection criteria**

2.121. One of the methods for tenant selection involves adopting a use clause
which for example might allow for, research, development and design in any
science or technology, including a social science and to include ancillary
business activities necessary to run a company from a single location which
complements a single or range of technology or sciences. This can then be
used as a statement against which to judge the uses of potential tenants.

2.122. Another well tried method is to use a scale which is scored as follows
and where those scoring below three would be permitted to take space on
the site while those scoring 4 need to be judged against other criteria. An
example of this is as follows:

- Companies that are exploiting new technology that is unique in the market
  and may be a platform technology or create a new product or service - score 1
- Companies that are merging technologies from a number of sources to
develop an innovative idea - score 2
- Companies that are extending an existing technology as part of an
  incremental change to existing technologies - score 3
- Trading activities - score 4

2.123. It is suggested that the initial screening of companies is carried out by
the managers of any science park and where cases become more complex
the management board responsible for governance is approached for further
guidance.
Physical planning

2.124. Experience suggests that the long term planning and development of a science and technology park complex requires a long term investment strategy in terms of basic infrastructure, housing and urban services. The basic components of this are set out in Figure 2 below.

Figure 2. MXD model of science cities – science city development for regional innovation and economic growth.

2.125. Ideally the plans for this should enable this model to built up in phases.

2.126. In this model there is a combination of higher education and its outputs with a high quality living environment, exploitation of the outputs from higher education through the services and facilities of a science park. The presence of production capacity allows for a two way exchange where production draws on the innovation in a science park and the innovation on the science park can lead to new products utilising the capacity on the high tech park. This helps to tie production to the area.

2.127. The future physical planning of the project (science and technology park itself) requires a good understanding of the process that the site is aimed at supporting.

2.128. Figure 3 characterises the flow of companies that are commercialising science and technology through the two routes to the market, for which infrastructure needs to be provided as part of the development of the site.

2.129. Although this figure stylises the flow through the site, experience shows that companies can join and leave the flow at a number of stages depending on their origin, the market the companies address, the entrepreneurs that run them and the point reached by these companies in the cycle of research, development and design, business development, growth of sales and reinvestment in innovation.
2.130. Figure 2 which characterises the potential flow of companies through a science and technology park and for which provision is required in the any physical planning.
Governance

2.131. A science park has to succeed in a competitive business environment even though some of its goals are different from those of simple commercial schemes. It has to be responsive to fast changing technologies and businesses working in these technologies. To provide this these sites need to have a flexible culture with the capability of making quick decisions and following them through in a business like manner. To do this these sites needs to have the authority to deliver decisions. It is important that the procedures for decision making are not overly bureaucratic.

2.132. Concurrently, this system has to have close relations with its sponsor university and give confidence that it will respect the longer term and sometimes non-commercial goals of research and new knowledge based business development. Most science and technology parks have, therefore, an institutional form that is:

- Separate from its sponsor university.
- Placed within the private corporate legal codes rather than the public sector.
- Directed by a Board with strong membership, and in many case the majority membership, from outside the academic and government communities.
- Constrained through its articles of association to give strong weight in its activities to research and technology development and new knowledge based business creation.

2.133. One of the underlying principles for the management of universities has been the use of committees which operate in an open democratic style. The open nature and diverse constituency of universities means that this style of management allows the widest of possible influences to be represented in making longer term decisions for these institutions. Experience suggests that the decision making process can be protracted within universities as management tries to build consensus from groups that do not have a single purpose.

2.134. The management of most commercial activities is in sharp contrast to that of universities in that this tends to have a much more focussed view on their market and way of addressing it to create shareholder value. Most companies operate through a board where individual members have responsibility for particular aspects of the operation and performance of the company in the context of this single purpose.

2.135. The management of science and technology parks is much more like that of business than of a university. It is strongly recommended that a management model is based on the principles of managing a business.

2.136. The series of step in building appropriate governance structures is set out in Figure 4. This suggests a number of steps that might be taken in developing this corporate governance.
UNESCO report on Science and Technology Parks in Egypt
Draft report

Figure 4

Stage one
- Part time team
- Feasibility study
- Viability decision

Go ahead decision
- Create Advisory Board
  University director, business leaders, finance, legal, marketing and property

Stage two
- Appoint a dedicated team
- Skills required: legal, finance, development & management
- Create a master plan and business plan

Supervisory Board
- University director, business leaders, finance, legal, property skills

Implementation phase
- Development tasks
- Operational tasks
2.137. Stage 1 covers the initial stage feasibility for a site. This is usually carried out under the guidance of a part time team led by a ‘Champion’ that has some authority. If this leads to the decision that a project is viable and there is a ‘go ahead’ decision made then stage 2 is started.

2.138. It is important that at this stage, i.e., as soon as the project is judged viable, that an Advisory Board is created. This should include those that have an interest in the project include the host university or research institute, relevant Ministries, business and those that are to develop their careers in bringing the project to fruition. It is sensible that representatives from each of those groups should form the core of the Advisory Council.

2.138.1. The competences required of this Council include commercial acumen as well as financial, legal, marketing and property skills. It is suggested that this comprises a University Director, at least two business leaders that have an interest in science and technology based companies, a representative from the finance sector, a lawyer that has broad property experience and an individual that has marketing skills, all of whom should preferably have some loyalty to the host institution, perhaps being alumni of the host and in addition there should be two representatives from the academic community but these individuals should have a strong commercial focus.

2.139. It is suggested that at this second stage a dedicated team is created, with a clear leader. This group should have skills in legal, finance, development and management and together the group should create a master and business plan.

2.140. This group should appoint a dedicated team that should take forward the project. The competences, responsibilities and members of this group should cover and include:

- An overall director that has the task of: co-ordination of the team and external professionals; covering strategy and legal issues; defining, creating and deploying support services for the incubator; and general administration of the project.
- Marketing - deciding what and when to build and they should be supported by a commercial real estate agent from the business community. This role should also cover public relations and dealing with the press to encourage as much press coverage as possible as this helps with early marketing.
- A building and construction project manager that understands and can influence the development of the master plan and its deployment.
- A financial manager that deals with the financial administration of the project.
- Support staff.

2.141. As the project develops the range of skills required by the team will migrate from those necessary in a start up and development phase to those better suited to an operational activity. The period in which the initial development team is involved will be influenced by the rate at which the site is developed.
2.142. Job descriptions for these roles can be further developed as part of a longer term involvement in the project by the UNESCO consultancy team should that be required.
3. SECTION THREE – SCIENCE AND TECHNOLOGY PARKS IN EGYPT

Policy background

3.1. The policy to support investment in science and technology and its manipulation and exploitation through technology transfer is supported at Presidential level with the intention of it being a greater part of the economy of Egypt in the future.

3.2. The Ministry of Science and Technology and Higher Education under its Minister Dr Hany Helal, has created a framework for establishing a number of science and technology parks in Egypt. Leading this initiative is the Assistant Minister for Scientific Research, Professor Dr Maged M Al-Sherbiny. Through the work of Professor El-Sherbiny interest in this initiative has been developed in a number of additional ministries including the Industrial Development Board and among leading universities and research institutes in the country which include the National Research Centre, Cairo University, Alexandria University and in a new Research Centre in Bourg El Arab known as Mubarak City of Science and Technology (MuCSAT) which is now the first area designated as a science and technology park.

3.3. In addition to this first project three further parks are being considered. Of these one is in association with Cairo University and the National Research Centre, and the other two are being planned for the Suez Canal area and in Upper Egypt.

3.4. However, there are also other initiatives that have the potential for contributing to the work of the science and technology park movement in Egypt. These include, for example, the potential for links between universities associated with the Smart Village and the incubator that is already operating from that site.

3.5. The area Bourg El Arab in which MuCSAT is located lies around 50 km to the southwest of Alexandria and is in an area in which significant investment by both industry and other facilities is planned. These facilities include those for supporting the textile industry among other industrial sectors, establishing a financial district, developing an area for recreation, improving communications with investment in rail links and an international airport.

3.6. As part of this process the management of MuCSAT and those involved in the development of Bourg El Arab have recognised the importance of internationalising the region by attracting foreign direct investment to support: the science base and there already in place connections between MuCSAT and China; overseas investment in real estate, significant overseas investment planned for the industrial development of the region; and investment in education.

3.7. Experience suggests that developing a thriving industrial and business sector as well as investing in improved communications and education facilities close to a science and technology park are all important factors in driving successful development.
3.8. To support this process a Board of Trustees has been established and is clear from a number of presentations made at MuCSAT by Member of the Board that there is broad recognition of the importance of this project.

3.9. There has already been substantial investment in MuCSAT with extensive and modern facilities for work in a number of advanced area of science and technology which include a Genetics Engineering and Biotechnology Research Institute (GEBRI), an Informatics Institute (ITI), an Advanced Technology and New Materials Institute (ATNMRI), a Technological Capability Development Centre (TCDC) and a Special Unit for Scientific and Technology Services.

3.10. In addition to these plans a 300-acre park, which is 20 minutes away from downtown Cairo in 6 October City, and known as Smart Village has been developed to provide state-of-the-art infrastructure, a high quality working environment and a range of facilities for technology businesses.

3.11. The Smart Village has been very successful in attracting both Egyptian government activities such as Egypt Telecom as well as a number of Egyptian and overseas industrial companies that include Microsoft, Oracle, HP, Alcatel-Lucent, and Ericsson. The success of the site in attracting ICT activities has stimulated a plan to establish a new financial district on the site.

3.12. The most common business development activity associated with science and technology parks is business incubation and Smart Village has created on site a centre that provides incubation for ICT companies. The Centre has attracted a number of new companies which were recruited through a business plan competition.

MuCSAT

3.13. The MuCSAT project is an initiative that has been developed in response to a positive policy environment in Egypt which is concerned with the economic development of the country through using a 'knowledge based industry strategy' (KBI).

3.14. This centre is currently operating from a three iconic buildings which give a brand and identify to the site as one that is forward looking and modern.

3.15. The current stated overarching objective for the site is to serve the economic development in Egypt through the following strategies:

- Developing centres of scientific excellence to serve both the economic and social development of Egyptian society.
- Developing new technologies and provide new scientific methods in different fields of industry to link research programmes with national development plans.
- Providing training, consultancy and technology transfer to different production and services agencies in Egypt.
- Conducting applied projects to ensure better performance in different areas that can benefit Alexandria region and the national economy.
• Cooperating with different national and international institutes in relevant technologies.

3.16. It is suggested that if considered appropriate these objectives might be extended to include the following additional activities:

• To assist in the commercialisation of science and technology which spins out from the local industrial base, the MuCSAT Research Institute and other higher education centres with which it should develop links.

• To raise the profile of MuCSAT as a centre of excellence in commercialising science and technology.

• In giving a competitive advantage to the companies that locate on the site by providing appropriate support services.

3.17. To achieve these strategic objectives it is necessary to translate these into both physical facilities and operational activities. It is suggested that the greatest effort should be applied to attempting to encourage demand for science and technology from industry and that entrepreneurship should be encouraged as a way of driving science and technology into the marketplace.

3.18. MuCSAT is the first national science and technology park that has been funded by Egypt's central government which has given the project significant momentum; however, to ensure that it can build on this initial central government stimulus it suggested that the local team in MuCSAT takes the initiative and works with central government to develop its own a decentralized regional innovation strategy, create its own networks with business and the HE sector in the region as well as act as a point of interest to attract foreign direct investment.

3.19. The initial investment in MuCSAT represents a key step in creating a centre of research excellence. It is clear that many of the management policies that are already being taken forward in MuCSAT are focused on commercialisation, however, it is suggested that the Research Institute that forms the core of MuCSAT would benefit from the development of a pre and full blown incubation centre.

3.20. The local high-tech industrial parks represent the third phase of technopolis development in Korea. In selecting appropriate locations for Technopolises, the central government took into consideration similar factors to those applied in Japan. These include proximity to a major city (the mother city), proximity to universities and research institutions, the current agglomeration of industries and national policies for balanced regional development and good access to highways. It is clear that many of these factors are either already in place or are planned in the Bourg El Arab region.

3.21. The local high-tech industrial parks focus on attracting the plants of high-tech industries and their research labs. At the same time, residential zones are being planned to accommodate their employees and families. The scale of development is smaller than that of MuCSAT because they are being developed by local authorities with only limited support from central government.
3.22. Incoming private sector companies are regarded as key actors in the technological innovation process. Local governments should establish ‘third sector’ development agencies as a private-public sector collaboration to establish local high-tech industrial parks.

3.23. It is necessary for central government to integrate the development of science and technology parks into the regional innovation mechanism. Central government lead the MuCSAT local Science Park development initiative to prepare the RIS strategies under the guidance of national government sector. RIS to let technopark play the important role for regional innovation and balanced development.

Physical planning

3.24. The site that is allocated to MuCSAT is 225 acres.

3.24.1. The existing scientific research facilities are in buildings that give significant and valuable status to the site. The high quality of the architecture of the initial buildings brings a constraint of limiting the potential for any extensions to buildings. To overcome this constraint it is suggested that that there is an area near these buildings that is protected for future expansion of the scientific facilities.

3.24.2. The intention that a polytechnic is developed on the site will require an allocation of space. It is proposed that this facility will provide a technical education and training for young people that would serve both the activities MuCSAT as well as the surrounding extensive industrial base. There is also a suggestion that space may be allocated to a Japanese University.

3.24.3. Facilities to provide both pre – incubation and incubation activities that emerge from both the MuCSAT Research Institute and from other sources. It is suggested that facilities are provided in a separate building from the R&D facilities already located on the site. However, if there is an urgent need to provide pre-incubation space then temporary provision could be found in an existing building on the site. There is substantial international experience on the design and range of facilities and services that support these two activities and further guidance on this issue could be provided by UNESCO.

3.24.4. The pre-incubation and incubation facility should also provide accommodation for the administrative and business development centre, marketing suit, an exhibition area, a café that would be accessible to both researchers from the Research and Technology Institute and the businesses operating from the site, and an equivalent to an Industrial Liaison Office which could link with a comparable office in the University of Alexandria. This office could promote the location to both the faculty and students at the University with the view to trying to encourage new business formation.

3.25. Business incubation or business development centre: commonly these are multi-occupancy centres where a range of facilities are provided by the operator and the cost of provision and operation of these is included in the occupancy fee. This reduces the need for early stage companies in these centres having to waste time and resources in establishing these when their time is better spent on pursuing business objectives. These facilities normally include telephone and data services, reception, access to meeting rooms,
parking, cleaning, a café, and lavatories. In addition many parks have an overlay of business support services which are in place to assist with business development.

3.26. Business incubators can also offer space to specialised parts of large companies that are looking to locate close to a particular university because of the particular skills, technology or other location specific advantages offered by the site.

3.27. Strategies for providing these services have to be considered in the planning phase of any park. However, care should be taken not to overburden occupiers with services in the optional and specialised categories and at the core level these must be managed on a cost effective basis.

3.28. Grow on accommodation: experience across many science and technology parks has shown that for companies involved in businesses that rely on skills and knowledge held by their workforce there is a need to maintain continuity with this group. The option to provide space that goes beyond a business incubator is important. A number of designs for these can be developed to suit local conditions but it must be remembered that flexibility is important for growing companies that want to maintain continuity with their employees and customers as they grow.

3.29. Larger units: it is clear that many companies want to secure an individual identity for their business. In addition if they want to carry out a laboratory function then there is an advantage to the provision of individual buildings with their own car parking area. Planning should allow for these to be provided in phases to accommodate growth of existing companies on the site or companies that may want to locate to the site.

3.30. Facilities: the location of a park in relation to retail, hotel, housing and recreational facilities can influence planning. The first three of the categories can be provided and usually this can be done once there is a critical mass on site, on a commercial basis through franchise arrangements. Recreational facilities are likely to have to be subsidised as these are costly to provide and require significant membership if they are to gain the necessary commercial momentum to be self funding. In the case of housing experience suggests that technology based businesses are driven predominantly by younger staff. Low cost flexible accommodation for these staff is important as this can help with recruitment and retention of staff within companies on the site.

3.31. In addition to the plans for MuCSAT the Industrial Development Agency has significant plans for adjacent areas which is intended in bring to the Bourg El-Arab significant heavy industry. This plan adds weight to the argument that by having a site dedicated to providing for organisations that are involved in research and business development may provide the opportunity for attracting parallel investment which could help to tie industrial investment to the region.

3.32. Finally, care must be taken in the control over detailed design to ensure that there is a coherent scheme in which all the different elements contribute to both the visual impact and operational efficiency of each science and technology park project. This will emerge during detailed design work but it
should be established as a key guiding principle from the start for all of the proposed projects and for the completion of the MuCSAT site.

3.33. For example, if it is a realistic possibility that a park will attract a large facility of a substantial corporation, then the master plan should reflect this scenario. Also, if a park with an incubator is located close to a centre of research, rather than in a remote location, there is a good chance of a number of spin off companies being formed. In this case, it would be sensible to provide “grow on space” so that successful companies can move on and release space for new entrants to the incubator while retaining their existing links with supplier and customer networks as the tenant’s address can remain the same.

Scientific staff and facilities

3.34. MuCSAT already has the benefit of being staffed by highly qualified researchers and technicians. The former group have professorial status associated with Alexandria University. It is suggested that these ties with Alexandria University are strengthened in order to create links with the young talent that forms the core of undergraduates and post graduates at Egypt’s largest and oldest university.

3.35. To create and manage this link it is suggested that consideration is given to establishing a young dynamic business development team to both look into the sources of technology in the local university and MuCSAT base to try to identify technologies that have commercial potential and to use the pre-incubator that is proposed to form companies around young entrepreneurs to undertake this activity.

3.36. To do this it is suggested that either a limited area in an existing building is designated as a temporary pre and full scale incubator or there is a delay while a new, building is developed specifically for this purpose. It is recommended that this buildings is constructed to offer flexibility to enable companies in a wide range of technologies can be incubated. An existing model for an ICT incubator has been established at the SMART Village project in Cairo; however, it is also suggested that the degree of financial support for incubator companies, is moderated to introduce a more commercially founded regime that requires companies to pay rent and service charges.

3.37. It is also important that plans are set for space on the same site into which successfully incubated companies are able to grow. Retaining these companies not only builds a cluster of technology based companies that can network in order to refine technologies and business models but services can be delivered to them in an economical way as they concentrate on a single site.

3.38. Once a pre and full incubator is in place it is suggested that the rate of growth of the number of companies on site can be accelerated through a range of strategies that include, for example, running business plan competitions for businesses in selected sectors, creating a web portal to encourage on line application for space on the site, developing links with the business schools or Faculties of Commerce at both Cairo and Alexandria Universities.
3.39. It is recommended that Science Park should play the role of so-called one-stop shopping mall where possible high-tech entrepreneur can their R&D commercialization. Public infrastructure including examination facilities, batching equipment plants for the pilot outputs etc need to be included in these services.

3.40. Technical assistant including supervising and consulting activities is strongly recommended in science park to cover the various request from SME's in MuCSAT and its catchment area.
Appendix 1

Malcolm Parry OBE, BSc, Post Grad Cert Ed, PhD, M.Inst. Biol. CBiol.
Managing Director of the Surrey Research Park

Dr Malcolm Parry is a graduate of the University of London where he also secured his PhD.

He joined the faculty at the University of Surrey in 1977 where he taught applied physiology and Ergonomics. He also built up a research team that was funded by the private sector.

He was asked by the then Vice Chancellor to take secondment from his academic and research post to found the Surrey Research Park in 1981 for the University of Surrey; this is now a 190 million Euro project with an annual turnover of 14.5 million Euro and offers pre-incubation, incubation, grow on space and larger facilities to over 120 tenant companies. These companies currently employ some 2,750 staff.

The Park now offers a pre-incubation and full incubation programme as well as grow on space and larger buildings on site. Some of the companies that have been incubated on site have become highly successful and now employ over 300 people. Others have floated and have a full listing on the London Stock Exchange while others are listed on the Alternative Stock Market AIM.

Malcolm Parry was also one of the founder members of the UK Science Park Association. He has served as Chairman of the Association and has just been re-elected to its Board for the third time. He has also been elected to the Board of the International Association of Science Parks (IASP) and is currently appointed to their Advisory Council. He is also on a UNESCO / World Technopolis Association Panel that is concerned with advising a number of countries on developing science and technology parks.

In addition to practical experience he is the author of a number of papers on the design, development and operation of Science Parks and Business Incubators; he has spoken widely on the subject and also co-edited both the first and second editions of a UK Science Park Association book on the planning, development and operation of science parks to which he has contributed a number chapters. The first edition was published in October 2000 and was subsequently translated into Chinese. The second edition was published in September 2006.

Dr Parry has also started three companies two of which spun-out from his research interests when he was a full time member of faculty. These have now all been sold and the last of which, when he was Managing Director, had a turnover of over £2 million: this was sold in 2005.

In June 2006 he was awarded an OBE for his services to business and education on the Queen’s Honours list and in 2007 the UK Science Park Association gave him a life time award for an Outstanding Contribution to the Science Park movement.
Deog-Seong Oh, PhD, M.Sc, MUP(Master of Urban Planning), BSC

General Secretary of WTA, Professor of Chungnam National University, Republic of Korea

Prof. Deog-Seong Oh is currently a professor of College of Engineering at Chungnam National University, Daejeon, Republic of Korea and Secretary General of World Technopolis Association (WTA) which consists of 56 members cities in 24 countries in the world. He has involved in WTA as a Chairman of the Academic Committee since 1997 and is acting the role of General Secretary Since 2004. WTA is currently doing the cooperative projects of Science City governance with UNESCO.

He received a Master of Urban Planning in 1979 and a Master of Science in Architecture from Seoul National University, Korea in 1981. He got a PhD degree in Urban Planning from Hanover University, Germany in 1989. He did his post-doctoral research at University of Sheffield, UK in 1993. He joined the faculty of spatial planning at University of Dortmund as a visiting professor in 2002-2004.

He also acted the executive director of Regional Development Research Institute (RDRI) for 7 years from 1995 which did important role for regional innovation in Daejeon City and Chungnam province. He was asked by the President Chungnam National University to do the management of whole university as provost.

In academic society, he was vice president of KPA(Korean Planner Association) and joined several domestic and international association of town planning and Regional development. He is also the chief editor of APPR(Asian Pacific Planning Review).


He is involved with several committees of central and local government as special advisor to the Presidential committee of national balanced development, Ministry of Industry and Resources, Daejeon metropolitan City, Chungnam Province among others.

He has also done several important development projects of science and technology parks such as Daedeok Technovalley, Chungnam Technopark, Kyungbuk Technopark, Seoul business incubator, and the master plan of Daedeok Science Town to mention a few.
**Appendix 2**

Details of meetings that were held in developing this report are noted in Appendix 1:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Hany Helal PhD</td>
<td>Minister of Higher Education and State for Scientific Research</td>
</tr>
<tr>
<td>Professor Mageb M Al-Sherbiny</td>
<td>Assistant Minister of Higher Education and State Ministry for Scientific Research</td>
</tr>
<tr>
<td>Professor Dr. Moshen M Shoukry</td>
<td>Academy of Scientific Research and Technology – Acting President of Scientific and Cultural Relations Sector</td>
</tr>
<tr>
<td>Professor Dr. Muhammad El-Saadani</td>
<td>Chairman of the Mubarak City for Scientific Research and Technology application.</td>
</tr>
<tr>
<td>Dr Eiman Abdel-Aleem</td>
<td>Assistant Director for Development and International Cooperation at Mubarak City</td>
</tr>
<tr>
<td>Dr Ahmed Moussa</td>
<td>Programme Manager, R&amp;D Centres of Excellence, Smart Village</td>
</tr>
<tr>
<td>Professor Dr Osama El-Shabrawy</td>
<td>Vice President for Research, National Research Centre</td>
</tr>
<tr>
<td>A team of the senior research staff from the National Research Centre and visits to a range of laboratories that included biotechnology, material science and health.</td>
<td></td>
</tr>
<tr>
<td>Professor Dr Hossam Kamel Mahmoud</td>
<td>Vice President for Graduate Studies and Research, Cairo University</td>
</tr>
<tr>
<td>Dr Ali Abdel Rahman</td>
<td>President, Cairo University</td>
</tr>
<tr>
<td>Professor Dr Muhammad El-Saadani</td>
<td>Chairman Mibarak City for Scientific Research and Technology Applications</td>
</tr>
<tr>
<td>Professor M El-Demellawy</td>
<td>Genetic Engineering and Biotechnology Research Institute – MuCSAT</td>
</tr>
<tr>
<td>Dr Walaa Shetaa</td>
<td>Informatics Research Unit – MuCSAT</td>
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<tr>
<td>Professor M.K El Bahr</td>
<td>Agricultural Research and Development Centre – MuCSAT</td>
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<td>Molecular Biomedicine</td>
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<tr>
<td>Dr M Sameer</td>
<td>Advanced Technologies and New Materials Institute – MuCSAT</td>
</tr>
<tr>
<td>Dr Mohamed S. Mohyeldin</td>
<td>MuCSAT</td>
</tr>
<tr>
<td>:</td>
<td>A range of scientists and technologists that are leaders of divisions at MuCSAT including</td>
</tr>
<tr>
<td>Dr H Enshasy</td>
<td>Visit Pilot Plant – MuCSAT</td>
</tr>
</tbody>
</table>
| Members of the Industrial Council of Borg El Arab | Including: Hany El-Menshawy - President Summer Moon  
|                             | Dr Mohamed B. Ghatwary - Vice President and Head of Members Relations Committee - Alexandria Business Association  
|                             | Professor Dr Abdulla Molokhia - European Egyptian Pharm. Ind |
| Prof. Dr Hassan Nadir Kheirallah | President of Alexandria University                      |
| Amr Assal                   | Chairman Industrial Development Authority                |
| Eng. Ashraf Dowidar         | Assistant to Chairman Industrial Development Authority |
Appendix 3 - Objectives for stakeholders

1. A brief review of the organisations involved in the development of science and technology parks indicates that there are a number of major stakeholders in these projects. These include:

- The host organisation, which is the source of technology and may include a university, government laboratory, or private sector organisation that would like to commercialise its technology.
- Organisations, including the private sector, with appropriately located building or land assets.
- National, regional and local government, as well as other public sector organisations that include regional development agencies.
- The owners, managers and employees of tenant companies on science and technology parks and those in the supply chain for these tenant companies.
- Private investors, whether they are involved in financing the park or tenant companies through equity finance.

2. Objectives for host organisations

2.1. To create a property asset to provide some independent income and against which an institute may borrow funds.

2.2. To influence an internal culture by creating the opportunity for academic or research staff to develop technology that might be commercialised directly or transferred to businesses that are already established on the park.

2.3. To create the opportunity for academic and research staff and students to transfer technology into the commercial domain and, through this activity, develop some independent income stream. This might include licensing intellectual property (IP) to a tenant company, taking an equity stake in a successful spin out business, or selling services to tenant companies. The ability to do this depends on the legislative framework in which host organisation operate, government policy, the nature of the contract of employment of staff, and the internal structure of the host organisation which may or may not be geared up to interface with business. It is clear that in some countries the nature of the contracts for academic staff precludes them working with commercial organisations. This type of contract is a major problem and a limiting factor in trying to establish a science park.

2.4. To raise the profile of the host organisation as agents of change in a region.

3. Objectives for governments or other public agencies

3.1. The involvement by government in the development of science and technology parks ranges from simply granting planning permission for a project to enable development, through to (at the other extreme), providing land and/or other resources to initiate a development that
otherwise would not be possible because of the prevailing economic conditions.

3.2. Encouraging and facilitating economic development at both national and regional levels. This can be achieved through an increase in the number, size or productivity of companies in a region. It is important to recognise that in order to build the most effective reputation for a science park, the businesses that they support should be those that do not simply provide more of the same products or services that already exist within a region. The intention, although not always achieved, is the formation and growth of new businesses that develop new market opportunities created by the evolution of technology or through research, development, design and innovation relating to products, processes and technologies.

3.3. Population retention. It is clear that the human capital in any area represents a significant resource. However, some areas find it hard to retain their most able young people. The opportunities for creating commercial enterprises provided by parks can help to establish an environment that will contribute to the retention of young people in a region.

3.4. Parks can act as centres that provide business advice to local communities; however, this dynamic is more likely to occur where parks receive civic or public funds to enable this to take place. Examples of these services include the provision of training, access to business support services, and advice on access to grants. More recently, UK government policy has resulted in funding pre-incubation activities that are aimed at encouraging the formation of high growth companies that have global potential. Such a project has been established by a consortium of universities including Bath, Bristol, Southampton and Surrey and the facilities that have been set up are branded as SET Squared Centres.

4. The objectives for business include:

4.1. The most important of all of the stakeholders are the businesses that are attracted to a park. Without their support all parks are doomed to the unacceptable position of having to survive on public subsidy.

4.2. Improving recruitment and retention of staff.

4.3. Gaining access to well qualified manpower.

4.4. Gaining access to emerging technology that can provide a commercial advantage.

4.5. Presenting a high quality image to their customers and creating a reputation for value for money.

4.6. Benefiting from business development services.

4.7. Objectives of the private sector investors

4.8. There is a growing interest in the real estate dimension of science and technology parks by private investors that are concerned with commercial value and revenue generation as they recognise that
science and technology parks are attractive to tenant companies. After all, science and technology parks can generate their own occupiers if they offer successful business incubation facilities, and can provide specialist facilities that suit science based occupiers.

4.9. The role that science and technology parks play in supporting innovation also helps equity finance organisations meet their objectives of extracting value from science and technology.
Appendix 4

Types of companies attracted to science and technology parks and there likely requirements for interaction with the host organisation

Experience has shown that the following types of companies are attracted to science and technology parks:

Global (dominant) companies:

- Global companies may seek to gain wide influence by collaborating with universities.
- Can afford long term commitments.
- Often more concerned with growing the overall sector (through research-based innovation) than gaining competitive edge.
- Often have the capacity to distinguish goals of internal and external research.
- Will be interested in recruitment.
- Interaction with them can be straightforward (though they will tend to only have interest in a small number of globally excellent universities)

Large companies:

- Large companies may have a medium term research agenda which requires specific expertise found in universities.
- Will be interested in recruitment.
- Interactions with them are potentially complex (because of IP concerns and possible tensions in shaping the research to fit academic priorities).
- Medium size companies:
- Medium size companies tend to be more interested in short term expertise, than in consulting.
- Will be interested in recruitment.
- Interaction should be straightforward (though timescales may be an issue and companies may find that now universities are required to recover the full economic costs of research they are less cheap than before).

Start-ups (high tech ones):

- Start-ups want help with special infrastructure.
- Will be interested in recruitment.
- Interaction should be straightforward (especially if the start-up team members have personal links to the nearby university).
- Ordinary Small and Medium Sized Enterprises (SMEs): this category of company is important for the future economic growth of many economies as from among them will emerge large companies of the future as well as companies that possess IP which may be acquired by
larger companies as part of their innovation strategies. However, the evidence suggests that universities and research institutes find it difficult to deal with these corporations because:

- Often are unable to state what help they need – only knowing they have a problem.
- Tend to seek outside help when a crisis occurs and a panic response is needed.
- Have quite unrealistic expectations of what university staff can do for them.
- Expect to pay next to nothing.
- Offer little prospect of a future relationship which would allow the, often considerable, ‘transactions cost’ to be spread over a number of assignments.
Appendix 5

The development of SMEs through the incubation

Pre incubation business selection

Stage 1 Does this idea have potential

- Write it down (it focuses thoughts)
- Explain this to a friend, preferably a business friend (it will provoke more thought and raise questions)
- Research it on the internet (clarifies, diverts, disillusions early or boosts confidence)
- Draft a very simple business plan (don't be put off by those words. Just answer the following questions - don't kid yourself and make sure your friend understands).
- Who will buy your product or service? Give real examples
- At what price? Why that price?
- And how many per month or per year? A few now, more later? That gives you some idea of revenue.
- Who (how many people) will make the product or perform the service?
- At what cost? Low now, rising later - or high now to build it at all?
- Add 50% for overheads (this is a very simple plan!)
- That gives some idea of costs.
- Take costs from revenue. Is it profitable? Would it work? Ever?
- If you get this far (whatever the answer) you are already further along the road of starting a business than many. Your idea, your dream, your vision has got you going.
- So even if the first answer is negative you are unlikely to give up. A plan rarely works first time. Look at your answers again. What if you adapt your idea? What would make the sums work? Can you justify the changes?
- This is the point where you have some concrete ideas to take to others for good business advice.

Stage 2 - My business plan needs working on

- You have an outline plan, you have done some research and you can show how your business could work if your assumptions are correct. What then?
- Almost certainly you need some money. You will probably need some equipment and development resource before you can bring your idea to market. If you plan to work off savings, you need to know how long your money will last and if (more likely when) you will need to borrow some more.
In general, whilst you are employed, money is easy to borrow from a bank. As soon as you are without a regular income it is harder to persuade the banks to lend you anything at all. Banks don't take risks – that's what investors are for.

So if you aim to get money from a bank the manager will want to see a business plan that shows a good reliable income. In that way you look much more like an employed (i.e. low risk) person and they may lend you money.

If you go to an investor (who could be friend, a business angel or a professional venture fund) they too will want to see that you know what you are doing.

Therefore your good business plan has to show detailed thought and (very importantly) solid justification. For a start you will have to show monthly income and expenditure plans and make sure you have not forgotten anything significant (web site presence, travel, license fees, protection of intellectual property).

Then there are all the business regulations. Do you have to charge VAT? How do you handle National Insurance? Should you start a Limited Company or be a Sole Proprietor?

And the track record and strength of the management team is all important. Anyone can write a wonderful business plan but do you have the skills and know-how to make it work?

Can you sell your idea? Answer these few questions. Be honest and preferably make sure you can persuade your business friend that you are right.

You have identified some real customers. Why will they buy your product?

Is there any independent research to support your argument?

Why will they buy from you and not from your competitors?

Who and where are your competitors?

What do your target customers do now (before they have your product)?

What will be the benefits to them of having your product?

Will it be crucial for them (their business) or just a lifestyle "Nice to have"? Put simply, can they do without your product or service?

Remember, your business plan is the evidence of your business thinking and (mostly) it is your sales tool to get money. You are selling right now. You are selling your dream.

Possible funding organisation include: Banks; Business Angels; Early Stage Seed Funds; Proof of Concept funds; R&D Grants

Stage 3 - We need a place to meet and work
UNESCO report on Science and Technology Parks in Egypt
Draft report

- You have got a plan that you (and your business friends) are convinced will work. You have got some money to get started. What next?

- There are numerous books and guides available on what you should do to start a business. You can get them from just about any bank, bookshop or advisors like Business Link. Essentially all you really need to start on your own is some headed paper, a bank account and tell the Inland Revenue.

- You can, of course, start in the classic spare bedroom, dining room or in the garage.

- You probably don’t need planning permission to run a small service business from home but you should check with your local Council. The benefit of working at home is that you don’t pay extra rent. The disadvantage is the lack of a professional image and support services.

- When there are a few of you, you will soon want some office space. And the first office is often the hardest decision.

- More space means more fixed costs. Property leases can be expensive and restrictive. Short term rental licenses offer greater flexibility.

- Does your plan/business give you reasonably secure income?

- Can you get out of your office commitment if your business suffers?

- Is there space to expand if your business grows quickly?

- Renting space in an un-serviced building on a fixed 5 year lease may be a far worse deal than a renting a unit in a managed small business centre that’s on one month’s notice.

- What facilities does the office provide?

- Will you have to pay for computer cabling, for instance? (And you can’t take it with you when you leave)

- Does it (or the site) have fast internet access? (If that’s relevant)

- Will you have to build a meeting room or internal office or are there meeting rooms you can hire nearby? Are they affordable.

- Is there any security or reception service?

- What’s the car parking like?

- Public transport?

**Stage 4 - Cash flow is tight. We need working capital**

- So you have got your business going. You have some customers and can show income (or possibly more precisely you can show contracts).

- You have a good business plan that shows how you intend to get more customers and more profits. And it shows quite clearly that you need more cash to fund the time between building your products and selling them (and getting paid for them).
• There are two broad scenarios here.

• You have started a business but your customers pay you much slower than the time you have to pay for the goods or services.

If your business is basically profitable you should eventually build up enough funds in the business not to have a problem. However at the beginning you will have to spend a lot of money paying for products that you have sold but not yet been paid for. Under these conditions a bank or factoring company may lend you the money you are waiting for from your customers. This means you can get 75% or more of the cash as soon as you have invoiced for goods – and this can be 30, 60 90 or more days before you would otherwise see it. This is called factoring or invoice discounting.

• You have started a business but you have to pay people to build the product before you can even sell it – and then wait for the customer to pay you the money.

This means you need investment or a longer term loan.

Investment means that you effectively sell a portion of your company (the equity) for a cash injection. The investor takes the risk with you that your business will succeed and both he and you will share the rewards then.

A loan just means you pay it back with interest and you keep all your company whether successful or not. Loans (especially risky loans) are hard to get. After all why should a lender take the risk that you cannot pay it back without sharing the rewards if you do.

Both ways give you working capital, i.e. money you can use to keep the business going.

• Try Banks; Factoring; Loans; Investment

**Stage 5 - My idea is working. I want to expand my client base**

• If your idea is working you probably NEED to expand. If you do not expand you will probably sooner or later be unable to fulfil orders or meet your customers expectations.

• You will already know what you seem directly short of. For instance it could be

• production people, larger equipment, working space or almost anything else.

• And you may find yourself saying "if only I could afford xxxxx" or "if only I had an assistant" we could do so much more.

• Recognise the situation you are in for what it is – absolutely normal hectic business life! Many many people have been there before. You are not alone!
Find the friend you talked to when you set up the business (see Scale 1) or find another friend or mentor through the Enterprise Hub (this site), the Entrepreneurs Club (Business Link) or almost any other business support organisation. You really should not have forgotten about networking. This is one of those times when you need the contacts.

Simply explain your business and its expansion needs again. However this time the mentor should help you look at it all from a wider perspective. Questions you should answer may be:

Do you really need the new production people or equipment that you are looking for or should you be delegating more and/or making time for you or preferably others to make the existing resources more efficient?

Would you really be better widening your management team and bringing in complementary skills to your own?

Is it really all about your time management? Or man management? Or finance?

How permanent is the current pressure for expansion? Can you find other ways to get over the hump until you are sure a major investment is worthwhile?

If you are already a team and have no time to resolve these pressures MAKE time to meet away from work to discuss the above points - with a mentor if necessary.

Whatever the results, write them down. Just like with the first plan this forces you to think, justify and understand – and then act on them.

If you need further help and support your mentor should be able to point you in the right direction. If in doubt use the Hub to ask. That’s why it’s here.

Stage 6 - I want to start developing new additional ideas

This section has similarities to Scale 5 in that if you are deep into the daily problems in your business you are unlikely to be reading this. But let’s hope that if your business does get into trouble you remember this advice.

Firstly don’t panic - but do act! Preferably as early as possible. Business problems happen to everyone. It’s just that all the others hide their problems from you just as you are hiding yours from the world right now. We know. We have been there!

Secondly find your business friend (see Scale 1) or mentor. If you don’t have one Ask the Hub – it’s our job to point you in the right direction.

Explain your business and its problems. Just doing that often helps immensely. (It’s just like visiting your GP really and should be just as confidential).
• Remember your problem is almost certainly not unique even though your particular circumstances may be. Your mentor should help you set up a simple action plan and/or point you at the right professional advisors or support.

• There is an army of excellent support out there (accountants, lawyers, patent attorneys, business sector specialists etc. etc.) but knowing who to go to and what the costs might be is enough to frighten anybody. A good mentor will have the experience to guide you through.