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**Technology Parks, Incubation Centres, Centres of
Excellence:
Best Practices and Business Model Development in
North and Southern Africa**

EXECUTIVE SUMMARY

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1. INTRODUCTION

1. During the last decade, African countries have embarked on projects for the establishment of science and technology parks, business incubators and centres of excellence with the aim of spurring and sustaining economic growth, meeting the job needs of new graduates and of integration into the knowledge economy. These centres and parks are designed to bring together various actors in knowledge management, research and development and companies.

2. African countries have shown a growing interest in establishment of science and technology parks, business incubators, and centres of excellence, frequently within a science, technology and innovation policy framework.

3. The objectives of this study are to present a comprehensive and comparative analysis of the overall situation, review the evolution of technology parks, centres of excellence, and business incubation centres in identified countries of North and Southern Africa, highlight the lessons learnt, examine continental and worldwide best practices, and develop a comprehensive Business Model that can be used as a policy tool for development actors and decision makers.

Background to the Development of Technology Parks, Incubators and Centres of Excellence

4. The International Association of Scientific Parks (IASP) considers that the term “Science Park” could include all “Technology Parks”, “Technopole” or “Research Park” and defines a Science Park as “an organization managed by specialized 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”.

5. IASP defines a **business incubator** as "an organization designed to accelerate the growth and success of entrepreneurial companies through an array of business support resources and services that could include physical space, capital, coaching, common services, and networking connections". Incubators may intervene upstream of business incubators. They come into play starting from the project idea, its translation into a marketable product or service and the creation of a start-up. This support continues to accompany the new organization in its infancy.

6. A **scientific research centre** is a research organization that produces knowledge and makes that knowledge available for economic and social progress.

7. Some countries grant the status of **centre of excellence** to a research centre if they have a critical mass of researchers considered excellent in the sense that they have made their mark in research evaluated by peers. As this notion of a centre of excellence is still very recent and adopted in only a few countries, this report uses “research centre” equivalently in the terminology.

8. The background literature review focuses on technology parks and incubators as they are relatively recent phenomena. The review identified the following main elements:

Parks: from the 1980s, a significant growth of technology parks has been observed, the total number worldwide being about 700 in 2003. The main lessons learnt at the international level are:

- There is no single model for the establishment of technology parks: they can be specialized, semi-specialized or generalist. In terms of size, they may be small, medium, or large;
- They offer multiple services including logistics, financial and business, technological, social, events management, and incubation;
- Management is generally entrusted to a private company; and
- They are located near or created around a university campus.

9. The study conducted by **UKSPA** came to the conclusion that:

- For park managers, the success of many parks is due to successful marketing of flagship (golden) products, which are multi-let accommodation and are fully serviced sites for single-occupier buildings;
- The factors that attract most companies to move into a technology park are essentially, the image and profile of the site, space expansion possibilities, transportation and cost of premises; and
- On-park companies achieve overall better performances than off-park companies.

10. **Incubators:** The number of incubators in the world was about 5,000 in 2006, with the larger proportion in developing countries. Lessons learnt are mainly:

- The creation of business incubators is a response to a variety of needs ranging from the commercialization of university research results to increased employment in the economic zones in difficulty by acting as a catalyst for investment;
- Most incubators are non-profit organizations whose primary objective is economic development;
- The foundations of successful incubators are linked to investment in a feasibility study that determines the strength of the market and the financial viability of the project as well as the strong support of the community.

II. METHODOLOGY

11. The present report summarizes the reports of the three experts who conducted the study in selected countries of North Africa (Algeria, Egypt, Morocco, Tunisia) and in selected countries of Southern Africa (South Africa, Botswana, Mauritius, Mozambique). It also offers comparisons and highlights the major findings and recommendations.

12. In order to carry out the assignment effectively and in a manner that harmonizes with parallel studies, appropriate survey tools were collaboratively developed by the three participating consultants. In summary, 30 interviews were conducted in 4 North Africa countries

(Algeria, Egypt, Morocco and Tunisia) and 13 in Southern Africa countries (Botswana, South Africa).

13. Furthermore, a survey was conducted by questionnaire; the response rate was low.

The report is organized into six parts:

- The first part gives a background overview on the development of technology parks, incubators and centres of excellence;
- The second part deals with the methodology of data collection;
- The third, fourth, and fifth parts focus on comparative analysis of the development of technology parks, incubators, and centres of excellence in North and Southern Africa; and
- The sixth part proposes business models for technology parks, incubators and centres of excellence for Africa.

III. REPORT FINDINGS

3.1 Technology parks

14. The establishment of technology parks finds its rationale in the willingness of African countries to seek greater competitiveness of their economies through improved achievement of their scientific and innovation potential. Development of technology park/technopole policies aim at two major objectives: territorial development and integration into the international economy by attracting international companies.

3.1.1 Policies and achievements of technology parks

15. Five of the 8 countries have integrated the development of their parks in their science and technology policies. Six have initiated the creation of parks: Algeria, South Africa, Egypt, Morocco, Botswana and Tunisia. In total, only 4 technology parks are fully operational, 6 partially operational and 6 under construction. Most parks are specialized. The information and communication technology (ICT) sector is the dominant sector of activity in the operational parks.

16. The most advanced countries in the deployment of technology parks are Tunisia and Morocco. Only South Africa among the Southern African countries included in the study has a fully operational park.

17. The comparative analysis focuses only on the operational parks visited, which are: Casablanca Technopark (Morocco), Elgazala Park (Tunisia), Smart Village Cairo (Egypt), and Innovation Hub (South Africa). The main findings from visiting these parks are:

- The 4 parks were created in the same period, 2000-2001, but the dates of their entry into operation are different;

- Two out of the 4 parks are of average size (about 60 ha) while one is small (Casablanca Technopark) and the other large (Smart Village Cairo);
- The 4 parks are located in urban areas, near major cities and national and international transport infrastructure;
- Three parks are specialized in ICT; one of them (Smart Village Cairo) is engaged in a diversification process, while the fourth was diversified from the outset, including ICT (Innovation Hub);
- Only Elgazala Park has been developed around educational and research institutions hosted in the park, while all the other parks do not include training and research institutions;
- Casablanca Technopark, the smallest in size, is hosting the largest number of companies (140), followed by Smart Village Cairo (about 100), the Innovation Hub (54) and Elgazala (52) ;
- Except for Elgazala Park, the other parks were created in a public-private partnership framework or belong to a public holding company (e.g. Blue IQ Investment Holding (Pty) Ltd, South Africa);
- The ownership structure determines the legal structure of the management company: Elgazala management is provided by a public company (EPNA) while the management of the other parks is provided by private firms;
- The 4 parks host incubators and 3 of them host business incubators.

3.1.2 Business models of the parks studied

18. The business model of the 4 parks was studied on the basis of a business model framework developed by the team of experts. The business model framework comprises eight dimensions of choices for a park, namely, location, actors/promoters, vision, mission of the park, strategic objectives, governance, operational management, and performance measurement indicators.

19. Public actors and park promoters intervene in all 4 studied cases. Only in the case of the Egyptian and Moroccan parks are private stakeholders (including banks) involved in the creation of the parks. In the case of South Africa, the State intervened through the public holding Blue IQ Investment Holding (Pty) Ltd. In the case of Tunisia, the State is the sole owner of Elgazala. For the North African countries, interest in creating jobs for university graduates is recognized in the vision for technology park development. The other element that is part of the vision is to attract foreign multinational companies.

20. Regarding the services offered, the visited parks cover the basic services outlined in the literature (accommodation, logistics, and technical services). These services are not always fully insured by the management company itself. The case of Smart Village is instructive, as it outsources services to suppliers considered as specialists in their fields. Parks are designed to also support the creation of innovative companies through the exploitation of research results. All 4 parks offer incubation services.

21. With regard to governance beyond the usual bodies, two organs differentiate parks:

- Casablanca Technopark established a strategic committee; and
- Elgazala established a scientific council.

22. Finally, park publications show the use of commonly adopted performance measurement indicators for benchmarking purposes (number of jobs created, number of hosted companies, number of incubates graduating, etc.). Casablanca Technopark is the only park that has carried out a satisfaction survey, completed in 2008.

3.1.3 Impact and performance of technology parks

23. All 4 technology parks have contributed to the creation of companies and jobs for young university graduates. Available data on Casablanca Technopark (Park Directory (2007) indicate that 2000 skilled jobs have been created in 5 years. At Smart Village, the creation of 20, 000 jobs for professionals working in 120 companies was projected by the end of 2008.

24. With regard to the total number of employees (in 2008) Smart Village is leading with 12,000, followed by Innovation Hub (1,500), then Casablanca Technopark (1,400) and Elgazala (1,370). The total number of companies per park ranges between 50 and 140. The companies in the 4 parks are very active and dynamic players in the ICT sector. All 4 parks have contributed effectively to development of exports in ICT-related products and services.

25. A number of impacts at country and regional levels have also been observed in terms of communication infrastructure and development of an enabling environment.

26. The establishment of links between on-park companies and training and research institutions was noted in Morocco and Tunisia. Even though these links focus basically on training, internships and end-of-studies projects, a few small joint research and development (R&D) projects have been set up.

27. Overall and for all parks, the on-park companies appreciated the services rendered by the park and considered park impacts as positive, even if synergies were not always realized among them.

28. Among the main strengths particularly noted at the parks visited were the proximity of a large economic city, spaces that met the needs of businesses, affordable rental cost, availability of services, the park brand name and international visibility, and access to qualified human resources.

29. The most salient weaknesses were: inadequate synergies among on-park companies, and insufficiently developed training and research institutions that face the risk of poaching and personnel turnover.

30. Numerous best practices and key success factors were identified. They have been classified according to the dimensions of choices of the park business model framework. The main best practices and key success factors are included in the business model proposed in the report.

3.2 Incubators

31. The development of incubators and business incubators in African countries are projected to meet the needs of commercialization of research results from universities and/or research institutes, of increasing job opportunities and to catalyze investment.

3.2.1 Policies and achievements of incubators

32. A total of 18 incubators and 40 business incubators have been created. The majority are located in Tunisia, Morocco and Egypt, where networks of incubators have been created.

33. Egypt and Tunisia are the first countries of the subregion to have launched incubators/business incubators. The majority of African countries have not yet included (at least initially) the creation of incubators in their national system of innovation (NSI).

34. The main objective of the Egyptian model was the development of a sustainable network of incubation-related facilities that would spur the competitiveness and productivity of small and medium enterprises (SMEs). Locations were selected for incubators in non-exploited areas characterized by availability of technical infrastructure, a good business environment and an academic or industrial base to service projects.

35. In the Moroccan and Tunisian models emphasis seems to be more on the commercialization of research results. In these countries, incubators/business incubators are also a response to the need for development of an entrepreneurial culture.

36. In South Africa, the South African Business and Technology Incubator Association (SABTIA) has been established to take stewardship of the development of business incubation in the country and to ensure that such incubation plays its role in national development as an integral part of the NSI.

37. The comparative analysis focuses solely on incubators/business incubators visited and which are in operation. These are the incubator and the business incubator of Elgazala (Tunisia), Casablanca Technopark, the "technology innovation centre" of the Mohammadia School of Engineering (Morocco), and Maxum, SoftstartBTI, SmartXchange and Upstarts in South Africa. The comparison of the main characteristics of the 8 incubators/business incubators highlights the following main elements:

- Four are located in technology parks; 2 are on university campuses; 1 is located in a business area; and 1 is located at a scientific research centre
- Seven have public status and 1 has public-private status
- The main sponsors are public
- Four are specialized in ICT
- Their size varies between 500 and 1,500 m²
- The number of projects incubated is generally fairly low except in South Africa.

3.2.2 Business models of incubators

38. The business models of the 8 incubators are compared according to the dimensions of choices of the incubator business model framework developed by the team of experts. The comparison of incubators highlighted the following main features:

- An effort is made by public authorities to create incubators and business incubators;
- The major concentration is on the ICT sector;
- There is a strong similarity in the services offered, which, in addition to providing hosting space and communication infrastructure, support the preparation of business plans, fundraising, networking, marketing and training; and
- Spaces and services offered for free or at moderate prices.

39. No major differences were found between on-park and off-park incubators. However, some incubators/business incubators provide scholarships to project holders or allow them to benefit from state subsidies, as in the case of Tunisia.

40. The majority of incubators seem to be more focused on hosting innovative projects based on research results rather than on production and spin-off companies.

3.2.3 Impact and performance of incubators

41. The total number of projects hosted (in 2008) by the 8 incubators was 99 and the total number of projects graduated was 28.

42. Overall, South African incubators are the most efficient in terms of number of incubated projects and graduated projects.

43. Globally, business incubation has not yet reached its cruising speed neither in terms of projects hosted nor in terms of creation of start-ups. Nevertheless, the dissemination of an entrepreneurial culture mainly through training is considered as an important achievement. This should have positive effects in the medium and long term in dissemination of an entrepreneurial culture among young graduates.

44. The strengths and weaknesses that were identified show that the networking of incubators and the diversification of service offerings are shared strengths. However, incubator management bureaucracy, inadequacies in funding, limited client entrepreneurial skills, and the limited awareness of potential clients are shared weaknesses.

45. The main best practices and key success factors that emerged from visiting incubators are classified according to the dimensions of choices of the incubator's business model framework. We noted a low number of these best practices and key success factors. This can be explained by the relatively recent experience of the countries studied in the establishment of incubators/business incubators. Indeed, the learning process has just been initiated.

46. The main best practices and key success factors are included in the business model proposed in the report.

3.3 Centres of Excellence

47. Due to the fact that not all countries have adopted the concept of “centre of excellence” to characterize their best research centres, the study addresses centres of excellence as well as research centres.

3.3.1 Policies and achievements of centres of excellence

48. The centres of research/excellence are major components of national science and technology and innovation systems. The countries studied have made strenuous efforts in this area. They have established research governance structures at the national level and increased their research expenditures that rely mainly on public funding.

49. All countries studied have research centres whose sizes vary from a few dozen to several thousand researchers. The total number of research centres is 298 of which 221 are located in Egypt followed by Tunisia with 32 centres.

50. The centres of research/excellence in the countries studied involve several research areas. The comparison with reference to scientific disciplines is quite problematic given the multitude of classifications and the high number of scientific disciplines. The areas in which 4 or more countries are involved are: Agronomy (4), Environment (4), Health (5), Biology and Biotechnology (5), Minerals (5), and Energy (6).

51. The comparative analysis presented in the report focuses only on the nine visited research/excellence centres, which included the National Research Centre (NRC) and MUCSAT in Egypt, the National Institute for Agronomic Research (Institut National de la Recherche Agronomique) in Morocco, the Department of Science and Technology/National Research Foundation (DST/NRF), Centre of Excellence in Strong Materials (SM), and Biomedical TB Research (CoE-BTBR), the Council for Science and Industrial Research (CSIR) in South Africa; the Department of Agricultural Research (DAR) in Botswana and the Botswana Technology Centre (BOTEC).

52. The comparison between the visited centres of excellence led to the recognition that the oldest centres are INRA (1914) and NRC (1956). The largest centres are located in Egypt (NRC has 5000 researchers) and South Africa (CSIR has 1500 researchers). Four centres have not yet reached a critical mass of researchers. The majority of research centres provide services to industry and have developed projects in cooperation with industry. INRA and DAR specialize in the agricultural domain, whereas CoE, SM and CoE-BTBR specialize in materials and health. The other centres are diversified. The countries covered in this study invest in materials research. With the exception of the 3 centres specializing in agriculture and health, all the others deal with materials research, among other areas.

3.3.2 Business models of the studied centres of excellence

53. In order to be able to compare the business models of the centres of excellence, the reference frameworks are used, worked out to propose a single business model for adoption, with its different dimensions of choices.

54. The research centres visited are centres created by public authorities. The missions and research domains of the centres of excellence/research centres are clearly defined.

55. The centres for agricultural research are supported by regional representations; these regional 'antennas' allow attention to be paid to the needs of agricultural enterprises on one hand, and on the other, facilitate the diffusion of the research results to users.

56. Generally speaking, the governing structure is composed of a board of directors. The other governing elements are specific to the country and to the centre. Data on performance indicators are not available in all cases.

3.3.3 Impact and performance of the centres of excellence

57. The performance of a centre of excellence/research can be measured in terms of number of researchers, patents accepted/plant varieties registered, number of publications, and contracts with the industry.

58. NRC has a critical mass of researchers at its disposal, followed by CSIR, MuCSAT and INRA. CSIR has recorded 2,500 patents, which corresponds to a ratio of 1.67 patents/researchers; this ratio is the highest of all the centres visited. At this level, one must also take notice of the performance of INRA, which accounted for 216 recordings of plant varieties for 230 researchers (ratio of 0.94). CoE-BTBR is remarkable for its publications ratio (5.2 per researcher) the highest ratio of all the centres of excellence.

59. Regarding the number of collaboration research contracts with industry, INRA is the best performing. At this level, one should mention that MuCSAT undertakes an average of 15 analyses for industrial enterprises per day.

60. The main strong points and the most important weak points of the centres of excellence that were visited are summarized below. Specificities exist in the strengths and the weaknesses of each centre; for this reason, we have attempted to identify the common points between at least 2 centres of excellence and the points specific to one centre.

61. Among the main strong points of the visited research centres is development of services destined for enterprises. These services are essentially centred on analysis, and incubation of new research and development ideas (vulgarization).

62. The proximity of the skills and services of the centres of excellence to the users (industrial, agricultural enterprises) must be appreciated as a strong point since this recognizes user needs. Another is the nature of the participation and, consequently, the development of relations of trust between research and practice.

63. Conversely, the centres of excellence suffer from lack of financial resources. The commercialization of research results is also relatively weak. The average ratio of publications per researcher is also relatively low. The main best practices and key success factors identified are included in the business model proposed.

IV. RECOMMENDATIONS

64. The last part of the report is devoted to developing business models for technology parks, incubators and centres of excellence/research, as major instruments for building the knowledge economy.

65. The development of business models adapted to African countries must take into consideration their varying levels of development. In order to recognize the different levels of development and rank countries, the framework of the World Bank for measuring the knowledge economy has been used. Based on the Knowledge Economy Index (KEI), 30 African countries are grouped in 5 clusters (A, B, C, D, E) according to their scores (data do not exist for the other 23 countries).

4.1 Business model for technology parks: recommendations

66. Before dealing with the business model to be developed for African countries, one must bear in mind that technology parks are part and parcel of a more encompassing whole which is the NSI. A NSI is defined as “the elements and relationships which interact in the production, diffusion and use of new and economically useful knowledge” (Lundvall (1992).

67. Technology parks are considered as interfaces or bridging systems between training and research on the one hand and firms on the other. Intermediation structures have no *raison d'être* in the absence of qualified human resources and of useful and relevant research activities. Research has to lead to results that can be commercialized on one hand, and to an environment conducive to the creation of innovative companies or companies able to use these results, on the other.

68. Concretely, the creation of technology parks (mediation organs) is justified if a minimum of preliminary conditions is met. In the opposite case, it is more logical to act on the preliminaries as a point of departure. Two questions arise:

- Is it pertinent to create technology parks for all African countries?
- If the answer is yes, then, what type of park is the most adequate in relation to the category to which the country belongs?

69. To answer these questions, we refer to the grouping of countries according to KEI and its pillars:

- For group E and D (21/31 countries), the preliminaries for the creation of technological parks do not exist. However, certain localities or large towns in a country offer the necessary conditions for the creation of parks. Consequently, the decision to create parks can be taken only on the basis of a field study to determine the specificities and advantages of the locality or town under consideration.

- Groups A, B and C which comprise 10 countries, including 6 which have already established technology parks, satisfy the prerequisites. The recommendation here is that these countries that already own parks should consolidate their efforts after reviewing the nature of their evolution, and the countries which do not have them should opt for the creation of **business parks** from the initial stage.

70. The business model proposed for technology parks is based on good practices and key factors of success determined by the consultants and on the analysis of international publications reporting on country experiences and the business model framework. A framework was developed in order to elaborate the business model. It is composed of 9 dimensions of choices.

71. The proposed model is generic. It necessitates more country-specific and park-specific. The main recommendations for the dimensions of choices are:

72. *Country environment:* the establishment of a technology park must be part of a NSI. It is recommended that at the country level, a vision and a strategy be developed for the sector of activities chosen for the park.

73. *Location:* One of the preliminaries is the existence of trained human resources in that area or town, especially in the case of business parks. The technology park should be set up on a pleasant site including or having nearby centres for research and training. The existence or development of national and international transport and communication (broadband Internet, etc.) infrastructure is essential to attract businesses and skills. The choice of site must also take into account the proximity of a city. Indeed, the park must be set up according to high quality standards.

74. *Actors/Promoters of the park:* Private sector (corporate and financial institutions) must be involved in partnership with the State. At the level of participation by the private sector, it is preferable to associate the financial institutions and the representatives of the sectors of the park activities.

75. The role of the State in financing the creation of business or technology parks is paramount in view of the heavy costs of such investments. The State should contribute the land and participate, at least in the initial start-up stage, in the construction of the first buildings.

76. *Vision:* The vision should be shared by the professionals in the park's sectors of activity and should be consistent with country needs and resources.

77. *Mission:* defining the park activity as well as its type (business park or technology park) is of paramount importance. In the case of business parks, the customers must be well targeted

on the basis of a market study. In all cases, it is recommended that efforts be made to attract world-renowned firms, to improve the image of the park and its attractiveness.

78. Whenever the original sector of the park's activity reaches maturity or begins to weaken, and while the park is still offering a potential for development (land, buildings, tax incentives, etc.), it is recommended that park activities be identified.

79. The services provided by the park to its residents must also be defined within the framework of the mission. These services concern: space and modularity, logistics, financial services, technology services, organization of events, information services, amenities, incubation services, training services, and social services.

80. *Strategic objectives:* The strategic objectives to be designed for the park must take into consideration the time dimension in terms of their staggering the various stages according to the development cycle of the park. The recommendations pertaining to the strategic objectives deal with the following aspects:

- Buildings must be modular so as to adapt the offerings to the tenants' development. The quality of the buildings infrastructure including the communications infrastructures is a key factor of success;
- Service offerings have to be adapted to the needs of the tenants. A minimum of basic services must be secured;
- The commercial and financial objectives concerning the number of tenants, turnover and profitability must be detailed in keeping with the development stage of the park;
- The objectives of directly creating jobs and, more particularly, for graduates must be defined;
- Business parks should cooperate with training institutions in order to provide the professional training needed;
- For technology parks, the objectives of technology transfer, research commercialization and the creation of innovative enterprises must be specified;

81. *Governance of technology parks:* To ensure flexible management of the park, it is recommended that a management company be created under private law. In the governance structures of the company, it is recommended that shareholders, as well as professional associations and representatives of park tenants, be involved.

82. *Operational management:* it is recommended that the management company of a park should:

- Define the type of real-estate (single or multi-user space), space concessions, and space transfer;
- Provide basic services in compliance with high quality standards;
- Develop synergies between tenants of the park (companies, training and research institutions, etc.) through organization of professional meetings, events and off-business cultural activities;
- Develop a programme of support and mentoring to its tenants and SMEs;
- Develop a micro-economy within the park to the extent possible;

- Develop cooperative relations with local authorities and academic institutions;
- Develop a network of international cooperation;
- Launch park marketing actions;
- Develop a brand name and a solid reputation for the park;
- Develop partnerships with training institutions such as universities and vocational training centres in the area; and
- Create exchange mechanisms for skills and technology transfer between academics, researchers and park companies.

83. *Performance measurement indicators:* the park management company should develop a scoreboard based on performance indicators such as the rate of occupation of the site, the number of jobs created in the park, including graduate jobs, and the total turnover of on-park companies.

84. The elements of the proposed business model collectively allow for objective assessment of the pertinence and feasibility of the creation of a park and, consequently, the elaboration of the business plan. These same elements also serve to diagnose and propose practical improvements for the existing parks.

4.2 Business model for incubators: recommendations

85. Field visits have shown that the boundaries between incubators and business incubators are not rigid but are instead, rather elastic. Owing to the difficulty that African countries face in generating a continuous and consistent flow of innovative projects emanating from R&D, creation of one single entity is recommended, which would simultaneously ensure the functions of incubators and business incubators.

86. The business model is developed using the same approach used to develop the business model for technology parks. A framework was developed to elaborate the business model. Below, the main recommendations regarding the dimensions of choices are presented.

87. *Country environment:* the creation of incubators/business incubators must be developed within the framework of a clear country strategy regarding innovation and the promotion of entrepreneurship. It is necessary that the enabling environment for incubation (seed money, capital risk, business angels, etc.) be prepared.

88. *Type of incubator:* Incubators should be independent legal entities, preferably tied to existing institutions (a research centre, a technology park, etc.). In the beginning at least, the incubator must be an organization with a non-profit goal. After the development phase, the incubator should be able to recover its expenses from its activities.

89. *Location:* the incubator should be situated in an accessible location, where a critical mass of potential customers exists.

90. *Actors/Promoters:* it is advisable that, besides government agencies, companies, financial, training and research institutions should also be involved in the promotion of incubators/business incubators.

91. *Vision:* the guiding vision to develop incubators/business incubators must take into consideration the types of projects targeted for incubation, the types of project holders targeted, as well as business creation and job creation.
92. Incubation being a new activity, incubators/business incubators should be integrated into national, regional and international networks.
93. *Mission:* defining the activity of the incubator is of utmost importance. The incubator must take into consideration a wide array of clients (researchers, young graduates, young entrepreneurs, and so on.). It should offer services to resident clients as well as to clients outside the incubator, thus generating extra income.
94. *Strategic objectives:* In addition to spaces, incubators must also include services related to support in preparation of business plans, funding, market research and structured training in the field of management. The incubator should consider diversifying its activities to exploit skills and achieve financial balance.
95. The incubator must set its objectives in terms of start-ups, projects to incubate and the number of direct jobs to create as well as its objectives in financial terms.
96. *Governance:* The legal form to adopt must be of private law. If a network of incubators/business incubators is created, it must also have a legal structure of private law.
97. Regarding the selection of projects and start-ups to accommodate, it is recommended to create a selection committee which includes representatives of the activity sectors, research and funding parties.
98. *Operational management:* At a country level it is necessary to pool efforts in the framework of a national incubator network and to exchange on best practices.
99. To attract project holders or project idea holders, the network of incubators/business incubators should initiate promotional actions towards universities, research centres, businesses and advertise through the mass media and the Internet.
100. To realize these commercial and financial objectives, the incubator/business incubator must work out an appropriate marketing concept.
101. Services to be offered should include: shared business support services, advisory services, entrepreneurship and business related training, mentoring and counselling, facilitation of technology assessment and acquisition assistance in the preparation of business plans, the search of funds, the undertaking of company creation procedures. The incubator should concentrate on its core activities and rely on specialized organizations for the rest.

102. The incubator/business incubator must develop relations with multiple actors in order to secure better success for innovative projects and start-ups (financing structures such as priming funds, venture capital companies, research centres and industrial firms)

103. Performance measurement indicators: It is recommended to choose indicators to measure performance in relation to the level of development and the type of incubator. Among these indicators we mention: number of businesses created, graduation rate, turnover, percentage of charges covered by revenues, space occupation rates, project portfolio, number of jobs created, types of jobs created, satisfaction of project holders and start up managers.

4.3 Business model for centres of excellence: recommendations

104. The centres of research/excellence constitute the cornerstone of the research and innovation system. The centres of excellence also play an important role in supporting the research structures in the universities and bringing them up to higher levels.

105. For some African countries rather than creating parks the preliminaries for which are constraining, they could be better suited for the creation of centres of research/excellence.

106. The business model is developed using the same approach used to develop the business models for technology parks and incubators/business incubators. A framework was developed to elaborate the business model. In what follows, we present the main recommendations regarding the dimensions of choices.

107. *Country environment*: Before the creation of a centre of excellence/research centre, a country must develop policies and strategies for research, development and innovation at the national level. These policies determine research domains, priorities and funding means. They must be translated into programmes subject to regular evaluations.

108. *Location*: Research centres should be established close to what is seen as key resource for its operations (industry, university, special natural resources).

The existence or the development of national and international transport and communication infrastructures is essential to attract skills and ensure interaction with its environment.

109. *Actors/Promoters*: One main objective is to bring the R & D conducted by research centres close to the needs of companies and to encourage greater private sector involvement. It is thus advisable to get businesses involved, in the creation and promotion of these centres.

110. *Vision*: It is necessary to develop a vision for each centre of excellence/research. This vision should:

- Take into account the needs of the country in its choice of development and research;
- Take into consideration existing resources (skills, structures, and natural resources) and build upon them to anchor the reality and target actions accordingly; and

- Avoid spreading financial and human resources too thinly, and create critical masses.

111. *Mission:* In addition to research activities, the centre of excellence should offer services and expertise to businesses, educational and research institutions and other social actors. Offering these services allows the socio-economic actors to benefit from the available human and material potential on the one hand and to generate financial resources on the other.

112. *Strategic objectives:* It is recommended that the strategic objectives of the research centres should be defined in relation to:

- The R&D projects to be realized by the socio-economic actors and also prospective fundamental research projects;
- The types of collaborative projects to be undertaken within the context of international cooperation in order to allow the researchers of the centre to integrate with the international dynamics for production of knowledge; and
- The motivation of the research staff to maintain their competence.

113. The centre of research/excellence should not lose sight of the financial and commercial aspects and it is advised that they define their objectives to that effect.

114. *Governance:* because bureaucratic structures do not provide the flexibility needed for a centre of excellence / research centre, governance must borrow the practices developed in private companies.

115. With regard to the collegial governance bodies, the involvement of production companies, banks, capital risk, business angels, through their associations / federations is paramount.

116. It is also recommended that centres of research/excellence create an entity in charge of research commercialization and technology transfer; this entity should act as an interface with the economic actors.

117. *Operational management:* The establishment of a participatory management style is equally important. Communication must be regarded as a central aspect in the operational management.

Incentives should be given to motivate the personnel and create a work environment conducive to enthusiasm.

118. *Performance measurement indicators:* The centre should adopt indicators for measuring its performance. Two categories of indicators are recommended:

- Indicators related to research and development activities: number of research projects, of patents filed, of publications, of incubated projects for industry, exploitation and commercialization of results, and expertise contracts;

- Indicators related to management, revenues from services, customer satisfaction, financial indicators and product/service quality.

Recommendations for science, technology and innovation in Africa

Partners: they should support African countries in developing the policies and strategies related to creation of technology parks, business parks, incubators and research/excellence centres.

Existing parks: they should:

- Support the managing enterprises of the park in the development of synergies between the training/research institutions and the enterprises of the park;
 - Establish networking among the African parks;
 - Undertake studies to find out the possibilities for diversification of park activities;
- and
- Support capacity-building of park management staff.

Creation of parks: park business models have to be developed and/or adapted, and feasibility studies must be carried out.

Incubators: they should:

- Support the capacity-building for incubator management and for support and advisory staff; and
- Support the development of an appropriate marketing concept and the networking of the African incubators.

Creation of incubators: development and adaptation of incubator business models must take place and feasibility studies must be undertaken.

Research/excellence centres: these should seek the partnerships needed to assist in promoting networking among the African centres of research/excellence. They should also seek partners to assist with development of a cooperative approach among the countries. What is needed is the creation of complementarities in the respective priority domains of these countries. Such complementarity can take several forms, such as engaging in collaborative projects, having each centre specialize in a given research domain, and financing projects from funds originating from the cooperating countries and from other funding parties. Partners are also needed to support the research/excellence centres (in existence or to be created) in the elaboration of development plans, particularly in terms of human resources, equipment, working spaces, governance and management modes and interfacing with the socio-economic world.

Furthermore, it is also recommended that a yearly competition be organized for selecting the best innovation in Africa, for which criteria would be established, especially success in the marketplace.

