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STPs AS TECHNOLOGY DEVELOPMENT CATALYST

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STPs filling the gaps

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مجمع الابتكار مسقط
Innovation Park Muscat

Executive Summary

The global innovation imperative illustrated successful cases in improving the economy of many countries. In fact, the developed countries are having huge R&D investments. In other words, there is a strong relationship between Innovation, R&D and countries' prosperities. It has been identified that STPs are playing a vital role as R&D facilitators which build strong technology development catalyst. They generate great outcomes by transferring and directing basic researches towards applied researches. This place STPs as critical component in the economical ecosystem. Oman as an example is in the transition period from being efficiency-driven to innovation-driven economy[1]. The Research Council of Oman (TRC) is executing one of the milestones in passing this stage by constructing the first STP, Innovation Park Muscat (IPM). IPM will achieve organizational Knowledge creation through the implementation of STP concept that synergy the efforts of the private and academic sector.

1 The Global Competitiveness Report 2013–2014

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Introduction

In the south-eastern quarter of the Arabian Peninsula, Oman covers a total land area of 309,500 kms2 and has a population of 3.8 million. Ranked 10th in the XYZ list of exporters, Oman exports a variety of products to 140 countries. However, Oman's petroleum activities are responsible for the majority of its GDP and oil accounts. In 2011 this was 52.6%. As a result, the country's vision for 2020 is aiming to carry out a substantial transformation in the structure of the national economy by developing a variety of income sources in order to achieve economic balance and sustainable growth. The cornerstone of this vision is to gradually create a knowledge-based economy which is becoming the key tool for taking the societies towards advancement and prosperity. Clear examples are countries like United States, China, Japan, South Korea and India.[2]

Oman is in the process of shifting towards knowledge based economy

In parallel, the Global Innovation Imperative illustrated how a variety of countries improved their economies and the role of R&D in this is clear. However, GCC is having a low investment in R&D. *Science and Technology Parks (STPs) can serve as a strong technology development catalyst in the region. They can create significant outcomes by transferring and directing basic researches towards applied research and commercialization. Accordingly, The Research Council of Oman (TRC) is constructing the first multi sectorial STP, Innovation Park Muscat (IPM). IPM will focus on four specializations based on the national economic needs: Energy, food & Bio Technology, Water & Environment and Health Science. It is projected to have phased one ready by the middle of 2015.*

As a result of the importance of R&D, Oman is constructing the first STP as main facilitator of the knowledge transfer process

With the goal of having a smooth flow of technology transfer, IPM has been strategically located close to Oman's main university, Sultan Qaboos University (SQU).In addition to SQU, it is planned that the park will have a strong collaboration with the academic institutes like: Sohar University (SU), University of Nizwa (UoN) and Dhofar University (DU). In fact, IPM has been designed to meet the needs of all sectors and this is reflected in the composition of its board. This will ensure efficient collaboration and communication between all stakeholders in the knowledge transfer process.

IPM has been shaped to meet the various needs of the governmental, academic and private sectors.

This paper will discuss the importance of R&D activities in building up the economies and how to direct the efforts of both sectors towards this goal through STPs. Then the operational module of each of the academic and private sector will be illustrated. Also it will describe how STPs serve as Technology development Catalyst. Finally the paper will highlight the collaboration pattern within STPs with some recommendations

Role of STPs as Technology development Catalyst

IPM will fit and operate within the current strong national innovation system in Oman. It will act as catalyst innovation that will spark a new age of science advancement which will benefit the people of Oman and achieve regional and global recognition.

IPM will spark a new age of science advancement

2 Appendix 1

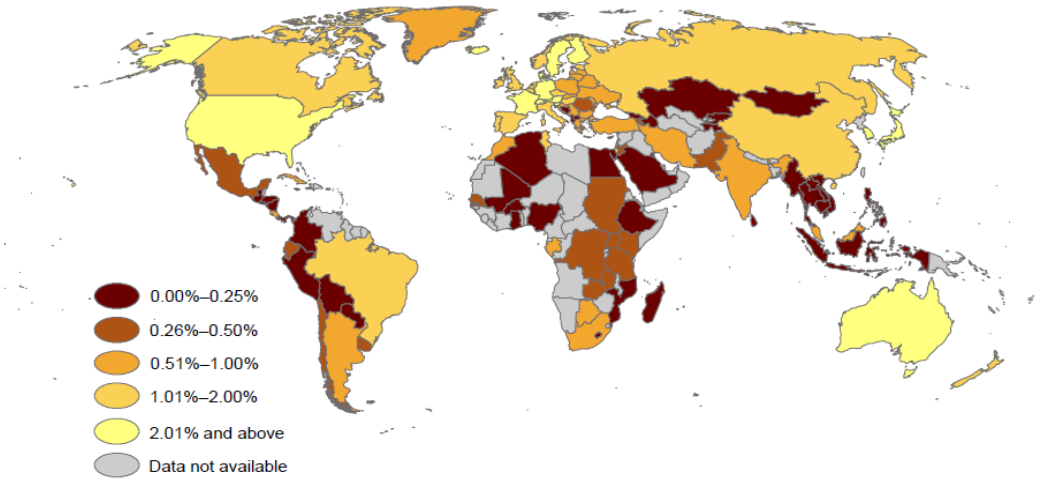
The importance of R&D activities for building up the economies[3]

The below chart is illustrating the R&D expenditure as percentage from GDP across the word. It *clearly shows the positive impact of R&D on a country's economy. This is an imperative that GCC countries should consider and act on. STPs is one of the main R&D facilitators and present a promising opportunity for economic diversification by creating knowledge based economies.*

R&D activities has a direct impact on counties prosperities

Figure 1:

GROSS DOMESTIC EXPENDITURE ON R&D AS A PERCENTAGE OF GDP, 2010 OR LATEST AVAILABLE YEAR



Source: UNESCO Institute for Statistics, October 2012.

[3] Appendix 1

The classical operational modules of the academic and private sectors (solo)

The academic sector

The traditional *components of the academic institutes consist of a classical mixture of students, admins, researchers and Lecturers. Moreover, some of the universities have research centres related to their specialisations. For example, in Oman, Sultan Qaboos University (SQU) has 9 research centres which are: Marine Biotechnology, Communication and information, Earthquake monitoring, Oil and Gas, Omani studies, Remote sensing, water, Humanities and Environment. In fact, there are huge numbers of researches, papers and publications that are conducted within this sector. However, in most of the cases, a prototype is the last outcome of those efforts. In other words, the created knowledge will stay within the shelves with no real impact on the world taking place. Moreover, many of them are pure academic researches that does not focus on the industry demand.*

Many of the academic sector outcomes are not really utilised or transformed to products that can have positive impact on the economy

The private sector

The private sector is a key player in building up the economy of the devolved countries. In fact SMEs are making up to 80% of the US economy. This sector includes experts in various fields where they have a deep understanding of the industries as well as the market challenges and demands. In other words, those companies are having a full view on the business environment and investments opportunities. In general, the private sector compose start-ups, SMSs and large corporations. As a result, the competitive rivalry is becoming higher and the market is experiencing various trends continuously. To survive and compete in the competitive private sector environment companies adopt rigorous R&D strategies *to insure that their products remains competitive, continuously developed and match the market demand in an innovative way. This vital practice ensures financial sustainability where Companies like Uniliever, Schlimberger and General Electrics are spending over 1 billion dollars annually for R&D activities. To put it in another way, investing in the R&D activities is rapidly increasing in private sector.*

The private sector is playing a key role in building up the economies of some counties. It includes expertise in various filed with willingness to invest in R&D activities

Binging it all together, science and technology parks

The Park is intended to function as an independent and self-sustaining institution serving as a bridge between Industry and Higher Education and supporting joint initiatives in the areas of Research and Development. Many people do not realize how important role do the universities play in creating technology which is commercialized by the private sector. Accordingly, the role of science and technology parks as technology development catalyst is significantly increasing. The concept is to create an enabling and knowledge transferring environment where the academic and private sector are linked together in a unique ecosystem. Simply put, STPs focus on commercialization – the business of science and technology. *The process takes place by managing the flow of knowledge through the mentioned sectors where the researches are analysed and turned out to prototypes that can be shifted to the mass production stage which meet the market demand.*

STPs connect the academic and private sector into a unique ecosystem

On the other hand, governments are adopting sets of incentives for their STPs' members such as: free zone advantages, access to databases, networking, business incubators, intellectual property, venture capital financing and so many other benefits. In fact, there is a strong competition globally among Science and Technology Parks on the attraction of R&D players. In most cases the priority of those companies is to have an ideal location with the necessary services, infrastructure and

Governments are adopting sets of incentives for STPs

enabling environment. The main potential of providing such attractions is to promote the economic development and competitiveness of the regions and cities by being Technology development Catalyst.

STPs as Technology development Catalyst

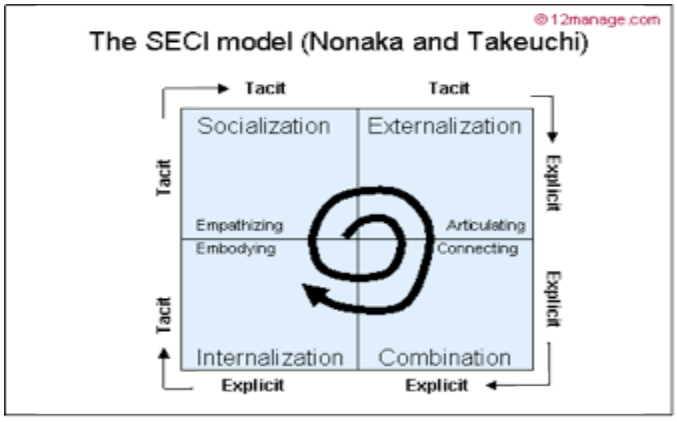
The main strength of STPs is the maintenance of effective collaboration among knowledge creators through the adoption of synergy strategies. . To answer the above question, SECI model developed by Nonaka and Takeuchi recommends that knowledge held by individuals is shared with other individuals so it interconnects to a new knowledge. The four elements of this theory – socialization; externalization; combination; and internalization (see fig 2 below) – are applied by STPs across their operational activities. *The below paragraphs will discuss the role of STPs as Technology transfer catalyst on the framework of the mentioned theory.*

STPs apply the 4 elements of SECI model across its operational activities

*As illustrated on the below graph (*see fig 2 below*), there are two types of knowledge: tacit and explicit. Tacit knowledge is subjective and experience based knowledge which includes the know-how technical skills. On the other hand, explicit knowledge is objective and rational like theoretical approaches, problem solving, manuals and databases. STPs build attractive spaces for the emerging knowledge workers by enhancing the synergy between universities and companies. It worth to mention that the below activities are enabling STPs to work as a facilitator/middleman that enhance the collaboration among the private and academic sectors.*

STPs process the conversation of tacit and explicit through their unique elements

Figure 2:



To start with, socialization is the straightforward stage where it's all about capturing knowledge by walking around and interaction with people. This is also called personal interaction. This can take the form of daily face to face communicating and sharing experiences among individuals. In STPs, those people are either highlight qualified undergraduate / graduated students and researches or innovators as start-ups or experts within SMEs or R&D arms of international companies. Using IPM as an example, there are 4000 sqm allocated within the main building for business incubators that includes start-ups and SMESs. This space has been designed to facilitate the interaction among them within the open spaces, shared facilitates and entertainments. For instant, the auditorium can accommodate up to 150 people. It will be used to host a variety of events and workshops that enable knowledge sharing and exchange not only between IPM tenants but also with visiting experts. In addition, there are nine large lots for long leasing contracts with R&D centres related to the mentioned specialisations. Moreover, the social centre services as an optimal environment to break the work routine, strengthen the personal relationships and enhance the networking among the park's members.

Stage 1, socialization: STPs enable direct interaction between unique diversified parties.

The next stage is externalization where those tacit ideas are gathered and shaped up as explicit knowledge. In other words, it is about eliciting and translating the tacit knowledge into a readily understandable form. In fact, there are many innovative ideas yet only few are really translated into actions. In fact, this is the main different between an innovator and an entrepreneur. There are many great ideas within academia that have the potential to impact positively on the economy but they need direction and support from industry experts. To pass this stage, STPs provide many services to start-ups and SMEs to convert their technical capacities to a written proper business plan. They help innovators become entrepreneurs. *This accrues through competitively priced consultancies for the members in areas like marketing, finance, communication and others. This is in addition to the technical support. For instance, to get the prototype, IPM offers its members an access to the fabrication workshops where all the technical machines for welding, fabrication and 3D printing are available with the technical supports provided by deducted professional. To keep it in a simple way, STPs articulate their members thinking and give them a clear guidance on establishing or improving their business.*

Stage 2, externalization: STPS provide many services that support their members in transferring the tacit ideas to explicit knowledge

Combination is the third stage where the final shaping of the outcomes takes place. This is followed up by sharing the created explicit knowledge through various media. In STPs it can take the form of mails, databases, meetings, conferences and workshops. In other words, it allows knowledge transfer among groups across organizations. A clear instant for this is the periodic papers published by various STPs through their websites or association like IASP.

Stage 3, Combination: STPs shares the created knowledge through various media

Internalization stage closes the loop by linking the individuals to the explicit Knowledge by implementing it by their owners. Alternatively, through actualized simulation. The internalization process transfers organization and group explicit knowledge to the individuals. Within STPs, the outcome of this is presented by spin off companies where talented individuals pick the knowledge and create their own companies. IPM will have a training centre for an international oil and gas company. The centre will include simulations training which will keep the people in real work environment which will enhance the learning process.

Stage 4, Internalization: Implementation of ideas by actualization or simulation

To summarise, the above model projects that Knowledge transfer as a spiral process among the mentioned various aspects. The next section will elaborate more on the collaboration pattern within STPs, evaluate it and suggest some recommendation that can improve it.

Knowledge transfer as a spiral process within SECI model

Collaboration pattern within STPs

The classical triple helix suggests that three sectors presented Public, Private and Academic. In the case of IPM, the board of directors will contain representatives from all key stakeholders. The people who will be appointed should reflect the participation of the triple helix principle (Government, Academia and Private Sector). The Board of Directors of the PMC is projected to consist of eight (8) members coming from

The classical triple helix suggest three sectors: Public, Private and Academic

- *Two members from TRC where one of them is the chairperson*
- *Two members from the Omani Government*
- *One member from SQU*
- *Private University / College (1 member) Private Sector (2 members, initially CCI and then one from an SME and one from a large enterprise)*

However, the four helix module recommends adding a fourth element which is the society. STPs does not operate alone and they need to be accepted and supported by the community. This can added through involving activities within the park.

The society should be added as fourth helix

For optimum collaboration, *the location of the STP is very critical and it is always recommended to be close to the academic sector while considering the other business elements such as: main roads, airports, city centre and industrial area. This can make the collaboration works better. Moreover, frequent meetings between the stakeholders should take place to ensure that the park maintains its focus on R&D activities and innovation and is not side-tracked to f areas outside its remit. It is worth to mention that there are some STPs who failed to make the right balance between the commercial and academic functions. In fact, they became as real statures in the first extreme and pure academic institute on the other case.*

The classical triple helix suggest three sectors: Public, Private and Academic

Another recommendation is to assign a specialised private company to operate the park. The reason is that the STP is a dynamic environment where daily decisions should take place. The high bureaucracy in the public sector will be a real constrain in front of such operational module.

Private company should operate STP

To optimise their role as technology cluster, STPs should adopt smart building management system that will boost the knowledge transferring process by enhancing the overall system. It will provide best empowerment to the members where they can work at anytime from anywhere by any device. In addition to productivity, it will strength the collaboration and knowledge sharing process. On the other hand, it will enable efficient utilisation of facilities by reducing the energy consumption through controlling system. IPM is in the process of designing this intelligent system that will be integrated with the district cooling system, solar panels, facility management and so on.

Smart building management system present a promising tool for STPs

Finally, STPs around the world should be linked to each other through various organisations such as IASP. Moreover, focused MOU among STP themselves will strength the knowledge transfer process. In fact, exchanging talents, experts, learnings and facilities will open new paths for innovation. Networking is a core tool in attracting local and foreign companies and this enhance the knowledge generation through a dynamic interaction among various parties.

Networking is a key added value

Conclusion:

To summarize, as many of the academic institutes dose not run the technology transfer function well, the role of STPs as technology development catalysts is significantly increasing. However, many STPs face the challenge of having the right balance between technology and business development. To avoid such scenario, STPs should consider all the dimensions equally and manage the flow of knowledge between the academic and private sectors. SECI model serve as a strong module for this purpose where each step presents a milestone in the knowledge facilitation process.

The role of STPs a technology development catalysts is significantly increasing

STPs should promote themselves for the general public and increase he involvement of the community as a fourth element. The paper recommended a set of suggestion such as: developing intensives to promote foreign investments, allocating specialized private company to manage the park, adopting smart building management system and forming strong network with the other STPs through associations and direct MOUs

A set of actions can take place to improve the efficiency of STPs

Appendix 1: