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A Preliminary Study of Research-Driven University Spin-off Companies in UAE

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Abstract

Entrepreneurship is the procedure of a new business development to make a profit in the market. In many countries, Technology Transfer Offices (TTOs) in research-driven universities serve as an intermediary between suppliers of innovations and those who can potentially commercialize them. TTOs are always run as cost-centers on campus, often have business or operation managers, and facilitate intellectual property licensing activities. In the United Arab Emirates (UAE), TTOs are taking an important role in the evolution of a successful spin-off company from innovation to production to sales to sustainable profit. An innovative technology may be a research outcome and seem to have value as an application or product with commercial potential in the market. In this context, TTOs often support spin-off companies becoming a learning organization and easing into an articulated management of activities complementary to the research and design activities that create the innovation and drive the transition from innovation to product lines. That is, even though such academic entrepreneurs have built and run entities that are similar to small businesses, and even though these entrepreneurs have learned how to secure and manage revenues to sustain cash flows for their companies, they still may not be sustainable in the market. The long term of this research study aims to investigate the current situation of research-driven university entrepreneurship in UAE. This paper presents a preliminary study of two TTOs: Etisalat BT Innovation Center (EBTIC) at Khalifa University and Masdar Institute.

Keywords: Research-driven University Entrepreneurship, Technology Transfer Office, Spin-off companies, Business Incubation

1. Introduction

Entrepreneurship is the procedure of a new business development to make a profit in the market. Entrepreneurs often fail because they may not always have the requisite financial, managerial, marketing or administrative capabilities to run a company (Elmansori, 2014). In many countries, Technology Transfer Offices (TTOs) in research-driven universities serve as an intermediary between suppliers of innovations and those who can potentially commercialize those (Siegel et al., 2007). TTOs in research-driven universities are always run as cost-centers on campus, often have business or operation managers, and facilitate intellectual property licensing activities. Indeed, some internationally known TTO, such as the MIT Technology Licensing Office and UC San Diego Office of Innovation and Commercialization, with multimillion dollar funding revenues per year have many similarities to intermediate sized businesses. Academic researchers

should always have consistently secured extramural funding and sustained continuously operating research programs for their spin-off companies. In the United Arab Emirates (UAE), TTOs are taking an important role in the evolution of a successful spin-off company from innovation to production to sales to sustainable profit in research-driven universities. An innovative technology may be a research outcome to have value as an application or product with commercial potential in the market. This paper first aims to investigate the TTOs that help UAE academics get past the notion that they know how a business really works and can be grown into a profitable venture. That is, even though such academic entrepreneurs have built and run entities that are similar to small businesses, and even though these entrepreneurs have learned how to secure and manage revenues to sustain cash flows for their research programs, they still may not be sustainable in the market (Hung et al., 2010).

Once on the path to commercialization, the academic researcher now steps into the role of academic entrepreneur and often applies research program management processes to their business model. Basically, good academic researchers know how to fund and run a research program, from goal-objectives promised in a proposal through budgeting of funds received from a grant to measurable outcomes. In this context, TTOs often support spin-off companies becoming a learning organization and easing into an articulated management of activities complementary to the research and design activities that create the innovation and drive the transition from innovation to product lines (Senge et al., 1999). These activities include, but are not limited to, different set of processes that include marketing, understanding and managing the meta-layers of complexities in selecting strategic partners and landing clients, creating viable corporate structures, understanding an array of tax and regulation issues, working out human resource infrastructures and employee recruitment and management including firing, keeping up-to-date in new laws and policies related to corporation activity, setting up and managing legal and accounting technical assistance, assessing regional and global impacts on product development and sales (Hitt, 1995). These activities tend to fall into categories of micro, meso, and macro levels for a spin-off company (Quinn, 1980). The micro level is the level of individual and small group interaction within an organization. This level is the level that usually occurs within a unit or subsystem of a university or company. The meso level can be defined as the level of subsystem or system interactions, often referred to as the organization or institutional level. Examples include interactions of units or subsystems, such as university departments or different production units in a company. At a different scale, but still within a meso level, it also includes interactions of universities within a cluster or system of universities, as well as a corporation working with strategic partners in UAE or even overseas. At the macro level of organization, it places interactions that occur at a more systemic level. Such interactions include policy, legal, and economic decisions made at levels of regional, state or provincial, or national government (Quinn, 2000).

The long term of this research study aims to investigate the current situation of research-driven university entrepreneurship in UAE from the meso level. This paper presents a preliminary study of two TTOs: EBTIC at Khalifa University (<http://www.ebtic.org/>) and Masdar Institute (<https://www.masdar.ac.ae/>) in UAE. This paper is organized as follows. Section 2 provides background information with literature review. Section 3 describes the preliminary study of Etisalat BT Innovation Center (EBTIC) at Khalifa University and Masdar Institute, and Section 4 concludes the paper with future work.

2. Background Information

Many generic academic entrepreneurs are working at the micro level while in their laboratory making breakthroughs in basic and applied research (Porter, 2008). The entrepreneur enters the meso level of interactions when he/she takes what he/she believes to be an innovation to university's TTO of sponsored programs or technology transfer or some unit responsible for protecting intellectual property and promoting commercialization for promising innovations. The university is working at micro levels to manage its many faculty and staff while also working at the meso level across departments, colleges, or academic units as well as with other universities in a state system or an academic consortium. The university also is engaging in macro level organizations when dealing with regional, state or provincial, or national government, for example for funding for large scale infrastructure or macro level agencies governing academic policies or program development or accreditation. Many academic entrepreneurs are rudely awakened to the complexities of these different levels and their impact on the process of starting and sustaining a university spin-off company (Gunderson and Holling, 2003).

Even if the university is fairly nurturing and facilitates intellectual property protection and generous sharing with the academic entrepreneur, a spin-off company in which a university holds an ownership share enters a remarkably complex world. University polices are now compounded by meso and macro level factors impinging on a new corporation (business licenses, taxes, laws) and regulations related to human resources as well as to the types of products that may be developed by the spin-off company. And, even if a university is supportive in helping an academic entrepreneur enter the business world via TTO (e.g., university incubation programs), few universities have personnel with the breadth and depth to understand each and every viable commercialization pathway from academic research innovation to a university spin-off company creating and selling a viable product line (Hung et al., 2010). Certainly, good university incubation programs engage a diversity of staff or consultants to provide technical assistance at TTO. Some TTOs have connections to venture capitalist groups through their business partner and sponsor. However, the time, money, and personnel of a university can only be brought to bear on a certain number of spin-off development ventures. Often, both the university and the academic entrepreneur have under-sampled both the variables shaping commercialization as well as the market receptiveness to the emerging product line (Porter, 1996).

There is limited related research in studying the current situation of research-driven university's TTO in UAE. For example, Elmansori (2014) presents a case study of Arabic business innovation centres in Jordan and UAE as a model for demonstrating economic impact on the performance of assisted businesses. Next Kargwell and Inguva (2012) discuss a survey on recent graduates of various universities located in UAE to investigate their new business ideas based on one-on-one interviews. Then Slavtchev and Goktepe-Hulten (2016) present survey questions particularly to analyze the entrepreneurial activities of scientist from the perspectives of individual and professional characteristics related to the propensity to start a business and to the development and success of the ventures. Lastly Boh et al. (2016) present case studies on graduate and post-doctoral student participants in university spin-offs in a typology of spin-off development with four pathways, based on the varying roles of faculty, experienced entrepreneurs, PhD/post-doctoral students, and business students. However none of these studies focus on the current situation of TTO for research-driven university spin-off companies in UAE.

Table 1. Questionnaire

<p>Early Stage of Establishing</p> <ol style="list-style-type: none">1. Would you like to comment briefly on the scope and mandate of your Technology Transfer Office (TTO)?2. How was this TTO initiated and how would you explain its journey until this moment?3. Would you like to comment on how the resources including the budget were secured for this initiative?4. What were the main obstacles such as approval process, University/Institute and government policies in taking this initiative?5. What were the strong and convincing arguments of your business case, which led to materializing this TTO?6. Would you like to mention the name of your collaborators and partners? If so, what are specific role of each one of them? <p>Securing Resources and Logistics</p> <ol style="list-style-type: none">7. Did you receive any external support in terms of logistics and financial support from any governmental entity or industry?8. Did you hire any full time staff such as Intellectual Property (IP) expert and marketing specialist or any technical professional such as computer programmer?9. Did you hire some consultancy services in the beginning of the initiative? <p>Operational Details and Issues</p> <ol style="list-style-type: none">10. What is the role of your TTO in commercializing IP?11. What type of support is available for facilitating knowledge transfer/consultancy/enterprise/technology transfer at your TTO?12. How successful is your TTO in generating revenue from the various modes of IP?13. What are the key challenges in enabling your TTO to generate revenues from IP?14. What kind of barriers do you see in technology transfer?15. What policies need to be developed to meet these challenges?16. What are the types of incubators currently in operation in your TTO?17. What are the types of financial model in your TTO's incubators?18. What are the target group and sector in your TTO's incubators?19. What is the contribution of Small and Medium-sized Enterprises (SMEs) within the incubators to the economy in your TTO?20. What have been the accomplishments and results of the technology transfer activities of your TTO? <p>Overall Comments and Suggestions</p> <ol style="list-style-type: none">21. Are you aware of other similar TTO in the UAE or other Gulf countries?22. From a global perspective, what are the regional and UAE-specific challenges?23. From a global perspective, what are the regional and UAE-specific opportunities for establishing TTO or university spin-off companies?24. Please provide any comments and suggestions that you can think of, to the start-up, TTOs and/or government or other public and public sector organizations?
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3. A Preliminary Study of EBTIC at Khalifa University and Masdar Institute

One important contribution of the research-driven university relates to academic entrepreneurship, the establishment of new spin-off companies based on technologies stemming from university research (Hayter, 2016). There are two paths to knowledge-intensive entrepreneurship based on university knowledge. The first is the direct path where individuals first study, and then work at universities and subsequently spin-off their business directly from the university which is called university spin-offs. The second path is represented by university graduates who pursue careers in private industry and spin-off their companies from that context

which is called corporate spin-offs (Wennberg et al. 2011). This study focuses on the role of TTO to support university spin-offs. In this preliminary study, the research method includes both quantitative research by questionnaires (see Table 1), and qualitative research by site visit and structured interviews at BTIC at Khalifa University and Masdar Institute in UAE (Elmansori, 2014). Like other similar organization in UAE such as Mohammed Bin Rashid Establishment for Small and Medium-sized Enterprises (SMEs) Development, the main objectives of TTO are: (1) promote entrepreneurship by supporting innovation and research; (2) enhance employability by providing access to quality education and professional development programmes; and (3) support Business Incubations in UAE (Elmansori, 2014). Both BTIC and Masdar Institute have similar objectives.

Education and incubation industry linkages are visible especially in the history of the business and entrepreneur incubator. Majority of the entrepreneurs expressed that the business education in the related field is highly needed but not the basic general business education (Kargwell and Inguva, 2012). In this context, TTOs facilitate commercial knowledge transfers of Intellectual Property (IP) resulting from university innovation through licensing and patenting to existing firms or start-up companies of inventions or other forms (Siegel et al., 2007). Though nearly 75 % of university inventions are never licensed to commercial entities (Swamidass, 2013), there is an increasing attention devoted to the creation of spin-off companies by academic scientists and scholars, typically focusing on the performance of TTOs (Siegel et al., 2007). The key issues are whether researchers have sufficient incentives to disclose their inventions in further development in bringing IP to the value of university inventions (Siegel et al., 2007). According to the authors a university spin-off involves (O'Shea et al., 2008): (1) the transfer of a core technology from an academic institution into a new company; and (2) the founding member(s) may include the inventor academic(s) who may or may not be currently affiliated with the academic institution. Further, there are four definitions of university spin-offs based on the following salient characteristics (Pattnaik and Pandey, 2014): (1) the parent organization from which the innovation emerges has to be a university or academic institution; (2) the output that is a university spin-off has to be a separate legal entity and not an extension or controlled body of the university; (3) the new entity has to exploit knowledge produced from academic activities or academic pursuits; and (4) the spin-off should be aimed at profit generation and commercialization of technology.

Boh et al. (2016) identified the following university programs and practices that enhance entrepreneurial efforts for commercializing university technologies, independent of the TTO:

(1) Project-based classes on technology commercialization. Project-based classes bring together interdisciplinary teams or teams of Master of Business Administration (MBA) students to work on business plans and create roadmaps for the commercialization of university technologies. In nearly half of the spin-offs in our sample, founding team members took these classes. And in eleven of the spin-offs we studied, the founding team formed or attracted a new member in such a class. The instructors of these classes typically work with the TTO to identify university technologies that have invention disclosures or provisional or utility patents filed. They then invite the faculty Principal Investigators (PIs) of the inventions to participate in the class. Interested faculty PIs or PhD/post-doctoral students also may apply to participate in the class with their technology for potential commercialization.

- (2) *Mentoring programs. Universities often provide mentoring services that offer guidance and advice to new entrepreneurs, as well as referrals to lawyers, industry experts, potential customers, licensees, and investors who help founding teams build their networks.*
- (3) *Accelerator/incubator programs. Formal accelerator or incubator programs at universities often help start-ups intensively over a period of time, providing mentoring, funding, office space, enhanced credibility, and, in some cases, oversight and management.*
- (4) *Business plan competitions. Business plan competitions often play a key role in spin-off development. Not only do they provide a platform for team formation, but also they offer potential founding teams the opportunity to develop a business plan and strategic roadmap for the technology. Competitions also offer enhanced credibility and publicity for the winning teams.*
- (5) *Entrepreneurship education for students. Entrepreneurship education is critical for inspiring students to pursue entrepreneurship and for providing knowledge that will facilitate successful spin-off development.*
- (6) *Entrepreneurship education for faculty. Faculty members often are reluctant to participate in workshops or educational programs that are not directly related to their research. While proactive efforts to educate them regarding entrepreneurship may not be effective, it is important for universities to have educational programs and resources available for faculty to access when they choose.*

Based on all these programs and practices, we generated 24 questions into four categories: (1) Early Stage of Establishing; (2) Securing Resources and Logistics; (3) Operational Details and Issues; and (4) Overall Comments and Suggestions. The interviews for both TTOs were conducted on December 12, 2016 and the results are shown in the following sub-sections.

3.1 EBTIC at Khalifa University

1. Would you like to comment on the scope and mandate of your TTO?

EBTIC tackles national and societal challenges by conducting research that solves challenges; it aims at developing solutions in the areas of smart infrastructure, smart enterprise and smart cities. It helps build national capabilities in the areas of research and innovation; it has dual supervision with Khalifa University for Masters and PhD programs, and runs some projects with Khalifa University. In addition, EBTIC offers trainings for engineers from government entities and offers internship programs for students. Moreover, EBTIC has filed patents and will start to exploit them and commercialize them at a later stage.

2. How was this TTO initiated and how would you explain its journey until this moment?

EBTIC was started in 2009 and was known as “Etisalat BT Innovation Center.” In phase 1, it started with a partnership between Etisalat and British Telecom (BT) and Khalifa University to drive next generation research in intelligence systems, develop research talents in the UAE, and generate IP. In phase 2, which started in 2013, ICT Funds started investing in “Etisalat BT Innovation Center” to become the fourth partner; this is where the name was changed to EBTIC. EBTIC is managed by a board comprising of the 3 partners: Etisalat, BT and Khalifa University.

Currently, all the work done at EBTIC is EBTIC's own research. Later in phase 3, EBTIC wants to evolve to be an "innovation hub" where they can support organizations and individuals in carrying out research.

3. Would you like to comment on how the resources including the budget were secured for this initiative?

The budget comes from all 4 main partners. UAE's ICT Finds is the main financial provider for EBTIC. Etisalat, BT and Khalifa University also contribute a fixed amount equally every year.

4. What were the main obstacles such as approval process, University/Institute and government policies in taking this initiative?

The lack of resources and skills were the main obstacles that EBTIC faced upon starting up. However, they benefited from BT's research capabilities and had clear framework of what they aimed to accomplish.

5. What were the strong and convincing arguments of your business case, which led to materializing the initiative of establishment TTO?

One of the main arguments presented was to create a unique center in the UAE that drives research and innovation to make EBTIC as BT for the region. Another argument was to develop skills and capabilities to that will develop solutions for the partners and deliver tangible value.

6. Would you like to mention the name of your collaborators and partners? If so, what are specific role of each one of them?

Etisalat and ICT: provide financial support

BT: provide experience and required skills

Khalifa University: run programs for developing research skills

Health Authority of Abu Dhabi (HAAD): collaborate in running health-related projects

7. Did you receive any external support in terms of logistics and financial support from any governmental entity or industry?

The financial support is mentioned above.

8. Did you hire any full-time staff such as IP experts and marketing specialist or any technical professional such as computer programmer?

N/A

9. Did you hire some consultancy services in the beginning of the initiative?

EBTIC did not hire consultancy services to start the center; they used the qualifications BT has to start EBTIC since BT has over 170 years of experience (founded in 1838).

10. What is the role of your TTO in commercializing IP?

EBTIC has been doing its own research and filing their patents; the center is not open to the public yet.

11. What type of support is available for facilitating knowledge transfer/consultancy/enterprise/technology transfer at your TTO?

N/A

12. How successful is your TTO in generating revenue from the various modes of IP?

EBTIC has not commercialized any IPs yet; they are in the process of generating revenues from the IPs they have filed. They have invented 42 inventions, where each invention may contain multiple patents. It has filed 15 patents, and in the process of filing others. EBTIC files patents in different areas of the world depending on the technology in the product they want to patent. Mainly, all patents are filed in the US and Europe, and sometimes in China. They are looking at filing some patents in the UAE.

13. What are the key challenges in enabling your TTO to generate revenues from IP?

EBTIC is relatively a new entity. They will start generating revenues in the soon.

14. What kind of barriers do you see in technology transfer?

N/A

15. What policies need to be developed to meet these challenges?

N/A

16. What are the types of incubators currently in operation in your TTO?

N/A

17. What are the types of financial model in your TTO's incubators?

N/A

18. What are the target group and sector in your TTO's incubators?

N/A

19. What is the contribution of Small and Medium-sized Enterprises (SMEs) within the incubators to the economy in your TTO?

N/A

20. What have been the accomplishments and results of the technology transfer activities of your TTO?

N/A

21. Are you aware of other similar TTO in the UAE or other Gulf countries?

Masdar Institute, Khalifa University, and United Arab Emirates University

22. From a global perspective, what are the regional and UAE-specific challenges?

One of the main challenges in the UAE is getting the capitalists to invest in research and innovation. The investors are biased towards the real-estate business and other business where the return on investment is high. The risk model between these industries and the research industry is different. To change this culture into investing in research is a challenge, especially since most tech start-ups fail. Another challenge is the availability of skills and resources. The UAE's population is relatively small; therefore, finding the right resources is challenging.

23. From a global perspective, what are the regional and UAE-specific opportunities for establishing TTO or university spin-off companies?

Currently, there is a huge appetite for innovation in the UAE and Gulf Cooperation Council (GCC) area. In addition, there is a significant drive from the governments to support and invest in innovation and create ecosystems to support research and innovation.

24. Please provide any comments and suggestions that you can think of, to the start-up, TTOs and/or government or other public and public sector organizations?

The EBTIC agreement states that the Intellectual Property Rights (IPR) are owned and shared by the three founding partners (i.e. Etisalat, BT, and Khalifa University) equally. They all can use all IPR for their own use as if it was their own.

Trying to please all partners and deliver to them is a challenge. The partner's objectives are not aligned; it is EBTIC's responsibility to align them. EBTIC has limited resources; therefore, they go through a complex and long process to build a program that allows the research and products being delivered to be used by all the partners.

Besides the senior management at EBTIC, EBTIC has 3 main boards: a board consists of the 3 founders (Etisalat, BT and KU), a technology advising board, and a strategic board.

- EBTIC has quarterly board meetings (Etisalat, BT and KU) and sends them monthly progress reports. In addition, EBTIC sends regular updates to ICT Funds regarding budget expenditure. A final report is sent to the board members at the end of the year.*
- EBTIC has a Technology Advising Board, which consists of professors from the US, UK and Australia. They meet at the beginning of the year to review the technical program developed by EBTIC, and then meet in June to review the progress. This board ensures that the research done in EBTIC is world-class research.*

- *EBTIC has a strategic board, which is made of representatives from government organizations. They meet in December and support EBTIC in engaging with the government.*

3.2 Masdar Institute

1. Would you like to comment on the scope and mandate of your TTO?

Masdar Institute is a research institution, and part of what they do is commercialization. They do not have “commercialization center” per say. The main research is done in cooling, water, energy, and micro (electronics). In addition, some research is done by professors outside these areas such as research in plants, materials, solar energy, etc. There will be some strategic changes where there will be some research done about advanced materials. Masdar Institute develops its own research, and also collaborates with other institutes in some research. Masdar Institute has about 170 patent applications, where 14 patents have already been filed. The location of the patent depends on the market they want to market in; these patents are usually filed in the US, EU, PCT, South Korea, Japan and China. Based on the agreements signed with the researchers and employees, the IPs, licenses and royalties are agreed upon between concerned parties. This is done on a case by case basis.

2. How was this TTO initiated and how would you explain its journey until this moment?

Masdar Institute was started in partnership with MIT in order to set up the institution for education. It started with Master programs with less than 100 students. It expanded to about 400 students (where about 40 percent of the students are nationals), about 100 faculty members and developed PhD programs as well. This is a way to develop skill sets, which is an important part in research institution and commercialization; it helps building intellectual capital for the UAE by training students on conducting research in the fields mentioned earlier. Masdar Institute consists of Sponsored Research Office (SRO), which is the office that is responsible for getting funding for projects, Research Development Office (RDO) where the projects get developed, and Technology Transfer Office (TTO) where the patents get filed.

3. Would you like to comment on how the resources including the budget were secured for this initiative?

About 50% of the research budget comes from the Department of Finance of Masdar City. The other 50% comes from working with corporations on specific research projects (sponsored projects), where Masdar Institute conducts research for them.

4. What were the main obstacles such as approval process, University/Institute and government policies in taking this initiative?

There are obstacles currently faced. Masdar Institute is currently focusing on creating spin-off companies; the issue they are facing is how to create spin-off companies that are based on

tangible inventions that may need to be manufactured. One of the main obstacles is funding for Proof of Concept (POC); investors need to see a POC and a prototype to ensure potential return on investment. In addition, access to equipment and consultants and agreements with those who funded the research in terms of ownership. Furthermore, it is difficult to know what type of company it should be; if the company is in the free zone, it is not easy to introduce it to the market due to capital, money and legal challenges.

5. What were the strong and convincing arguments of your business case, which led to materializing the initiative of establishment TTO?

Mainly MIT experience and arguments were used as MIT has more mature and well established TTO and successful model for university spin-off companies.

6. Would you like to mention the name of your collaborators and partners? If so, what are specific role of each one of them?

- *Mainly MIT: education curriculum*
- *Some collaboration is done with some institutions on specific projects.*
- *Masdar Institute is currently merging with Khalifa University and Petroleum Institute (PI); this will expand their capabilities and experience.*

7. Did you receive any external support in terms of logistics and financial support from any governmental entity or industry?

Budget-related support is mentioned above.

8. Did you hire any full-time staff such as IP experts and marketing specialist or any technical professional such as computer programmer?

Yes.

9. Did you hire some consultancy services in the beginning of the initiative?

No, the institute mainly relies on MIT experience and then hired full time staff.

10. What is the role of your TTO in commercializing IP?

The TTO works with the professors directly and draft the patents and understand the scope of the claim in order to know the limitations of the patents.

11. What type of support is available for facilitating knowledge transfer/consultancy/enterprise/technology transfer at your TTO?

N/A

12. How successful is your TTO in generating revenue from the various modes of IP?

Masdar has not generated revenues yet; they passed 8 IPs this year. In addition, Masdar is currently not allowed to own companies. However, they generate revenue from licensing.

13. What are the key challenges in enabling your TTO to generate revenues from IP?

One of the main challenges Masdar Institute facing is time. It mostly produces tangible product, which is a process than can take months or years to develop.

14. What kind of barriers do you see in technology transfer?

Developing POC and prototypes to show them to investors takes months or years to finish. In addition, the market in the UAE is small. Furthermore, deciding where to file the patent and how much money it costs to file patents is a challenge. In addition, Masdar Institute does not have business school.

15. What policies need to be developed to meet these challenges?

Masdar Institute targets global markets and files patents in where they would be more beneficial. In addition, they connect their faculty and researchers with the right resources in marketing and business areas.

16. What are the types of incubators currently in operation in your TTO?

They do not have set up incubators because the mass is small and they work on case by case basis. However, they are setting up incubation programs internally to TTO.

17. What are the types of financial model in your TTO's incubators?

N/A

18. What are the target group and sector in your TTO's incubators?

N/A

19. What is the contribution of Small and Medium-sized Enterprises (SMEs) within the incubators to the economy in your TTO?

N/A

20. What have been the accomplishments and results of the technology transfer activities of your TTO?

Masdar Institute has one of the biggest patent portfolios in the country in terms of the number of patents and patent applications. In addition, it has grown exponentially in a small period.

21. Are you aware of other similar TTO in the UAE or other Gulf countries?

American University of Sharjah, Khalifa University, United Arab Emirates University, and Dubai Science Park

22. From a global perspective, what are the regional and UAE-specific challenges?

Generally, the investors want to invest in a low-risk project; they usually stick to specific industries and do not contribute to the research industry. Furthermore, the market in the UAE is small; therefore, Masdar Institute targets global markets.

23. From a global perspective, what are the regional and UAE-specific opportunities for establishing TTO or university spin-off companies?

Government support regarding research and Department of Economic Development provides financial support for start-ups.

24. Please provide any comments and suggestions that you can think of, to the start-up, TTOs and/or government or other public and public sector organizations?

Masdar City is a free-zone; therefore, they have agreements between Masdar Institute and the free-zone. Companies can set up offices in the free zone, and they will have advantages since they come through Masdar Institute. Masdar Institute has well-established companies that set up offices in their buildings (i.e. incubator building). In addition, they have spaces for start-ups and SMEs.

4. Conclusion and Future Work

In the interview, both EBTIC at Khalifa University and Masdar Institute mentioned that entrepreneurs in the UAE face challenges of a highly competitive global business environment and risk to invest their capital in a particular industry sector. Their focus is on the global market or at least the GCC area. Thus it is essential for TTO to determine the critical success factors of the business within particular industry. Critical success factors are defined as vital elements for an organization's current operating activities and to its future success to realize its goal and to achieve its mission (Kargwell and Inguva, 2012). In particular, both TTO are facing financial challenges as well as the investors would like to see the Return on Investment (ROI) in a short period of time. Based on the study of business incubations in Jordan and UAE (Elmansori, 2014), our study also believes that TTO provides information on business incubation for fostering and strengthening innovation and entrepreneurship in UAE as follows: (1) businesses that have been through an incubator programme are far more likely to succeed in the long term; (2) the incubator programmes are designed to accelerate the successful development of young entrepreneurs and their businesses through an array of support resources and services; and (3) launching incubation programmes is crucial for technology innovation and exporting tech-based products: the technology incubator can form a supportive component of a national innovation system (Elmansori, 2014). It is obvious both TTOs we interviewed are still in the early stage before there is a benchmark case success in their context.

For the future works, we plan to interview the TTO at American University of Sharjah, Khalifa University, United Arab Emirates University, and Dubai Science Park to collect more information. In the long term, we aim to study university spin-off companies from these TTOs and study their current situation on the micro level.

References

1. Boh, W. F., De-Haan, U. and Strom, R. (2016). University technology transfer through entrepreneurship: faculty and students in spin-offs, *Journal of Technology Transfer*, Vol. 41, pp. 661–669
2. Elmansori, E. (2014). Business incubators in the Arab World Comparative study of Jordan and UAE business incubators, *World Journal of Science, Technology and Sustainable Development*, Vol. 11, No. 4, pp. 282–293
3. Gunderson, L. H. and Holling, C. S. (2003). *Panarchy – Understanding transformations in human and natural systems*. Washington, DC: Island Press, December 2003
4. Hayter, C. S. (2016). A trajectory of early-stage spin-off success: the role of knowledge intermediaries within an entrepreneurial university ecosystem, *Small Business Economics*, Vol. 47, pp. 633–656
5. Hitt, W. D. (1995). The learning organization: some reflections on organizational renewal, *Leadership & Organization Development Journal*, Vol. 16, No. 8, pp. 17–25
6. Hung, P. C. K., Ritchie, P. and Tashiro, J. S. (2010). Foundational Innovation and the Evolution of Research-Driven University Spin-off Companies in Emerging Global Markets, the Sixteenth International Working Seminar on Production Economics, Innsbruck, Austria, March 1-5
7. Kargwell, S. and Inguva, S. (2012). Factors Influencing the First Generation Entrepreneurs: An Analytical Study on the Graduates of UAE Universities, *International Journal of Business and Social Science*, Vol. 3, No. 7, pp. 143–149
8. O’Shea, R. P., Chugh, H. and Allen, T. J. (2008). Determinants and consequences of university spin-off activity: a conceptual framework, *Journal of Technology Transfer*, Vol. 33, pp. 653–666
9. Pattnaik, P. N. and Pandey, S. C. (2014). University Spin-offs: What, Why, and How? *Technology Innovation Management Review*, pp. 44–50
10. Porter, M. E. (1996). What Is Strategy? *Harvard Business Review*, 21 pages, Publication date: Nov 01, 1996, Prod. #: 96608-PDF-ENG
11. Porter, M. E. (2008). *On Competition*, Updated and Expanded Edition, Harvard Business Review Book, USA
12. Quinn, J. B. (1980). *Strategies for Change*, Richard d Irwin, USA, ISBN-10: 0256025436 and ISBN-13: 9780256025439
13. Quinn, J. B. (2000). Outsourcing Innovation: The New Engine of Growth, *MIT Sloan Management Review*, Summer 2000, Vol. 41, No. 4, ABI/INFORM Global, pp. 13–28.
14. Senge, P., Kleiner, A., Roberts, C., Ross, R., Roth, G. and Smith, B. (1999). *The Dance of Change: The Challenges of Sustaining Momentum in Learning Organizations*. Doubleday, USA. ISBN: 0-385-49322-3
15. Siegel, D. S., Veugelers, R. and Wright, M. (2007). Technology transfer offices and commercialization of university intellectual property: performance and policy implications, *Oxford Review of Economic Policy*, Vol. 23, No. 4, pp.640–660

16. Slavtchev, V. and Goktepe-Hulten, D. (2016). Support for public research spin-offs by the parent organizations and the speed of commercialization, *Journal of Technology Transfer*, Vol. 41, pp. 1507–1525
17. Swamidass, P. M. (2013). University startups as a commercialization alternative: lessons from three contrasting case studies, *Journal of Technology Transfer*, Vol. 38, pp. 788–808
18. Wennberg, K., Wiklund, J. and Wright, M. (2011). The effectiveness of university knowledge spillovers: Performance differences between university spin-offs and corporate spin-offs, *Research Policy*, Vol. 40, pp. 1128– 1143