



Egypt's Innovation Ecosystem

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Eng. Marwa Alaa El-Din
Eng. Mohamed Nabil Kash
Sherif Fahmy, Ph.D.

Innovation Support Department - Science & Technology Development Fund
Cairo, Egypt

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1. Introduction

This report gives a brief account about the entities that support innovation activities in Egypt. The report is divided into five main sections, along with the introduction. The second section introduces the innovation models commonly used and suggests a dynamic model upon which the analysis is built. The third section explains the different innovation phases the invention goes through, and lists the entities supporting each phase in Egypt. The fourth and fifth sections introduce the innovation activities and toolbox required to support the innovation process. Sections 2, 3, and 4 end with a list of existing gaps, and the recommended strategies to bridge these gaps. The sixth section lists recommended future improvements to this report to cover any missing information and to be an up-to-date reference to all innovation actors in Egypt.

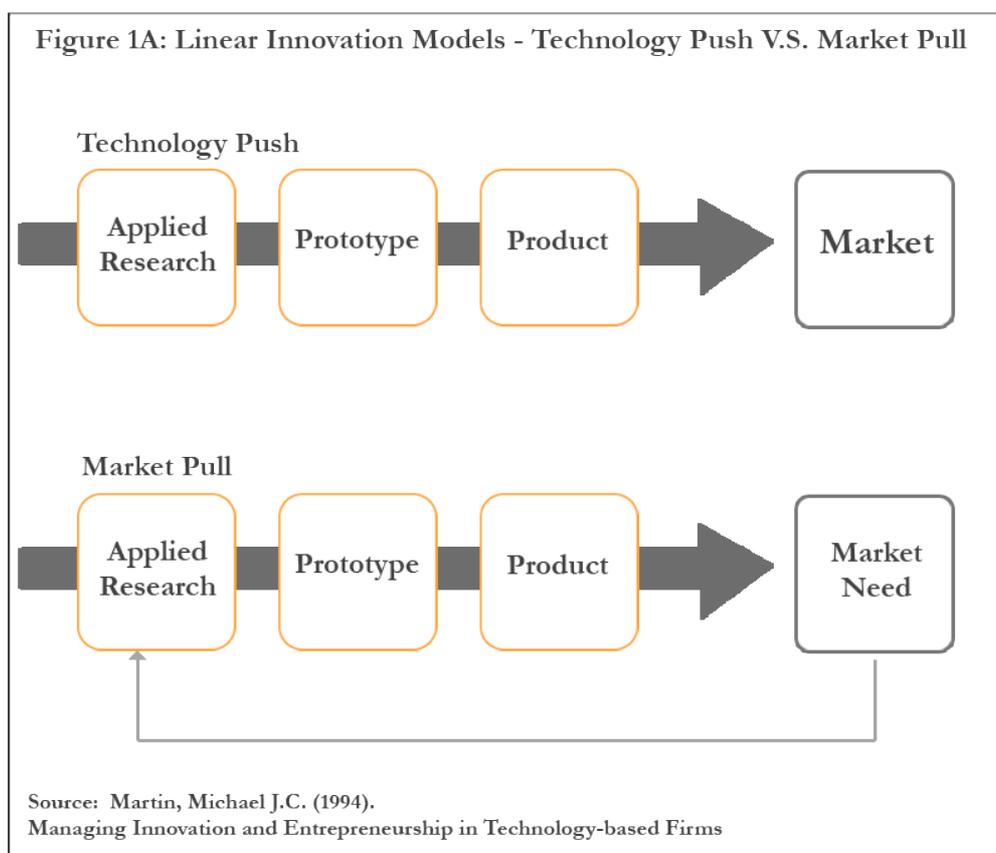
The study covered in this report is based on personal interviews with the innovation actors mentioned in Appendix 1. It is also based on previous studies conducted by the Industrial Modernization Center (IMC) in 2005, the Regional Agency for Technology and Innovation (ARTI) in 2007, and the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH in 2008. In addition, the world's bank Knowledge Assessment Methodology (KAM) was used as a framework to guide us through our study.

2. Innovation Models

In this section we review the early linear innovation models that are still prevailing in most of today’s practices. We give a brief account about their limitations and introduce the coupling model, which is a more dynamic model based on the interaction between the different elements of the innovation process.

Linear models of innovation consider the innovation process as a linear sequence of activities. Figure 1 shows the “Technology Push (TP)” and “Market Pull (MP)” linear models. TP implies that the innovation process starts with a scientific invention that is pushed to the marketplace through a sequence of activities without properly considering the market need. On the other hand, MP implies that the research is conducted based on a previously identified market need.

Opponents of the linear model consider the innovation model a complex process that requires continuous feedback and evaluation from different stakeholders throughout all the stages of development. They also argue that the innovation process is not just a sequence of activities but rather a set of interactive activities that are affected by several factors like the state of the art technologies, changing market needs, sales and customers’ feedback, etc. This is where more recent dynamic models come into practice, from which we chose the “Coupling Model (CM)” shown in Figure 2 to apply to our analysis and recommendations.



In figure 1B, the black boxes represent the main innovation phases from the moment a new idea is generated until it reaches the marketplace. Unlike the linear models, the arrows indicate the continuous feedback and evaluation in every phase and they show the interaction between the different phases of the innovation cycle, the market needs, and the state-of-the-art technology and production techniques.

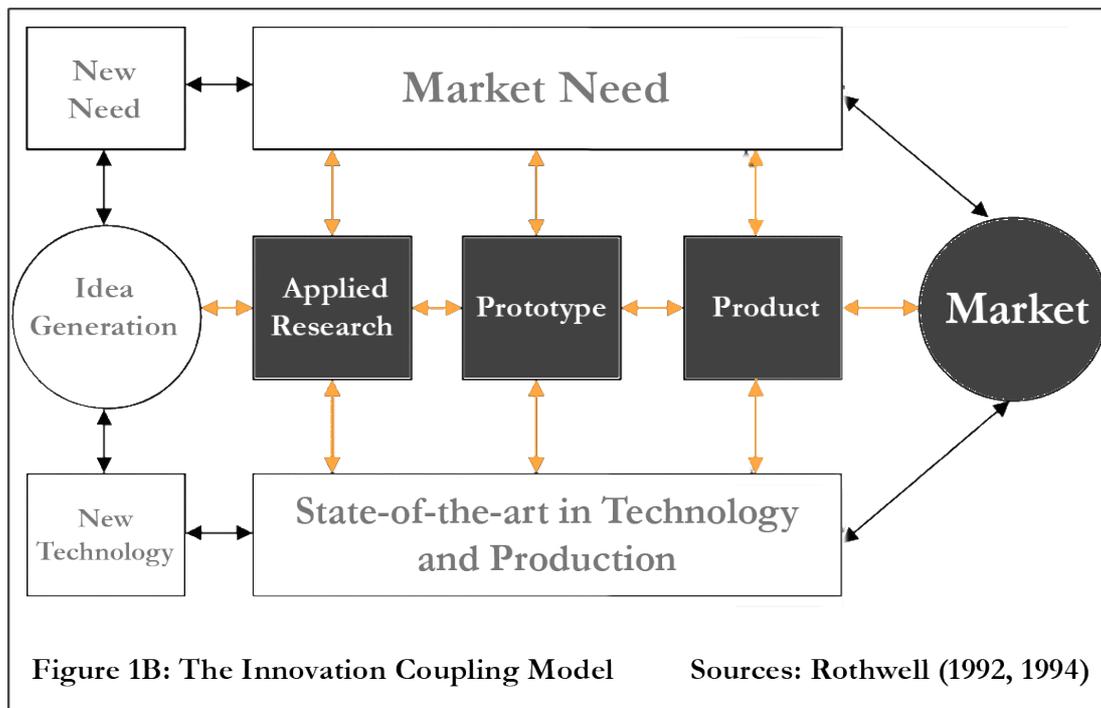
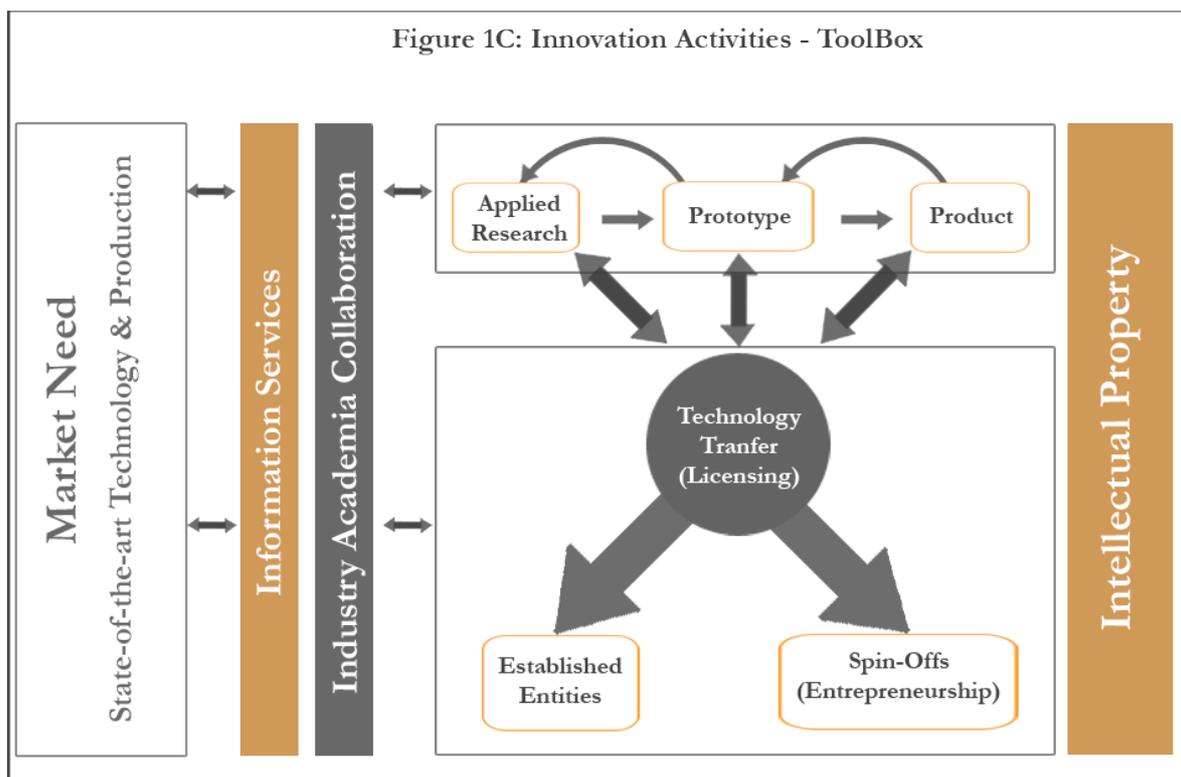


Figure (1C) below summarizes the innovation ecosystem in Egypt. We based this diagram on the innovation coupling model mentioned earlier, which explains how the relationship between the different “Research to Market” phases should be. Then we integrated into that model two more elements, which we believe are necessary to successfully commercialize inventions and generate social and economic benefits out of them. These elements are the “Innovation Activities” and the “Innovation Toolboxes”.

In the below diagram, the box that includes the applied research, prototype, and product represents the “Research to Market” phases explained in details in the next section. The “Innovation Toolboxes” is represented by the orange boxes while the “Innovation Activities” are represented by the gray “Industry Academia Collaboration” box and “Technology Transfer” circle.

The innovation cycle starts with an invention that is ready to be commercialized or utilized for the benefit of the society. The commercialization of an invention can take place at any phase whether the invention is an applied research result, prototype, or product. This depends on many factors like the nature of the technology and the market needs. This is shown in our diagram by having an arrow connecting each one of the “Research to Market” phases to the “Technology Transfer” activity.



3. Research to Market Phases

Inventions pass through different phases from the moment new ideas are generated until these ideas are turned into innovations that have social or economic benefits. In this section, we cover the funds and programs available for applied research, prototype and product development, the entities that provide them, the gaps we found, and our recommendations to bridge these gaps.

3.1. Funding

There are different funds and grants available from different entities to support applied research, prototype and product development. Here is a list of those funds and the entities that provide them.

i. Applied Research Grants

Agricultural Research & Development Fund (ARDF)

ARDF provides grants for researchers who submit proposals providing solutions aligned with the agricultural development strategy. The call for proposals' announcements and proposals submission takes place on ARDF's website. The submitted proposal has to be executed by a team from more than one institution to encourage multidisciplinary research.

Industrial Modernization Center (IMC) - Science & Technology Development Fund (STDF)

STDF collaborates with IMC in three programs: Scientific Research & Development, Professor for every factory, and Innovation programs.

- **Scientific Research and Development:** The purpose of this program is to develop and enhance the competitiveness of the Egyptian products, invent new methods to solve the industrial problems, and to apply the modern technology in different industrial fields. There are a number of different schemes under this program, each with a different funding mechanism.
- **Professor for Every Factory:** This program is currently being restructured. The aim of this program is to engage one or two academic professors in specific assignments for medium term periods inside factories to focus on resolving specific technical and non-technical problems, enhancing innovation, and strengthening linkages between academic community and the industrial community.
- **Innovation program:** The purpose of this program is to fund scientific innovation and its development till the development of prototype, alleviate the technological risk in the technology application, and strengthen the links between academia and Industry. Accepted projects are eligible for a fund of maximum 5 million Egyptian Pounds.

Information Technology Industry Development Agency (ITIDA)

ITIDA Fellowship (IF) supports scientific research by funding researchers from universities or research institutions. The applicants to the program shall be registered or working at a university or a research center. ITIDA specifies the required topics of research after arranging conferences attended by individual researchers, research institutions, and international companies. Research priority areas are decided based on the outcome of those conferences. The IF funded projects shall

end with proof-of-concept and published papers. The fund is up to L.E. 130,000 per project and the project is one year expandable.

Misr El Kheir (MEK)

MEK provides grants in the form of target calls for applied research in the areas of health, social sciences, and renewable energy & desalination. The aim of those target calls is to fund scientific research with highest potential impact on society and economy. The calls support research up to 2 million Egyptian pounds per project. Submitting applications for these grants is limited to specific time periods per year.

Research, Development & Innovation Programme (RDI)

The main component of the RDI Programme for supporting research, development and innovation initiatives in Egypt is the EU-Egypt Innovation Fund (EEIF). The fund encourages applicants from both the industry and the research community to contribute with applied research that leads to innovation in Egypt. The fund does not cover research projects in certain areas such as art, social sciences, defense, and public security. There are two grant schemes within this fund:

- *Grant Scheme 1:* Projects under this scheme are eligible to a fund between €100,000 and €500,000. This scheme supports projects and initiatives that enhance the technological innovation in Egypt. It also aims at strengthening the cooperation with European institutions to facilitate the transfer of technology and know-how to Egyptian institutions. The maximum duration of the project is three years and the project activities have to take place in Egypt. The applicants have to be at least one university/research institution and at least one large enterprise/SME. The main applicant can apply only once as a main applicant. Project's payments are made to the main applicant whether that is the researcher or the industrial entity. If the main applicant is not a public or a government institution, no letter of guarantee from a bank is needed to be funded.
- *Grant Scheme 2:* Projects under this scheme are eligible to a fund between €10,000 and €25,000. This scheme supports projects that enhance the collaboration between the research community and the industry and that enhance innovation in Egypt. This grant is useful for entrepreneurs and SMEs who want to develop innovative solutions and do not want mega financing. The scheme also aims at strengthening the cooperation with European institutions to facilitate the transfer of technology and know-how to Egyptian institutions. The maximum duration of projects under this scheme is one year and the project activities have to take place in Egypt. Preference is given to researchers who own IPR by the time they apply. This grant is open for individuals, entrepreneurs, researchers at universities/research institutions, and industrial organizations.

Science & Technology Development Fund (STDF)

STDF provides different national research grants (NRG) that include "Basic and Applied Research Grants", "Young Researchers Grants", and "Reintegration Grants". In addition, STDF provides targeted grants in line with the national requirements indicated by the Higher Council for Science and Technology (HCST). Furthermore, STDF provides different types of joint grants that serve in collaboration with a number of international partners.

ii. Prototype Development Grants

Academy of Scientific Research and Technology (ASRT) - Misr El Kheir (MEK)

MEK and ASRT initiated a program called "Solutions with Our Minds". The aim of the program is to help the inventors develop prototypes for their patented inventions. Grants are only provided for those who already have granted patents or applied for ones in the areas of agriculture, energy, health, and water. Each project receives up to L.E. 250,000 for a maximum duration of two years.

Industrial Modernization Center (IMC) - Science & Technology Development Fund (STDF)

The Scientific Research & Development program and the Innovation program between STDF and IMC support the development of prototype as part of the applied research proposal. However, there is no specific fund for developing prototypes.

Information Technology Industry Development Agency (ITIDA)

The Advanced Research Projects (ARP) grants require the collaboration between researchers from the academia and ICT industries. All proposals must be submitted jointly by a researcher and an industrial partner. Researchers who successfully completed their ITIDA Fellowship program are eligible to apply for the ARP with an industrial partner. ARP starts with a proof-of-concept and ends with a prototype. ITIDA funds accepted projects in this program with up to L.E. 1 million per project for a maximum duration of two years.

Research, Development & Innovation Programme (RDI)

The two grant schemes within the EU-Egypt Innovation Fund (EEIF) require that the applied research ends up with a concept or prototype development.

iii. Product Development Grants

Industrial Modernization Center (IMC) - Science & Technology Development Fund (STDF)

The Scientific Research & Development program and the Innovation program between STDF and IMC support the development of products if this is part of the applied research proposal. However, there is no specific fund for developing industrial products.

Information Technology Industry Development Agency (ITIDA)

The Product Development Projects (PDP) grants also require the collaboration between researchers from the academia and ICT industries. The role of the researcher and the industrial partner has to be defined clearly. PDP starts with a prototype and ends with a product. ITIDA funds accepted projects in this program with up to L.E. 2 million per project for a maximum duration of three years. More priority is given to fund prototypes that were developed from ITAC programs.

Research, Development & Innovation Programme (RDI)

The two grant schemes within the EU-Egypt Innovation Fund (EEIF) support the development of products if this is part of the applied research proposal. However, there is no specific fund for developing industrial products.

3.2. Research to Market - Gap Analysis

The following are the gaps we found in the innovation process from the phase of applied research until the invention reaches the market place:

- Although some entities provide applied research grants to private sector and independent researchers such as IMC and RDI, the majority of the grants are restricted to individuals who are working at universities or research centers
- Researchers search scientific journals for prior arts before starting their research to make sure they are not repeating work done in the same field. However, most of them do not use international patents databases in their prior art search. Awareness about patented inventions and being able to search for international patents not only keep the researchers up-to-date with the latest applicable inventions in their field but also keep them aware of what areas are of interest to the industry and which parts of their inventions can be protection by IPRs.
- Researchers might not find the lab equipment they need at their universities. These equipment might exist at other universities but they do not have access to them. Some research institutions offer paid access to their lab facilities for researchers from other institutions. However, this approach is not applied on a large scale to satisfy the needs of Egyptian researchers.
- Almost all the institutions that fund applied research apply the “Market Pull” linear model. The limitation of this model is that the industrial entities only get involved in specifying industry needs or evaluating the proposed research before the beginning of the research project. However, they do not interact, evaluate, nor provide feedback throughout the innovation phases. Therefore, most of the resulting inventions have mismatching criteria related to the industrial process, which could have otherwise been considered during the early stages of research and development. Accordingly, when the applied research phase is done, most industrial entities do not show interest in funding the prototype or the product development phases.
- The government fund available for applied research is very small. Moreover, other than the prototype development programs offered by ITIDA and Misr El Kheir, there are no grants dedicated towards prototype development.

3.3. Research to Market – Recommendations

We recommend the following strategies to bridge the gap in the current innovation process. An action plan with milestones shall be developed for the implementation of those strategies.

- Developing new short-term and long-term mechanisms for funding innovative youth, SMEs, and independent researchers who are not working at research institutions. While short-term mechanisms shall focus on overcoming the barriers and red-tape that exist due to the current laws and regulations, long-term mechanisms shall change these laws and regulations.

- Establishing collaboration between the different government funds in Egypt. The purpose is to make it easier for fund applicants to apply for different funds without going through the same procedures all over again. For example, applicants whose projects pass the technical evaluation at one funding entity and then got rejected due to lack of finance can still apply at another fund and refer to the technical evaluation done earlier. This process will save time and resources for both the applicants and the funding entities and will help the funding entities keep track of and share the funding history of all applicants with other government funding entities for later reference.
- Encouraging researchers to search the international patent databases during their prior art search and literature review. This has benefits such as giving them insights to the latest technologies that might not be published, the protected applications of such technologies, the companies interested in these applications, and the markets in which these technologies might have value.
- Promoting the concept of open patents among the research community, in which researchers are provided free license to use others' patented inventions and research tools to conduct new research or improve existing ones. In this case, the improved patents will have to be re-licensed to the researcher from the original patent was licensed. By law, research institutions in Egypt own the patents generated from any work done by their staff if that work is part of their duties at those institutions. Open patents will open the door to improve the institutions' patents in different areas, strengthen the institutions' technology transfer position, and increase the researchers' ability to innovate new applications for existing inventions without fear of infringing others' patents.
- Encouraging universities and research institutions to align their resources to support researchers in different areas of science. Lab equipment is expensive to purchase and there is currently a limited government budget to purchase all the required equipment for universities and research centers. To compensate this limitation in budget, we recommend establishing virtual incubators in all fields of applied science. The virtual incubator is simply a database of all scientific equipment and expertise in Egyptian universities and research centers. This database can be available to all researchers after agreeing with all the research institutions. Access to equipment can be offered for free or as a paid service. The virtual incubator concept can be integrated in future government capacity building funds by asking the beneficiaries to share access to lab equipment purchased from those funds with staff from other institutions. The database helps keeping track of all equipment specially those purchased from capacity building funds, which in turn increases the efficiency of these funds.
- Establishing cooperative research-to-market programs between the research institutions, funding agencies, and industrial/government entities. Industrial/government entities will specify their needs and calls for proposals will be prepared based on those needs and communicated to all the research institutions. The submitted proposals are then evaluated by the funding agencies and the industrial/government entities. All entities in those cooperative programs agree that the funding agency will fund the applied research and concept development stages while the industrial/government entities will continue funding the prototype and product development stages.
- Developing funds for researchers who have proof of concepts and want to develop prototypes. These funds shall be available for independent researchers and SMEs as well. Priorities can

always be given to those who can show that an industrial entity is willing to fund product development afterwards. Researchers and research entities face difficulties commercializing their research because they do not get industrial entities involved in the innovation process from the beginning. Many inventions have marketing potential but prototypes are needed to convince the industrial partners to invest in producing the working prototypes. This is why this fund is necessary.

4. Innovation Activities

The innovation activities in this report are divided into Technology Commercialization and Industry/Academia Collaboration. Technology Commercialization is further divided into transferring technology to established entities through licensing/selling its Intellectual Properties and starting-up new ventures to capture the value of the technology.

Technology Transfer is the transfer of inventions, technologies, know-how, and methods among research institutions, industrial entities, and government entities. On the other hand, entrepreneurship involves activities undertaken to transform inventions into new products, services, methods, and innovations that have economic or social benefits and most of the time leads to starting new ventures “Start-Ups”. Depending on the type of technology and its market potential, inventions can be commercialized at any stage of development: applied research result, prototype, or product.

The Industry/Academia Collaboration activity establishes links between the industrial and the research communities, which are missing to a great extent in Egypt. It encourages the industry to believe in scientific research as a reliable solution to their current and future needs and thus facilitates the technology transfer process from academia to the industrial and government entities.

This section provides details about the three innovation activities mentioned above, the entities that perform them, the gaps found in the current innovation ecosystem, and our recommendations to bridge these gaps.

4.1. Technology Transfer - Licensing to Established Entities

This section lists the Egyptian entities that are concerned with technology transfer from/to established companies and factories.

Academy of Scientific Research and Technology: Invention & Innovation Development Agency (IIDA)

The IIDA’s main role is the commercialization of inventions. The commercialization process starts with the marketing team looking at granted patents in the patent office’s periodic publications. They evaluate the marketing potential of these patents and pick up the ones with high potential to commercialize. The marketing team comes from commerce, engineering, and Information Technology academic backgrounds. After that, they ask the inventors for approval to commercialize their inventions. Then they send official letters signed by the president of the academy of scientific research to the industrial entities who they believe would benefit from the patented inventions. When the industrial entity replies to the letter showing interest in the invention, the marketing team starts conducting field visits to negotiate the terms of testing and using the invention.

The deal is closed by signing a marketing contract between the inventor, the academy of scientific research, and the industrial entity. IIDA receives 10% of the generated revenue in return of their services. Inventors are free to commercialize their inventions on their own and they can always ask

IIDA for help in drafting and negotiating contracts. In this case IIDA would also get 10% of the revenue in return of such services.

Commercializing the technologies, IIDA does not perform intellectual property assessment, technology and intellectual property valuation, or deep market assessment. There is no clear business model for commercialization such as licensing or spin-offs. They mainly depend on sending official letters and arranging local exhibitions to market the inventions and they focus on the Egyptian market only. IIDA's marketing team focus on patented inventions that are ready to market or that have prototypes. They do not fund the development of prototypes. However, they can produce prototypes for some inventions in their scientific equipments center at the National Research Center.

Ministry of Industry & Foreign Trade: Technology & Innovation Centers (TICs)

TICs work close to their industry partners providing them consultation and training and meeting with them on a regular basis. Consequently, each TIC is among the first to know about the industry problems and can recommend solutions for them. So far, when industrial entities face problems, TICs search for solutions implemented outside Egypt, and ask Egyptian researchers to implement the same solutions at the industrial partner's premises. Choosing the researcher, TIC depends on their personal contacts.

Currently, TICs only transfer technologies to the Egyptian industry from technology partners outside Egypt. Those partners are entities selling high end products, licensing their patented technologies, or selling knowledge in the form of training and consultancy. TICs do not yet work on transferring technologies from the Egyptian universities and research centers to their industrial partners.

National Research Center (NRC): Businessmen & Investors Service Office (BISO)

BISO's main role is to commercialize the outputs, prototypes, and inventions of the NRC. The marketing team consists of PhD holders having experience in different areas such as wastewater treatment, agriculture, chemical industries, marble, and environmental issues. The office collaborates with business men associations and the Federation of Egyptian Industries (FEI) to license the know-how generated at NRC. In addition, they organize exhibitions every two years to market their inventions and they publish booklets that include all the inventions available for licensing.

Technology Innovation and Entrepreneurship Center (TIEC)

TIEC offers an Innovation Voucher Program, which encourage SMEs to acquire technologies from other companies. The program offers 10 vouchers each quarter. The value of each voucher is L.E. 50,000. Such program encourages technology transfer between companies but it does not touch on transferring technologies from universities and research centers to SMEs and the industrial community in large.

Technology Transfer Offices (TTOs)

There are currently five TTOs in Egypt, one in each of the following universities: Alexandria University, American University in Cairo, Assuit University, Cairo University, and Helwan University. In addition, there is a network of TTOs under establishment, which will include TTOs in three more universities. One of the main roles of these offices is to commercialize the university

inventions. The business model used is licensing the Intellectual Property Rights and know-how to the industrial entities in return of either a lump sum or a percentage of the generated revenue. The generated revenue is shared among the inventor, the university, and the TTO according to the policy of each TTO.

Virtual Incubator for Science based Business (VISB)

VISB commercializes technologies offered by either the private sector or the academic community. This is done through making them available to potential investors and licensees on VISB's website and sending periodic emails to all members of the Islamic Development Bank's science development network. In Egypt, marketing technologies is also done through contacting entities like the industrial chambers.

4.1.1. Technology Transfer - Gap Analysis

The following are the gaps we found in the Technology Transfer activities:

- Most entities involved in technology transfer activities work in separate islands. They either are not aware that other entities are involved in similar technology transfer activities or are not willing to build on others' experience. There is no collaboration or knowledge sharing between those entities. We believe there are several reasons for that. First, lack of information and research done about which entities support innovation activities in Egypt and what services they offer. We faced that problem during our study. Second, some entities do not put enough effort in searching for what others do and what is achieved in their area of interest. Third, some entities are not willing to collaborate with others either because they do not trust their work quality or they want to get credibility for starting something successful from scratch without depending on what others have already achieved.
- There are some initiatives to transfer technology from universities and research centers to the industry. There are also other initiatives to encourage transferring technologies among private companies and SMEs. However, the number of existing Technology Transfer Offices is not big enough to support the research and industrial communities in Egypt. Besides, most of them do not have success stories yet. The existing Technology Transfer Offices (TTOs), specially those established in public universities, are still not ready to perform their tasks effectively. They lack resources and expertise; they need to hire experts, receive more training, develop their strategy, agree with their universities on clear roadmaps and procedures, and develop sustainable business models. The TTOs at universities were established part of a project funded by the European Union. The project is currently about to finish and those offices need to secure funds to continue operations before they can self-sustain.
- Most of the established Technology Transfer Offices at Egyptian universities do not receive support from the university's upper management. The support is not only financial but also in terms of required resources. Professors who work at the TTOs cannot dedicate enough working hours because they are teaching courses at the same time and their universities do not help in solving this problem. The universities are not willing to cover or share some of the TTO's

operations cost such as staff salaries, Intellectual Property protection fees, training courses, and marketing materials, especially after the European project finishes. Moreover, almost all universities and research centers are not very concerned with having a clear Intellectual Property, revenue sharing, and commercialization policies for the inventions that come out of their labs.

- There are no clear guidelines and mechanisms for the commercialization of government owned Intellectual Property (IP) to make sure of its compliance with the national laws and regulations. Many legal advisors in public entities like research institutions, government entities and funds lack knowledge and experience in IP commercialization legal issues. They consider licensing IP the same as selling normal products and services.
- There is no government support to implement the inventions that solve national problems. Many Egyptian research results and inventions provide solutions to national problems such as rice straw recycling, waste water treatment, and others. However, there are no efficient mechanisms to present those inventions to decision makers at the different ministries and government bodies. It is very difficult to arrange a meeting at any ministry with a decision maker who can assess the inventions and take quick decisions to fund and implement those inventions. In addition, there are no government incentives for private investors who are willing to convert research results into applications that can solve national problems.
- There is no formal education or training courses in Egypt on technology transfer and commercialization.

4.1.2. Technology Transfer – Recommendations

We recommend the following strategies to bridge the gap in the Technology Transfer activities:

- Disseminating up-to-date reports about innovation activities in Egypt on a regular basis. These reports can include information about all the innovation entities, activities, offered services, needs and requirements. Establishing communication channels between all innovation entities in Egypt through regular gatherings and collaboration programs.
- Establishing a number of Technology Transfer Offices (TTOs) at universities starting with the ones who show real commitment and knowledge in this subject matter. Not only that, but also supporting them for a certain period of time until they can self-sustain. The support includes giving them grants to hire qualified staff, attend training courses, and cover operational costs. We believe that universities should share some of the operational costs and be committed to support their TTOs after the grants end. Current TTOs should also be able to receive support grants after assessing their past performance and future plans.
- Getting the top management and staff at universities and research centers involved in supporting the Technology Transfer activities. This includes the presidents, deans, heads of departments, and researchers. They shall believe in the positive impact of TTOs on the Egyptian innovation ecosystem. We believe that this strategy shall be communicated by the Minister of Higher Education and Scientific Research to all the presidents of universities and research centers.

- Having clear guidelines and procedures to be followed in public institutions for the commercialization of government owned Intellectual Property. The guidelines must adhere to the national laws and internal regulations of each government entity. In addition, ministries and government bodies that are involved in IP related activities should hire an IP legal consultant or outsource this task when needed because many of the current advisors do not have enough experience in such issues, especially when it comes to commercialization and licensing activities.
- The government should support and encourage the inventors as well as the private investors who are willing to invest in implementing the inventions that solve national problems. Some projects need approvals and collaboration with different ministries. Mechanisms are needed to fulfill this need. We recommend establishing innovation focal points at the ministries and government entities starting with the ones that would benefit most from applied research. Each entity should be encouraged to assign one or more technology oriented staff to run these focal points. Those staff should be decision makers or in direct contact with decision makers in their ministry. They will be the points of contact with the innovators and will receive their submitted inventions. Their main tasks are to assess the submitted inventions, decide which ones to implement, study collaboration proposals submitted by the private investors, and take the necessary actions to fund and implement these inventions.
- Establish formal education and training courses in technology transfer. The required training shall cover technology assessment and valuation, market assessment, patenting and IP protection, marketing strategies, licensing and negotiations. It shall also include hands-on training in topics related to managing technology transfer offices and the commercialization process such as deciding on the TTO's best revenue models, funding sources, tools and software, internal and external resources, policies, guidelines, and best practices.

4.2. Entrepreneurship Support & Spin-Offs

This section lists the Egyptian entities that support entrepreneurship activities and spin-offs. We focus on five main activities: incubation, equipment, mentorship & assistance, seed funds & start-up loans, and graduation projects' support.

i. Incubation

Ministry of Industry & Foreign Trade: Technology & Innovation Centers (TICs)

There are twelve Technology & Innovation Centers in total. Ten centers serve specific sectors and two serve all sectors horizontally. Sectorial centers are fashion and design, marble and quarries, plastic, food, leather, leather tanning, furniture, jewelry, textile and clothing, and engineering industries. Horizontal centers are productivity and quality improvement and Egypt national cleaner production centers.

TIC offers technology incubation in five of these technology centers: fashion, plastic, jewellery, engineering, and leather. Entrepreneurs are offered office space, technical assistance, mentorship, and access to the centers equipment for a period up to two years. Incubated teams have to bring their own materials and bear their own salaries and expenses. TIC is currently looking for partners with previous experience in establishing and managing incubators to advice them regarding the best business model for running technology incubators.

Nahdet El Mahrousa (NM)

NM provides incubation only for social start-up ideas. Youth groups and individuals can apply to the called "Junior Incubator" in order to develop their social ideas into real projects. The incubator offers technical & legal support, capacity building training, and access to required human capital including volunteers. In return, NM gets up to 10% of any grant received or fund raised by its incubated projects.

Social Fund for Development (SFD)

SFD funds the construction work of the incubator as well as managing and operating the incubator until it can sustain itself. The day to day operations of the incubators is carried out by SFD partners such as the Egyptian Incubator Association (EIA) and other business partners.

There are currently 7 working incubators inside Egypt as shown below:

- Tala Generic Business incubator - Menoufiya Governorate
- Mansoura Generic Business incubator - Dakahliya Governorate.
- Assiut Technology incubator - Assiut Governorate.
- Tebbine Technology incubator - Metallurgical Institute - Cairo Governorate.
- Douwaika Virtual incubator - Cairo Governorate.
- Port Saeed Virtual incubator - Port Saeed Governorate.
- New Tebah Business incubator - Luxor Governorate.

In addition, SFD is going to establish 2 incubators, one in the 5th settlement in New Cairo and another one in 10th of Ramadan.

The maximum incubation period is 5 years during which SFD offers office space and facilities for rent at a lower price than the market. It does not provide the required equipments. However, it provides free space for the incubated teams to bring their equipments at their own expenses. The financial support that SFD provides is neither a grant nor an equity sharing but rather a loan at 6% interest rate. So far, SFD does not keep any records of the performance and the status of the projects that leave the incubation to the outer world.

Technology Innovation and Entrepreneurship Center (TIEC)

TIEC has a Technology Incubation Program (TIP) in place. TIP was launched by the Information Technology Industry Development Agency (ITIDA) in August 2006 to help entrepreneurs develop their innovative ideas and create seed companies and start-ups. It is currently managed by TIEC. There are currently two technology incubators in the smart village (buildings B115 and B145) and three incubators in Assuit, Alexandria, and Cairo universities. So far, entrepreneurs can only join the incubators through applying in business plan competitions that are organized by TIEC, once every year, or any of their partners. The teams that win in those competitions are offered a free incubation space and facilities for a period of up to 24 months. Each team receives up to 250,000 dollars per 24 months as a grant.

ii. Equipment

Agricultural Research Center (ARC): Technology Management and Commercialization Office (TMCO)

TMCO offers business entities and individuals the ability to use their lab facilities and equipment on a rent basis. This service can be utilized by entrepreneurs in fields like agriculture, vaccines, plant varieties, pesticides, fertilizers, and pharmaceuticals.

Ministry of Industry & Foreign Trade: Technology & Innovation Centers (TICs)

TICs that incubate start-up teams allow them to use the equipment in the technology centers free of charge.

iii. Mentorship and Assistance

General Authority for Investment (GAFI)

GAFI established “Bedaya” center for Small and Medium Enterprises (SMEs) development. Bedaya initiated its “Business Clinic” program that helps entrepreneurs develop and grow their ideas. The program started by choosing individuals who had entrepreneurial ideas and skills. Bedaya offers them mentorship through its business partners who dedicate man hours to this program. Entrepreneurs who joined this program will get the chance to work with other entrepreneurs in established start-ups and to benefit from their experience. After that, Bedaya will help them secure the fund they need by linking them to available funds, investors, and venture capitals. In addition, entrepreneurs can always benefit from Bedaya’s advisory services that are dedicated to SMEs.

Ministry of Industry & Foreign Trade: Technology & Innovation Centers (TICs)

TIC offers technology incubation in five of its technology centers: fashion, plastic, jewellery, engineering, and leather. During the incubation period, entrepreneurs are offered technical assistance and mentorship for a period up to two years.

Nahdet El Mahrousa (NM)

NEM provides entrepreneurship courses to its incubated projects' members through the Career & Entrepreneurship Development Office (CEDO) at Cairo University.

Social Fund for Development (SFD)

SFD gives the incubated projects access to technical training and consultancy. It helps them in marketing their products and services and in preparing their feasibility studies and financial statements. It also offers them a 10 days training course in entrepreneurship.

SFD opens channels for their funded projects to market their products and services. An example of this is that it established partnerships with supermarkets and hypermarkets to market the products of some of those projects.

Technology Innovation and Entrepreneurship Center (TIEC)

TIEC recently introduced an Entrepreneurship Qualification Program (EQP), which is considered a developmental pre-startup screening process. Entrepreneurs who apply for TIEC's Technology Incubation Program and who pass the idea assessment phase are required to attend this EQP program. The program includes an intensive 4 weeks entrepreneurship training courses and aims at providing entrepreneurs with the basic skills they need to grow and sustain their start-ups. In addition, the entrepreneurial capabilities of the applicants are assessed during and after finishing this program. Those who pass this program will join the technology incubators.

The program covers training in four topics: knowledge management, project management, financial management, and sales and marketing. The same courses are also available to the teams who are already incubated to assess and develop their entrepreneurial skills.

TIEC is also building a network of mentors who can provide guidance to the incubated teams. There is also a plan to develop a network of seasonal CEOs who are willing to capitalize on their experience and networking asset and lead start-ups towards being profitable businesses.

iv. Seed Funds and Start-Up Loans

Agricultural Research & Development Fund (ARDF)

ARDF together with its partner banks provide loans for farmers, companies, and small investors in support of specific activities. The loan size and conditions differ according to whether the loan is given to an individual or an entity and according to the type of activity. The interest rate ranges between 7% for short term loans and 9% for long term loans.

General Authority for Investment (GAFI)

GAFI recently established a fund of L.E. one billion for the development of SMEs. The fund has a fixed term of 10 years. A maximum of 10% of this fund will be dedicated to green field and venture

capital investments. This fund will be managed by three professional fund managers who will provide necessary support for SMEs to grow and succeed.

Social Fund for Development (SFD)

The Social Fund for Development provides loans to start-up projects at 6% interest rate.

Technology Innovation and Entrepreneurship Center (TIEC)

The center provides fund to their incubated technology start-ups. Those startups can only join the incubators through applying in business plan competitions that are organized by TIEC, once every year, or any of their partners. Each one of the teams who win in those competitions receives up to 250,000 dollars per 24 months as a grant.

Venture Capitals

Some venture capital firms provide seed funds for start-ups working in the Information and Communication Technology (ICT) industry. An example of these firms includes Ideavelopers and Sawari Ventures who provide funds for start-ups that prove their high growth potential and that have working concepts or prototypes in place. In return, they own equity in those start-ups.

v. Graduation Projects Support

Information Technology Industry Development Agency (ITIDA)

ITIDA funds ICT related Students Graduation Projects with a maximum of L.E. 10,000 per project. Projects are accepted based on the market needs as proposed by ICT companies. Funded projects are invited to an exhibition at the end of the year where projects' teams get to meet public figures and people from the industry who might be interested in sponsoring these projects. Some of these projects might also be chosen by the TIEC to join their incubators. So far, ITIDA does not follow up the status or the progress of the funded projects after the graduation year ends.

Nahdet El Mahrousa (NM)

NM arranges a yearly competition called "young innovators award" for university students in the faculties of science, agriculture, and engineering to submit their graduation projects' ideas. The projects are evaluated by a panel that includes people from both the academia and the industry. The winning projects get L.E. 10,000 each. 6,000 to be spent on the project itself and 4,000 to be spent on awareness campaign about the program. Another competition is made after the graduation projects end to choose the best projects and the winners receive an additional L.E. 10,000 each.

Research, Development & Innovation Programme (RDI)

Undergraduate students can apply for the second grant scheme within the EU-Egypt Innovation Fund (EEIF) to support their graduation projects. Those who finished their graduation projects can also apply for this grant to develop their projects' concepts into prototypes.

4.2.1. Entrepreneurship Support & Spin-Offs - Gap Analysis

The following are the gaps we found in the Entrepreneurship Support activities:

- There is a lack of formal education and training courses in Entrepreneurship, Incubator management, and Innovation Management. The German University in Cairo (GUC) offers an innovation management major under its business school. Science and engineering students can not join these courses because it is only for business students. Thus, this program is not available for graduate students, non business GUC students, and those who cannot afford the GUC fees.
- Start-Ups and SMEs are not encouraged to participate in solving national problems. There are no serious actions taken to capitalize on the creativity and flexibility of Start-Ups and SMEs.
- Although there are a number of incubators operating in Egypt, most of them lack the required expertise, business models, and efficient networks of stakeholders. ICT incubators show some successful stories with a relatively structured business model, experienced personnel, and good stakeholders' network compared to other technology incubators. However, they still need more training and experience in issues related to managing incubators such as mentorship & training, incubator finance, leveraging stakeholders' networks, tracking & graduating companies, and Intellectual Property management. Moreover, the number of ICT incubators is very limited. Therefore, they are not open to everyone but only accessible to the winners in the business plan competitions that are held every two years.
- There is a demand for specialized technology incubators in Egypt. These incubators will introduce to the market startup companies capable of utilizing new technologies in the different fields of science and contributing to the overall performance of the Egyptian economy. The current specialized technology incubators are managed by the Social Fund for Development (SFD) and the Technology & Innovation Centers (TIC). SFD's business model is not the best model to follow because they do not share risks with entrepreneurs. They rent their incubation space, finance projects by loans with interest, do not provide any equipment, and do not provide efficient training focused on entrepreneurship and Intellectual Property. On the other, TIC still do not have clear models in place to manage their incubators. They lack knowledge and expertise in incubator management.
- Investing in innovative ideas at early stages is very risky for private investors. Almost all Venture Capitals (VCs) in Egypt, who invest in high risk projects at early stages, do not get involved until they see a working prototype or a proof of concept. Some of them have recently established what is called "Acceleration Programs" to provide seed fund and mentorship to entrepreneurs whose ideas have growth potential. These programs help entrepreneurs develop their first prototype and get ready to raise additional funds from VCs.
- Although available seed funds are available to ICT innovations only, they are not enough to support all such innovations in Egypt. Moreover, there are no seed funds available for inventors willing to start-up companies based on non-ICT inventions.

4.2.2. Entrepreneurship Support & Spin-Offs – Recommendations

We recommend the following strategies to bridge the gap in the Entrepreneurship Support activities:

- Developing formal education and training courses in Incubator Management, Entrepreneurship, and Innovation Management. Topics in Incubator Management can include the incubation process, commercialization, incubator finance, Intellectual Properties, leveraging stakeholder network, licensing and negotiations, technology assessment and valuation, and international business development. Topics in Entrepreneurship and Innovation Management include innovation management, commercialization, Intellectual Properties, licensing and negotiations, Venture development and finance, business planning, innovation marketing, competitive strategies, and HR management.
- Setting up a number of technology incubators according to the best practices worldwide and hiring qualified personnel to manage them. We can start by establishing incubators that serve a specific industry sector such as the chemical industries. Taking this industrial sector as an example, we can establish an efficient stakeholders' network of inventors, technology transfer offices, research institutions, members of the chamber of chemical industries, presidents and managers of local companies and multinationals, government officials, mentors, and investors interested in this industry. We can also facilitate access to required lab equipment and facilities at different research institutions and provide an initial seed fund beside other incubation services. Once we succeed in graduating start-ups that add value to the chemical industry in Egypt, then we can capitalize on the gained knowledge and establish technology incubators in different industries and technology areas.
- Science based start-ups might need access to scientific equipment and lab facilities to test their inventions and to develop them based on market needs. Founders of these start-ups sometimes find the equipment they need at their universities. However, sometimes entrepreneurs require equipment that are not available at their university and they cannot afford purchasing them. Giving them access to virtual incubators, which are the shared lab facilities and expertise at universities and research centers, will help them boost their research and development capabilities within their limited financial resources.
- Depending on entrepreneurs in commercializing the inventions of universities and research centers. Many challenges face the inventors and technology transfer offices when trying to license technologies to established companies. For example, an invention might need further investment for additional research and invention adaptation to satisfy market needs or to develop/modify its prototype according to industry requirements. Inventors might face difficulties securing the required lab equipment and facilities to do further tests to their inventions. Some inventions require approvals and others require collaboration with different entities to ensure successful implementation.
- Only entrepreneurs can face those challenges and establish start-ups to manage the technology transfer process, secure funding, handle the research and development process, secure access to

required equipment, manage the associated intellectual property, define a suitable business model, establish partnership with different stakeholders, plan and implement a marketing strategy. This approach will create solid research based startups, create more job opportunities, promote the entrepreneurship culture, and positively impact the Egyptian economy as a whole.

- We recommend training entrepreneurs from different educational backgrounds. They can work with Technology Transfer Offices and Incubators in commercializing research based inventions. A seed fund should be available for those entrepreneurs to support them at the very early stages of development until their technologies and business models become attractive to private investors from whom entrepreneurs can secure their first rounds of finance.
- The Egyptian government can always encourage start-ups to provide solutions for existing problems, improve existing systems, and participate in planning activities. Start-ups are more flexible than large organizations and they can compete in providing creative solutions at lower costs. The government needs to believe in their capabilities, support their participation, and bear some of the risks with them.
- Establishing seed funds for inventors and business innovators who are willing to start new ventures to commercialize their inventions. This fund should not be provided as a loan but rather as a grant. It is not recommended that government funds own equity in private companies because even if this equity is small, it will get them into lots of red-tape that will hinder their growth and kill their creativity.

4.3. Industry Academia Collaboration

The following Egyptian entities either perform or support activities that establish and strengthen links between the academia and the industry.

Agricultural Research Center (ARC): Technology Management and Commercialization Office (TMCO)

TMCO offers to carry out lab tests and to produce some products on behalf of business entities. This service not only generates revenue for the office but more importantly increases the researchers' contribution and exposure to industrial requirements and operations.

Industrial Modernization Center (IMC) - Science & Technology Development Fund (STDF)

STDF and IMC support the collaboration between industry and academia through their joint programs: Scientific Research & Development, Professor for every factory, and Innovation programs.

Information Technology Industry Development Agency (ITIDA)

In November 2006, ITIDA introduced an initiative called Information Technology Academic Collaboration (ITAC). This initiative aims to promote Industry/Universities collaboration through linking academic research with industry and market needs. ITAC includes a range of programs divided into two main categories. The first category, the Postgraduates Programs, includes ITIDA Fellowship (IF), Advanced Research Projects (ARP), Product Development Projects (PDP), and Patent Filing Program (PFP). The second category, the Undergraduate Programs, includes Students Summer Training and Students Gradation Projects.

Summer internships are offered by ITIDA in large ICT companies in Egypt. ITIDA pays each intern L.E. 500 per month during the training period for a maximum duration of two months. Students can agree with companies on their own to do their internships but these companies will have to adhere to ITIDA's internship policy.

National Research Center (NRC): Businessmen & Investors Service Office (BISO):

BISO gets the NRC researchers involved in industry related activities by offering consultancy and technical advice to industrial entities in different areas including environmental issues. This helps the entities solve some of their problems and improve their productivity. The office also carries out lab tests, analysis, and scientific measurements on behalf of industrial entities in order to obtain quality certificates. Moreover, it charges for preparing feasibility studies for individuals and companies.

Research, Development & Innovation Programme (RDI)

RDI supports the collaboration between industry and academia through their fund programs, which support projects that enhance the collaboration between the research community and the industry and that enhance innovation in Egypt.

Technology Innovation and Entrepreneurship Center (TIEC)

TIEC initiated the Collaborative Innovation Network (COIN), which is a regular gathering designed to foster innovation in the ICT Sector in Egypt by developing a network of participants from industry and academia. Those participants meet regularly every 2-3 months to share experiences, lessons learnt, technology trends, opportunities and challenges.

TIEC also encourages innovators, SMEs, and academics to join international programs that promote collaboration between the research community and the industry such as the Information Technology for European Advancement (ITEA) program. Such programs get them involved with participants from different countries in high end collaboration projects and gain knowledge in various areas related to innovation and technology transfer.

Technology Transfer Offices (TTOs)

One of the main roles of the five TTOs is to establish links between the industry and the academic community. However, almost all the links established by the TTOs with the industrial entities are for the sake of commercializing the inventions that they currently have in hand rather than establishing a link for future collaborative research between the industry and the academia. So far, no serious efforts have been done to communicate the industry requirements to the research community or to bring both communities on the same table to discuss the industry needs and the available inventions that might fulfill those needs.

Virtual Incubator for Science based Business (VISB)

VISB matches industry needs with academic research by identifying problems that face the Organization of the Islamic Conference (OIC) industry and then searching local and international scientific papers and patents that are in the public domain for solutions to those problems. It focuses on low-end technologies that are not complicated to implement.

VISB also promotes and disseminates knowledge generated from the COMSTECH technology forum to the scientific and industrial community in OIC member countries. The forum covers issues concerning technologies offered, technologies required, creative scientific ideas for business development, and technical problems of the OIC industrial sector. This is carried out through VISB website and the electronic monthly bulletins of the Islamic Development Bank's science development network.

4.3.1. Industry Academia Collaboration - Gap Analysis

The following are the gaps we found in the Industry Academia Collaboration activities:

- Some research is done without knowing all aspects of the problem they're trying to solve and many researchers do not have exposure to business operations and their available facilities and resources. The result is either a research that is not related to existing needs or research that solves industrial problems but cannot be implemented because it is not considering all business aspects. For example, a researcher might come up with a solution that requires the factory to replace all its equipment, consume more power, or purchase more land area than what is available. There is currently no entity that communicates the government and industry needs in

each sector to research institutions in order to educate their researchers about the industry needs and the business aspects that should be considered during the research.

- There are brains and valuable research in our Egyptian institutions. However, most industrial entities lack trust in the academic research. Most industrial entities are not aware of the achievements and capabilities of the academic community. There are some initiatives to build trust between industry and academia. Some entities organize regular gatherings to get both communities together while others fund collaborative innovation and R&D programs. However, these initiatives are not big enough to solve the lack of trust issue. Moreover, there are no collaborative efforts to capitalize on the success stories of each other for the benefit of the whole society and to disseminate and advertise for those success stories.
- The “Open Innovation” approach is the main route to strengthening the collaboration between the industrial and academic communities. This approach assumes that each entity can depend on external research beside its own to benefit from the widely distributed knowledge worldwide in advancing its own development process. This opens the way for R&D departments in industrial entities to use external research done at universities and research institutions. It also encourages those entities to generate revenues from selling or licensing out unwanted technologies to others.
- Most industrial entities do not have in-house Research and Development (R&D) in the first place. They still do not trust the ability of turning research inventions into industrial innovations that can create value. They prefer to buy technologies from abroad instead of developing their own. This is one of the main obstacles against their collaboration with the academia. The R&D staff is always the link between their entity and the academic community. They translate business problems into research requirements, develop their own technologies, license out the technologies they don’t need to other entities, and most importantly collaborate with academic researchers to make sure the research coming from outside their entity fulfills the business requirements and is implemented efficiently.
- There are some initiatives whose objectives include promoting the R&D and open innovation cultures in the industry. However, these initiatives are not done on a large scale and there are no success stories yet. Moreover, these initiatives do not have KPIs concerned with the number of newly established R&D departments or the number of licensing agreements to and from the beneficial industrial entities. There are no precise records of how many of the existing industrial entities have internal R&D and how many do not.
- There are few focal points at universities and research centers to link the industry with the academia. The Technology Transfer and commercialization Offices are mainly the ones who perform industry academia collaboration activities. Most of these offices have some contacts with industrial entities to whom they commercialize their inventions. However, they do not communicate industry requirements to the academic community, do not have databases of industry problems and all research done at their institutions, and do not focus on getting the industry involved with their institutions in collaborative research projects. Moreover, most of these offices have university staff with no previous business experience.

4.3.2. Industry Academia Collaboration – Recommendations

We recommend these strategies to bridge the gap in the Industry Academia Collaboration activities:

- Creating different programs to increase the research community's awareness about industry needs and the different business aspects that should be considered during the research process. These programs will also encourage industrial entities and research institutions to communicate their achievements and requirements to each other on a regular basis.
- Starting with specific industries and capitalizing on previous success stories about collaboration between entities in these industries and academia. If there are no stories then build new ones. Disseminating these stories to the public and to all entities in the same industry is the first building block in the bridge between industry and academia.
- Establishing communication channels between the industrial and academic communities. The purpose of these channels is not only to raise awareness about industry needs but also to inform the industry and keep them up-to-date with the achievements and capabilities of the research community in Egypt. This can be achieved by different means that includes organizing regular events that are attended by academic researchers, R&D personnel, and industry experts. A collaboration platform is also necessary to link the industry, academia, and government together.
- Promoting the R&D and open innovation cultures among industrial entities. The government can provide incentives such as research and development grants and tax reductions for R&D activities. Dissemination of success stories among the industrial community and the Egyptian society as a whole is important to raise awareness and promote R&D activities. Incentives will help promote open innovation and encourage industrial entities that already have R&D to license technologies to and from research centers, Start-ups, SMEs, and other big organizations.
- Establish more industry-academia focal points at research institutions to establish links with the industry, communicate industry needs to the research community, and facilitate the collaboration processes to the industrial partners.

5. Innovation ToolBoxes

This section covers two main innovation toolboxes that are important to support the innovation activities: intellectual properties and information services. It lists the entities that have the infrastructure and capabilities to support them, the gaps in such infrastructures, and our recommendations to bridge these gaps.

5.1. Intellectual Property (IP)

This section provides details about the entities that have IP ownership and revenue sharing policy in place, entities that conduct activities to increase awareness about IP, entities that have knowledge in IP legal protection issues, and those who provide funds for IP protection.

i. Intellectual Property (IP) Ownership & Revenue Sharing

Agricultural Research Center (ARC): Technology Management and Commercialization Office (TMCO)

TMCO owns 100% of the IP generated at ARC. If any invention is commercialized successfully, the IP cost is deducted from the generated revenue and then the net revenue is divided as following: The first L.E. 5000: 80% goes to the researcher.

After that: 25% goes to the researcher and 75% to TMCO.

Industrial Modernization Center (IMC) - Science & Technology Development Fund (STDF)

STDF collaborates with IMC in three programs: Scientific Research & Development, Professor for Every factory, and Innovation programs. There is no clear IP ownership and revenue sharing policy for the "Professor for Every Factory" program. Regarding the "Scientific Research & Development" program, the IP ownership varies between sharing the IP ownership between STDF and IMC and allowing the industrial entity to own the IP in return of bearing more cost. This depends on the scheme of the project and the type of funded activities. In the innovation program, IP is shared equally between STDF and IMC.

Information Technology Industry Development Agency (ITIDA)

ITIDA does not own any stake in the Intellectual Property (IP) generated from its funded programs. The researchers and their industry partners are free to agree on the commercial and IP terms of their joint projects' output.

Ministry of Industry & Foreign Trade: Technology & Innovation Centers (TICs)

So far, there is no clear IP ownership and revenue sharing policy in place. When it comes to Intellectual Property, TICs currently solve the industry problems they face through implementing foreign solutions. Accordingly, they require owning any IP that results from those implementations. In case they want to implement a solution whose IP is owned by a researcher, they require an exclusive license to that IP in order to be able to apply the same solution at all their industrial partners without restrictions. For them, IP ownership and revenue sharing is a hassle that they try to avoid.

Misr El Kheir (MEK)

In general, MEK does not own any of the IP generated from the projects that they fund. Moreover, they do not cover any cost related to IP protection as part of the project such as filling patents. They receive 2.5% of the revenues generated from any of the funded projects.

Research, Development & Innovation Programme (RDI)

RDI does not own any of the IP generated from the projects that they fund. Moreover, they do not cover any cost related to IP protection as part of the project such as filling patents. The applicants from the industry and the academia bear the cost of IP protection and they agree in advance about IP ownership and revenue sharing between them.

Science & Technology Development Fund (STDF)

STDF owns 100% of the IP generated from its funded research projects. If any of the research output is commercialized successfully, the inventor receives a share that varies from 2% to 15% of the generated gross revenue according to the amount of that revenue.

Technology Transfer Office (TTO) at the American University in Cairo

AUC's TTO is the only office that has a clear IP and revenue sharing policy. First, it states that if the IP is generated from sponsored research then its ownership will be determined based on the agreement with the sponsor. However, if the sponsor decided not to own the IP, the ownership shall be transferred to the university. Second, the IP generated by researchers as part of their duties shall be owned by the university. Third, the ownership of the IP generated by researchers using university's resources and support is shared between the inventor and the university. Fourth, the IP generated by researchers' own efforts is fully owned by the inventors. Finally, other cases that are not covered in the policy shall be approved on an individual basis.

The net revenue generated from commercializing or exploiting the university owned IP is shared among the university, inventor's school, and the inventors after deducting all costs related to acquiring and maintaining the legal IP protection in the following percentages respectively: 30%, 20%, and 50%.

ii. IP Awareness

Agricultural Research Center (ARC): Technology Management and Commercialization Office (TMCO)

The office works on increasing the ARC's researchers' awareness about Intellectual Property (IP) and the management of their research lab data. It has an IP policy in place that explains everything related to the inventors' relationship with the office. The policy covers details related to inventor rights, invention disclosure, invention evaluation & protection, contracts & licensing agreements, collaboration agreements, know-how transfer, revenue sharing, appeals and dispute resolutions.

In addition, the office encourages the ARC's researchers to pay attention to and protect their inventions before publishing their work by considering any filled patents in their evaluation process; thus, affecting their appraisal and promotion.

Technology Innovation and Entrepreneurship Center (TIEC)

TIEC started an Intellectual Property Capabilities Development Program (IPCD). The purpose of the IPCD Program is to develop innovation and intellectual property capabilities of ICT Organizations to enhance the process of identifying and documenting possible inventions. The program is conducted in collaboration with IBM who agreed to transfer knowledge and to train 30 organizations. The program is currently taking place on three phases that include: 3 workshops, 1:1 mentoring sessions, and follow-up sessions respectively. So far, 30 companies attended phase one workshops and one out of eight chosen companies attended a 1:1 meeting session with IBM.

Technology Transfer Offices (TTOs)

One of the TTOs' activities is to increase the research community's awareness about Intellectual Property and technology commercialization. This should be done through organizing regular seminars and workshops on universities' campuses. However, this activity is not yet effectively done by existing TTOs.

Virtual Incubator for Science based Business (VISB)

VISB spread awareness about Intellectual Property through making online resources about IP laws, innovation guidelines, and best practices in Islamic countries available on their website free of charge.

iii. IP Legal Protection (Drafting patent documents)

Agricultural Research Center (ARC): Technology Management and Commercialization Office (TMCO)

TMCO has trained 16 of its staff on IP related topics such as searching for prior arts and drafting patent documents. The staff comes from different academic backgrounds such as science, engineering, agriculture, pharmacy, and medicine. They have been drafting patent documents since year 2000. The training took place in Michigan patent office and the American University in Cairo.

The legal services offered by TMCO includes representing ARC and employees' at IP legal protection offices, reviewing contracts, drafting IP claims and license agreements, monitoring any IP infringement, and maintaining periodic legal status of ARC's IP.

Technology Transfer Offices (TTOs)

Some of the TTOs have legal expertise to help researchers in drafting their patent documents. They sometimes use the legal services of patent agents abroad for drafting international patents. Most of the TTOs depend on the inventors to draft their own patent documents, which ends up in weak patents.

iv. Funding Intellectual Property Protection

Agricultural Research Center (ARC): Technology Management and Commercialization Office (TMCO)

The office covers all IP related fees of ARC's inventions. These include patent drafting, application, prosecution, and maintenance. All the generated IPs are evaluated first by TMCO to decide which ones to support. When the invention is commercialized by TMCO, all previously paid IP fees are

subtracted from the total revenue and paid back to the office. Then, the net revenue is shared among the inventor, the university, and TMCO according to TMCO's IP policy.

Information Technology Industry Development Agency (ITIDA)

ITIDA supports filling a number of international patents per year in the ICT sector through its Patent Filing Program (PFP), which covers 80% of the international patent filing fees for a maximum of \$15,000.

Science & Technology Development Fund (STDF)

STDF covers the patent application and maintenance fees of the IP generated from its funded projects. All the generated IPs are evaluated first by STDF to decide which ones to support, especially on the international level (PCT).

Technology Transfer Offices (TTOs)

Some TTOs bear the local patent costs on behalf of the inventors in return of additional revenue share in case this local patent is commercialized successfully. Only the AUC's TTO bears the cost of filling international patent in case they believe that it has a commercial potential. This is because the other TTOs do not have enough budgets to bear the cost of international patent filing.

5.1.1. Intellectual Property - Gap Analysis

The following are the gaps we found in the Intellectual Property Support activities:

- Most of the Egyptian inventors write their own patents following the instructions given to them by the Egyptian Patent Office (EGPO). The result is a bunch of weak Egyptian patents. Moreover, most of these applications get rejected when their inventors try to apply for international protection because international patent offices are even more strict than the Egyptian Patent Office. This is considered one of the main barriers against the innovation process minimizing the chances to commercialize Egyptian inventions. Egypt lacks professional IP agents who can write strong patent documents. Currently, when individuals or entities want to file strong international patents, they have to go through international patent agents. This is very expensive for inventors and start-ups inside Egypt.
- There are no clear IP ownership, revenue sharing, and IP commercialization policies and guidelines at most of the research institutions, government entities, and funding agencies. This lack in clear structure hinders the innovation process and discourages industrial entities, inventors, faculty members, and universities from engaging in and supporting IP related transactions.
- There are no collaborative efforts to spread awareness about IP among innovation stakeholders such as researchers, R&D managers, technology start-ups, SMEs, and policy makers.
- There is no formal education or training courses about Intellectual Properties in Egypt.

5.1.2. Intellectual Property – Recommendations

We recommend the following strategies to bridge the gap in Intellectual Properties:

- Establish a program to develop expert patent agents inside Egypt. Such program includes training courses, internships, and access to consultation from international IP law firms. Those patent agents will provide prior art and patent drafting services to inventors, universities, SMEs, and other stakeholders at no or low cost. This approach will improve the quality as well as the quantity of filled patents inside and outside Egypt.
- Encourage research institutions, government entities, and funding agencies to develop their own IP guidelines and policies. A center of excellence can be established to provide guidelines and best practices related to Intellectual Properties and to deliver IP related issues and recommendations to policy makers.
- Develop programs to increase awareness about intellectual properties among innovation stakeholders. These programs can be organized in collaboration with universities, research centers, industrial & commercial chambers, government entities, and NGOs.
- Develop formal education and training courses in intellectual property management.

5.2. Information Services (IS)

Information services is considered an important toolbox that is lacking in Egypt. It is very difficult to find information about inventions or industry requirements. We consider the information services as the information required by the different innovation actors, the databases that host these information, and the platforms that make such information easily accessible by all the innovation stakeholders. This section gives a brief about what entities are currently contributing to the information services in Egypt. It also covers the gaps in the current system and provides some recommendations to bridge those gaps.

Egyptian National Scientific & Technical Information Network (ENSTINET)

ENSTINET is a national public information services organization. It has developed a database that contains both the literature published in Egypt in the field of science and technology, and the thesis abstracts from Egyptian universities and research centers. A hard copy of each thesis is brought to ENSTINET and its team adds the abstracts and descriptions of those theses to the database.

This database is only accessible by researchers who belong to the research centers that are under the supervision of the ministry of scientific research. Moreover, this database can only be accessed from specific IP addresses at the universities and the research centers.

ENSTINET provides a Document Delivery Service where a group of specialist from different backgrounds can help the researchers find local and international publications and master's thesis in their area of interest. They use both local and international databases in their search. To benefit from this service, researchers have to visit ENSTINET's office, provide them with information and keywords to use in their search, pay for the service, and receive a copy of the search results.

Egyptian Patent Office (EPO)

Patent information is in the form of a periodic publication. No online database access. Searching for Egyptian patents is done by going to the patent office and providing them with the search keywords and paying for this service.

Science Age Society (SAS)

SAS is currently developing a database that shall include all theses from universities around Egypt.

5.2.1. Information Services - Gap Analysis

There is a deep gap in the availability of information in Egypt. The following Information Services' gaps have negative impact on the innovation ecosystem:

- The Egyptian Patent Office (EGPO) provides a limited access to the inventions patented in Egypt. It issues a periodic publication of patent applications that passes the examination phase. In order to search for specific patent applications or granted patents, one has to go to the patent office, pay a search fee, write down all the search criteria, and wait for the results. There is no

online full access to patent applications and thus there is no local or international exposure for the Egyptian inventions through the EGPO.

- Finding information about innovation activities in Egypt is a very difficult and tedious job. Many innovation actors are not aware of the activities and services offered by other innovation entities. Some entities develop their own information system that is only accessible by them but not shared with others.
- Researchers face difficulties finding lab equipment available not only outside their institution but also inside their institution and sometimes inside their own faculty.
- Industrial entities cannot find information about recent inventions at universities and research centers, which ones are patented, and which ones are available to license. On the other hand, information about industry needs and production facilities is not available for the research community.

5.2.2. Information Services – Recommendations

We recommend the following strategies to bridge the gap in Information Services:

- Create an online collaboration platform accessible by the public and a database of all the information that is useful to innovation actors and decision makers. This information inside this database will come from ministries, government entities, chambers of commerce, industrial chambers, funding agencies, research institutions, inventors, technology transfer offices, businessmen associations, industrial entities, incubators, and other innovation stakeholders. This platform will not only provide links between industry, academia, and government but will also be an efficient communication channel with innovation entities outside Egypt. The platform's database will contain different information including:
 - Information about Egyptian researchers and their funding history.
 - Patents from research institutions and private companies that are offered on a free license for other researchers to improve.
 - Research and inventions done at universities and research centers.
 - Collaborative research and investment opportunities.
 - Technologies available for licensing.
 - Entities that support innovation and the services they offer.
 - Industrial entities that have in-house R&D and their contact information.
 - Problems facing the industry and their plans for future improvements.
 - Lab equipment and facilities available for researchers and entrepreneurs at universities, research centers, and private institutions.
- Promoting this collaboration platform to the public and among the innovation stakeholders inside and outside Egypt is important to get as many entities to use the platform as possible and to build a credible database in a short time. We recommend collaborating with all innovation stakeholders

in designing and developing the platform and to utilize their existing databases instead of starting from scratch.

- Make the Egyptian patent database fully accessible online free of charge. This is one of the first steps to promote innovation in Egypt because it will encourage researchers to stay up-to-date with recent inventions and will promote the open innovation culture among the Egyptian industry. Companies should be able to search for patented technologies in their areas of interest and access the contact information of their inventors. We also recommend the Egyptian Patent Office to conduct training on patent search techniques to the innovation stakeholders on a regular basis to enhance their search capabilities.
- Integrate the Egyptian patents database with international databases such as the European Patent Office's (EPO) and the World Intellectual Property Organization's (WIPO) databases. This will promote our Egyptian inventions worldwide because they will appear to everyone searching those international databases. Increasing the international exposure of our inventions improves their competitiveness and enhances their potential to be commercialized.

6. Future Activities

This report will be updated on a regular basis. It will be available online and to our mailing list. Updates will include adding more innovation actors who are not included in this report, responding to feedbacks and comments, and adjusting the report accordingly.

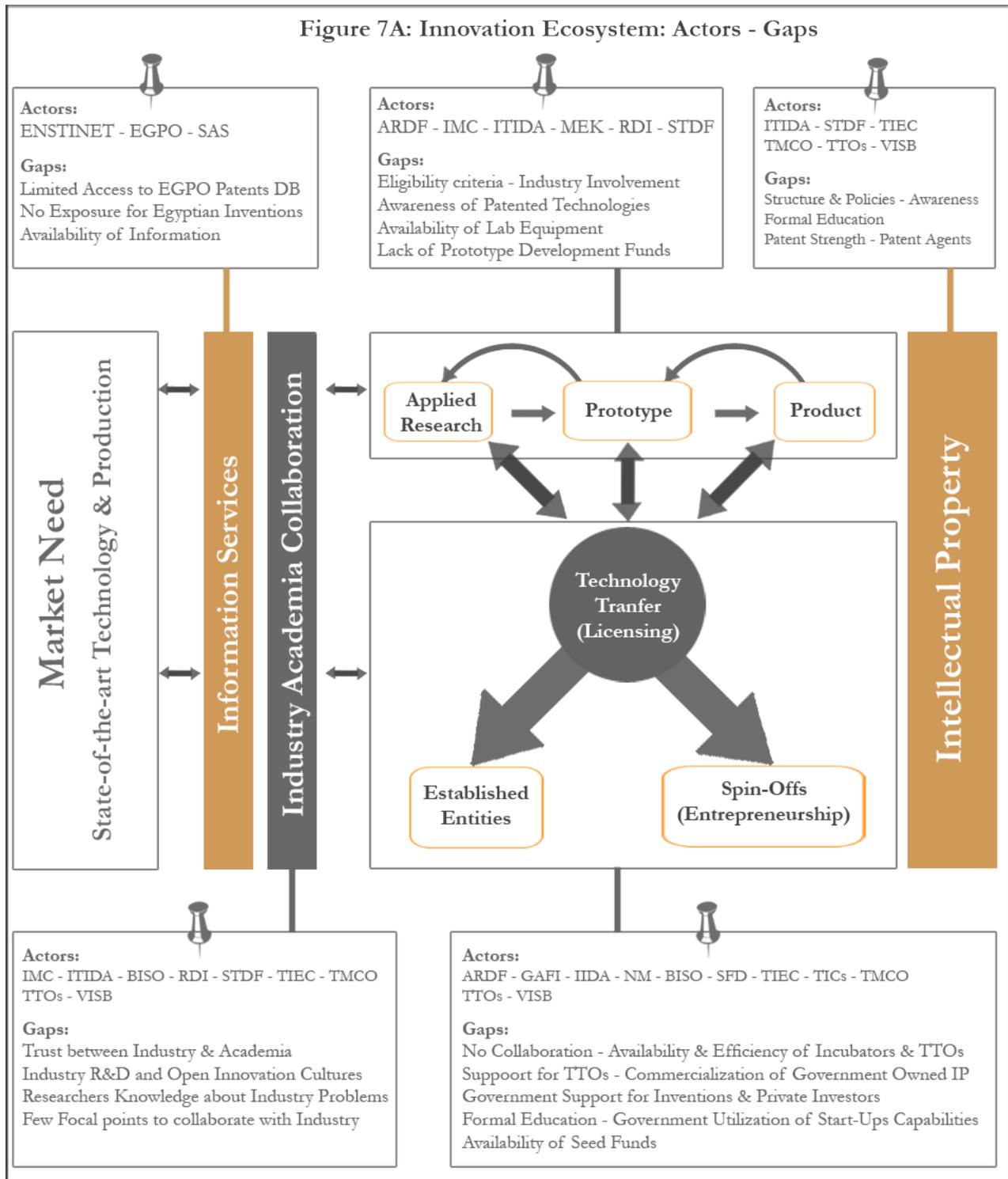
A more detailed assessment need to be done to evaluate the performance and quality of existing Technology Transfer Offices (TTOs) and incubators.

This report does not cover details about the innovation culture and activities inside companies and industrial entities. This is something we are looking forward to integrate in this report in collaboration with the industrial and commercial chambers.

We would like to welcome all individuals, entities, and innovation stakeholders in Egypt to get in touch with us, provide feedback, and share thoughts and any valuable information about the innovation ecosystem in Egypt.

7. Conclusion

The following diagram summarizes all the innovation phases, activities, and toolboxes explained in this report as well as the gaps we found in each of them.



8. Appendix 1: List of Interviewees

Entity Name	Interviewee
Academy of Scientific Research and Technology (ASRT) - Invention & Innovation Development Agency (IIDA)	Eng. Janet Ibrahim Yousef, President
Agricultural Technology Management and Commercialization Office (TMCO)	Dr. Eid Mohamed Abdel Mageed, Director
Egyptian National Scientific and Technical Information Network (ENSTINET)	Ms. Ola Laurence, Director Dr. Amr Radwan, Projects Manager
General Authority for Investment (GAFI)	Dr. Hadia Hamdy Abdel Aziz, Consultant - Entrepreneurship & Innovation
Industrial Modernization Center (IMC)	Dr. Hany Amin Elghazaly, Executive Director Dr. Amr Taha, Research & Development Programme Manager
Information Technology Industry Development Agency (ITIDA)	Eng. Mohamed Salama, Executive Manager - ITAC Program
Misr El Kheir (MEK)	Dr. Abeer Shakweer, Innovation Consultant
Nahdet El Mahrousa (NEM)	Mr. Ahmed Hussein, Manager of newly Incubated Social Enterprises
National Research Center - Businessmen & Investors Service Office (BISO)	Dr. Farouk El-Baz, Office Manager
Research, Development & Innovation Programme (RDI)	Dr. Ahmed Saleh, Head of Innovation Fund
Social Fund for Development (SFD)	Mr. Gamal Mosalam, Director of Non-Financial Services Sector
Technology & Innovation Centers (TIC)	Ms. Hanan El Hadary, Director Mr. Mohamed Abbas, Projects Operation Supervisor

Entity Name	Interviewee
Technology Innovation and Entrepreneurship Center (TIEC)	Eng. Sally Metwally, Innovation Support Manager Mr. Ahmed Laiali, Entrepreneurship Support Manager
Technology Transfer Office (TTO) at the American University in Cairo (AUC)	Eng. Ahmed El Laithy, Director
Technology Transfer Office (TTO) at Helwan University	Dr. Ayman M. Mahrous, Director
Virtual Incubator for Science based Business (VISB)	Dr. Wagdy Sawahel, General coordinator of IDB Science Development Network