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## Universities and Innovation in a Factor-Driven Economy: The Egyptian Case

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# Universities and innovation in a factor-driven economy

## The Egyptian case

**Hala El Hadidi and David A. Kirby**

**Abstract:** *The paper explores the role of universities in innovation in the modern knowledge economy, discusses the Triple Helix model and the entrepreneurial university, and then examines the application of these concepts in Egypt. The study, which specifically addresses the roles of universities in the innovation process in Egypt, is based on a series of in-depth interviews with eighteen Egyptian experts drawn from government, non-governmental organizations (NGOs) and academia. The paper shows that universities do play a role in the innovation process in Egypt, but that more needs to be done. It points to the challenges the universities encounter and calls for an integrated innovation policy that includes higher education. The paper will be of particular relevance to academics and policy makers in Egypt and other factor-driven economies.*

**Keywords:** *Egyptian universities; entrepreneurial university; factor-driven economy; innovation process; innovation policy; Triple Helix*

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Innovation is important in the contemporary knowledge economy and universities are increasingly seen as significant contributors to both the innovation process and economic development. As a consequence, new university formats have emerged including the Triple Helix university and the entrepreneurial university, a subset of the former. Both are characterized by knowledge creation, knowledge dissemination, knowledge transfer and knowledge commercialization (Kirby *et al.*, 2011). To achieve their aim, they have to work in partnership with industry and to build environments that stimulate these activities, including pre-incubators, incubators and science parks, thereby recreating the conditions to be found in places like Silicon Valley. Often this requires government intervention in the form of policy formulation and fiscal

incentives, as well as training and development (Casper, 2007).

This paper examines the role of Egypt's universities in the innovation process, the challenges they face and the support they need to address those challenges.

### Literature review

Universities have evolved from institutions focusing only on teaching and research to a more significant role as drivers of innovation and economic development through the generation of new knowledge. Policy makers and universities have become eager to involve academia in the innovation system (Gunasekara, 2006). As Power and Malmberg recognized,

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‘This notion that universities can contribute to innovation is based on two key ideas: (a) universities increase knowledge production through the provision of graduate employees and scientific research turned into patents; (b) it can lead to university–industry knowledge transfer and commercialization.’ (Power and Malmberg, 2008, p 240)

As a result, universities and academic research have become recognized as key institutional actors in national innovation systems. Indeed, the resultant ‘linear model’ of the innovation process asserts the importance of funding basic research in order to promote innovation, because professional recognition depends crucially on disclosing and publishing results (Slaughter and Leslie, 1997).

Accordingly, there has been a policy shift on the part of governments as they increasingly expect universities to play a major role in promoting innovation in the knowledge economy. Governments are thus exhorting universities to be entrepreneurial and to commercialize their knowledge in order to enhance economic competitiveness. To achieve this and find new ways to remain as main actors in the knowledge economy, universities have begun to perceive industry as an alternative source of funding, helping replace some of the budget frequently lost as a result of public expenditure cuts.

This trend has resulted in a Triple Helix of government–university–industry relations that has enabled universities to play an advanced role in innovation in increasingly knowledge-based societies. This model differs from the traditional approach which considered the firm as having the leading role in innovation, or the triangle model in which the State is privileged, because it is the source of finance.

‘In this new network of relationships among academia, industry and government the objective is to create an innovative environment consisting of university spin-off firms, tri-lateral initiatives for knowledge-based economic development and strategic alliances between firms and government.’ (Leydesdorff and Meyer, 2004, p 200)

Thus, as Leydesdorff and Meyer (2004) have recognized, the Triple Helix model has increased the focus on the role of universities in the innovation process. Instead of acting as independent, separate entities as previously, government, university and industry are adopting more complementary roles and it is acknowledged that ‘one of the key components in replicating Silicon Valley in other regions is the

existence of a strong university system’ (Leydesdorff and Meyer, 2004, p 205).

Especially important is the entrepreneurial university which, according to Power and Malmberg (2008, p 235) is a vital part of the innovation system because it ‘orients the direction, organization, funding, and conducting of research to the surrounding society’s benefits and values’ and ‘addresses research issues and topics that are relevant not only in an academic but also in an commercial context’.

External research funding is critical, not least because there is a general tendency for the share of government funding to decrease. Thus, university–industry collaboration is frequently required to solve two problems. First, universities and academic researchers recognize and welcome industry funding as a means of overcoming financial difficulties (Antle and Crissman, 1988). Second, the increasing cost of corporate R&D makes it difficult for companies to maintain their corporate R&D laboratories, with the result that collaboration with public universities is encouraged.

Partly because of this reduction in their share of public funding, therefore, universities are increasingly required to market their innovations. This has created new opportunities for higher education to engage in entrepreneurial activities. The role of the university has therefore been altered, from that of knowledge producer to that of knowledge capitalizer and, as Etzkowitz (2003, p 115) has recognized, ‘. . . though the provision of education has been perceived as not for profit business under strict government control’, institutions and academic researchers are becoming involved to a greater extent in commercial activities, exploiting the results of their research via technology transfer and spin-off firms (Verberne *et al*, 1996).

Faced with tighter constraints on public funding since the 1970s, increased competition for research funding and continuing cost pressures during the past two decades, many universities have therefore become more aggressive and eager to look for new sources of funding and have sought closer links with industry as a means to expand research support and strengthen their contribution to innovation and economic growth (Hottenrott and Thorwarth, 2011).

Innovation is therefore based more and more on the Triple Helix of university–industry–government interaction and the concept of the entrepreneurial university, which ‘retains the traditional academic roles of social reproduction and extension of certified knowledge but places them in a broader context as part of its new role in promoting innovation’ (Kelli and Lars, 2013, p 230). A Triple Helix begins as university, industry and government enter into a reciprocal

relationship with each other, with each attempting to enhance the performance of the other. Each partner assumes some of the capabilities of the other but retains its primary role and distinct identity. This emergence of the new university role that links private industrial firms, entrepreneurial universities and government organizations has introduced the notion of a Third Mission, an entrepreneurial role to support the process of universities spinning off their research to industrial firms. Academic entrepreneurship is a unique feature of the Triple Helix model, founded on the idea that universities have a role in directing regional economic development through academic entrepreneurial activities that share common characteristics with industry and government.

### **The Egyptian context**

As a 'factor-driven' economy, Egypt has a low level of economic development, competes on the basis of factor endowments (primarily unskilled labour and natural resources) and is characterized by low wages and low productivity. Its economic competitiveness appears to be deteriorating and the 2010 Global Competitiveness Report attributes this deterioration to the decline in its capacity for innovation. This results from a number of factors, including the low performance of higher education, the lack of an educational system that encourages innovation, low private sector contribution to scientific research, low rates of technology transfer and the low quality of the country's scientific research institutions, university spending on R&D, weak university-industry collaboration in R&D and low government spending on R&D (amounting to only 0.23% of GDP).

In terms of innovation, the country's overall rank has gradually deteriorated from 59 out of 114 countries in 2005/2006 to 83 out of 139 countries in 2010/2011 (CAPMAS, 2012). The Global Innovation Index (GII, 2011) ranked Egypt 108th out of 142 countries in terms of progress and innovation, while the World Economic Forum's Global Competitiveness Report 2011-2012 ranks it 113th out of 142 countries on the quality of its scientific research institutions, and 83rd on its capacity for innovation. In terms of education, Egypt is characterized by a weak university sector that is highly centralized and governed by the Ministry of Higher Education and the Egyptian Supreme Council, with the result that institutions have little autonomy or independence. There are 20 public universities (with approximately two million students) and 23 private sector universities (with some 60,000 students). However, the country's ranking in terms of the quality of higher education and training has been deteriorating,

from 80 out of 114 countries in 2005/2006 to 128 out of 139 in 2010/2012 (Reda, 2012). Similarly, spending on higher education has been declining and the problems have been exacerbated by inefficient spending, with 70% of the total directed towards wages and salaries (Reda, 2012; Egyptian National Competitiveness Report, 2008).

Transformations in the purpose and scope of Egyptian higher education have taken place in recent years and, according to Badawi (2010, p 125), 'over the last three decades or so, the Egyptian education system has positively and actively responded to international trends in education'. However, although education is now perceived as a means to foster economic growth, its modernization remains one of the country's top priorities. As Badawi concludes, 'It is crucial that reforms will be undertaken in the education system. . . ' including restructuring, ' . . . to foster creativity and independent thinking' (Badawi, 2010, p 123) in order to increase innovation. The main trend driving this development is the emergence of the knowledge economy, and the recognition that Egyptian universities are not ranked in the top 500 worldwide and are not contributing significantly to research and development, technology transfer or entrepreneurship. According to the 2012 Global Entrepreneurship Monitor (GEM) Report for Egypt (Hattab, 2014), Egypt was ranked last in the 69 participating countries in terms of the contribution of education to entrepreneurship development in the country and 68th for research and development and technology transfer.

### **Aims and methodology**

Against this background, the aim of this research is to identify:

- Why Egyptian universities are not contributing to the competitiveness of the country, particularly with regard to generating new innovations and transferring and commercializing new knowledge;
- The challenges they face when attempting to do so, and to transform their role to that of a modern Triple Helix institution; and
- What needs to be done to help them to overcome the challenges and enable them to contribute more fully to the competitiveness and innovativeness of the national economy.

It is our belief that the findings will not only benefit Egypt but also should contribute to the body of understanding and thus be of use to other factor-driven economies facing similar problems in transforming to an innovation-driven economy.

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To meet the project's aims, the study adopts a three-phase strategy, whereby each phase contributes to greater understanding of the aims of the research (Kirby, 2007). This paper reports the results of phase one of the project, which contains a series of in-depth expert interviews executed over two months in the winter of 2013–2014. It is a qualitative analysis of the views of a panel of 18 experts drawn purposively from senior university administration and relevant departments in government and non-governmental organizations. Given the confidential nature of the interviews, it is not possible to provide details of the interviewees but details of their professional roles are provided in Appendix 1. Each conversation, which lasted between 1.5 and 2 hours, took the form of an in-depth semi-structured interview to scope the subject and identify the key issues. The interview schedule covered three main topics: the general role of universities in the innovation process; the specific role of Egypt's universities; and the support available in Egypt to encourage university participation in the innovation process.

An example of the interview schedule is provided at Appendix 2. Its purpose was to structure discussion, and follow-up questions were carried out to elicit further detail, explanation and understanding. Prior to use, a panel of 10 additional, independent experts evaluated the content of the interview questions and agreed that the content was consistent with the body of understanding identified in the review of the literature and the research aims. A test procedure was used to estimate the reliability of the interview (with a 7–10 day gap) and the results indicated reliability of 0.7 to 0.95. Content analysis was used to analyse the collected data and test the validity of the interviews.

## Findings

A summary of the main findings is presented in tabular form in Appendix 3: the key issues identified are discussed below.

### *The role of universities in the innovation process*

The majority of the interviewees believed that universities have a role to play in stimulating innovation. According to one respondent, 'Universities are the main actor, since they gather skills and proficiencies that are well fitted to push ahead innovation.'

Universities were seen to have three roles to play in stimulating innovation – their research, increasing the number of graduates, and establishing an ecosystem that encourages and fosters innovation. According to the

Head of the Technology Innovation and Commercialization Center,

'This is to be achieved through giving sessions on innovation and inviting role models, assisting students in bringing their innovative ventures to life through equipping them with the necessary know how tools and linking them to funds, and also propagating a culture to try things'.

Thus the interviewees recognized that universities have an indirect role through transferring knowledge to society and equipping students with the skills needed to innovate and create new commercial opportunities. In addition, they acknowledged that universities must teach innovation and entrepreneurship as part of the curriculum. However, the experts also recognized that universities have a direct role to play in stimulating innovation through their research, by establishing university incubators and by bringing ideas to market. Clearly, universities have an important role to play by undertaking innovative research that is transferred to industry through their technology transfer and technology commercialization activities, and in this context several experts expressed the view that universities should concentrate on 'market pull' not 'technology push' – solving the needs of society and the economy. Indeed, several held the view that universities should have people in them who are aware of the funding programmes available both nationally and internationally, because these programmes indicate the priority issues that need to be addressed and for which support is available.

### *The existing role of Egypt's universities*

Although the experts recognized the importance of universities in the process of innovation, they asserted that Egyptian universities make only a minor contribution. This is reflected in the low number of innovators and innovations arising from Egypt compared to other countries. The majority argued that Egypt's universities are not producing creative graduates who can innovate. This was attributed to the curricula which depend on memorization and dated teaching methods, while the number of students is believed to be too large, especially in the state universities where the average is in excess of 100,000 students. As one of the interviewees noted,

'... there is no critical thinking in the education system. Not only is it not encouraged but culturally it is discouraged. No risk taking is allowed. No safe space for trial. Also the curricula and the methods of

teaching and the exposure that universities provide is not very good.'

However, as two of the respondents observed, there are examples of outstanding students starting their own companies, and others who innovate in specific technological disciplines. In addition, 'there is the ability to produce more to increase the pool of students, put a capstone, give the tools, broaden the student knowledge'. Thus, Egypt's universities can and do produce creative graduates who can innovate, but not in all specialties and on a very small scale, not least because this is only a recent development.

The experts also recognized that there are too few university start-ups and spin-out companies based on innovative ideas coming from university research laboratories. What is missing, they claimed, are the mechanisms that allow universities to create links with companies. These mechanisms are difficult to introduce because universities have to avoid two tendencies. The first is the move towards a profit company, the second is the tendency to barricade themselves behind their traditional role, thus not understanding the needs of the economy and producing graduates that are not fit for the labour market.

The experts recognized that the involvement of the universities in knowledge commercialization was limited, though it would appear that some universities are involved in knowledge transfer through joint programmes with international universities and guest lecturers. However, it was believed that the majority of Egypt's universities were not involved in knowledge commercialization and transfer because they do not produce knowledge to an influential extent, that the research in Egypt's universities is not sufficiently 'leading edge'. Also, and importantly, according to one expert,

'The current universities law does not allow commercialization. State university staff are not allowed to become part or full partners in enterprises (spin-offs). Egypt's universities are not involved in knowledge commercialization, as they shouldn't be. It is the role of start-up firms and entrepreneurs. That's why collaboration with industry is important.' (Executive Director of the RDI programme)

Some of the experts believed that Egypt's universities are not involved in knowledge commercialization because there is no expert database. As one observed, 'If we had a good database it would be great and would benefit industry'.

Egypt's universities are working with industry but, according to the majority of the interviewees, to a

limited extent only. There is an apparent lack of trust between university and industry, and universities lack the organizing mechanisms for the proper management of formal relationships with industry. Nevertheless, there is a network of 32 technology transfer offices (TTOs) in Egyptian universities. The main role of the TTOs is to work on knowledge and innovation commercialization and to link the innovation with the existing needs of Egyptian industry. According to one of the interviewees,

'Traditionally, university and industry are on a different wave length. However, the solution for this has been through research and development (R&D) departments in the universities which focus on innovation and development and have a good interface with industry. Unfortunately, in Egypt most, if not all, companies do not have R&D activities. R&D activities and funding are needed to support university research and ideas.'

Teaching and research in universities need to be geared more towards industries' needs in terms of problems faced and new developments. Currently, the universities are not working effectively with industry.

Others argue that the country's universities do work with industry, doing considerable consultancy, and that industry benefits from intellectual property (IP) protection. As one respondent put it,

'There is a mutual link between industry and university. The university gives consultancy to industry to solve a problem. And innovation comes from the university lab and the university approaches industry through licences. The university is working with industry but on a small and pathetic scale because of the system that offers non-competitive prices for university services for industry and the miserable customer care skills of university staff members. Industry does not value the impact of scientific research from the universities.'

However, Egypt's universities are encouraged to work with industry because, according to the laws governing scientific research, taxes are decreased for scientific research and the training of personnel. However, as one academic expert put it,

'Sometimes there are research centres inside the universities dealing with industry but the link is weak. A clear example is the projects funded through the EU-Egypt Innovation Fund (EEIF) of the RDI programme where 51 projects were funded in the first phase of the programme and the majority of them were to link industry with academia.'

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*The support available in Egypt*

The interviewees recognized that the Egyptian government has a policy directed towards increasing the capacity for innovation and university–industry research, but believed that more support was needed.

There are mechanisms that have been in place for several years which support university–industry collaboration, such as the Industry Modernization Centre, the Science and Technology Development Fund, Research Development and Innovation, and the EU–Egypt Innovation Fund. The Egyptian Academy of Scientific Research and Technology offers grants to fund the start-up of projects in all Egyptian universities. In addition, Egyptian government policy directs other grants to support university–industry research (for example, Science, Technology and Development Funds (STDF)).

Despite these initiatives, the experts believed that there is more room for collaboration, clarity, transparency and policy making. The Ministry of Industry is currently (late-2014) developing a national innovation strategy, while the Ministry of Research and Development has developed Science and Technology Indicators for measuring the country’s performance in this field (RDI). However, clearer mechanisms appear to be needed in order to link industry with the research community, and these will require further focus and coordination between the concerned ministries and entities.

The experts believed that more needs to be done if universities are to fulfil their potential in the innovation process. For example, a larger fund was proposed, to be directed to applied scientific research and innovatory projects, together with a widely publicized national project with declared priorities for research and innovation, in all fields. At the same time, it was felt that specific topics of interest should be identified; for example, in the field of medicine priority should be given to eradicating hepatitis C and children’s malnutrition-related diseases. Such projects should have specific earmarked funds, a known duration and, ultimately, reports of progress and end of project reports:

‘Advertising such projects will increase public awareness of the critical problems facing Egyptian society as well as increase understanding of the need for efficient research–industry cooperation in improving life standards.’ (Associate Provost for Research)

The majority view, however, was that the Egyptian government did not have a coherent policy aimed at increasing the capacity for innovation and

university–industry research. For example, university staff were believed to be undertaking research for promotion purposes only. However, if the promotion laws recognized applied research and patent applications, the situation would improve. Again, why should an enterprise seek research if it is costly and not perceived to be of relevance/value? From the perspective of business, there must be incentives in the form of tax breaks, new legislation, new laws to enhance cooperation between university and industry.

In summary, the experts confirmed that Egypt lags behind other countries in terms of its capacity to innovate through university–industry research and that, although there are numerous initiatives, there is a need for more coherent mechanisms and formal management. The situation is worse than it was in 2009 due, the experts believed, to the lack of political stability, which does not encourage either investment or innovation. As one interviewee put it:

‘There is no know-how, no equipment no infrastructure, no university–industry collaboration. Egypt has weak policies to increase the capacity to innovate from the perspective of the university and research institutes.’

Much can be done to improve this situation. First, it was suggested, the funding for research and innovation projects needs to be increased. Second, partial or complete tax exemptions need to be introduced for innovative projects in order to motivate industry to activate its R&D departments or/and links with universities. Third, the bureaucratic rules that discourage the registration of products’ intellectual property rights (IPR) need to be reduced. Fourth, innovators must be supported; and, fifth, universities must be encouraged to solve problems relevant to the needs of the market through their research and teaching.

## Conclusions

The aim of the research discussed in this paper was to identify the role of universities in Egypt, a factor-driven economy, with regard to the process of innovation, the challenges they face and the support needed to help them contribute more fully. The findings of interviews with 18 Egyptian experts indicate that there is recognition of the importance of universities in the innovation process and the need for industry–university–government linkages (a Triple Helix). It demonstrates that Egyptian universities do already contribute, but that they generally lag behind those of other competitor countries. Although support exists, there are numerous factors that contribute to this

situation, including the nature, quality and amount of research being conducted in Egyptian universities, the mistrust between industry and academia and the lack of resources, both human and physical.

Such findings have policy implications for Egypt and, in all probability, other factor-driven economies. Although government support is being provided in an attempt to stimulate entrepreneurship and innovation, there is no coherent strategy that co-ordinates the activity and includes higher education (Kirby and Ibrahim, 2013). Clearly, it is important not to over-estimate the role of government and its expectations of what is achievable (Henry, 2013) but government intervention is important (Kirby, 2006) and might be expected from the Triple Helix model. The need is for a research and innovation strategy in which all stakeholders (universities, industry and government) have both a clear role and a mandate to achieve a common goal – to increase the country's innovativeness and, thereby, its competitiveness. Long-term, however, universities themselves will need to be freed from both external and internal bureaucracy, so that they can be more innovative and flexible than at present. At the same time, their funding base should be diversified and they should be encouraged to interact with their external environments through both the transfer and commercialization of knowledge. Importantly, they need to move away from close government regulation and sector standardization and search for their own organizational identities by risking being different and taking 'chances' in the market. Indeed, they will need to believe 'that the risks of experimental change...should be chosen over the risks of simply maintaining traditional forms and practices' (Clark, 1998, p xiv).

While the findings of this largely exploratory pilot study do appear to corroborate the existing body of understanding drawn mainly from more advanced economies, and have implications not just for Egypt but for other factor-driven economies, clearly the study is not without its limitations. It is based on a case study of one factor-driven economy that has gone through particularly difficult political times in recent years. In addition, it is based on a set of in-depth qualitative interviews with a small number of Egyptian experts. The findings may thus be regarded as indicative only of the situation in Egypt and, possibly, other factor-driven economies in the process of transformation. Thus, while the research provides valuable insights into the role of universities in stimulating innovation in such environments, further research is needed. This project will go on, therefore, to triangulate the findings from stage 1 with a quantitative questionnaire survey of academics in a sample of Egypt's private and public sector universities, while further similar studies in other

factor-driven economies would seem both appropriate and necessary.

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## Appendix 1

### Occupations/positions of the interviewees

University interviewees	Expert interviewees
Dean of Engineering in a private university	Science and technology and innovation management, EU
Former Executive Director of the RDI Programme and President of a private university	Minister of Scientific Research
Director of state University Innovation Support Office	Chairman of Innovation Council, Ministry of Industry and Foreign Trade
Vice President of a private university	Executive Director of the RDI Programme
RDI focal point at a state university	Managing director of a private company
Direktor of a technology transfer office at an international university	Innovation Officer, EU delegation to Egypt
Institutional Development Consultant at a private university	Head of innovation support department, STDF
Associate Provost for Research at an international university	Director of the Technology innovation and commercialization centre at a private university
Professor of Business at a university	Representative of Nahdat El Mahroussa Association, NGO

## Appendix 2

### The British University in Egypt

#### Research Project

'The role of universities in stimulating innovation and economic development in a factor-driven economy: a study of higher education in Egypt.'

#### Interview schedule

We are conducting research into this important topic by asking a series of experts their opinions. The questions are intended to provide a framework for our discussion. We will treat your views in strictest confidence though we may wish to quote you. If, so, we will not do so without first consulting you and receiving your permission. Hence, we would like to record the interview. If you would prefer, we can quote you anonymously; it is not a problem. I hope this is acceptable to you.

#### Section A: general

(1) Do universities have a role to play in stimulating innovation?

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- (2) Do universities have a role to play in stimulating economic development?
- (3) Do Egypt's universities contribute to innovation in the country?
- (4) Do Egypt's universities contribute to the economic development of the country?
- (5) Could Egypt's universities contribute more to innovation in the country?
- (6) Should Egypt's universities contribute more to the country's economic development?

*Section B: specific*

- (7) Are Egypt's universities producing creative graduates who can innovate?
- (8) Are Egypt's universities involved in *knowledge transfer* ?
- (9) Are Egypt's universities involved in *knowledge commercialization* ?
- (10) Are Egypt's universities working with industry?

*Section C: policy*

- (11) The Egyptian Competitiveness report for 2009 makes the point that 'Egypt lags far behind other countries in terms of a capacity for innovation and university-industry research'. Do you agree with this statement?
- (12) Does the Egyptian Government have a policy towards increasing the capacity for innovation and university-industry research?
- (13) Do you have any further comments you would like to make on this topic with respect to policy?

Thank you for your assistance. We will process the results of all of the interviews and let you have sight of our final report, which we hope you will find helpful. Again, we will not quote you without seeking your prior approval.

## Appendix 3

### Summary of main findings

*The role of universities in the innovation process*

- Most of the interviewees believe that the universities have a potential to play a main role in stimulating innovations from the accumulation of skills and proficiencies.
- The interviewees see that universities can have a role to play in stimulating innovation, through establishing university incubators and bringing ideas to market, and an indirect role through transferring knowledge to society, and preparing students and equipping them with the skills needed to innovate and create new commercial opportunities.
- Universities should concentrate on 'market pull' not 'technology push'.

*The existing role of Egypt's universities*

- Egypt's universities are not producing creative graduates who can innovate as the curricula depend on memorization and dated teaching methods; in addition there large numbers of students.
- Some students do start their own companies, and others innovate in specific technological disciplines.
- There are few university start-ups and spin-out companies, and the involvement of the universities in knowledge commercialization is limited, though it would appear that some are involved in knowledge transfer through joint programmes with international universities and guest lecturers.
- What are missing are the mechanisms that allow universities to create links with companies
- The current universities law does not allow commercialization. State university staff are not allowed to become part or full partners in enterprises (spin-offs). However, some believe that Egypt's universities are not involved in knowledge commercialization because there is no expert database.

*The existing role of Egypt's universities*

- The Egyptian government has a policy directed towards increasing the capacity for innovation and university-industry research; however, more support is needed.
- There are mechanisms that support university-industry collaboration.

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- There is more room for collaboration, clarity, transparency and setting policies.
- Clearer mechanisms are needed to link industry with the research community; this will require further focus and coordination between the concerned ministries and entities.
- More needs to be done if universities are to fulfil their potential in the innovation process.
- Specific topics of interest should be identified; for example, in the field of Medicine priority should be given to eradicating hepatitis C and children's malnutrition-related diseases.
- The Egyptian government does not have a coherent policy for increasing the capacity for innovation and university–industry research. For example, university staff were believed to be undertaking research only for promotion purposes. However, if the promotion laws recognized applied research and patent applications, the situation would improve.
- From the perspective of business, there must be incentives in the form of tax breaks, new legislation, new laws to enhance cooperation between university and industry.
- It was confirmed that Egypt lags behind other countries in terms of its capacity to innovate through university–industry research and that, although there are numerous initiatives, there is a need for a more coherent mechanism and formal management.
- There is no know-how, no equipment no infrastructure, no university–industry collaboration. Egypt has weak policies to increase the capacity to innovate.
- The funding for research and innovation projects needs to be increased.
- Partial or complete tax exemptions need to be introduced for innovative projects in order to motivate industry to activate their R&D departments or/and link with universities.
- The bureaucratic rules that discourage the registration of intellectual property rights (IPR) need to be reduced.
- Innovators must be supported.
- Universities must be encouraged to solve problems relevant to the needs of the market through their research and teaching.