

# New educational services development

## Framework for technology entrepreneurship education at universities in Egypt

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### Abstract

**Purpose** – The overall objective of the current study is to explore how universities can better developing new educational services. The purpose of this paper is to develop framework for technology entrepreneurship education (TEPE) within universities.

**Design/methodology/approach** – Qualitative and quantitative research approaches were employed. This study passes through four phase: reviewing of good practices; a survey of academics ( $n = 150$  respondents); semi-structured interviews with leaders of Ministry of Higher Education, the Social Fund for Development, and the ILO Sub-regional Office ( $n = 30$  respondents); and two workshop with expert group and stakeholders ( $n = 65$  respondents).

**Findings** – This study developed framework for TEPE within universities from three aspects (center for innovation and entrepreneurship (CIE), technology entrepreneurship professors/educators, and technology entrepreneurship programs/courses).

**Research limitations/implications** – TEPE will have an impact at the individual and enterprise. It prepares students to be responsible, enterprising individuals who become entrepreneurs, enhances life skills and life learning experiences and contributes to economic development and sustainable communities; at the enterprise level, this education is expected to create and operate a new venture, help innovation, enhance the level of competitiveness, and develop a more practical entrepreneurial environment.

**Practical implications** – It is important for practitioners and policy makers to gain insights on how academic entrepreneurship support works elsewhere as inspiration for the further development of their approaches.

**Social implications** – TEPE can assist in obtaining higher economic growth and sustainable development, in keeping up with the fast pace of an open-market capitalist society and in promoting self-employment and training, which all lead to the reduction of unemployment.

**Originality/value** – This study offers three principal contributions: first, development of framework for the TEPE from all perspectives within universities as TEPE differentiates from other entrepreneurship education types; second, development of an uncommon concept of new educational services in the marketing literature that is incoherent and lacks theoretical models that reflect good practice of entrepreneurship education; third, identification best practices of TEPE in universities by reviewing and analyzing policy and continuing to experiment.

**Keywords** Entrepreneurship education, Service marketing, Center for innovation and entrepreneurship, Curricula and courses for entrepreneurship, Educators for entrepreneurship, New educational services development

**Paper type** Research paper

### Introduction

At the beginning of the twenty first century higher education is still facing many challenges. In April 2009, the Global Education Initiative of the World Economic Forum issued a report entitled “Educating the Next Wave of Entrepreneurs,” explaining the need for entrepreneurship and small business education. This report suggests the adoption of twenty first century methods and tools which encourage creativity,



innovation, critical thinking, opportunity recognition and social awareness (Volkman *et al.*, 2009). Organisation for Economic Co-operation and Development (OECD) has provided policy development support to enhance the entrepreneurship and innovation within universities that have become key actors in local innovation systems and important partners for national and local governments (OECD, 2009).

Technology entrepreneurship education (TEPE) played a major role in instilling into society a culture that focusses on employment creation and poverty reduction with the goal of promoting creativity, innovation and self-employment (European Commission, 2008). TEPE may take the form of an academic program, entrepreneurship training and individual or peer coaching (Katz, 2007). These programs are instrumental in the development of key integrated competencies that will ultimately enable the students to create and improve technology-based small businesses, maintain their competitive advantage, develop further and even grow into the large businesses of tomorrow. For these and other reasons, there is a pressing need to identify potential areas for empirical research on entrepreneurial marketing (Abou-Warda, 2015) and appropriate a new service development (NSD) processes that promote innovation and technology-based entrepreneurial action in academic programmes.

Although many studies addressed the definition of entrepreneurship education, TEPE is still a relatively new field of study. The author believes that, unless a generally accepted definition of TEPE is established, these debates lose their focus. Therefore, the author will propose a working definition according to study's interests. A general definition of entrepreneurship education in higher education is "development of entrepreneurial capacities and mindsets" (European Commission, 2008). The number of scholars publishing articles about technology entrepreneurship in top journals remains quite small; the definitions found in the 93 articles reviewed suggest that technology entrepreneurship is about: first, operating small businesses owned by engineers or scientists; second, finding problems or applications for a particular technology; third, launching new ventures, introducing new applications or exploiting opportunities that rely on scientific and technical knowledge; and fourth, working with others to produce technology change (Bailetti, 2012). The proposed working definition hinges on the interdependence between innovation and technological knowledge for entrepreneurial businesses, biases in the existing entrepreneurship literature, links among new educational services development, the theory of sustainable competitive advantage and the theory of the stakeholders. Therefore, the following working definition of TEPE is proposed:

All activities related with developing entrepreneurship educators' skills and curricula; and establishing centers for innovation and entrepreneurship which aim at building entrepreneurial mindsets, attitudes and skills that are intricately related to innovation and advances in scientific and technological knowledge for the purpose of creating, delivering, and capturing value for stakeholders.

NSD process is a similar development process to product. There are, however, significant differences in the activities and the research techniques (Johne and Storey, 1998). Tatikonda and Zeithaml (2002) view NSD as the organizational process that links marketing and operational capabilities to conceiving, designing and implementing a service valued by a customer (Tatikonda and Zeithaml, 2002, p. 201). However, through a comprehensive review of a service development literature, the author agrees with researchers which found a lack of effort to develop NSD models, few systematic empirical studies and relatively little literature address the detailed steps in a NSD process (Edvardsson *et al.*, 1995; Martin and Horne, 1993; Tax and Stuart, 1997;

Fitzsimmons and Fitzsimmons, 2000); more than a new educational service development process has been relatively neglected in the literature on marketing and entrepreneurship education. Therefore, Shekar (2007) developed an innovative model of service development based on an in-depth analysis of good practices and “success” case stories and participants’ experiences. On this basis, the same approach is followed here with the aim of the current study.

### **An overview of entrepreneurship education in Egypt**

Egypt took steps toward establishing entrepreneurship education. According to the 2008 report of the Global Entrepreneurship Monitor, the Egyptian population has a relatively positive attitude toward entrepreneurship: it ranked 12th among the 43 countries covered by the report in the percentage of the adult population that considers entrepreneurship as a desirable career choice (73 percent), and 11th for the establishment of small and medium enterprises (SMEs) and starting of new businesses. This reflects a favorable mindset toward entrepreneurship, which may lead to ultimate engagement in entrepreneurial activity (Hattab, 2008). However, the same report confirmed that Egypt still has the second lowest percentage of population that has received any exposure to entrepreneurship and innovation in the education and training system (Hattab, 2008). On December 2009, the project Entrepreneurship Education in the Arab States (Egypt, Jordan, Tunisia and Oman) was implemented jointly by the UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training-Bonn and the UNESCO Regional Bureau (Masri *et al.*, 2010). UNESCO program supports the creation of a number of science and technology parks to link researches at Egyptian universities with the industrial sector so as to SMEs (UNESCO, 2007, report on Science and Technology Parks in Egypt, p. 7). Now, Egypt is cooperating with the OECD and the European Union in promoting SME’s development and related entrepreneurship education (European Commission, OECD and ETF, 2008). Thus, an important OECD report (2008) rings a bell for appropriate action on entrepreneurship education not only for Egypt but also for other Mediterranean countries (OECD and EU, 2008, p. 17). Despite a plurality of voices has been calling for the promotion of entrepreneurship education, until now only two universities in Egypt took steps toward establishing entrepreneurship education: the American University in Cairo (AUC) and Cairo University (CU). Moreover, it is no university in Egypt has taken steps toward establishing TEPE.

#### *The AUC*

AUC established the Entrepreneurship and Innovation Program in 2010. As part of this framework, a Venture Lab, that is a startup accelerator and incubator, was launched in 2013. The mission of the Venture Lab is to translate technologies and innovations, enable innovative start-ups to capitalize on its knowledge, wide network, outstanding facilities and alumni in various countries, and foster an environment of innovation, education and business. The Venture Lab case-study demonstrates that stimulation activities between the university and industry need not be financially prohibitive and can, indeed, be carried out with relatively limited means in terms of organizational and financial resources. The main activities of the Venture Lab can be divided into: first, the promotion of new business establishment; second, the updating of business expertise of already established firms; third, the promotion of social networking activities and exchange of information; and fourth, development of a strong relationship between

university and industry including a commitment in catalyzing innovative activities, pooling resources and sharing different technical and business experiences. The Venture Lab conducts activities intended to stimulate the growth and development of technology-based firms. These activities are planned and conducted in close co-operation with the Technology Innovation and Entrepreneurship Centre (TIEC) at the Ministry of Communications and Information Technology (MCIT), the Ministry of Higher Education in Egypt, the Social Funds for Development (SFD) and a local business association whose membership is composed of small technology-based firms. The main purpose of the Venture Lab is to create a fruitful integration between stimulation activities for technology-based firms and the teaching and research of technology-based entrepreneurship.

Professors/educator training programs in AUC aim at the following: first increasing educators' awareness and understanding of the aims and working methods of technology, innovation, small business entrepreneurship and entrepreneurship education; second, equipping educators with the knowledge to implement the pedagogy of technology, innovation, entrepreneurship education and the development of attitudes and skills related with entrepreneurship as motivation, creativity, self-drive; third, developing the practice of the issues related to the place of technology, innovation and entrepreneurship education in mainstream educational philosophy.

The Technological Entrepreneurship Programme in AUC adopted integration between training in the innovation process and in entrepreneurship, promoting the creation of new technological small businesses. The program includes integrated courses; it is the ideal launch pad to international careers in innovation management, entrepreneurship and technology consulting and transit students into future technology business leaders. Students go through a rigorous hands-on training that covers the entire venture creation process. Students learn to use emerging science and technology as a basis for the creation of commercial value and new ventures. The program offers students a strong basis on how to start and grow a technology-based business in a dynamic, competitive marketplace. Its main courses aim to create a new product/service; develop the ability to coordinate multiple, interdisciplinary tasks in order to achieve a common objective; apply different methods for generating innovative products and services; understand technology commercialization; assess and interpret innovation processes; formulate managerial strategies to shape innovative performance.

#### *CU*

CU established Centre for Entrepreneurship and Small and Medium Enterprises (CESMEs) Management . The Centre has a clear agenda for promoting entrepreneurship education on the undergraduate, postgraduate and professional levels. The main activities of CESME's are: first, workshops, which have been attracting more people than planned; second, a survey on entrepreneurship education on offer conducted in 11 Egyptian universities whereby the major players in entrepreneurship education among Egyptian universities have been identified and documented; third, a symposium organized to foster the collaboration of Egyptian universities in entrepreneurship attended by 123 individuals from six universities and the Egyptian supreme council of universities – this event was also used as a platform to spread information about the HEI ICI project and its objectives among other HEIs in Egypt; fourth, seven in-class entrepreneurship awareness sessions for students of Faculty of Commerce Cairo University (FCCU) attended by 1,298 participants, six sessions of elective bachelor level entrepreneurship course attended by 470 students of FCCU, and a session of compulsory

masters level entrepreneurship course attended by 46 students of FCCU; fifth, a pilot doctoral level entrepreneurship course attended by eight students of FCCU.

The HEI ICI project between the FCCU and Aalto University School of Economics (AUSE) have provided training programs for educators in technology, innovation and entrepreneurship education in FCCU with more than 260 staff members involved in 28 interventions. The project comprised three interactive pillars meeting the needs of collaboration between Egyptian universities, students and the staff of the FCCU, and current and aspiring entrepreneurs. Ten staff of FCCU visited AUSE and were introduced to Aalto University's entrepreneurial premises as well as participated in various seminars and workshops. In May 2012 a seminar session on "Entrepreneurial University" for teachers took place in Cairo during the visit of the AUSE and was attended by 60. Moreover, various workshops on entrepreneurship education, teaching approaches and methods, as well as events aimed at identifying possible future researchers at FCCU in Cairo were well received and recorded good participation.

The Entrepreneurship Programme in CU carries tremendous value for a wide range of small businesses and business functions, and is a valuable complement to marketing, finance, IT and supply chain expertise. They are essential to cross-functional positions such as new business development, market analysis, product development and open innovation/technology scouting/acquisition. The result of the HEI ICI project between the FCCU and AUSE has provided training to students in entrepreneurship at FCCU about 1,900 students were involved in 28 activities. The main courses aim to understand and analyze the entrepreneurial process and the entrepreneurs' way of thinking; accurately identify marketing problems and create strategic solutions; elaborate and interpret the different financial statements; recognize an opportunity; entrepreneurial strategy development; developing a new small business.

On more general notes, the author found that:

- (1) The co-operation between the Venture Lab and TIEC in AUC reflects the recognition of the need to stimulate both the creation and growth of knowledge-intensive types of firms as an essential factor to foster an effective and mutually beneficial connection between universities and industry. However, the CESMEs Management in CU reflects the recognition of the need to create entrepreneurship and SMEs.
- (2) The educators in in AUC have a clear understanding of TEPE policies; however the educators in CU have some understanding of innovation and entrepreneurship education policies in broader contexts. This may in part be accounted for as training programs of educators do not seem – based on an overall observation – to equip educators with the specific skills and knowledge to implement technology, innovation and entrepreneurship education in mainstream educational philosophy.
- (3) AUC has a clear understanding of key integrated competencies on innovation and entrepreneurship that will ultimately enable the students to create and develop new technology-based businesses. However, CU has some understanding of key integrated competencies on entrepreneurship that will ultimately enable the students to create a new small business.

Therefore, this study not only has a particular interest in process of a new educational services development, but also focusses specifically on the development of a framework for TEPE within Egyptian universities.

### Literature review and research gap

Many studies focussing on entrepreneurship education in university have been carried out, concentrating on various aspects of the issue: the role of marketing strategy (Morris *et al.*, 2002; Liu, 2001; Riviezzo *et al.*, 2012; Jones and Hegarty, 2011); centers for innovation and entrepreneurship (OECD, 2009); building a strong pipeline of entrepreneurship educators (Curth, 2011; Wilson, 2008); and the relevance of entrepreneurship courses and programs (OECD, 2009; World Economic Forum, 2009; Kaijage and Wheeler, 2013). While a wide range of studies have sought to concentrate on theoretical evidence, four research gaps are salient. First, marketing literature is incoherent and lacks theoretical models that reflect new educational services development process (Jones and Hegarty, 2011). Second, there are no fundamental studies that address developing of entrepreneurship education from all these previous perspectives together at universities generally, and especially in Egyptian universities; as entrepreneurship education must be developed taking into account the cultural impacts and possibilities of each university (Quan-Hoang and Tran, 2009). Third, no study has identified best practices of entrepreneurship education in universities by reviewing and analyzing their policies and continuing to experiment; as universities should continue to experiment in order to truly identify best practices and select a good practice model (Botham and Mason, 2007). Fourth, TEPE differentiates from other entrepreneurship education types (Bailetti, 2012). Therefore, the author is interested in filling these gaps so as to explore how universities can better developing their new educational services and develop a framework for TEPE within universities. The major research question is the following:

*RQ1.* Can we fill these gaps and develop a framework for TEPE at universities?

This framework can not only empower the TEPE within universities, but also elsewhere, to self-assess and re-orient their CIE, their pool of educators for entrepreneurship, and their entrepreneurship curricula and courses. It is also important for practitioners and policy makers to gain insights on how academic entrepreneurship support works elsewhere as inspiration for the further development of their approaches.

The overall objective of the current study is to develop a framework for TEPE within Egyptian universities. The author believes that this study is considered a national input to the Ministry of Egyptian Higher Education's initiative to support entrepreneurship education in formal education, which started in 2008.

### Methodology

Qualitative and quantitative research approaches were employed.

This study passes as shown in Figure 1 through four phases: reviewing of available information about the good practices of entrepreneurship education at universities; a comparative (online) survey of academics in the Egypt created a template which documented desired TEPE perspectives; focus groups and semi-structured interviews to define the success factors that enhance TEPE; two workshop to disseminate the evidence and assessment of information, initiatives and practices that have so far been undertaken at the national and international levels, of discussions with researchers, senior officials, experts and stakeholders.

A comparative (online) survey of a stratified random sample of 159 academics (heads of department, associate deans, senior lecturers, program leaders) from universities in Egypt (based on faculty staff lists); 79 from universities who establishing EPE and 80 from universities who donom establish EPE by e-mail

university, asking them to complete an (online) questionnaire. The achieved useable sample for further analysis is 150 questionnaires: 75 from group who establishing EPE and 75 from universities who do not establish it; representing a response rate of 93.5 percent. The researcher acknowledges that this sample is not large, but is nonetheless sufficient for conducting a study. Pallant (2005) argues the 30 respondents in each group (in this case took/do not take steps toward establishing entrepreneurship education) is sufficient and the pilot study (Hemsley-Brown and Oplatka, 2007) indicated that based on sample size calculations 50 respondents would be the minimum sample size needed for further research. This survey has been conducted during the academic year of 2014. Semi-structured interviews with a purposive judgmental sample of 30 leaders of Ministry of Higher Education, Social Fund for Development (SFD), and ILO Sub-regional Office in Egypt during the academic year of 2014. Finally, the meeting with a purposive judgmental sample of 65 expert and stakeholders took place at two workshops in Egypt (July 2014/May 2015).

## Results

### *Phase 1: good practice of TEPE*

Based on a review of good practice at universities and the research published about its activities, entrepreneurship education can be better empowered in the context of universities through four main activities: first, establishing the CIE; second, building a strong pipeline of entrepreneurship educators; third, integrating the technology entrepreneurship courses/program in university education; and fourth, developing appropriate evaluation methods for this particular kind of education.

*Good practice of the centre for innovation and entrepreneurship (CIE).* The main purpose of the CIE is to create a fruitful integration between stimulation activities for technology-based businesses and the teaching and research of technology-based entrepreneurship. The MCIT in Egypt has established the TIEC to develop ICT companies that will act as the main vehicle enabling Egypt to become the leading regional player in ICT-based innovation and entrepreneurship (MCIT, 2010). One of them defined the responsibilities of the SFD as establishing training centers to qualify enterprise owners or to prepare those who desire to set up enterprises by providing them with the necessary basic skills (Egyptian Prime Minister Decree, 2004).

The AUC launched the AUC Venture Lab, a startup accelerator and incubator created in 2013 by the School of Business. The mission of the AUC's Venture Lab is to translate technologies and innovations, enable innovative start-ups to capitalize on AUC's knowledge, wide network, outstanding facilities and alumni in various countries, and foster an environment of innovation, education and business.

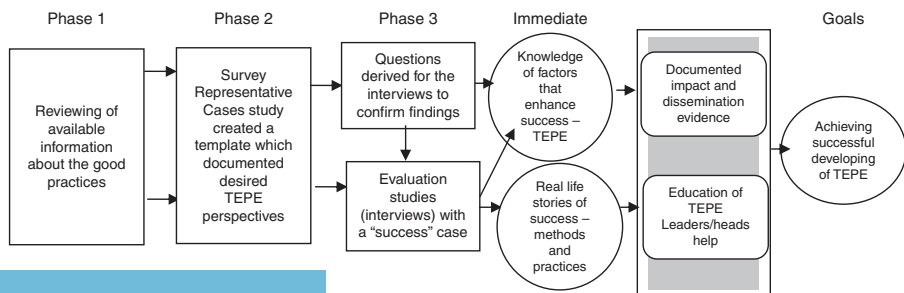


Figure 1.  
Research design

CU established a project titled “Entrepreneurship Capacity Building between Faculty of Commerce (FCCU), EGYPT and AUSE, FINLAND” to advance entrepreneurship education capacity of FCCU, adopt a broad understanding of entrepreneurship, enhance entrepreneurship education offered in Egyptian universities, meet the needs of Egyptian universities, students and the staff of the FCCU and of current and aspiring entrepreneurs (HEI ICI Report, 2011-2012). Moreover, CU established the CESME Management as a part of the newly-established International Business School of Cairo University. The center has a clear agenda for promoting entrepreneurship education on the undergraduate, postgraduate and professional levels. Some governmental universities in Egypt (e.g. Minia University, Tanta University and Alexandria University) took steps toward establishing a Centre for Entrepreneurship and embed entrepreneurship not only into their curriculum, but also into the institutional paradigm. However, the formal Centre for Entrepreneurship does not contain official content related to entrepreneurship education.

OECD (2009) presented the strategies, structures and practices to support technology entrepreneurship set in place by 20 CIEs at universities and university partner organizations in the six eastern German Länder (Berlin, Brandenburg, Mecklenburg- Vorpommern, Sachsen, Sachsen-Anhalt and Thüringen), England, Finland, France, Poland, South Africa and the USA (OECD, 2009).

*Good practice for building a strong pipeline of technology professors/educators.* Educators are a major challenge to present entrepreneurial education. Not all educators are university professors; the fact that educators come in many forms should be recognized, those with experience in the entrepreneurial field should be set alongside professors in a synergy relationship (European Commission, 2008). In the USA, entrepreneurship educators often have experience working with start-ups; entrepreneurs and many of the alumni of the university are both brought into the classroom to speak to students as well as to teach courses (Gibb and Hannon, 2006; Gibb *et al.*, 2009). In the UK, the International Entrepreneurship Educators’ Programme (IEEP) focussed on staff in higher education. The program was financially supported by a number of national and regional agencies and it was developed principally under the umbrella of the main UK organizations, the National Council for Graduate Entrepreneurship ([www.ncge.org.uk](http://www.ncge.org.uk)), Entrepreneurship Educators UK ([www.enterprise.ac.uk](http://www.enterprise.ac.uk)), the UK Higher Education Academy, and the US-based Ewing Marion Kauffman Foundation. IEEP is described more fully in [www.allangibb.com/download](http://www.allangibb.com/download). It has elements of uniqueness in concept, practice and philosophy hence the rationale for citing it in this paper. The program engaged 25-32 participants, and consisted of six three-day modules running over a period of 15 months. Participants were broadly divided into those whose main focus of interest was on developing their own programs, entrepreneurial curriculum and pedagogy and those with a wider interest, and in some cases remit, to take TEPE right across their institution and/or faculty (Gibb, 2011).

European Entrepreneurship is building a strong pipeline of educators by supporting the following actions: provide training for entrepreneurs and other practitioners to become effective educators; review regulations on the participation of entrepreneurs in teaching activities; encourage the development of doctoral programs specialized in entrepreneurship (Wilson, 2008, p. 16). According to Curth (2011), training programs aim to foster the development of skills and attitudes; increase educators’ awareness and understanding of entrepreneurship education; and equip educators with the specific



skills and knowledge to implement the pedagogy of entrepreneurship education. Until now, a good practice for building a strong pipeline of educators in universities can be identified through the main forms of educator training programmes (Curth, 2011, p. 40): compulsory modules (University of Oulu/Kajaani; and University of Oslo); elective modules (Pedagogical College Vienna; University of Strathclyde); extracurricular activities (University of Applied Sciences/Netherlands; Nordland/Bodø University); and horizontal approach (Group T Leuven Educational College/Belgium; Avans University of Applied Sciences/the Netherlands; University of Corvinus/Hungary).

*Good practice of technology entrepreneurship program/courses.* TEPE must be deeply embedded into the curriculum to install a new entrepreneurial spirit and mindset among students. Solomon *et al.* (2002) draw attention to the importance of entrepreneurship education outside the domain of business schools, for example in engineering and science. Recently, many universities have started offering entrepreneurship-related courses such as “Entrepreneurship and Venture Creation,” “Small Business Management,” “Enterprise Development,” etc. as an important part of their curricula (Kaijage and Wheeler, 2013). Entrepreneurial education must include skill-building courses in negotiation, leadership, new product development, creative thinking, exposure to technological innovation (Solomon *et al.*, 2002), action learning and the development of actual ventures, new venture simulations, technology-based simulations, skills-based courses, video role plays, experiential learning and mentoring (Pittaway and Cope, 2007). The basic skills can be classified into five types: technical skills; technological skills; managerial skills; entrepreneurial skills; and personal maturity skills (Bellotti *et al.*, 2012). In Europe, entrepreneurship remains primarily elective at European universities. Entrepreneurship tends to be offered in stand-alone courses rather than being integrated in the content of courses in other departments or disciplines (Wilson, 2008). In Korea, only a few colleges have developed entrepreneurship as a business field of study. Most Korean colleges have introduced entrepreneurship-related courses as part of the requirements for fulfilling general education rather than a specialization area (Lee *et al.*, 2005). In the USA, the number of universities and colleges with entrepreneurship curricula has increased dramatically since the late 1960s (Lee *et al.*, 2005).

On the other side, according to a UNESCO and StratREAL Foundation report, (2010) about Arab countries, in Tunisia there are some entrepreneurial education projects that aim to promote programs/courses and skills of entrepreneurship education: my place and role in the community; The principles of economics; management of business; tourism skills; economics for success; how to be a leader; skills for success; and the establishment of an enterprise. In Oman various approaches were outlined to prepare students for the labor market by courses and skills, including teaching entrepreneurial skills such as decision making, problem-oriented thinking and discipline. In Egypt entrepreneurship education programmes and training centers have been established, but most of them lack basic entrepreneurial skills. Therefore Egypt needs a systematic entrepreneurship education system to help in achieving a decline in unemployment rates (Masri *et al.*, 2010).

Some international institutions developed a list of criteria for good practice in delivering entrepreneurship programs. The OECD, developed a criteria list for good practice in entrepreneurship education that contains the following criteria: first, entrepreneurship education is progressively integrated into curricula and the use of entrepreneurial pedagogies is advocated across faculties; second, a suite of courses

exists, which uses creative teaching methods and is tailored to the needs of undergraduate, graduate and postgraduate students; third, the suite of courses has a differentiated offer that covers the pre-start-up phase, the start-up phase and the growth phase (OECD, 2009). The World Economic Forum (2009) draws a boundary around functional curricula of entrepreneurship education. Alternatively, the European Commission funded a project on entrepreneurship in higher education. This project has been conducted by the European Commission and experts in the field of education for entrepreneurship appointed by the national authorities, under the Multiannual Programme for Enterprise and Entrepreneurship coordinated by the European Commission's Directorate-General for Enterprise and Industry. The important final report of the Expert Group from the EU Member States produced for the European Commission stressed the need for building integrated competencies on innovation, entrepreneurship and technology, enabling students to create and develop new technology-based businesses, and ultimately bridging the gap between technology discovery and the commercialization of innovative products and services (European Commission, 2008).

#### *Phase 2: a survey of TEPE at universities in Egypt*

The questionnaire used comprises 30 factor items rated on a five-point scale, categorized using three headings: CIE; pool of professors/educators for entrepreneurship; and technology entrepreneurship program/courses. Tests to measure the reliability of these constructs and the whole questionnaire were conducted during the pilot stage. The pilot study provides evidence that the constructs are reliable, with Cronbach  $\alpha$  scores above 0.83: total TEPE components (30 items), 0.94; CIE (15 items) 0.851; pool of educators for entrepreneurship (7 items) 0.881; and entrepreneurship program/courses (8 items) 0.873. The following study hypotheses were formulated:

- H1. Academics from universities who establishing and not establishing entrepreneurship education in Egypt show differences in perceptions of the TEPE components (CIE; entrepreneurship professor/educators; and entrepreneurship programs/courses) of their universities.
- H2. There is a difference between the mean scores academics award for the three components of TEPE (showing academics are more positive about one/two components of TEPE than other components).

In order to verify the constructed hypotheses and because of the character of the study, the researcher analyzed results using SPSS software. Summative scores and mean scores were calculated for each respondent for each component and are used for hypothesis testing.

*A survey of CIE.* The construct to measure the activities of the CIE comprises 15 items. Integration of entrepreneurship programs into all study programs gained the highest mean score: 5.5 on a five-point scale, As a result of mean scores (see Table I), participants described their perception to the activities of CIE at universities.

Academics also believe that building of a strong pipeline of entrepreneurship professors/educators (5.4); establishment and development of technology business incubator (4.9) and evaluation of the impact of entrepreneurship education programs outputs (4.8). The lowest mean score was for "Encouragement of idea scouting and competitions" (3.4).

**Table I.**

Summary of mean scores for center for innovation and entrepreneurship (CIE) construct items

Centre for innovation and entrepreneurship (CIE) items	Mean
1. Integration of entrepreneurship programs into all study programs	5.5217
2. Building of a strong pipeline of technology entrepreneurship professors/educators	5.4216
3. Establishment and development of technology business incubator	4.9215
4. Evaluation of the impact of entrepreneurship education programs outputs	4.8542
5. Involvement of professors and educators	4.8132
6. Development of entrepreneurial skills through lectures	4.7216
7. Start-up support through provision of infrastructure	4.6541
8. Building and maintenance of science-industry linkages	4.5532
9. Support of networking with patent agents and financing institutions	4.5012
10. Organization of meetings with entrepreneurs, business owners	4.4987
11. Provision of focus workshops and special seminars	4.3216
12. Consulting services and exchange	4.0123
13. Coaching and mentoring	4.0011
14. Assistance in R&D team building	3.5431
15. Encouragement of idea scouting and competitions	3.4286

**Note:**  $n = 150$

*A survey of building a strong pipeline of technology entrepreneurship professors/educators.* The construct to measure building a strong pipeline of entrepreneurship professors/educators comprises seven items. Academics from both groups believe that development of professors' skills and attitudes to technology entrepreneurship (4.67), however, they were modest about this and give a lower score to the statement that "Encourage the development of doctoral programs specialized in entrepreneurship" (3.01). A full list of the mean scores for each item in entrepreneurship professors/educators construct is provided in Table II.

*A survey of technology entrepreneurship programs/courses.* There are eight items measuring technology entrepreneurship courses/programs. This construct attempts to measure academics' perception to develop technology entrepreneurship courses/programs at universities. The highest mean score is for defining the purpose of the course/program and linking it to the delivery of the expected outcome (4.98) followed by two items relating to balancing theoretical and practical aspects (4.89) and collaborating with real business practice and industry (4.88) (see Table III).

**Table II.**

Summary of mean scores for technology entrepreneurship professors/educators constructs items

Pipeline of entrepreneurship professors/educators items	Mean
16. Development of professors' skills and attitudes to technology entrepreneurship	4.6754
17. Develop the proper incentives, assessment, rewards and recognition to encourage professors for integrating technology entrepreneurship into all courses	4.6453
18. Review regulations on the participation of entrepreneurs and educators (not professors) in entrepreneurship teaching activities	4.6001
19. Increase educators' awareness and understanding of entrepreneurship education	4.5432
20. Equip educators with the specific skills and knowledge to implement the pedagogy of entrepreneurship education	4.5321
21. Provide training for entrepreneurs and educators to become effective educators	4.4123
22. Encourage the development of doctoral programs specialized in entrepreneurship	3.0133

**Note:**  $n = 150$

It is clear from this perhaps that academics do believe they contribute to the linking with real business practice and industry although they give lower mean scores to organizing activities and events (3.89) and supporting mechanisms for students' pre-start-up phase, start-up phase and growth phase (3.56).

### Comparison between academics from universities (establishing/not establishing EPE) to TEPE

Independent samples *t*-tests were conducted to compare the mean scores on the TEPE items grouped into the three constructs: CIE; technology entrepreneurship professors/educators; technology entrepreneurship courses/programs as well as for TEPE as a whole (30 items). There was no significant difference between the two groups in terms of items related to TEPE as a whole (0.47); CIE (0.29); or entrepreneurship program/courses (0.29). However, the result of the *t*-test in relation to entrepreneurship professors/educators shows that there is a significant difference between two groups.

Academics from universities who have EPE show more positive responses – i.e. more agreement with the statements, and more agreement between respondents. Among academics from universities who have not EPE, the responses are less positive and slightly more polarized. There is only a marginal difference – 0.5 is considered significant and score is 0.49 – but nonetheless, the difference is statistically significant. The group statistics for each construct are provided in Table IV.

Technology entrepreneurship program/courses delivery items	Mean
23. Defining the purpose of the course/program and linking it to the delivery of the expected outcome	4.9807
24. Balancing theoretical and practical aspects	4.8974
25. Collaborating with real business practice and industry	4.8861
26. Embedding practical experience of cooperating between students and enterprises	4.7991
27. Using creative teaching methods	4.7432
28. The suitable pedagogy to technology entrepreneurship education will be classroom, labs, informal learning, mentoring, networking, simulations and action learning	4.7387
29. Organizing activities and events to improve students' basic skills	3.8941
30. Supporting mechanisms for students' pre-start-up phase, start-up phase and growth phase in place and actively utilized	3.5642

Note: *n* = 150

**Table III.**  
Summary of mean scores for developing technology entrepreneurship programs/courses construct items

Construct	Groups	<i>n</i>	Mean	SD	SE mean
Total TEPE' components	Establishing EPE	79	3.8652	0.61104	0.12113
	Not establishing	80	3.7512	0.66324	0.12331
Centre for innovation and entrepreneurship	Establishing EPE	79	4.1115	0.71700	0.13381
	Not establishing	80	3.8201	0.68152	0.12101
Entrepreneurship professors/educators	Establishing EPE	79	3.7922	0.63561	0.11335
	Not establishing	80	3.3426	0.76754	0.12832
Entrepreneurship program/courses	Establishing EPE	79	3.3373	0.70391	0.12344
	Not establishing	80	3.7426	0.89521	0.14782

**Table IV.**  
Group Statistics for TEPE

Following these findings, a Mann Whitney test (the non-parametric test) was conducted to identify the differences between two groups for each individual item. One-way between groups analysis of variance (ANOVA) was conducted to test whether there was a significant difference between the mean scores for each construct (CIE; entrepreneurship professors/educators; or entrepreneurship program/courses). For example – were academics more positive about one of these aspects of TEPE than the others? The results showed that there was a statistically significant difference at the  $p < 0.05$  level in the scores for the three different aspects of TEPE. *Post hoc* comparisons using Tukey HSD test indicated that the mean score for “CIE” (mean = 4.01 SD = 0.68) was significantly different from perceptions of entrepreneurship professors/educators and entrepreneurship program/courses. CIE scores are more positive; both entrepreneurship professors/educators and entrepreneurship program/courses are close to the midpoint on the semantic differential scale (3.66 and 3.70, respectively).

### *Phase 3: factors that enhance success of TEPE at universities*

Most participants confirmed the study findings related to CIE; building a strong pipeline of entrepreneurship professors/educators; and technology entrepreneurship courses/programs. Other participants (e.g. leaders of Ministry of Higher Education, SFD, and ILO Sub-regional Office in Cairo and sample of academics from “success” group) were interviewed to confirm the findings and define the factors that enhance success of TEPE at universities. According to their comments, the author could define these factors according to the interpretation of the mean score of each factor (Othman, 2002). The mean score 1.00-2.00 = low (L); 2.01-3.00 = moderately low (ML); 3.01-4.00 = moderately high (MH); 4.01-5.00 = high (H).

*Success factors of the CIE.* Table V shows the interpretation of the mean score of each success factor of the CIE.

*Success factors of building a strong pipeline of technology entrepreneurship professors/educators.* Table VI shows the interpretation of the mean score of each

**Table V.**  
The interpretation of the mean score of success factor of CIE

No.	Success factors	SD	Mean	Level
1	Stimulation activities between university and industry	0.601	4.76	H
2	Examination of the various problems	0.532	3.56	MH
3	Contribution of the SFD and TIEC	0.511	4.55	H
4	Coordination with resourceful people	0.542	3.55	MH
5	The CIE-TIEC initiative	0.621	4.82	H
6	Connected with the regional environment	0.634	4.77	H
7	Existence of high-technology large firms	0.543	4.21	H
8	Synergies among business stimulation, R&D and educational activities	0.516	4.61	H

**Table VI.**  
The interpretation of the mean score of success factor of technology entrepreneurship professors/educators

No.	Success factors	SD	Mean	Level
1	Educators' skills, value and attitudes related to TEPE	0.543	4.92	H
2	Practice of TEPE philosophy	0.672	3.11	MH
3	Commitment of professors and educators to TEPE	0.547	4.89	H
4	Integration of academic expertise with practical experience	0.531	4.59	H
5	Focussing of teaching which goes beyond start-ups	0.601	4.77	H

success factor of building a strong pipeline of technology entrepreneurship professors/educators at universities.

*Success factors of technology entrepreneurship programs/courses.* Table VII shows the interpretation of the mean score of each success factor of technology entrepreneurship programs/courses at universities.

*Framework of technology entrepreneurship education at universities.* This section proposes a possible framework that can be used in empowering TEPE within the Egyptian higher education system, as suggested by the members of the Expert Group, the ILO Sub-regional Office in Cairo, researchers and senior officials of the universities and stakeholders. These suggestions came up during discussions over the dissemination of evidence of the current study at two workshops (July 2014/ May 2015) which took place in Egypt. The proposed framework reveals a diversity of objectives, targets, methods and solutions, which are relevant not only for Egyptian universities, but for universities in general (see the Appendix).

### Concluding remarks

In Egypt, a great emphasis has been given to the promotion of the higher education system as an international educational destination. As part of the main policy, the Egyptian Higher Education Enhancement Projects (HEEPs) were established after the approval by the World Bank of a \$50 million loan in 2002 (World Bank, 2002). HEEP's aim at laying the foundation for improving the quality of the higher education system, through legislative reform, institutional restructuring, and the establishment of independent quality assurance mechanisms and monitoring systems (Abou-Warda, 2014a, b). All these initiatives are linked to TEPE. In a highly competitive environment it is likely that the encouragement of creativity, innovation, critical thinking, opportunity recognition and social awareness would be the responsibility of every member in the university, including academics. They will adopt a CIE viewpoint, and will be engaged in the new educational services development processes of their institution. Despite some universities took steps to establish a CIE, only two universities from all in Egypt who took steps toward establishing entrepreneurship education and there seems to be a gap between the practices applied and those that are seen as the good practice in supporting entrepreneurship and the creation of new ventures. As these two arenas differ in the level of their marketization, accountability and privatization, the author postulated that the degree of TEPE perception among academics in the two arenas would differ. The overall objective of the current study is to explore how universities can better developing new educational services. This study developed framework for TEPE within universities through reviewing of available information about the good practices of entrepreneurship education at universities; comparing the extent of TEPE among academics from two

**Table VII.**  
The interpretation  
of the mean score  
of success factor  
of technology  
entrepreneurship  
programs/courses

No.	Success factors	SD	Mean	Level
1	Integration of self-employment and technology entrepreneurship into the curriculum	0.603	4.67	H
2	Empowering TEPE within the technical education system	0.621	4.99	H
3	Students' opportunities to travel abroad for understanding technological business culture	0.661	4.79	H
4	Engagement of students in experience-based learning	0.531	3.65	MH
5	Courses, incubators and other activities for promoting TEPE	0.624	4.89	H

different higher education settings; creating “success factors” case stories; and discussing the study’s findings with experts.

Overall, participants indicated that the empowering of TEPE is significantly affected by the internal organizational structure of the university. There is a need to establish centers for entrepreneurship and innovation for integrating of TEPE programs into all study programs; building of a strong pipeline of technology entrepreneurship professors/educators; evaluating of the impact of entrepreneurship education programs outputs; stimulation the growth and development of technology-based small businesses.

Notably, the academics identified three programs to stimulate the growth and development of technology-based small businesses: new technology small business development program to solve the problems that can be encountered in establishing and managing a new technology small business and a new venture through co-operation with the science and technology park; development programs and management groups to update the business expertise in firms by working out solutions to certain known specific problems in their activities; and club and networking activities and a good marketing device for small high-technology firms to create a social network and exchange information and knowledge among high-technology firms in the region.

This goes hand-in-hand with two fundamental, essential factors underlying the TEPE requirements: technology entrepreneurship professors/educator’s program and the suitable pedagogy to technology entrepreneurship programs/courses. Participants identified some main pedagogies that will be used in the technology entrepreneurship professors/educator’s program as: use of ice breakers, small group work, external speakers/presenters, hot seats, critical incidents, empathy in communication exercises (with entrepreneurs), shadowing, role play, relationship learning, achievement motivation, finding opportunities (ideas for technology business), outcomes from entrepreneurial learning, surviving in the early years of the venture, and evaluation of technology entrepreneurship. In this regard, participants identified the suitable aspects to technology entrepreneurship programs/courses and the suitable pedagogy to TEPE. The suitable aspects were: ideas generation and opportunities recognition and its evaluation; technology commercialization; creation of a new venture/organization; startup’s strategy development for the commercialization of a technology-based product/service. The suitable pedagogy were classroom, labs, informal learning, mentoring, networking, simulations, and action learning to make students more innovative, pro-active, highly motivated, self-confident, willing to challenge, better negotiators, communicators, problem solvers, leaders, decision makers; thinkers; less risk averse, less dependent, able to live with uncertainty, capable of recognizing opportunities.

### **Final recommendations for action**

The following activities are recommended at the level of government authorities: first, developing a national strategy for entrepreneurship education generally, and particularly for TEPE, to empower entrepreneurship education and TEPE into the education system across technical secondary, and higher education by steering a group including the Ministry of Education, Ministry of Technical Education and Ministry of Higher Education; second, review regulations on the participation of entrepreneurs and educators in entrepreneurship teaching activities; third, develop an Egyptian accreditation system to include informal learning, favor practical activities related to technology/entrepreneurship education, and sustainable market (Abou-Warda, 2014b);

fourth, establishing awards for entrepreneurial universities, teachers and students; and fifth, promoting positive examples of academic spin-offs.

Activities recommended at the level of institutions include: sixth, integrating technology entrepreneurship into the vision and mission of a university and developing a strategy and action plan for TEPE; seventh, integrating technology/entrepreneurship education into all faculties and establishing an entrepreneurship education department in business schools; eighth, establishing a center for entrepreneurship and innovation responsible for integrating, coordinating, organizing and promoting technology/entrepreneurship education action across all other departments within the university; ninth establishing incentive systems for motivating and rewarding faculty who support students interested in entrepreneurship and new technology business start-ups, and acknowledging the academic value of research and activities in the entrepreneurial field; tenth Encouraging the involvement of members of business associations in teaching entrepreneurship within university; eleventh supporting programs aimed at training entrepreneurship educators within universities; and twelfth using the developed framework in this study to integrate technology/entrepreneurship education within the university.

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**Appendix. Technology entrepreneurship education framework at universities  
The framework of the Centre for Innovation and Entrepreneurship (CIE) at universities:**

*The CIE activities:*

There are four main groups of CIE activities:

- (1) Integration of entrepreneurship education programs into all study programs (bachelor and master courses, and offer of additional courses for post-graduates, natural scientists as well as a full MBA program) and integration of TEPE into programs of science, engineering, and technology.
- (2) Building of a strong pipeline of entrepreneurship professors/educators.
- (3) Evaluation of the impact of entrepreneurship education programs outputs.
- (4) Stimulation the growth and development of technology-based small businesses.

*The main success factors of CIE:*

- (1) Stimulation activities between university and industry.
- (2) Contribution of the SFD and TIEC.
- (3) The CIE-TIEC initiative.
- (4) Connected with the regional environment.
- (5) Existence of high-technology large firms.
- (6) Synergies among business stimulation, R&D and educational activities.

*Partners of CIE:*

The important partners of CIE at Egyptian universities are:

- (1) The training center (FLCD).
- (2) The Technology Innovation and Entrepreneurship Center (TIEC) at the Ministry of Communications and Information Technology.
- (3) The science and technology park.
- (4) Governorates.
- (5) The Social Funds for Development (SFD).

*The framework of building a strong pipeline of entrepreneurship professors/educators at universities:*

The successful implementation of technology entrepreneurship education need to build a strong pipeline of technology entrepreneurship professors/educators as the following:

- (1) Development of professors' skills and attitudes to technology entrepreneurship.
- (2) Develop the proper incentives, assessment, rewards and recognition to encourage professors for integrating technology entrepreneurship into all courses.
- (3) Review regulations on the participation of entrepreneurs and educators in entrepreneurship teaching activities.
- (4) Increase educators' awareness and understanding of TEPE.
- (5) Adopt new paradigms and pedagogical models, which will eventually equip future professors/educators with the necessary skills and attitudes for TEPE such as "The Technology Entrepreneurship Educator's Program."

*The main success factors of technology entrepreneurship professors/educators:*

- (1) Professors/educators' skills, value and attitudes related to TEPE.
- (2) Commitment of professors/educators to TEPE.

- (3) Integration of academic expertise with practical experience.
- (4) Focussing of teaching which goes beyond start-ups.

*The framework for technology entrepreneurship programs/courses:*

- (1) Defining the purpose of the course/program and linking it to the delivery of the expected outcome and integrated it in the vision and mission of a university.
- (2) Balancing theoretical and practical aspects.
- (3) Collaborating with real business practice and industry.
- (4) Embedding practical experience of cooperating between students and enterprises.
- (5) Using creative teaching methods.
- (6) The suitable pedagogy to TEPE will be classroom, labs, informal learning, mentoring, networking, simulations, and action learning.

*The main success factors of technology entrepreneurship programs/courses:*

- (1) Integration of self-employment and technology entrepreneurship into the curriculum.
- (2) Empowering TEPE within the technical education system.
- (3) Studentes' opportunities to travel abroad for understanding technological business culture.
- (4) Courses, incubators and other activities for promoting TEPE.

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