

A New Way of Infusing Entrepreneurship Education into the IT Curricula: A Special Case from UAE

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Abstract—This research paper reports on the successful experience of the College of Technological Innovation at Zayed University in introducing a new academic component “entrepreneurship and innovation” to its IT curriculum. Since the journey started in fall 2011, it has been full with challenges, successes, as well as lessons learned. The introduction of entrepreneurship education stresses out the role that the college has to play in preparing students who will contribute positively to the future development of the United Arab Emirates (UAE). In UAE, there is a growing trend and interest among the national female populations to start their own businesses after graduation. This clearly shows a new way of thinking among the new waves of graduates, which is deviating from the traditional thinking of pursuing careers in the government sector. This new path of ventures is not going to be free of challenges and frustrations. The paper discusses in detail the course contents, learning outcomes, delivery modes, and last but not least, graded assessments. The paper also lists over fifteen government initiatives to instill and promote the culture of entrepreneurship and provide a conducive support environment for UAE entrepreneurs. Finally, the paper proposes several recommendations to strengthen and make entrepreneurship education at ZU more robust.

Index Terms—IT curriculum, entrepreneurship education and culture, business plan, and innovation.

I. INTRODUCTION

In 2014, the United Arab Emirates (UAE) Government declared 2015 “Year of Innovation” [1] and announced a new strategy that should help the country be one of the most innovative nations in the world within the next seven years [2]. Innovation and creativity contribute greatly to the development of the entrepreneurship culture and spirit of any country. According to Global Innovation Index: UAE is ranked No 1 in MENA region and 36th in the world [3]. Dubai is planning to invest Dh4.5 billion to make the emirate innovation hub for entrepreneurs [4].

According to Majdalawieh *et al.*, 2015, “*The UAE Government has promptly recognized the the Information and Communication Technology (ICT) sector as a job creator and vital infrastructure for the growth of the country. The significant and rapid development of the UAE economy in the last decade has also acknowledged the importance of the knowledge economy as another source of revenue. Both public and private organizations are “hunting” for ICT graduates equipped with critical thinking*

and problem solving, creative, and innovative skills and last but not least entrepreneurial” [5]. To achieve this goal, universities’ educational programs (or curricula) need to ensure that ICT graduates are capable of tackling the 21st century challenges. A challenge is to produce a new generation of female entrepreneurs who are equipped with the most advanced leadership skills and hence, can set-up new business ventures with high chance of success.

In 1997, UAE has introduced “Emiratization” to increase the number of Emirati Nationals in the workforce, especially in the private sector. As a result, more UAE women entered the job market. Preparing women to be entrepreneurs is another way of contributing and increasing their representation in the workforce. To support those are interested in starting up their own business ventures, UAE Businesswomen Council was established in 2002. Its main purpose is to provide the logistical and financial support to get women stand on their feet in a highly competitive business environment.

In a local study [6] influencing factors that impact first generation entrepreneurs were defined. Out of the graduates of UAE universities surveyed in the study, 50 percent believe that education is a key success factor to be a successful entrepreneur. Several international studies have shown the strong positive correlation between education and entrepreneurship. However, it has been argued that “traditional” education in general does not encourage entrepreneurship. It is kind of known in the academic community that “traditional” education prepare university students only for the corporate jobs [6], promotes a ‘take-a-job’ mindset rather than innovative and risk taker entrepreneurs [7], [8] and put less emphasis on creativity and innovation. Higher education systems need to reorient their content and pedagogy to foster entrepreneurship. Therefore, entrepreneurial education needs to focus on knowledge of small business ownership and self-employment, as well as entrepreneurial skills and attributes, which cannot be fostered through traditional teaching methods.

The continuous review of the College of Technological Innovation (CTI)’s academic programs and assessment of the market needs have resulted into identifying deficiencies of the current IT curricula and the skill gap between the graduates and the skills needed by the job market in UAE. In response to this, the college has identified entrepreneurship as a key driver for economic development and therefore, put more emphasis on entrepreneurship education. As an immediate action plan, the college introduced a new course in IT entrepreneurial and Innovation in fall 2011. Since then the journey has been full with a lot of challenges, successes, as well as lessons

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learned. The introduction of this new course is in line with one of ZU's strategic objectives (2017-2021) which states *"to establish a cutting-edge educational environment that promotes creativity and innovation"* and one of the core values of ZU that *"is to provide innovation through adoption and development of the highest global practices in teaching, learning and research."* [9] This research paper will report on the experience of integrating entrepreneurship education component into the IT curricula at ZU.

The paper is organized as follows. The first section discusses the research motivation and related work. The second section presents and discusses the motivation and the importance of entrepreneurship education to the economic growth of any country. The third section discusses ZU experience with entrepreneurship education and also explains the course structure, content, learning outcomes, assessment and activities as well delivery formats. The subsequent sections present the major initiative taken by UAE government to foster and promote the culture of entrepreneurship. The last section draws conclusions in terms of summary, lessons learned, and recommendations.

II. RELATED WORK AND MOTIVATION

In the literature, there is a strong link between entrepreneurship and economic growth of any country. The link between entrepreneurship and economic growth is also demonstrated by the contribution of small firms in modern economies [10]. Acs claims that small firms play a major role in the economy, as they are agents of change through their entrepreneurial and innovative activities and thereby stimulating industry growth and creating new jobs. Audretsch also states, "Entrepreneurship has become the engine of economic and social development throughout the world" [11].

The education system plays a critical role in the economic advancement of nations. It is the primary developer of human resource Entrepreneurship in any economy. In UAE, there is a growing trend and interest among National female population to pursue and start their own businesses after graduation. This clearly shows a new way of thinking among the new waves of graduates, which is deviating from the traditional thinking of pursuing government jobs. This new path of ventures is not going to be free of challenges and frustrations. However, these challenges and barriers will not stop them from pursuing their ambitious. In a study conducted by [12] to explore the main barriers that female entrepreneurs encounter during startup, the study highlights four categories of barriers: lack of managerial and financial know-how, traditional UAE society, family concerns, and personal reasons relating to the entrepreneur herself. Several women in the study complain of not receiving adequate training and education in entrepreneurship. In order to overcome these challenges, the study suggests providing UAE women with financial support, business opportunities, and practical entrepreneurship education and training. In another study [13] conducted to investigate the motivational factors of Emirati women entrepreneurs in UAE. The findings of the study indicate "independence" is the primary motivating factor driving them to be entrepreneurs. The study also recommends providing support training programs

to prepare and harness their entrepreneurial skills and talents.

This paper focuses on how CTI/ZU provides future female entrepreneurs with all the proper entrepreneurship education and skills to help them overcome the first challenge listed by the previous study, which is related to lack of knowledge in entrepreneurship education. According to [14] the vital skills needed to be a successful and effective entrepreneur: opportunity recognition, idea generation/creativity, risk taking, and critical thinking. The paper is about ZU experience of introducing and teaching Entrepreneurship to Information Technology (IT) senior female students. This paper includes various sections such as topics covered in the course, graded assignments, analyzed case-studies, conducted hands-on workshops, and last but not least suggested students' ideas converted into business plans. In addition to sharing our experience we are open and keen to similar experiences that describe the best practices in the how to develop and deliver a course in international entrepreneurship education. The course has been designed like a workshop whose ultimate aim would be for students to design, build their own IT products or services, develop a business plan then market and sell them.



Fig. 1. Images of Zayed University campuses at both Dubai and Abu Dhabi.

III. ZAYED UNIVERSITY OVERVIEW

In 1998, ZU was established as an academic public institution in the UAE. It operates two campuses, one in Dubai and the other in Abu Dhabi, see Fig. 1. Currently, the University is educating more than 9,000 students predominately females. It has adopted an outcome-based learning framework to ensure that specific outcomes such as teamwork, critical thinking, and leadership, drive student education. Moreover, the purpose of such a framework is to prepare graduates for a rapidly changing and unpredictable future. The University was accredited by the Middle States Commission on Higher Education (MSCHE) in 2008 (Zayed University, 2015). The College of Technological Innovation is one of the six colleges at ZU. CTI seeks to produce graduates recognized by business, government, and educational institutions in the United Arab Emirates (UAE), the Gulf Region, and the rest of the world. It also seeks to develop a strong applied research capacity in emerging technologies directed towards meeting the ICT needs of the UAE and Gulf region. The CTI academic programs are practical, competency-based, and designed to prepare

students for successful careers as Information Technology professionals. It offers two main specializations in Information Technology: Security/Networking and Enterprise Systems. The college's Security/Networking program is ABET-accredited.

IV. ZU EXPERIENCE WITH ENTREPRENEURSHIP EDUCATION

Entrepreneurship education is a three (3) credit-hour course that runs usually for 10 weeks, meets 6 hours per week. The main objective of the introduction of the entrepreneurship education is to promote and nurture an entrepreneurial and innovation skills, spirit, and attitude among IT students in the college. It is usually taken by senior students who would have completed an 8-week internship program and thus, have been exposed to the challenges of the work of world. This course introduces the concepts, practices, and challenges of IT entrepreneurship. It equips students with the skills to develop their entrepreneurial ideas and evaluate whether they can be the basis of a viable business that is worth investing time and energy. One of the main deliverables of the course is a business plan that the students develop to report on their entrepreneurial ventures. Here is an overview of the course content and structure.

Also, the course was able to address some of the deficiencies in the existing curriculum. Firstly, the development of entrepreneurial skills in the education system increases the number of future entrepreneurs in the UAE. In addition, the course is intended to foster the value of entrepreneurship as a mean of creating jobs for ZU graduates, through self-employment.

The objectives sets for the course include the following: understand the concept of entrepreneurship in the international and local contexts and from multiple perspectives like financial, legal, and ethical; be aware of the UAE incubation initiatives to promote and sustain entrepreneurship; differentiate between creativity and innovation and how both could lead into ventures; and identify an IT opportunity that will be the basis of a business plan. To achieve these objectives, regular lectures are held along with various in-class and outside-class activities such as homework, quizzes, presentations, group projects, on-campus seminars, etc. Feedback on students' assignments is also provided so that students improve their future submissions and establish how well they are doing in the course. Class discussions that boost student participation are also a key element in the success of the course by debating topics such as women as entrepreneurs, enabling technologies for entrepreneurship, leadership versus entrepreneurship, etc.

The students who sign up for the course are seniors who have usually completed the internship and hence, have experienced the work challenges, practices, and pitfalls. It is recommended that the students capitalize on the internship experience to identify opportunities that could help address certain problems that organizations face and improve current practices through creativity and/or innovation. The students are also tasked to study how international IT companies like Google and Apple embrace innovation. Presentations are planned regularly so that all students share

knowledge and benefit from their peers' findings.

A. *Course Learning Outcomes*

By completion the course, IT students will be able to:

- Identify the success and failure factors of entrepreneurs
- Develop the skills and knowledge required by commercial and social entrepreneurs
- Use a general framework for setting up a successful IT business
- Examine and evaluate an entrepreneurial idea
- Complete an opportunity assessment for their entrepreneurial idea
- Perform a basic financial analysis to check the viability of the new venture

B. *Learning Methods*

- Case studies: each group of students will present a case study on how Information technology supports entrepreneurial ventures.
- Guest speakers (when possible): students will have a chance to interact with successful entrepreneurs in IT to gain insights into careers prospects.
- Lectures: they cover the conceptual aspects and frameworks of entrepreneurship.
- Student presentations: in teams, students will be asked to present case studies, featured entrepreneurs in the country, and the final project (opportunity assessment).

C. *Highlights of the Topics*

Entrepreneurship ecosystem in the UAE (initiatives, challenges, and successful stories)

The Individual and corporate entrepreneurial mind-set

Factors leading to successful entrepreneurs

Entrepreneurial support and promotion strategies

Factors leading to successful corporate entrepreneurship

The social and ethical perspectives of entrepreneurship

Qualities of social entrepreneurs

Entrepreneurship ethics (challenges and policies)

Legal challenges in entrepreneurial ventures

The UAE venture landscape (laws, regulations, and policies)

The UAE venture capital landscape

Creativity and innovation

The search for entrepreneurial capital

Launching the venture

Business plan organization

Emerging information technologies in support of entrepreneurship ventures

Emerging technologies and feasibility

From the business plan to proof-of-concept

Commercialization opportunities and challenges

D. *Extra-Curricular Activities*

- 1) Workshops to be conducted by The Mohammed bin Rashid Al Maktoum Foundation.
- 2) Presentations by government (e.g., ICT Funds and private (e.g., SeedStartup) bodies.
- 3) Participation in events like the Global Entrepreneurship summit.

E. *Samples of Student Entrepreneurship Projects*

Smart home venture is a product that helps people who

are disabled and people with special needs. Many disabled people in UAE faced problems that prevent them from depending on themselves. Smart homes are easy to use comes with multiple languages, it also includes voice recognition service, see Fig. 2. The new homes will help the disabled and elderly people to improve their life of living and be more free and self-reliant. Smart home is a unique product in the UAE. This applications or products are for the disabled and elderly who want to be free and self-reliant. With the help of this product, smart homes would give people with disability the opportunity to turn on/off the lights, coffee machines, air conditioners, security alarms, and many more kitchen appliances that are connected to the core system of the smart home. The product aimed to provide valuable contribution to the community, economy, and the country. The students addressed all innovation, entrepreneurial and business aspects as well as the development of a business plan for the product.



Fig. 2. Smart home for the disabled and elderly.



Fig. 3. Helping older people in emergency situation.

Helping Older People in Emergency (HOPE) the business idea for this project is to develop a small device to give the senior citizens of life (the elderly) a notion of hope and peace in sickness and health, see Fig. 3. This device will notify the ambulance emergency and the family guardians in case the elderly fell for a comma due to a stroke, additionally, it will estimate whether or not the patient is at a high risk from a 1-5 scale. HOPE might be the reason behind giving stroke patients a second chance in life; early intervention is vital and the more time passes the more severe the damage would be on the patient. Hence, the stroke's motto is "Time lost is brain lost" [15]. The ability to market the HOPE watchband is fairly easy in the UAE because competition is not extensive; in fact, no watchband offers the same exact features in the region. Our revenue will mainly be from health institutes such as, private and public hospitals, pharmacies, e-commerce, and medical supply stores. A lack of specialized smart watchband manufacturers in the region is the reason why we decided to outsource the creation of the product to China, the hub country of most innovative inventions. Another reason we chose China as a manufacturer is because we want the

watchband to be sold at a reasonable price whilst assuring that the product would be convenient for the users. However, users ought not to fully rely on the HOPE watchband because technology fails us at times, thus, that should not alone

V. ENTREPRENEURSHIP SUPPORT INITIATIVES

Over the last ten years there have been enormous initiatives to promote the culture of entrepreneurship among nationals at both institutional and national levels.

A. Institution Entrepreneurship Initiatives

Zayed University has taken several initiatives and activities to enrich, promote and boost the culture of entrepreneurship among its students and graduates. Here are some of these initiatives:

- 1) As part of new ZU strategic plans for 2017-2021, it adds new goal to promote and instill the entrepreneurship and innovation culture among students, in order to achieve and implement this, an entrepreneurship education component has become a core course in the curricula which needs to be completed by all ZU freshman students regardless of their major programs of study.
- 2) Zayed University Entrepreneurship Carnival. It is an annual event held at Zayed University - Dubai campus. The event takes place over two consecutive days. The main purpose of this carnival is to motivate students to start their own businesses and give them the first chance to plan and run their own business venture. The initiative gives student participants a clear vision of the market status and how to deal with clients and competitors. Last year, the event hosted 85 new business ventures, this year the number has been reduced to 65 businesses to put more emphases on the quality of the services and products, see Fig. 4 for 2016 carnival program. The applications go through filtering process to select the best bossiness ideas with the help of Dubai SME office. Along with the carnival, the university plans several workshops and activities delivered by business leader to share their knowledge and experience of best entrepreneurial practices.

Time	Session	Location
10:30 am	Opening Ceremony - Rashed Aljassbi - MC: Hassan Mohamed	Atrium - Carnival Stage
10:45 am	Poetry Reading - Anna Al Jomaily	Atrium - Carnival Stage
11:00 am - 12:00 pm	Musical Performance - Harmony Club	Atrium - Carnival Stage
11:00 am - 2:00 pm	Water Art Workshop	Atrium - Pool Area
12:00 pm - 12:30 pm	National Songs by Musical Coral	Atrium - Carnival Stage
12:30 pm - 1:30 pm	Motivational Lecture: How asking "why?" made all the difference - By Group Al Busady	Blue Auditorium
1:30 pm - 1:45 pm	Fashion Show: Contemporary Abayas & Jalabiyas by Amal Alkay	Atrium - Carnival Stage
1:30 pm - 2:30 pm	Sport Session: We Value Your Life - By RUN&FIT Fitness	Atrium - Carnival Stage
2:00 pm - 4:00 pm	Healthy Eating & Cooking Competition - By Alasia & Co	Atrium - Carnival Stage

DON'T MISS THE CHANCE TO ATTEND ANY OF THE SHOWS, FREE VOUCHER GIFTS AND SAMPLES.

Time	Session	Location
10:00 am - 11:00 am	Absher Activity: "Dreams Come True"	Blue Auditorium
11:00 am - 2:00 pm	A play performed by Kuwait Preparatory School	Atrium - Pool Area
11:00 am - 12:00 pm	Water Art Workshop	Atrium - Pool Area
12:00 pm - 12:30 pm	"Outside your comfort zone." - Powered by Motivation Lab. By Tharwat Al Marzouqi	Atrium - Carnival Stage
12:30 pm - 1:30 pm	Musical Performance - Harmony Club	Atrium - Carnival Stage
12:30 pm - 1:30 pm	Motivational Lecture: Entrepreneurship, Community, and Using Work You Love - By Khalid Al Ameri	Blue Auditorium

DON'T MISS THE CHANCE TO ATTEND ANY OF THE SHOWS, FREE VOUCHER GIFTS AND SAMPLES.

Fig. 4. ZU entrepreneurship carnival program for 2016.

- 3) Creativity and Innovation Week. The event is designed to give ZAYED University students and alumni's the chance to showcase their creative and innovative

talents and learn how to be innovative and creative in different fields. During the week, the university provides set of lectures and workshops in innovation and creativity delivered by experienced people from inside and outside Zayed University.

- 4) Creativity and Innovation Competition. It provides an opportunity to think outside the box. The creativity and innovation contest offered in two areas; the first one will be for the best creative and innovative work and the second one will be for the best creative and innovative idea all under the theme of “innovation and creativity in UAE”. Students are encouraged to submit new business ideas which should be SMART (Simple Measurable Achievable Realistic Time framed. All produced work for the contest will be showcased in an exhibition on campus.
- 5) Entrepreneurship & Innovation Educational Summer School. A group of ZU/CTI students will have the opportunity to participate in an intensive and extreme summer program in innovation and entrepreneurship. The students from Zayed University is offered the full program (three weeks) supported by mentors and world-known academics. Through the program, ZU

students will have numerous opportunities to meet and interact with other delegates from many countries. This will also provide these delegates the possibility to interact with women from the UAE to foster greater international understanding and appreciation for the progress made in the UAE. This student engagement in the program would help Zayed University reach its newly added objective of enhancing the culture of innovation.

B. Government and Private Initiatives

There have been several national initiatives from both government and private sectors have been taken to provide financial and logistical support as well as to instill, foster, and help create a conducive environment for innovation and entrepreneurship to prepare a new breed of entrepreneurs in order to start their new small and medium business ventures. These initiatives intended to provide various services to new generation of entrepreneurs, which includes: mentoring and coaching, training and education, financial funding, business networking and opportunities, setup and logistics, and others. See Table I for a complete list of the most important initiatives in UAE.

TABLE I: INITIATIVES TO SUPPORT ENTREPRENEURSHIP IN UAE

Initiative	Main objective
Khalifa Funds for Enterprise Development	To offers business opportunities for young Emiratis in both industrial and service sectors. The Fund will target capable, young graduates as well as young businessmen and businesswomen with creative business ideas
Mohammed Bin Rashid Al Maktoum Foundation	To empower future generations to devise sustainable solutions that address challenges in the knowledge and research domains in the Arab world
Mohammed Bin Rashid Award for Young Business Leaders (YBL)	To help creating a competitive environment amongst the young entrepreneurs in the UAE and the Arab countries.
Mohammed Bin Rashid for Small and Medium Enterprises Development	To increase entrepreneurial activities in the economy as well as to enhance the competitiveness of Dubai SMEs through innovation, production and quality
Emirates Businesswomen Council	To Encourage the participation of UAE women in the different economic sectors besides boosting their role in the different commercial activities and providing the required training programs and studies.
The Knowledge Summit 2015, designed around the theme “The Way to Innovation”	The summit is hosting a group of experts and specialists in these areas to discuss developments and challenges facing the innovation process in the region and to spread the concepts of creativity and innovation as a life-style among its population.
Tejar Dubai initiative, launched by Dubai Chamber of Commerce	To offer a specialized programme and platform for youth to help them establish their own small-to-medium-sized businesses. It provides youth with access to an extensive development programs, including classroom learning, on-site training, mentoring and business advice, as well as networking opportunities with local and international business leaders.
In5	To promote entrepreneurship and technology innovation in UAE. The center specialized in supporting the development of private companies and entrepreneurs and in the encouragement of creativity and innovation
Dubai Smartpreneur Competition	Designed to help upcoming entrepreneurs to take part in Dubai’s mission to create more prosperity by embracing technology innovation. Submissions include business ideas related to smart economy, smart living, smart mobility, smart governance, smart environment, and smart people
Dubai Technology Entrepreneurship Centre (Dtec)	It provide incubators and logistics for techno startups.
Dubai Entrepreneurship Academy	To prepare a creative generation of entrepreneurs and equip them with the skills and knowledge they need to become future business leaders
Enjaz UAE	To inspire young people to dream big and reach their full potential. It works to connect corporate volunteers with students to mentor them on entrepreneurial, work-readiness, and financial literacy skills.
ICT Fund	To provide funding and advisory services to companies, organizations and individuals who can strengthen the innovation and knowledge capital level of the UAE ICT sector with their research, education, and entrepreneurial activities.
	To provide a useful resource information to help a new entrepreneurs in the middle east region to start up or grow their businesses and ventures

VI. RECOMMENDATIONS

- 1) Perform a regular revision to the entrepreneurship education content and outcomes to ensure it focuses on preparing entrepreneurial graduates who is able to generate IT business ideas, create ventures, think critically and analytically willing to take risk, as well as to tolerate ambiguity.
- 2) Incorporate project-based learning and learning by doing component to the course by linking up with SMEs, local industries, businesses and organizations by providing the students with the opportunity to innovate,

develop or improve real-life products, solutions and services offered by these entities.

- 3) Establish a new incubation center at ZU to support the course and help the promotion of entrepreneurial culture amongst the female IT graduates/seniors before they enter the job market. A university incubator can adopt project ideas generated during the course.
- 4) Introduce a new general and broad course in entrepreneurship education and innovation, which needs to be taken by all university students before they join the majors.
- 5) Provide more advanced training in the modern and effective methods of teaching entrepreneurship education to all faculty members who teach the course. One way to achieve this is through partnership with western universities, which are well-known for providing high quality courses in entrepreneurship education.
- 6) Increase level of student engagement in entrepreneurship hands-on activities, by inviting UAE entrepreneurs to campus to share their success stories with entrepreneur students
- 7) Organize a national forum to provide a forum for all UAE private and government universities to share their knowledge, experience and best practice in teaching and integrating the entrepreneurship and innovation course in the core curriculum.

VII. CONCLUSION

The paper discussed in detail the College of Technological Innovation's experience in rolling out a new course on entrepreneurship. This included course content, learning outcomes, delivery modes, and assessment and extra-curricular activities. The paper also listed over five institutional initiatives as well as fifteen government initiatives to instill and empower the culture of entrepreneurship and provide a conducive environment for UAE entrepreneurs. Finally, the paper proposed several recommendations to strengthen and make entrepreneurship education at Zayed University more robust. Some of these recommendations include: introduce project-based learning to the course by linking up with SMEs, local industries, and businesses, establish a new incubation center on campus. The college has a critical role to play in graduating students who will contribute positively to the future development of UAE. The entrepreneurial spirit of students will make them succeed in all aspects of their professional and personal life.

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