International Conference
ON
Higher Education in the Arab World: Building a Culture of Innovation and Entrepreneurship

Beirut - Lebanon, 16 - 17 November 2018
The conference organisers bear no responsibility for the opinions and contents of the contributions in this conference book
It is a great pleasure to welcome you to Beirut, Lebanon, and to this International Conference on “Higher Education in the Arab World: Building a Culture of Innovation and Entrepreneurship”.

The topic of the conference follows the recent decision of the Arab Academy of Sciences to switch focus from major scientific issues to concentrate on the higher-education sector, reflecting its pivotal role to address the major challenges facing all countries in the Arab region. University enrolments are relatively high although there are high levels of graduate unemployment and underemployment, coupled to weak and unstable economies, and a poor record of generating valuable intellectual property.

The conference will follow a series of our recent conferences on higher education. We are considering whether the Arab higher-education sector can be transformed into dynamic, internationally competitive group of institutions that are able to rebuild national economies and civil society. Innovative thinking and entrepreneurial behaviour are sadly lacking in virtually all Arab universities. Attitudinal changes are not only needed on the part of teachers in primary and secondary schools as well as the teaching and supervisory staff in universities, but also on the part of civil servants and politicians. The highly unionised teaching profession in many parts of the world has tended to discourage both performance monitoring and entrepreneurial behaviour, and public-sector attitudes dominate. In the rest of Arab civil society, there is a pressing need for legal firms to be able to handle contracts and intellectual property and copyright, and for entrepreneurs and innovators to raise money from venture capitalists, business “angels”, banks, and financial companies. In higher-education institutions, laboratory work needs to be revolutionised, so as to protect intellectual property using audited, dated, and countersigned laboratory notebooks and records, associated with quality-assured processes and instrumentation. Senior university staff must know how to recognise, and then identify routes to protect and exploit intellectual property and valuable “know how”. Employment contracts may need to be amended. In the leading international universities, associated business and science parks and company-incubator facilities have proved essential adjuncts to successful exploitation of innovations, including new business concepts. Leading researchers need to cultivate good business and industry connections.
Some of the most profound economic developments have arisen from the cross-fertilisation of ideas from diverse academic areas, in particular, exploiting developments in science, technology, engineering, and mathematics coupled to understanding the needs and desires of modern consumers in a range of societies. Thus, academic environments must favour creativity and innovation, and recognise the importance of entrepreneurship in thriving economies.

The participants in the Conference comprise a high-level group of experts covering diverse but relevant disciplines and we look forward to lively, informative, and constructive presentations, and discussions. In addition to exchanging information and establishing a contact network, the main output of the Conference will be a set of recommendations for use by the sponsors as well as by organizations and governments in the Region.

Finally, this Conference is only made possible by the continuing support of our main sponsors. We are very grateful for their financial support and their valuable inputs.

The Organizing Committee
This is the 16th Annual Conference sponsored and organized by the Arab Academy of Sciences. The first one was held in Beirut, Lebanon on 1-2 March, 2003 and since then these meetings have been held annually (except 2009, two in 2008). Below is a complete list of the Conferences. Further information can be found on our website: www.arabacademyofsciences.org

- Bioethics: How to Adapt Biotechnology to Culture and Values
  Beirut, Lebanon, 1-2 March, 2003
- Drug Biotechnology and Medicinal Plants
  Amman, Jordan, 9-11 October, 2004
- Nanoscience and its Impact on Renewable Energy and Medicine
  Beirut, Lebanon, 5-6 December, 2005
- Integrated Water Resources Management in the Arab Region
  Beirut, Lebanon, 14-16 December, 2006
- Science Parks for the Developing World: Engines of Economic and Social Growth
  Amman, Jordan 14-17 December, 2007
- Bridging the Digital Divide in Developing Countries
  Beirut, Lebanon, 14-15 November, 2008
- Training Managers of Science Parks
  Beirut, Lebanon, 17-18 November, 2008
- Alternative & Renewable Sources of Energy
  Beirut, Lebanon, 25-26 November, 2010
- Water and Energy in Sustainable Food Security
  Beirut, Lebanon, 2-3 December, 2011
- Energy and Water Sustainability
  Beirut, Lebanon, 7-8 December, 2012
- Water-Energy Nexus and Waste Management for a Sustainable Arab World
  Beirut, Lebanon, 6-7 December, 2013
- Sustainable Energy and Water Resource Management for Food Security in the Arab Middle East
  Beirut, Lebanon, 12-13 December 2014
- Climate Change and Water-Energy-Food Nexus in the Arab Middle East
  Amman, Jordan, 5-6 December, 2015.
- Arab Universities: An Urgent Need for Change
  Beirut, Lebanon, 4-5 November, 2016
- Major Challenges facing Higher Education in the Arab World: Quality Assurance and Relevance
  Beirut, Lebanon, 10-11 November, 2017
Organizing Committee

Adnan Badran
Elias Baydoun
Hamed Alhamami
Nuhad Daghir
John Hillman
Joelle Mesmar
John Waterbury
PROGRAMME
Programme

Friday, November 16, 2018

8:30 – 9:00  Registration
Ball Room, C Floor, Gefinor Rotana, Beirut, Lebanon

9:00 – 10:30  Opening Ceremony
• Elias Baydoun, Professor, American University of Beirut and Secretary General, Arab Academy of Science, Beirut, Lebanon
• Hamed Alhamami, Director, UNESCO Regional Bureau for Education in the Arab States, Beirut, Lebanon
• Marwan Muwalla, President, University of Petra, Amman, Jordan
• Salwa Ghaddar Youness, Ambassador, Beirut, Lebanon
• Adnan Badran, President, Arab Academy of Sciences, Beirut, Lebanon; Chancellor, University of Petra, and Chairman, Board of Trustees, University of Jordan, Amman, Jordan

Innovation and Entrepreneurship in Academia: A Review
John Hillman, Former Director, James Hutton Institute, Dundee, United Kingdom

From Teaching to Learning and Innovating
Talal Abu-Ghazaleh, Founder and Chairman, Talal Abu-Ghazaleh Organization, Amman, Jordan

Can Universities in the Arab Region Become the Engines for Knowledge and Innovations?
Adnan Badran, President, Arab Academy of Sciences, Beirut, Lebanon; Chancellor, University of Petra, and Chairman, Board of Trustees, University of Jordan, Amman, Jordan

10:30 – 11:00  Coffee Break and Group Photo
**Session I**

**Chair:** Wajih Owais, Senator, The Senate House and Former Minister of Higher Education, Amman, Jordan

11:00 – 11:30  **A Culture of Innovation and Entrepreneurship**

Quintin McKellar, Vice Chancellor and Chief Executive, University of Hertfordshire, Hertfordshire, United Kingdom

11:30 – 12:00  **The Role of University-Industry Partnerships in the Development of Science Parks**

Malcolm Parry, Director, Surrey Research Science Park, Surrey, United Kingdom

12:00 – 12:30  **Higher Education and Scientific Research in the Arab World**

Sultan Abu-Orabi, Secretary General, Association of Arab Universities, Amman, Jordan

12:30 – 13:00  **Research, Innovation and Ethics as a Cornerstone for the Added Value of Higher Education in Lebanon**

Mouin Hamze, Secretary General, National Council for Scientific Research, CNRS-L, Beirut, Lebanon

13:00 – 14:30  **Lunch, Olive Garden, Lobby Floor**

**Session II:**

**Chair:** Hani Mourtada, Former Minister of Higher Education, Former President, Damascus University, Damascus, Syria

14:30 - 14:50  **Innovation and Entrepreneurship in Higher Education: Enhancing Achievement of SDGs**

Mohammad Hamdan, Senator, The Senate House, Amman, Jordan

14:50 – 15:10  **The Role of Faculty Members in Building a Culture of Innovation and Entrepreneurship in Higher Education: The Case of the Australian College of Kuwait**

Isam Zabalawi, President, Australian College of Kuwait, Safat, Kuwait
15:10 – 15:30  Building the Entrepreneurial Mindset through Experiential Learning

Jacqueline El-Sayed, Vice President for Academic Affairs, Marygrove College, Detroit, USA

15:30 – 15:50  Strategies for Incorporation of Innovation and Entrepreneurship in Graduate and Undergraduate Programmes in Arab Universities

Sohail Murad, Professor and Chair, Chemical and Biological Engineering, Illinois Institute of Technology, Chicago, USA

15:50 – 16:10  Building a Culture of Innovation and Entrepreneurship by Addressing Affective and Psychomotor Development in the Arab World’s Higher Education

Mohamed El-Sayed, Director, School of Engineering and Technology and Editor-in-Chief, SAE International Journal of Materials and Manufacturing, Eastern Michigan University, USA

16:10 – 16:30  Innovation & Entrepreneurship, the Evolution in the Lebanese Ecosystem

Ramy Boujawdeh, Deputy GM, Berytech, Beirut, Lebanon
Session III

Chair: Nuhad Daghir, Dean Emeritus, Faculty of Agricultural and Food Sciences, American University of Beirut, Beirut, Lebanon

9:00 – 9:20  Turnitin: Building an Academic Integrity against Plagiarism  
Marwan Muwalla, President, University of Petra, Amman, Jordan

9:20 – 9:40  Innovations in Creating Incentives for Academic Achievement and Growth: Developing a Model at the Faculty of Medicine of the American University of Beirut (1999-2009)  
Nadim Cortas, Dean Emeritus, Faculty of Medicine, American University of Beirut, Beirut, Lebanon

9:40 – 10:00  A Perspective on Entrepreneurship in Graduate Education  
Muhammad Hajj, Chair of Civil, Environmental and Ocean Engineering, Director of the Davidson Laboratory, Stevens Institute of Technology, Hoboken, USA

10:00 – 10:20  R&D Challenges and Opportunities in the Arab World, the Case of Kuwait Institute for Scientific Research (KISR)  
Samira Omar, Director General, Kuwait Institute for Scientific Research, Safat, Kuwait

10:20 – 10:40  Imperatives to A Successful Technology Transfer Model; A Perspective from the Arab World  
Sami Bashir, Khalifa University of Science and Technology, Abu Dhabi, United Arab Emirates

10:40 – 11:10  Coffee Break
**Session IV**

**Chair:** Nessar Ahmed, Reader in Clinical Biochemistry, Manchester Metropolitan University, Manchester, United Kingdom

11:10 – 11:30  
**A Culture of Innovation and an Entrepreneur’s Journey in the Agriculture and Food Sciences Educational and Research Programmes**

Nabil Nemer, Associate Dean, Faculty of Agriculture and Food Sciences, Holy Spirit University of Kaslik, Jounieh, Lebanon

11:30 – 11:50  
**The Arab Innovation Academy: A Case Study on Hands-on Entrepreneurship Education**

Hayfa Ahmed, Director, Innovation Centre, Qatar Science and Technology Park, Doha, Qatar

11:50 – 12:10  
**Innovation in the Post Novel 2018 Economic Prize: A Hate and Love Relationship between Politicians, Academicians and Practitioners**

Maan Barazy, Entrepreneurs Ventures Network Holding SAL, Beirut, Lebanon

12:10 – 13:00  
**Session V**

**Final Discussion and Recommendations**

**Chair:** Adnan Badran  
**Rapporteurs:** John Hillman, Joelle Mesmar  
**Participants:** Quintin McKellar, Wajih Owais, Malcolm Parry
Innovation and Entrepreneurship in Academia: A Review

John Hillman
Innovation and Entrepreneurship in Academia: A Review

John Hillman* and Elias Baydoun**
*James Hutton Institute, Invergowrie, United Kingdom
** American University of Beirut, Beirut, Lebanon

Abstract

In the modern era, universities and other centres of higher education are expected to be at the forefront of generating and analysing new concepts, ideas, specialist know-how, and important intellectual property. Their active involvement in rapidly advancing technologies should provide a wide range of productive academic environments for the full expression of innovation and entrepreneurial initiatives, much to the benefit of the knowledge economy and society.

Educating and encouraging populations to prepare them for contributing to the knowledge economy involves formulating and implementing strategies to encourage three critically important aspects of modern higher education, namely innovation, creativity, and entrepreneurial behaviour. Quality assurance and relevance assessments of higher-education institutions that are now being implemented in many countries should therefore incorporate analyses of the extent to which institutions successfully address these three aspects. Governments also have a dominant role in implementing policies that encourage the establishment and functioning of companies, investment bodies, and independent civil-society groups. Other key government roles include the funding of research, formal recognition of intellectual property and copyright, and ensuring higher-education institutions operate to high standards with large measures of autonomy.
Universities should occupy a leading role in developing the fast-moving technologically driven modern knowledge economy. Innovation and creativity are closely aligned and have numerous definitions. Put simply, innovation is the product of creativity and means the introduction of something new. Innovation can refer either to something new or to a change made to an existing idea, product, or field, whereas invention usually refers to new types of musical composition, a falsehood, a discovery, or any product of the imagination. Some regard creativity as less tangible than innovation, such as an idea, theory, or figure of speech, but it extends into innovation with a musical composition or other works of art. In our opinion and contrary to the opinion of others, creativity does not have to be useful and/or valuable. The term “innovation” has been applied to new ideas, products, processes, concepts, services, technologies, business models, and reorganisation systems. Such innovations do not always infer an improvement such as an increase in efficiency or more sustainable use of resources. Innovation and creativity can seemingly be spontaneous but normally arises from pre-existing knowledge and from conducting orderly research and development. Brandt and Eagleman posit that creativity involves people refashion things or ideas by bending, breaking, or blending: bending refers to altering existing properties (e.g. artificial heart); breaking refers to assembling something new from existing parts of a whole (e.g. shotgun DNA sequencing); and blending refers to a mixing of multiple sources together in new ways. Ideas can come from diverse sources, especially technicians and students sometimes posing apparently simple questions challenging long-held assumptions. Lazy people can propose easier and quicker ways of doing tasks. People who can take ideas from one area of life or discipline and applying them to another are particularly valuable. Creativity can be regarded as a manifestation of human social development with an evolutionary premium on communication and social intelligence. This emphasises the roles in creativity and innovation of teams and groupings of people, and explains why centres of scholarship, towns, and cities are at the forefront of socio-economic growth. Surely, it must be the case that creativity thrives where there is the freedom to make mistakes and where rare or even unique attributes and abilities will be encouraged. An environment is needed that engenders self-confidence and positivity rather than continuous harsh reviews and negativity so often noted in academia where, for example, substantially more time is taken on thinking and disparagingly criticising why an experiment or building a prototype should not be done rather than in carrying it out. Examples of rapidly developing and interacting technologies are given in Table 1.

The degree of novelty can vary from the most minor invention or idea that are soon discarded to an entire reshaping of the international economy with wide-ranging political and social consequences. Examples of the latter include developments in financial services, new forms of healthcare, improved crop production, new forms of energy generation etc. Innovations may have local, national, regional, and global impacts. Some innovations improve bureaucratic and business efficiency, such as improved accountancy systems, ICT for large and constantly amended data sets, robotics, 3-D
printing, nanotechnology, biotechnology-derived materials and processes, etc. New research-based tools based on computing software design, quantum mechanics, big data, molecular genetics, etc. have the capabilities to give rise to an explosion of innovations. Many recent innovations integrate different technologies with fashion and behavioural changes, e.g. smartphones and the social media (Facebook, twitter, Instagram, and other related media and communication systems); their collateral effects on democratic processes have yet to be fully evaluated. As a consequence, innovation can bring about profound disruption to existing businesses and organisations. Even major companies can go out of business if they cannot create, acquire, adapt to, and exploit innovation. Countries can be impoverished if their wealth-creation model cannot keep up with competing countries, as the Arab world fully realises. In general, innovation empowers the consumer, making life easier and/or more interesting.

In education, the growing impacts of online education and digital technologies are revolutionising all levels of teaching, as they incorporate artificial intelligence (AI), virtual and augmented reality, and complex software tools to gauge the effectiveness of the teaching material, the performance and understanding of the student, and the competence and achievements of the supervisor. This so-called “ed-tech” is challenging traditional teaching methods but detailed studies are needed to examine the extent to which screen time has demonstrable beneficial or harmful effects on learning. Legitimate questions arise as to whether universities and related organisations in their current form are capable of stimulating their staff and students to be innovative. Changes are needed in teaching methods, materials, and attitudes to improve efficiency and effectiveness. In addition, the appropriate operating academic environment a priori and from observation needs freethinking, free speech, and encouragement to challenge without retribution orthodoxy and tradition. QA and relevance assessments should incorporate analyses of innovation and competitiveness.

The biggest impedances to innovation come from various standpoints. Activities and industries likely to be threatened by innovations can be expected to pose legal and other challenges. Also, impedances come from adherents to sections of certain religions, some political groupings, and followers of certain traditions, as well as those people in all societies with negative personalities resistant to change (often erroneously attributed to the old). The recent obituary of Calestous Juma is enlightening in this respect. Virtually all new technologies evince resistance, some times for good reason because virtually all technologies can be used for good or ill. The formulation and implementation of evidence-based policy to regulate the application of technologies are dependent on politicians with their advisors and civil servants having a working knowledge of STEMM (Science, Technology, Engineering, Mathematics, Medicine) subjects. Academia should play a major role in investigating the potential impacts of technologies as well as in their creation. Another major impedance to the introduction of new technologies or refinement of existing ones is the Precautionary Principle when aggressively utilised by those in pressure groups and politics who are variously anti-
science, anti-modernity, anti-experimentation, anti-corporations, anti-western, anti-American, and anti-progress. They demonstrate excessive concern about “unintended consequences”, ownership of intellectual property, health and safety, and effects on the environment. Their concerns are not assuaged by (a) highly detailed risk assessments; (b) detailed health and environmental monitoring (including containment facilities); (c) legislation that can force the dismantling of monopolies and/or rent-seeking economic behaviour; or even (d) legal systems that harshly punish transgressors. Conversion of an innovation into society can then be unjustly severely impeded or more probable stopped by energy-sapping excessive, time-consuming, and pointless bureaucracy that compounds the difficulties in addressing the usual legal complexities and garnering financial support faced by entrepreneurs. Governments should have policies coupled to customer-friendly administrative and funding structures that offer consumer protection as well as help stimulate innovation. Innovation-related indices include the World Competitiveness Index of the World Economic Forum and the Global Innovation Index. Parenthetically, governments should review the fact that data, mostly accessed freely from consumers and computing users, have now become the vast economic capital and huge competitive advantage of a few Silicon-Valley-based companies and a politically well-connected Chinese company, as they buy out or swamp competitors and create a socio-economic imbalance that needs to be corrected. In academia, deeper analyses are needed of decision-making, belief, and behavioural biases operating in various societies.

Entrepreneurialism in an academic context usually comprises training in the theory and skills needed to be an entrepreneur and start a new business or enterprise. The process starts with the entrepreneur perceiving a business opportunity and this may be connected with one or more innovations. Entrepreneurs may act as intermediaries but must have a willingness to assume the risk for running the business, demonstrate considerable initiative, and persistence in the face of various and sometimes numerous impedances. In designing, launching, and running a new business, the entrepreneur must have a clear vision, access to legal and accountancy advice, a reliable source of capital, a unique selling proposition, good market contacts, and the skills and capacity to appoint competent staff. A business plan is often the starting point for accessing support. Risk aversion is the enemy of entrepreneurialism.

Universities possessing business schools and science parks and business-incubator units have a marked competitive advantage in delivering education in relevance, innovation, creativity, and entrepreneurial behaviour. Teachers of student studying entrepreneurialism should have experience in launching start-up companies and a wide circle of contacts in venture-capital, intellectual-property and contract-law, accommodation, and banking communities. Having working examples on the university doorstep of successful start-up businesses generated within the academic environment can be hugely encouraging to both staff and students. Sometimes, the initiating factor comes from students discussing their personal interests. Examples
from the major top-rank international universities illustrate the synergistic effects of these businesses on other start-up enterprises. Universities should have technology-transfer arms and determine at the outset the relationship they want with these businesses and their science parks and business-incubator units. Assistance before the proof-of-concept phase may be deemed to be speculative but wisely allocated should give rise to a profitable business. If the conditions posed by the host university are oppressive then opportunities will be lost and the institution fails the staff and student body. Entrepreneurialism is the primary vehicle for effective and profitable technology and knowledge transfer. Arab universities have a poor record of creating companies, a situation that must not be allowed to persist.

Some universities are essentially public-sector institutions with self-serving public-sector attitudes pandering to and controlled by government and with expectations of entitlement of financial support from taxation of the private sector. An attitudinal conversion is needed to engender ambition and a commitment to improve the wealth-creating and quality-of-life capacities of the country without imperilling institutional integrity.

Conclusions

Universities worldwide are undergoing profound changes resulting from factors such as (a) new methods of teaching and assessment; (b) impacts of quality assurance and relevance assessments; (c) institutional mergers and closures; (d) competition for students and talented staff; (e) challenges to accessing sources of funding and variable degrees of financial resilience; (f) questions over the value for money of degrees; (g) publicity and reputation management; and (h) ownership of intellectual property and involvement in establishing successful spinout companies. In the modern era, innovation and entrepreneurship should lie at the heart of successful higher education. This means that teaching and research need to be reconfigured in many institutions so that a culture of enquiry and innovation is engendered in both students and staff. In addition, facilities must be made available for business incubator units and business or science parks. National, regional, and international links need to be established with (a) major international research centres, (b) manufacturing and marketing companies, (c) research-funding bodies, (d) venture capital and banking organisations, and (e) intellectual-property specialists.

Table 1. Examples of Rapidly Developing Innovative Technologies

Nearly all influence and advance all academic disciplines including the arts and humanities, as well as modifying national and regional economies and societies. Many technologies interact with other technologies and are cross-disciplinary, and underpin most entrepreneurial initiatives. Many provide regulatory challenges to governments, civil society, trade bodies, and the legal profession.
Agriculture, Horticulture, Food, Forestry, and Environment

- Precision agriculture
- Water-efficient and erosion-resistant agronomy
- Drone mapping, remote sensing, and interactions with ground equipment
- Accelerated breeding with high-throughput genotyping and phenotyping (phenomics) of improved food- and fibre-crop cultivars, livestock breeds, and trees. Temperature- and drought-tolerant crops and crops able to grow in high-salinity soils. Crops designed for uniform maturation and mechanical harvesting
- Mixed cultivar and mixed species sowing to reduce pest-and-disease resistance pressures and increase biodiversity in current monoculture crops
- Novel crop and livestock species for food and non-food uses
- Small-scale and mass production of synthetic (designer) foods, including cultured meat and fish products as well as meat, dairy, and fish substitutes
- 3-D printing of foods
- Private- and public-sector genebank and germplasm-collection technologies (removal of pests and diseases; complete genomic, proteomic, and phenotyping data; stable and monitored storage conditions; rapid multiplication, distribution)
- Soil improvement technologies (low-till and no-till systems; inorganic and microbial composition adjustments; structure improvement; strength improvement; organic matter enhancement; freedom from pests, diseases and weeds; drainage improvement; water retention modification etc.) and effects on crops
- Soil-free crop cultivation
- Protected cropping systems to diminish biotic and abiotic stresses (e.g. polytunnels with specific light transmission characteristics to modify growth and development and prevent insect attacks)
- Multi-storey/vertical crop cultivation indoors using LED and other types of lighting (photonics) of variable spectral compositions, radiant flux densities, and photoperiods
- Decision-support systems and predictive modelling for water-use and nutrient-use efficiencies, pests, diseases, weed control, and yield and wastage data
- New generation agrochemicals with minimal non-target environmental effects and without affecting flavour and nutritional value. There is a constant challenge for replacement active products to address tolerance and resistance to existing agrochemicals
- Automation for ground preparation, planting, protection, harvesting, storage, and processing crops and trees. Automation for livestock handling, growth monitoring, and welfare
- Specialist robotic planting, maintenance, and harvesting of soft fruit
- Rapid disease-free mass propagation of decorative and amenity species, trees, and shrubs
- Recyclable as well as biodegradable food wrapping with atmospheric composition control and absorptive qualities to impede microbial degradation
• Pre-gut and post-gut food-waste management technologies to extract nutrients, valuable compounds, energy, and fibre, and to remove odorous gases, pharmaceutical metabolites, heavy metals etc.
• Clean-up technologies in urban and factory environments, including bioremediation, waste exploitation for energy and recovery of metals, atmospheric scrubbing to remove pollutants and greenhouse gases, treatments with stable enzymes, and binding agents. Aggregation of nuclear waste and contamination in vegetation for harvesting and concentration. Deactivation of nuclear waste and reuse. Sterilisation and destruction of pathogens. Advanced oxidation sewage treatments to destroy excreted pharmaceuticals
• Factory-grown leather
• Habitat reconstruction/restitution – requires access to germplasm collections and gene banks of native species
• Construction of ecological dispersal corridors and refugia
• Monitoring of geneflow in flora and fauna
• Synthetic biology – artificial biological systems to produce non-food compounds and products normally obtained from agricultural, forestry, and from the natural flora and fauna
• Quantum biology – quantum coherence, tunnelling, and entanglement
• Enhancement of photosynthetic efficiency, principally the primary processes
• Perennial cereals
• Livestock cloning
• Regenics – regeneration of extinct cultivars, strains, and species
• Biofortification of staple foods
• Development of balanced livestock diets from competitively priced microbially based synthetic amino acids and fatty acids in order to reduce dependence on imports
• New forms of cross-laminated structural timbers
• Nanocellulose and cellulosic fabrics, coatings, and adhesives. Wood-based substitutes for plastics
• Biosecurity and biosafety technologies to control emerging pathogens, and foreign and invasive species
• Open ocean fish farming
• Selective breeding of corals to address tolerance of ocean acidification and warming
• Development of blockchain technology with timestamps and verifiable transaction data in open distributed ledgers operated by peer-to-peer groups with agreed protocols to ensure food provenance, traceability, and verification of quality and hygiene ratings.
Molecular genetics

- Rapid and accurate genome sequencing, and roles in parental and desirable gene selection, protection of intellectual property, monitoring gene flow etc.
- Gene and base editing, including use of artificial bases. Modification of evolution of life forms.
- New life forms. Bio/DNA foundries
- Epigenetics; intergenerational epigenesis
- Reverse and forward genetics
- Modification of organismal morphology, anatomy, chemical composition, and physiology for biotechnological, environmental, and medical projects

Artificial Intelligence

- Medical diagnostics, surgery, and healthcare, including management of complex diseases and conditions
- Crop, livestock, and tree decision-support systems for growth, reproduction, abiotic and biotic stress management, and breed and cultivar selection
- Voice and image recognition and understanding
- Legal documentation production and processing for different jurisdictions
- Prediction of judicial and arbitration decisions
- Spam and malware detection and prevention
- Knowledge acquisition, knowledge engineering, and knowledge representation
- Automated planning and scheduling; supply-chain management
- Simulation of conflicts and warfare
- Financial-management and asset-trading systems, book-keeping, and market monitoring. Fintech (financial technology) applications for automatic banking, insurance, trading, risk management, and cryptocurrencies
- Video-game technologies for education and training roles
- Machine learning and perception
- Algorithm development/training for greater sophistication, and removal of bias and unintended consequences
- Affective computing (social intelligence)
- Computational creativity
- Artificial general intelligence, machine consciousness, and superintelligence
- Risk assessments and regulation of AI (automation, unemployment, devaluation of humanity, military conflicts, avoidance of the technological singularity etc.). Prevention of malicious use of AI (manipulation of public opinion, damaging operation of public and company utilities – water, electricity, gas & other fuels, telecommunications, banking and financial management, hacking, acts of terror, fraud etc.)
Advanced Manufacturing, Construction, and Engineering

- 3-D printing, additive manufacturing, 3-D bioprinting, magnetically assisted slip casting, organ-on-a-chip, medical implants and devices, rapid prototyping, spacecraft and bridge technology
- Advanced automation for dangerous and/or repetitive production
- Computer-assisted (computer-aided) design, including 4-D, 5-D, and 6-D Building Information Modelling (BIM)
- Biotechnologically derived materials replacing materials derived from environmentally damaging mining, and replacing non-biodegradable plastics
- Renewable-energy generation and storage systems (wind, wave, tide, geothermal, solar, heat-sink, gravity-based, battery, synthetic fuels etc.)
- Electric battery technology
- Graphene coatings
- Kangome metals
- Recycling of the 17 rare earth metals (15 lanthanides, scandium, and yttrium) and cobalt, and development of alternatives
- Recovery and recycling of other metals, minerals, and plastics
- Robot tailors
- Geoengineering
- Small nuclear-power generators
- Virtual- and augmented-reality systems
- Automated autonomous mass-transport systems
- Aircraft, vehicle, and boat propulsion systems
- Environmental sensors (gravity, magnetic force, solar radiation, earthquake, volcano, tsunami, tide, wave, wind, temperature, gaseous composition, chemical composition, water, ionising radiation, spectral composition, movements, sound, contaminants, photosynthesis, heterotrophic living organisms etc.)
- Tunnelling and tunnel-lining machines
- Rapid-build roadway systems; automated road-repair systems
- New bridge systems
- Water-purification systems
- River-catchment and flood-prevention engineering to address rising sea levels and building on flood plains
- Rapid-build energy-efficient domestic housing units with earthquake and unstable-ground resilience
- DC regional electricity grids; minigrids for locally produced electricity; interconnected supergrids
- Robotics – construction, programming and use initially to replace humans in repetitive and/or dangerous functions. More sophisticated functions associated with machine learning and more advanced AI. Robots for use in all industries, medicine and healthcare, the domestic environment, and defence. Engineering cybernetics
- Miniaturised gas chromatography – mass spectrometers and nuclear magnetic resonance spectroscopy instruments
- Super-bright X-ray lasers
- Ocean floor mining

**Nanotechnology**

- Nano is a functional prefix for industries, activities, disciplines, and products including catalyst substitutes, electronics, foods, ionics, machines, materials, medicine, lithography, robotics, toxicology, tribology etc. where matter is manipulated at the atomic, molecular, and supramolecular levels
- Development of the mechanical, electrical, thermal, and optical properties of carbon nanotubes and their roles in nanotechnology engineering
- Bionanotechnology, tissue engineering, nucleic-acid nanotechnology
- Molecular and supramolecular self-assembly
- Quantum dots
- Technological developments for risk assessments and regulation of nanotechnology

**Human and Veterinary Medicine**

- See other sections
- AI and near-Al in diagnostics and decision-making (prognosis and treatment)
- Digital therapeutic health apps for smartphones (digiceuticals)
- Radiosurgery and robotic surgery
- 3-D printing for medical and dental implants
- Medical imaging including variants of magnetic resonance imaging, positron emission tomography, ultrasonography, elastography, photoacoustic imaging etc.
- Brain-computer interface technologies
- Wearable magnetoencephalography scanners
- Mind mapping, automated brain testing, and neural engineering and implants
- Cybernetics and computational neuroscience. Cortical computing algorithms
- Multispectral analysis of tissue morphology
- Pharmacokinetic and pharmacodynamics methods of severe pain control. Ultrasound-triggered local anaesthesia. Sphenopalatine-ganglion signal blockers
- Transdermal biosensors
- Stem-cell-based tissue engineering and replacement organs and joints
- Induced pluripotent stem cells for regenerative medicine
- Gut microbiome engineering
- Gene therapy
- Telomere engineering
• New-generation vaccines including anti-opioid vaccines
• Multi-specific antibodies and antibiotic mixtures
• Activation immunotherapies and stimulation of immune effector cells
• Pharmacogenomics and combinatorial chemistry for pharmaceuticals
• Psychopharmacology
• Early detection, treatment, and prevention of infectious and parasitic diseases
• Tooth restoration and regeneration. Tooth implantation with digital alignment and bone restoration
• Complement cascade immune-system strategies and retinal replacement patches for age-related macular degeneration

Physics, Computing, and Telecommunications

• Particle accelerators and quantum mechanics
• Quantum computing with programmable quantum processors and reduction in machine error rates and improvement in qubit quality. Quantum coherence, tunnelling, and qubit entanglement. Hybrid photon-atom (“polariton”) generation
• Higgs boson particle production facilities
• Atomic force microscopy
• DNA-code-based data storage
• Computer software engineering and cryptography
• Renewable space rockets and new space propulsion systems
• Nano and small satellites. Satellite interferometry and deformation mapping
• Satellite prospecting and mapping of managed and natural vegetation and minerals on earth, and extra-terrestrial minerals
• Astrophysics and astrobiology; exoplanet missions
• Development of 5G technology
• Counter-measures for (a) abuse of the democratisation of information via the internet; (b) invasion of privacy; (c) guerrilla drones; (d) cyber-attacks; (e) disinformation
From Teaching to Learning and Innovating

Talal Abu-Ghazaleh
Dr. Talal Abu-Ghazaleh is widely recognized as a philanthropic businessman at the leading edge of change. As Founder and Chairman of the Talal Abu-Ghazaleh Organization (TAG-Org), he has built up an international company operating out of 110 offices to become a formidable global provider of professional and educational services.

His longstanding commitment to education and training of Arab workers, youth and women, has resulted in significant progress during his lifetime in professional services such as accounting and financial services, intellectual property law and others. That commitment to education was driven by one fundamental objective, which was to contribute to the socioeconomic development of the Arab World.

He was one of the early enthusiasts and proponents of the Internet and related information and communication technologies (ICTs), serving on the United Nations Information and Communication Technologies Task Force, where he was an outspoken advocate of the power of ICTs to promote development and their power to deliver greater equality of opportunity for citizens in developing countries.

Dr. Abu-Ghazaleh’s vision is to establish world-class education a human right for all people; his commitment to this vision led him to create the Talal Abu-Ghazaleh University (TAG-UNI), a virtual gateway to the world’s best education, promoting global citizenship and individual responsibility, the Talal Abu-Ghazaleh Graduate School of Business (TAGSB), which is the first school of its kind in the Arab world and in Bahrain, the Talal Abu-Ghazaleh University College of Business established in 2012 with the aim of developing future business leaders.

His latest is a unique concept in the field of education: Talal Abu-Ghazaleh University College for Innovation (TAGUCI), an entity where no student will graduate from unless they innovate a new ICT related product or service.

His pioneering work has been recognized by a number of global institutions, including the United Nations, World Trade Organization and the International Chamber of Commerce to name just three, with Chairmanships to advisory boards and working groups charged with helping to shape the future.

Dr. Abu-Ghazaleh has been awarded a host of orders and medals with high honor including: the Order of Commander of Civil Merit by King Philip VI, King of Spain (2018), the Order of Independence of the First Class by His Majesty King Abdullah II (2016), the Legion of Honour Chevalier de la Légion d’Honneur from Mr. Robert Mitterrand, France (1985), Decoration of the Republic of Tunisia from His Excellency President Habib Bourguiba, Republic of Tunisia (1985), Honorary Award for Enhancing the Sino-
Arab Relations from HE Mr. Xi Jinping, President of the People's Republic of China, Egypt (2016), Presidential Decoration presented by General Emile Lahoud, President of the Republic of Lebanon, Lebanon (2001), Decoration of King Salman Bin Abdul Aziz, KSA (2012), and Decoration of Creativity in Innovation and Digital Transformation from Regional Donor Organizations, Bahrain (2016) in addition to others.

Born on April 22nd 1938 in Jaffa in Palestine, Dr. Abu-Ghazaleh received his Bachelor of Science in Business Administration from the American University of Beirut and has five Honorary PhDs from Canisius College, Buffalo, USA, Bethlehem University, Palestine, Mutah University, Jordan,

**Abstract**

With a special focus on increasing the current low levels of innovation and intellectual property production in the Arab region, this talk will tackle how to build a culture of innovation and entrepreneurship stressing on education as a fundamental human right.

The presentation will pass through history, present day and future vision starting with the great Arab educators and innovators who revolutionized the world through their academic prowess and innovation to the urgent need of attractive environments for technology investments and innovation and a need for great Arab innovators that can produce the next Google.

To nurture Arab scientists, Arab innovators and Arab thinkers who are loyal to their home countries is urgently needed to build a legacy and create an ecosystem which can serve the digital revolution with the help and support of the governmental bodies, academic institutions and the private sectors.
Can Universities in the Arab Region Become the Engines for Knowledge and Innovations?

Adnan Badran
Can Universities in the Arab Region Become the Engines for Knowledge and Innovations?

Adnan Badran* and Serene Badran**

* Professor of Biology & Chancellor, University of Petra, Amman, Jordan
** Faculty of Dentistry, University of Jordan, Amman, Jordan

Dr. Adnan Badran is currently the Chairman of the Board of Trustees of the University of Jordan and Chancellor of the University of Petra. He is a biologist with 120 publications, including 22 books and 4 patents. He was awarded Honorary Doctorates from Sungkyunkwan University, Seoul (1981) and the Michigan State University (2007 and an Honorary Doctorate in Business from the Yarmouk University, Jordan (2014). He was also awarded the West Watkins Distinguished Lectureship Award (2009) and the Hall of Fame Award from Oklahoma State University, USA; the Honorary Professorship from L.N. Gumilev Eurasian National University Kazakhstan (2012);

He was awarded the Arab Thought Foundation for Best Arab Scientist in Higher Education Research (2005), the TWAS Regional Prize for “Building Scientific Institutions” (2009), the World Education Asia award for Outstanding Contribution to education (2011), and the Shoman award for Peer Review of Young Arab Scientists.

Dr. Badran is a former Prime Minister of Jordan (2005), former Minister of Agriculture and former Minister of Education. He joined the UNESCO as Deputy Director-General of UNESCO (ADG) (DDG) from 1990-1998; Senator and Chair of the Senate Committee on Science, Education and Culture, and President of the National Centre of Human Rights of Jordan, and President of the Asia-Pacific Forum on human rights, Sidney (2009-2011). He is a Fellow and vice-president of the Academy of Sciences for the Developing World (TWAS), and fellow of the Islamic World Academy of Sciences and the Arab Thought Forum, also, President of the Arab Academy of Sciences, and President of the Board of the AFED in Beirut.

Dr. Badran received his BSc from Oklahoma State University (1959), and MS then PhD degree from Michigan State University, USA (1963).
Abstract

Entrepreneurship and innovation have become the power of knowledge economy for handling economic instability in the 21st century. Start up companies of commercialized delivery of R&D are driving economies to compete globally for the marketplace.

Although the Arab region houses more than 800 universities, the culture of building knowledge and innovation is lacking. Higher-education institutions in the Arab region have the infrastructure and resources to support a culture of innovation, but they are not operating together to develop the necessary critical mass among fragmented institutions that operate in isolation, while others lack governance and sound management of financial and human resources to move ideas of students and faculty to maturity. In this weak environment, institutions are not effectively moving from the current culture of traditional university “business as usual” into a entrepreneurial and innovative climate. To remedy the situation, institutions of higher learning need to set a policy of change to adapt the institution toward an R&D culture and to develop proactive collaborative partnerships to spark innovative ideas, incubate them in catalyzing environments, and attract business firms for employing a well-educated workforce, opening new opportunities of employability, and creating wealth by value-added enterprises to raise the GDP of nations.
SESSION I

Chair: Wajih Owais
Dr. Wajih Owais obtained his Ph.D. in Molecular Genetics from Washington State University, USA, his M.Sc. in Biochemistry from the University of Jordan and his B.Sc. in Biology from the American University of Beirut, Lebanon. He started his academic career as an Assistant Professor, then Associate Professor and Professor at Yarmouk University, Jordan. Currently, he is a Senator at the Senate House of Jordan. He served as the Minister of Education, Jordan (11-10-2012 to 30-3-2013), and Minister of Higher Education and Scientific Research, Jordan (9-2-2011 till 17-10-2011; 2-5-2012 till 10-10-2012; 11-10-2012 till 30-3-2013).

Dr. Owais was the President of Jordan University of Science and Technology, Jordan (2003-2011), Vice President of the same university (1998-2003). He also served as the Dean of Faculty of Sciences at Yarmouk University, Jordan (1994-1998).

Dr. Owais served on several international, regional and national committees including the Scientific Committee of the Institute of Tropical & Subtropical Agriculture, Czech University of Agriculture, Czech; the Arab Regional Secretary-Committee of Science and Technology in Developing Countries (COSTED); the Education Council, Jordan; The Board of trustees of king’s Abdullah II Fund for Development (KAFD), Jordan; Advisory Committee for Education, Higher Education and Scientific Research, Jordan; Advisory Royal Committee for Developing Education.

Dr. Owais was the advisor for more than 45 graduate students and served on the examining committees of more than 90 students. He published over 35 scientific papers in international journals.

Among the awards that Dr. Owais was granted are the “commemorative medal” and “sculpture of honor” by Czech University Agriculture, Czech and a Doctoral Honorary Degree from New York Institute of Technology, USA.
A Culture of Innovation and Entrepreneurship

Quintin McKellar
University of Hertfordshire
Hertfordshire, United Kingdom

Dr. Quintin McKellar has been the Vice-Chancellor and Chief Executive of the University of Hertfordshire since 2011. He is chair of the Board of Trustees of the Pirbright Institute and a member of the Hertfordshire Local Enterprise Partnership and chair of the Hatfield Renewal Project Board. In 2015 he was elected as a Board member of Universities UK (UUK) and is also chair of the University Vocational Awards Council. He has been a member of the government’s Apprenticeship Stakeholder Board since 2016 and has chaired the Higher Education Funding Council Apprenticeship Grants Panel. Since 2018, he is also a Non-Executive Director of the Centre for Innovation Excellence in Livestock.

Dr. McKellar was made a Commander of the Order of the British Empire (CBE) in 2011 for services to science. He was a distinguished researcher with interests in the pharmacology of anti-infective and anti-inflammatory drugs in domestic animals.

He graduated from Glasgow University Veterinary School in 1981, and went on to gain a PhD in Veterinary Parasitology in 1984. In August 1997 Dr. McKellar took up the post of Scientific Director of the Moredun Research Institute and Chief Executive of the Moredun Foundation. In 2004, he was appointed Principal of The Royal Veterinary College of the University of London.

Abstract

Creating a culture of innovation and entrepreneurship within the university sector may be considered to have two important objectives: the first is to create that culture within the academic and professional staff of the institution thus engaging the business community more effectively. This aspect has been considered previously in a ‘Higher Education in the Arab World’ conference [1] and has been shown to be critical to the innovative health and financial sustainability of the university sector. The second objective is even more important. It involves the innovation and entrepreneurship of the current students and recent graduates produced by universities. In the US, high-growth businesses have been shown to have upwards of 95% graduate employees, 45% of whom also hold advanced degrees [2]. On the other hand, businesses that lag behind in productivity in the UK have been shown to be those with fewest graduates [3].
Graduates are clearly good for business and the economy, and this presentation will make the case that their contribution can be enhanced further by specific enterprise and entrepreneurship education. Enterprise education might effectively change the mindset or attributes of a graduate toward improvement and innovation; this could lead to the creation of new business or improvement within a business or in a broader community, society or environment. It is best embedded fully within curricula and can be effectively taught through experiential action learning. It is applicable across all disciplines and subject areas. Entrepreneurship education should confer the skills, knowledge, and attributes helpful for the establishment of a new business. It can be taught by traditional educational methodology including didactic lectures and may comprise bolt-on modular sessions. It is most often taught specifically within a business school and embraces essential libertarian philosophy about the freedoms to create wealth in private-sector enterprise. The case supporting ‘teaching’ or ‘education’ in either enterprise or entrepreneurship is strong although it may be more appropriate to use terms such as ‘nurture’ or ‘encourage’ since both are likely to reap more fertile rewards in those already inclined towards them by culture and upbringing.

Education has evolved from that which mainly exercised the mind to think and reason with no particular objective outcome to education for the professions, initially medical and legal but now much more comprehensively, to vocational education with sandwich and placement periods contributing to practical work based learning, to experiential learning with simulated environments within universities and now almost by way of full cycle to degree apprenticeships and accreditation of work based activity. As occupations evolve, and in some instances disappear, it is going to be important that vocational education embraces intellectual flexibility and effectively incorporates enterprise and entrepreneurial education to deliver a more productive society.

References
1. McKellar Q (2018), Business Engagement is no Longer and Optional Extra for Universities, Higher Education in the Arab World, Beirut 2016
The Role of University-Industry Partnerships in the Development of Science Parks

Malcolm Parry
Surrey Research Park
Surrey, United Kingdom

Dr. Malcolm Parry gained a BSc Hons in 1972, PhD in 1977 and PGCE 1977 from the University of London after which he took an academic post at the University of Surrey in 1977. He moved from his academic post in 1983 to create for the University its Surrey Research Park. He has been active in supporting the commercialization of science and technology for over 35 years.

He has written and lectured extensively on the subject while also gaining commercial experience through starting and selling two companies. He continues to run the Surrey Research Park while also acting as an expert for UNESCO, the WTA, the UK Science Park Association, which he founded with colleagues in 1984 and is an active member of the International Science Parks Association.

He has also been active in the business community in his region for more than 35 years and was honored in 2006 with an OBE by Her Majesty Queen Elizabeth II for his work on Education and Industry links.

Abstract

There is now a worldwide shift in thinking about universities because it is clear that although scientific work and entrepreneurship are entirely different, it is entrepreneurship, which is now giving science its modern economic significance not the other way around.

This shift of view has become more influential because the value of knowledge in all economies is becoming increasingly important.

To respond to this there is both a commercial imperative for all companies to look forward to ways of driving innovation in their business and for government to resolve some of emerging challenges in what is being described as the 4th industrial revolution. Many universities are also interested in extending their traditional role of research and teaching by taking on the additional responsibility of community development.
A consequence of these imperatives is the increasing importance of what started as simple science parks. These and their more recently named derivatives have been evolving over the last 60 years. Today there are many variants but the broad principles behind these remain the same.

In essence these developments are places where there is some degree of risk sharing between the host organization and the entrepreneur led businesses (tenants) that locate on these sites.

For tenants the benefits include access to the physical assets and services in these locations where they can experiment with the innovation process. Other benefits include: support for business development from pre-revenue incubation through stages of scale-up; remaining on a single location where there is the opportunity to grow and retain continuity with staff, networks and customers; leveraging their location in terms of image and reputation; and there is access to a pool of talent and technology. All of these benefits are intended to give tenants a competitive advantage.

The benefits to the host include: the potential of some financial return on building; gaining access to companies for collaborative research; and finding student placements and employment. In addition, over time, these sites can also help to build clusters and benefit from the emerging idea of smart specialization and entrepreneurial discovery.

The provision of incubation also creates the opportunity to engage with large corporations that operate ‘techquisition’ strategies, as part of their open innovation policies, if they leave the acquired companies as tenants on the site.

The benefit for government is that by harnessing the process of entrepreneurial discovery it can help to widen the responsibility of creating the necessary fertile environment and fulfilling some of the path dependencies for the relationship between these three stakeholders to be successful.
Dr. Sultan Abu-Orabi is an organic chemist who obtained his BSc in Chemistry in 1973 from the University of Jordan and his PhD from the University of Michigan-Ann Arbor, USA in 1982.

He is the Secretary General of the Association of Arab Universities since 2011, which has its headquarters in Amman, Jordan. Dr. Abu Orabi previously served as President of different Universities: Yarmouk University (2009-2011), Jordan’s second largest public university; Tafila Technical University in Jordan (2005-2009) and Irbid National University (2001-2005).

He also was President of the Jordanian Chemical Society and President of the Arab Union of Chemists. He was a visiting Professor at Bahrain University (1989-1990) and King Fahd University for Petroleum and Minerals, Saudi Arabia (1990-1993 & 1996-1998).

Dr. Abu-Orabi is Editor-in-chief of many international journals, and is a member of many editorial boards. He is also member of the board of trustees of several local and international universities.

He organized, served on advisory boards, and presented lectures at hundreds of international conferences.

He participated in over 150 conferences at the national, regional and international levels, organized over 20 national and international conferences in Jordan and Arab countries, and served on many International Advisory Boards. He also acted as chair or member of the Scientific and Organization Committees of several national and international scientific meetings.

He was awarded the Shoman Prize for Young Scientists – Jordan, in 1988; Alexander Von Humboldt fellowship, Germany 1989, 2013 and 2018; “Badge of Honor Medal” presented by the International Scientific Partnership Foundation, Russia, for the Development of Science in Jordan and Arab countries and International Collaboration, 2007; “Jewels of the Muslim World” Award for ‘Top Movers of the Islamic Economics’, Kuala Lumpur, Malaysia, presented during the 2nd Muslim World Biz Conference, June 2011 and Fellow of the Royal Society of Chemistry, UK 2011, and recently he was awarded the Honorary Fellowship from Cardiff Metropolitan University, UK 2017.

He published over eighty papers throughout his career spanning thirty-five years. He supervised and served on examining dissertations of more than seventy MSc and PhD students in Jordan, the Arab World, India and Europe.
Abstract

Higher education in the Arab world goes back to the date of early Islam where several schools were established i.e. Al-Zaytounah (Tunisia, 734 AD), Al-Qarawiyyin in Fez (Morocco, 859 AD), Al-Azhar in Cairo (Egypt, 970 AD) and Al-Mustansir yah (Iraq, 984 AD). Those universities are considered to be the first universities in the world ever established (even before the first European University – Bologna University, 1088 AD), and most of them were funded by the Islamic waqf (endowment).

In modern history, higher education in Arab countries is considered relatively recent. Until 1953, only 14 Universities existed. In Lebanon, there were three institutions: the American University of Beirut in 1866, Saint Joseph in 1875 and the Lebanese University in 1951.

During the last thirty years, private universities increased in the Arab world and absorbed around 30% of students enrolled in higher education. At present, there are more than 1,000 universities in the Arab world, 40% of them are private ones.

The total number of students in Arab universities is estimated to be around 14 million, with 250,000 faculty members. The number of undergraduate students constitutes 90% of the total students number and only 10% of them are graduate ones. The percentage of female students is more than 55% of the total enrollment. Scientific fields are considered to take 25% of the total number of students, where humanities and social sciences take 75%.

The Arab universities are facing many challenges: overcrowding of students, lack of a clear focus in research priorities and strategies, low quality of infrastructure for research, inadequate networking opportunities and databases, limited international collaboration and the brain drain of the most qualified students and faculty members.
Research, Innovation and Ethics as a Cornerstone for the Added Value of Higher Education in Lebanon

Mouin Hamze
National Council for Scientific Research
Beirut, Lebanon

Dr. Mouin Hamze obtained his “Doctorat d’Etat - Es Sciences” from the University of Montpellier, France. He started his academic career at the Lebanese University where he established the Faculty of Agricultural Sciences and acted as its Dean from 1985-1997. He was concurrently acting as Chairman of the Lebanese Agricultural Research Institute. In 1998, Dr. Hamze was appointed Secretary General of the CNRS-L, where he has given special attention to the launching of research and capacity building programmes including: the Ph.D. Scholarship Program, the Joint Grant Research Program, the Associated Research Units Programme, and the Research Excellence Award in Lebanon. Since 2006, he has developed and implemented a fundamental science policy programme for Lebanon, while in 2016 he has lead an initiative to develop the Charter of Ethics and Guiding Principles of Scientific Research in Lebanon, which was recently confirmed as the basis for a regional Arab charter. Dr. Hamze has authored several books and scientific papers; lead EU and international projects, chaired numerous international and regional meetings; and has been actively involved in several international organizations, including: CIHEAM, IAEA, COMEST-UNESCO, ICARDA, ESCWA Technology Centre (ETC), AUF, PRIMA-EU… In recognition of his work, Dr. Hamze received two Doctor Honoris Causa from the University of Haute Alsace and from the University of Montpellier and was distinguishly awarded by France and Italy.

Abstract

A lot of evidence suggests that what the Arab countries are facing today is attributed to a failure to invest, adapt and reproduce knowledge in order to achieve the goals of comprehensive and sustainable development. Over the past decade, the higher education and research environment in the Arab Countries and in Lebanon in particular is characterized by a number of positive developments, including: formulation of policy documents, wider opportunities and higher enrollment in higher education, increased publication, the adoption of modern standards of quality and excellence, and the pursuit of better international classification.

However, a deeper look and analysis reveals a number of limitations and weaknesses, including: "one-size-fits-all" policies; a focus on ‘for profit’ higher educational institutes, limited investment of research in outputs, discontinuity between institutions of higher
education and institutions of research on the one hand and the productive and service sectors on the other; scarcity of studies in the social sciences; and limited cross-sectorial cooperation.

Despite some frustrating evidence, there are a number of bright points and well-established initiatives in the Arab World to build on. How we build on these in the decade to come will have important effects on enhancing a knowledge society in our region. These include, mainly: linking scientific research to comprehensive and sustainable development; increasing the support of the private sector to scientific research; enhancing research in the field of social sciences and their application; enhancing ethical and best practices in research; building on positive trends of women’s participation in the fields of science and technology; building on opportunities of international and regional cooperation, and mitigating the impact of artificial intelligence on jobs in the coming decade.

Through its Mandate, the National Council for Scientific Research – Lebanon (CNRS-L) works towards initiating, guiding, and supporting research, working towards enhancing research opportunities, capacity building and human resources development programmes. With a focus on collaborations and partnerships – with universities, stakeholder and decision makers – as a key opportunity for creating, sharing and utilizing knowledge; the CNRS-L works through well-established networks and partnership agreements to deliver quality and credible research (both basic and applied) for creating a critical mass in innovative fields with high impact outcomes for serving the community.
SESSION II

Chair: Hani Mourtada
Dr. Hani Mourtada got his Medical Degree from Damascus University in 1965. He has an American Board in Pediatrics, F R C P (Canada) and a subspeciality in infectious diseases. He is a Professor of Pediatrics at Damascus University. He was also the Head of the department of Pediatrics from 1985 to 1990.

Dr. Mourtada was the Dean of medical school and President of the Arab Board for Pediatrics from 1990 to 2000. He was the President of Damascus University from 2000 to 2003 and the Minister of Higher Education from 2003 to 2006.

Dr. Mourtada is currently the President of the Syrian Pediatric Society and the President of the Board of Trustees of the Syrian Private University since 2009.
Innovation and Entrepreneurship in Higher Education: Enhancing Achievement of SDGs

Mohammad Hamdan
The Senate House
Amman, Jordan

Dr. Mohammad Hamdan received his BSc in Mathematics (with honours) from Cairo University in 1957, and PhD in Mathematical Statistics from Sydney University in 1963.

He was appointed Senator at the Upper House of Parliament in Jordan in December 2007 by a Royal Decree. He served as Minister of Higher Education and Scientific Research in Jordan for three terms, and as Secretary General of the Higher Council for Science and Technology from September 1998 - July 1999.

He joined the Arab Open University as Rector and Founding Member from 1999 - 2001 and as Senior Advisor from October 2001 - August 2002. He had to leave the University to serve as Minister of Higher Education and Scientific Research from September 2002 - November 2003, but immediately after his term ended, he was re-appointed Senior Advisor of the Arab Open University, a post which he still holds today.

Besides the Arab Open University, Dr. Hamdan is currently Senator at the Upper House of Parliament in Jordan, Vice President for the Jordan Academy for Arabic Language and Vice President for the World Academy of Science/ Arab Region (TWAS), President of the Union of Arab Statisticians. He was also President and Founding Member of two public universities in Jordan: the Yarmouk University and the Hashemite University.

Earlier in his career, he held several posts at the University of Jordan including Professor of Mathematics, Dean of Faculty of Science, Dean of Scientific Research and Dean of Student Affairs.

At the academic level outside Jordan, Dr. Hamdan served as Faculty Member (Assistant Professor, Associate Professor, and Professor) at the American University of Beirut (Lebanon, 1965 – 1976), and as Visiting Professor of Mathematics at the American University of Cairo (Cairo), the Virginia Polytechnic Institute and State University (USA), and Riyadh University (Saudi Arabia).

In terms of academic research, Dr. Hamdan is Member of the Editorial Board of several research journals. He supervised several PhD dissertations and MSc thesis throughout his career, and was keynote speaker in numerous scientific conferences; and provided national and international consultations in the areas of mathematics, mathematical statistics, education and higher education. He is also member of several academic and cultural institutions, particularly: Arab Thought Form, Islamic Academy of Sciences (IAS).

He published numerous papers on mathematical statistics.
Abstract

Naturally, advances in education, higher education, and information and communication technology are considered to be great achievements in human endeavor. Besides, it is also natural to expect that such advances will enhance our aspirations to meet a number of the Sustainable Development Goals (SDGs), particularly SDG4: “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”. Needless to say, education is a fundamental goal that contributes to the fulfillment of several other goals of equal importance. As such, higher education is a major factor in poverty alleviation, SDG1: “End poverty in all its forms everywhere”, through enhancing job opportunities, SDG8: “Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all”. Besides, it has been demonstrated that illiteracy and poverty are two major factors that produce poor health and poor social development, SDG3: “Ensure healthy lives and promote well-being for all at all ages”. It is also known that low literacy impacts on mortality and quality of life.

In this presentation, we shall demonstrate fundamental changes in education and higher education, particularly in innovation and entrepreneurship, which are needed in order to contribute to the achievement of the SDGs. In this context, some ethical considerations are discussed, and some exemplary SDG4 innovative projects are presented.
The Role of Faculty Members in Building a Culture of Innovation and Entrepreneurship in Higher Education: The Case of the Australian College of Kuwait

Isam Zabalawi and Sam Toglaw
Australian College of Kuwait
Safat, Kuwait

Dr. Isam Zabalawi was born in Amman, Jordan (1950). He received his BSc Hons with distinction in electrical engineering (communications) in 1974 from Cairo University (Egypt), and his MSc with distinction in Microwave Communication Engineering and his PhD in Electrical and Electronics Engineering, both from Leeds University (England) in 1979. He was granted The Leeds University award for graduate studies for the three years 1976 - 1979.

Dr. Zabalawi is specialized in analog and digital signal processing and communication techniques. His interests include: communication industry, information technology, and technology transfer and higher education development and reform.

Dr. Zabalawi was the president of the Arab Academy for Banking & Financial Sciences from 2009 until 2016. He was the founding President of the International University for Science and Technology (IUST) in Syria 2005-2007 and was a higher education consultant for several companies (Trans Middle East Int. distribution Co – Eduhouse Int .Co, MMG of Austria and Shepherd Tech of the USA). Dr. Zabalawi became the Minister of Higher Education and Scientific Research in Jordan (2003-2005) and was the Chancellor of the University of Sharjah (1999-2003). In 1999 he became the Chairman of the Higher Education Accreditation Council of Jordan. In 1996 he became the Vice-President (Scientific and Medical Faculties) of the University of Jordan. In 1994 he headed the Electrical and Electronics Engineering Department of the College of Engineering at Sultan Qaboos University, Sultanate of Oman. Between 1989-1993, he served as the Dean of the Faculty of Engineering and Technology at the University of Jordan, Amman, Jordan. Prior to that he chaired the Department of Electrical and Electronic Engineering at the University, where he taught a number of courses in his field at the undergraduate and graduate levels and supervised a number of graduate theses. Dr. Zabalawi is a part-time professor at the University of Jordan and the German-Jordanian University.

Dr. Zabalawi was the founding minister for establishing the German-Jordanian University in Jordan. He was the founding minister for establishing the Jordanian National Scientific Journals in the various disciplines.

Dr. Zabalawi was an active member in the Jordan higher education and reform development team. He has organized and chaired a number of regional and international conferences and workshops. He is a well-published research scholar. He was a research fellow with the German Academy of Exchange (DAAD) at the
University of Karlsruhe, the Technical University of Hamburg, and the University Of Erlangen, Germany. In addition he was a research fellow at the Electrical Engineering Department at the University of Victoria, Victoria, Canada and research fellow with Telenokia, Helsinki, Finland.

Dr. Zabalawi served as the Council Representative for Jordan and the Gulf States at the Engineering Council, UK (1993-1999). He is a chartered engineer (CEng) and Eur-Ing with the European Union, Fellow (FIET), Institute of Engineering and Technology, (IET) UK and senior member at the IEEE (Institute of Electrical & Electronics Engineers, New York, USA. He is a member of many technical societies. He was chair of the IEEE section of Jordan (2012-2014) and a member of the Jordan IET executive committee. He is also member of the Jordan Engineering Association since 1974. Currently he is the chairman of the HEREs (Higher Education Reform Experts) with the European Union Program ERASMUS+ in Jordan.

Dr. Zabalawi is a member of the Arab Thought Forum and a member of the World Affairs Council (Jordan).

**Abstract**

The field of entrepreneurship education witnessed accelerated advancements in the last two decades with a trend toward a university-wide entrepreneurship education. The number of schools teaching entrepreneurship in terms of new venture creation has grown from about twenty schools in the United States to more than two thousand schools in just two decades (Morris et al 2004). Moreover, students who took courses in entrepreneurship and product innovation were more likely to be self-employed and launch either business startups or social enterprises.

There are pedagogic difficulties in teaching entrepreneurship because it is an active process rather than stasis. And it is a creative and challenging journey to establish a small business or to commercialize a new idea. It must be exercised practically overtime. Conventional colleges or university education provides only a glimpse or a snapshot of this process (Jack and Anderson, 2016).

Teaching entrepreneurship aims to provide the acquired "knowledge" (i.e. science) and "skills" (i.e. ability and tactics). The skills are fundamental to implement the acquired knowledge and transform ideas to real enterprises. Obviously this hinders the use of the more traditional approaches to teaching and learning.

It is also important to make a distinction between “building” and “fostering” a culture of innovation and entrepreneurship. Building a culture is a task of the executive management of the college or the organization. It is instilled by the top leadership then seeps through the whole organization. On the other hand, fostering a “culture” requires nurturing and encouraging activities that allows it to grow.
Faculty members’ personal attributes or qualities are important determinants of their abilities to promote and cultivate a culture of innovation and entrepreneurship among the students. According to our qualitative research, Faculty members should be self-motivated and passionate about innovation and entrepreneurship. Passion and motivation are transmitted to students through reciprocal influence, likewise other attitudes such as commitment, dynamism, perseverance and diligence are required. The work of Bandura (1986) explains this influence through reciprocal determinism which states that a person’s behavior can be conditioned by the social environment and other factors related to mutual influence.

The Australian College of Kuwait (ACK) provides an example of creating and fostering a culture of innovation and entrepreneurship. Founded in 2004, it was one of the frontier private colleges in the Gulf region which adopted a pedagogy based on applied education and hands-on experience with strong links with the industry. The “two plus two” system adopted by the college enables students to get a diploma after finishing the first two years then a bachelor degree after finishing a total of four years. The college has four schools, the School of Engineering, School of Business, the School of Aviation and the School of Maritime.

The applied education system in ACK is structured on problem and project based learning (PBL) to foster innovation and entrepreneurship. It is reinforced by supporting activities and links to the industry. Assessments are designed based on real problems. In many cases these involve real clients. Students are required to apply the knowledge acquired in class (i.e. theoretical part) in a real context. This involves the utilization of various important skills such as team work, critical thinking, problem solving and decision making. Students working in groups face different views and learn to solve intellectual conflicts and reach the optimum solution.

The curriculum encourages students to experience internship with various employers in industry in order to be exposed to real work environment. Students are also given the chance to meet real clients and present to them proposed solutions to a selected problem based on the knowledge and skills provided by the ACK curriculum. Finally, during the academic year, students have various opportunities to do extra-curricular training such as listening to visiting experts from the industry and go on field trips that expose them to the latest developments in the market.

In addition to the above, ACK participates in and organizes annual entrepreneurship competitions for startups and SME’s. Students from different schools present their business ideas to a jury of judges. Prior to that, students spend at least fourteen weeks (i.e. one semester) under the supervision of their faculty members and mentors to learn how to capture opportunities and develop new business ideas that add value to various industries. Students practice creativity, business analysis and operation management. Through teamwork they elevate their stamina, motivation and commitment to one common goal.
These activities contribute to the development and growth of important precursors of innovation such as critical thinking, observing and reflecting skills, brainstorming, problem solving and intellectual creativity. The above activities contribute to the progression of entrepreneurship skills such as decision-making, calculated risk-taking, inner passion, commitment, patience, self-leadership and integrity.

For ACK, the role of the faculty members in building and fostering a culture of innovation and entrepreneurship is evident through their involvement as a situational leader in the class who interacts with the students according to the changing demand of the class. He or she applies different modes of delivery and inspires the students to think critically and creatively. For example, in ACK’s Business school, faculty members apply the Socratic Method of teaching based on asking and answering questions to stimulate critical thinking and to draw out ideas through argumentative dialogue between individuals. Furthermore, in professional development courses, computational thinking is taught as a problem solving process that includes a number of dispositions to break down problems into smaller ones and express solution(s) in a flowchart in such a way that a computer program can be written to solve it.

The experience of faculty members in applied education and new didactic techniques based on active learning and interaction with the industry is an essential factor in fostering a culture of innovation and entrepreneurship.

References


The Australian College of Kuwait website: www.ack.edu.kw
Abstract

“Moore’s Law” states that the rate of technological enhancement increases exponentially over time. This classic law has been documented and validated by some of the world’s top scientists [1]. Because of this increasingly rapid evolution, the need for innovators who have the entrepreneurial mindset to develop and harness new technology has never been greater. These innovators must not only lead the discoveries but also translate new knowledge into products and services that benefit society and tackle tomorrow’s challenges. And the future challenges will certainly be great and will include challenges that we as today’s leaders, do not yet fully comprehend. Therefore, educators of today must prepare uniquely-skilled, agile innovators and engineers to meet the challenges of tomorrow [2].

To this end, educators are rising to the challenge and are optimizing the required educational criteria, instructional methodologies and high impact practices for our students. For example, ABET, the accrediting body for engineering programs, has updated the criteria for accreditation to include problem-solving, communication, teamwork, self-assessment, change management and lifelong learning skills [3] which are key components of the entrepreneurial mindset [4-6]. In addition, there is renewed focus on integrating new instructional methods, both in K-12 and higher education that have been shown by research to improve student learning as well as the development...
of the desired attributes, skills, and practices. Among these instructional innovations include pedagogies, delivery strategies, curricula and models that engage students and connect them with industry, sometimes also called “experiential learning” [7-8].

This presentation will 1) provide an overview of the key attributes of the entrepreneurial mindset and of the challenges faced by educators of today to train future innovators and engineers for tomorrow’s careers, 2) outline the emerging trends and instructional methodologies in experiential learning that have been proven by research to be most effective, 3) document a case study of an exemplar innovative experiential learning program in the U.S. that integrates optimal practices, specifically the Kettering University Cooperative and Experiential Education model, and 4) provide a summary of the educational mechanisms that are necessary for transformational change in order to build the entrepreneurial mindset through experiential learning.

References
Strategies for Incorporation of Innovation and Entrepreneurship in Graduate and Undergraduate Programmes in Arab Universities

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Dr. Sohail Murad is Professor and Department Chair of Chemical and Biological Engineering at the Illinois Institute of Technology in Chicago. Prior to this he was Head of Chemical Engineering at the University of Illinois in Chicago, where he joined the faculty in 1979 after receiving a PhD from Cornell University, Ithaca, NY. He spent 1981-82 at Exxon Research and Engineering Company in Florham Park, New Jersey, while on a leave of absence from the university. He was an ARO Research Fellow at the Ballistics Research Laboratory in 1985. He is the author of over 135 archival research publications and book chapters. He is a member of the Editorial Advisory Board of Computer Applications in Engineering Education, Scientific Journals International and Research Letters in Chemical Engineering. His research is focused on alternate energy and its efficient utilization, computational molecular modeling of fluids on membrane surfaces and pores and on heat and mass flows in nanosystems. It has been funded by the US National Science Foundation, US Department of Energy, US Army Research Office, American Chemical Society, IBM, Dow Chemical Company, Sun Microsystems, Microsoft, and other private and public funding agencies. He is an elected fellow of the American Institute of Chemical Engineers, and member of several other professional societies. He holds honorary faculty positions at Nanjing University (China), Petra University (Jordan), and University of Karachi (Pakistan). He has given many keynote talks at national and international symposia, and has served on panels of the National Science Foundation, Department of Energy, Department of Defense, Environmental Protection Agency, etc.

Abstract

Competing in the modern world will not look like it did when the major manufacturing industries were shipbuilding, steel mills, oil refineries, and automobile manufacturers. What will the oil exporting countries do when their wells go dry? What happens when your new industries must compete against the American, German, Korean, Chinese, and Japanese companies long established with strong balance sheets, global customers, and attractive income statements? It is not too late to begin a major cultural change in your universities. While this paper will address engineering applications, similar issues must be faced in law schools, medical schools, and business schools.
Building a Culture of Innovation and Entrepreneurship by Addressing Affective and Psychomotor Development in the Arab World’s Higher Education

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Dr. Mohamed El-Sayed, P.E., School of Engineering Technology at Eastern Michigan University. For over twenty years, he had served as a professor of mechanical engineering and director of the Vehicle Integration & Durability Laboratory at Kettering University, in Michigan, United States. He is a well-recognized technical leader in vehicle integration, vehicle development, optimization, and validation. He is an SAE and ASME Fellow as well as the Editor-in-Chief of the SAE International Journal of Materials and Manufacturing, and the Inaugural Chair of the SAE Journals’ Editorial Board.

In addition, Dr. El-Sayed is a member of the editorial boards of numerous other technical journals. He has served as board member, advisor, and consultant to several organizations. Through his research, teaching, and industrial practice he made important original and state-of-the-art contributions in product development, vehicle integration, design optimization, lean design, integrated design and manufacturing, and theoretical and applied mechanics.

Dr. El-Sayed has over thirty years of industrial, teaching, and research experience, several patents granted, and over a hundred publications in his fields of expertise. He is an award-winning educator, especially in the areas of engineering capstone project courses and online education. Through his teaching and advising he has contributed to the education of hundreds of engineers now engaged in the field of automotive engineering and product development.

Dr. El-Sayed has also worked as a chief engineer, director of engineering, lead engineer, and subject matter expert in the automotive industry. At General Motors, he led the quality, durability, and reliability integration, development, and validation of several vehicles, platforms, and architectures.
Abstract

Innovation is the action of creating new ideas, products, or processes etc. Creativity is the ability to produce and perform such innovative actions. The continuous nurturing and development of the innovation ability could result in creativity as a cultural attribute. In general, most creativity inspiring efforts are focused on the cognitive abilities, creative thinking, and creative problem solving. These efforts view creativity as a rational cognitive domain process. Fewer efforts address the affective aspect of creativity by focusing on the attributes and motivations of creative individuals. Limited efforts share the process thinking with the cognitive group and the affective aspect of creativity by emphasizing the human desire for fulfillment, and self-actualization.

Entrepreneurship is the process of realizing an enterprise from inception to maturation. Depending on the enterprise and prevailing environment, the entrepreneur must have the affective entrepreneurial drive in the form of passion, motivation, or willingness to take risks to initiate, propel, and complete the process. In addition, the entrepreneur must have the entrepreneurial abilities in the form of the knowledge and skills necessary to discover, assess, and seize opportunities.

The learner’s development in most higher education settings, including the Arab world, is focused on the cognitive domain development. Additionally, the cognitive domain development is mostly focused on the analytical abilities with limited attention to the integrative abilities. Furthermore, due to the ever-shrinking educational resource and the lack of opportunities for practice, more emphasis is usually given to theoretical knowledge than skill building in the field of practice. In industrial and technologically advanced societies, the skill building in the learner’s field of choice is usually provided by the employers at early career phases. Also, the existence of industrial and technological infrastructures inspires the integrative desire and abilities needed for creative and entrepreneurial activities.

To build a culture of innovation and entrepreneurship in the Arab world, a gradual shift towards a more holistic higher education system is essential. Consequently, balancing the learner’s cognitive domain integrative and analytical development would be a necessary step in the right direction. Also, as evident from the nature of innovation and entrepreneurship, the affective drive is a key factor for success in both endeavors. Accordingly, nurturing and developing the learner’s affective domain is another vital step towards motivating the desired cultural change. Furthermore, balanced cognitive development and nurtured affective drives without the skills needed for practice in the learner’s chosen field may not be enough to achieve desired results. Therefore, the development of the learner’s psychomotor skills is of equal importance in the realization of the desired innovation and entrepreneurship culture.
Innovation & Entrepreneurship, the Evolution in the Lebanese Ecosystem

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Ramy Boujawdeh is the Deputy GM of Berytech, leading the Incubation and Entrepreneurship Business Development arm that supports Innovative Lebanese Startups and SMEs, providing business support, mentorship, coaching, hosting, networking and internationalization and part of innovation and entrepreneurship regional programs. Between 2000 and 2014, Ramy amassed a diversified knowledge in the fields of change management, quality management, and operations in different industries across three continents. He is keen on mobilizing his knowledge and connections to the best interest of the people he supports. He advises startups in Lebanon and is an Angel Investor with SEEDERS. Since his return to Lebanon, Ramy has been actively supporting social causes such as education, agriculture, environment, gender equity and economic development in rural areas. Ramy is also the Vice President of a Lebanese NGO, Rural Entrepreneurs, a Board member on the UNDP’s Together towards Sustainable Development [T2SD] and an Ambassador for the Global Compact Network Lebanon focusing on the SDG9. He is also a member of the council of representatives at the order of Engineers and Architects. Ramy holds a bachelor’s degree in Agriculture Engineering from AUB, and a Master’s degree in Business Management and Economics.

Abstract

Lebanon is a country known for exporting one of its biggest assets, it’s people. Lebanon exports many of its talents and skilled graduates, who, if provided with the right support to startup businesses could generate economic growth and jobs from within the country. This analysis presents the case of the Lebanese Entrepreneurship and Innovation Ecosystem, its evolution over time to meet the needs of entrepreneurs, the role of different sectors to support this ecosystem and the areas of improvement to accelerate this growth. We ask what role is played by the public sector, academia, industry, financial institution and individuals.

This study will talk about the opportunities available to accelerate this growth, the limitations and challenges and how to overcome them. The analysis will put an emphasis on how universities can play an active role in this acceleration by supporting interdisciplinary applied researches for industries, integrating entrepreneurship support activities and implementing technology transfer policies, interacting with the ecosystem as a whole.
SESSION III

Chair: Nuhad Daghir
Dr. Nuhad Daghir received his B.Sc. from the American University of Beirut (AUB) and his M.Sc. and Ph.D. degrees from Iowa State University in the US. He started his teaching and research career at the AUB as Assistant Professor and in 1967, was promoted to Associate Professor and in 1975 to full professor. Professor Daghir has served as Chairman of the Animal Science Department for many years, as Associate Dean, and as Dean of the Faculty of agricultural and Food Sciences at AUB from 1996 to 2006. He is at Present Dean Emeritus at AUB.

During his tenure as Dean of FAFS, he reorganized and modernized the Faculty and started two new undergraduate programs: one in Landscape Design and Eco-System Management and one in Food Science and Management. He also initiated a new interfaculty program in Environmental Sciences, with emphasis on Ecosystem Management. Dean Daghir was successful to secure funds for research and development projects for the faculty from several international and private agencies such as USAID, IDRC of Canada, World Bank, FAQ, UNDP, EU and LNCSR. He added modern research and teaching facilities to the Agricultural Research and Education Center in the Beqaa' making it unique in the region.

Dr. Daghir is a member of several professional and honorary organizations such as the American Institute of Nutrition, the American Poultry Science Association and the World Poultry Science Association. In 2012, he was inducted into the International Poultry Hall of Fame, an honor that has been granted to only 50 scientists from all over the World since its initiation in 1912. Dean Daghir helped in establishing a Lebanese Branch of the World Poultry Science Association as far back as 1963 and since his return to Lebanon in 1996, he has been serving as president of that branch. He has served as consultant to agricultural companies in many countries in the region and abroad. Dr. Daghir has served on special assignments for the Food and Agriculture Organization of the United Nations (FAO) and Aramco and participated in preparing feasibility and pre-tender studies for several Middle East countries. Professor Daghir has served on several national as well as regional and international committees. He served on the technical advisory committee of the Ministry of Higher Education from 1998 to 2008.

Dr. Daghir has had over 100 articles published in scientific journals and the proceedings of international meetings as well as several chapters in books and compendia. His research has been mainly in the field of vitamin and amino acid nutrition and in recent years he has published on higher agricultural education in the region. Besides his academic and administrative positions at AUB, he served as team leader of the American University of Beirut mission to Saudi Arabia. From September 1986 to June 1992, he was Director of Technical Services and research at an International Agricultural Company in Cambridge, Ontario, Canada, and nutrition consultant for North America. He served as Dean of the Faculty of Agricultural Sciences and Professor of Animal Science at the United Arab Emirates University from 1992 to 1996.

Dean Daghir’s resume has appeared in Who’s Who in Lebanon, Who’s Who in the Arab World, and Who’s Who in the World. He has been selected by the International Biographical Center in Cambridge, England, as one of the 2000 outstanding people of the 20th century and by the American Biographical Institute as an honorary member of its research board of advisors. He was honored by the American Poultry Science Association as one of four great advisors for the year 2004.
Turnitin: Building an Academic Integrity against Plagiarism

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**Professor of Biology & Chancellor, University of Petra, Amman, Jordan

Dr. Marwan Muwalla is the President of the University of Petra and Professor in animal science at the faculty of Pharmacy & Medical Sciences. He got his PhD in 1982 from the University of Arkansas, Fayetteville, AR, USA. He is an experienced educator with a good record of designing university degree programs, conducting classroom instruction and providing administrative leadership. He is also an experienced researcher with training and expertise in animal science, and small ruminant nutrition and production. Dr. Muwalla was Vice President for Academic Affairs and Dean of Research and Graduate Studies of Petra University in the period September 2010 - August 2014. He was Vice President of Jordan University of Science and Technology, Irbid, Jordan from June 2005 to June 2010. He served in several universities in Jordan as a member of Board of trustees, dean, chairman, and professor. Dr. Muwalla has been principle investigator in a research project granted support of one million EEC unit from the EEC entitled "The improvement of sheep production in Jordan, with particular reference to increased efficiency of utilization of indigenous resources". He has published more than 30 journal articles and more than 18 conference papers. He was external examiner, committee member and supervisor for more than 25 Master students. Dr. Muwalla is a member of number of national and international committees e.g. he participated in the World Bank Technical and Appraisal Mission, workgroups for Higher Education Reform for the Knowledge Economy Project (HERKE) concerning governance and finance sectors in higher education, leading to the final project document presented to the World Bank, 2007-2009.

Abstract

Turnitin is an internet-based licensed software for plagiarism detection, launched in 1997. It checks the originality of research papers and reviews that ignore citations. It is a technological tool complementing peer review of students’ theses, papers and articles. It checks unoriginal contents by assessing and scanning other databases, copyrighted books, articles, and journals. There is criticism of the use of Turnitin so that some universities are banning its service because of intruding on privacy without permission to copy, reproduce, and preserve the work, and Turnitin, after all, is a commercial entity. Students are complaining that submission of their research work to Turnitin is an accusation of guilt. This is why some Canadian universities, and others such as Princeton, Harvard, Yale, and Stanford decided not to use Turnitin. However, many universities in the world still insist on the use of the software to check the originality of the work.
Plagiarism is simply a form of cheating in which copying someone else’s work is not acknowledged or cited properly in the text references. It is a problem embedded in some academic cultures. Foreign students using English as a second language tend to borrow phrases and words from original English writers to express themselves in foreign language and not their own. Publishing in the local language invites plagiarism from foreign text, since it is hard to detect.

A culture of enquiry rather than a culture of copying should be embedded in the minds of graduate students pursuing their PhD research degrees. In plagiarism, there is a distinction between inappropriate copying and dishonesty, and that is why some universities abandoned the term plagiarism. Acknowledgement of other peoples’ work must be cited, where authors and researchers can add to it and expand its horizon for building knowledge. Using Turnitin will demonstrate the presence of plagiarism, and faculty and students faced by evidence will learn how to use other forms of intellectual property more appropriately and become part of their academic culture. Critical pedagogy is an approach to deal with the rhetoric around plagiarism for fair action.

Although plagiarism is considered by many reviewers as a conduct of theft of other people’s work, others advocate that there are levels of plagiarism and argue whether the use is intentional or out of ignorance of proper citation.

The notion that dissertations from traditional institutions were more likely to involve plagiarism than those from online-institutions proved to be invalid by the analysis of Turnitin using the Mann-Whitney U test. However, the fact that both users from traditional and online institutions are using the Internet as the main source of information explains the similarity. Cut-and-paste from the Internet has became casual behavior and some users claim that information on the internet is public knowledge that does not need to be cited. Students are becoming too lazy or lack the skills to evaluate and synthesize information from the net to construct knowledge.

Turnitin has been used successfully in various researches on plagiarism in an academic setting and has been acknowledged as the best software detection technology among other systems and was rated the highest. Once the sample of research is uploaded to Turnitin, any overlap with previous work or the authors’ doctoral thesis will be detected.

It is acceptable among researchers for authors to reuse data or texts presented by them in conferences, or from previous papers as long as they refer to it. Within the “knowledge economy”, Turnitin may lead to more troubling epistemological and ethical implications of technologies. Turnitin claims that they are “deterring plagiarism for five million worldwide”. It searches for “multiple strings”, with matches databases, it uncovers plagiarism. It relies on available databases or memory banks.
Turnitin is a quick fix, certainly less time-consuming for peer-reviewing research articles. Information transfer historically has been policed by the rule of citations for the work of others. The software can detect the originality of the work submitted as self-proclaimed knowledge, and therefore assists in building with integrity the knowledge economy.

Turnitin detection uses databases created by others, stored on servers of others. It does not seek permission or conducts unauthorized use of other texts submitted for detection. It touches on the ethics of academic intellectual integrity for policing the principles of learning and research and helps prevent misrepresenting plagiarism as part of our educational structure.

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Innovations in Creating Incentives for Academic Achievement and Growth: Developing a Model at the Faculty of Medicine of the American University of Beirut (1999-2009)

Nadim Cortas
American University of Beirut
Beirut, Lebanon

Dr. Nadim Cortas is Emeritus Dean and Emeritus Professor at the Faculty of Medicine of the American University of Beirut (AUB). He is well published and internationally well known in academic medicine. From 1999-2009, Dr. Cortas was the Vice President for Medical Affairs and Dean of the Faculty of Medicine and the American University of Beirut Medical Center (AUBMC).

As Vice President for Medical Affairs and Dean, Dr. Cortas participated actively in all the senior University-wide committees. He led the Medical Institutions (MI) and was responsible to build and manage its budget amounting to $100-120 million per year. He realized major restructuring, both academically and financially of the Faculty of Medicine, the school of Nursing (SoN) and the Medical Center. He changed the landscape of Medical Practice by introducing a Medical Practice Plan (MPP) that fueled the recruitment of 110 highly credentialed faculty members in Medicine and 10 in Nursing, which increased significantly patient loads and encouraged establishment of multidisciplinary programs. The MPP provided funds for research, resulting in a 4-fold increase in research output, both in quality and quantity, which led to a five-fold increase in receipt of competitive external funding.

He introduced a system for effort analysis and evaluation, which provided standards for recruitment and promotion and established an ongoing performance improvement process. He led the process that achieved the following accreditations: Joint Commission International (JCI), the Magnet designation, College of American Pathologists (CAP), Middle States Association of Colleges & Schools (USA) accreditations for the FM and SoN and for the latter, accreditation by the Committee on Collegiate Nursing Education (CCNE) of the American Association of Colleges of Nursing. He forged partnerships with St. Jude’s Hospital in Memphis, Cleveland Clinic, MD Anderson, Sloane Kettering and Johns Hopkins University and established exchange programs with many prominent academic centers abroad. A joint AUB and MUSC (Medical University of South Carolina) MD/PhD program is successfully ongoing which has several graduate students enrolled in it, 4 graduated so far. He presented to the Board of Trustees in 2009, a detailed strategic plan for the Faculty of Medicine, School of Nursing and the Medical Center, with 5, 10 and 20-year horizon and landmarks.

At AUB, as Associate dean for Research and Development, he established multidisciplinary core research facilities in the Basic Medical sciences, described in the 1999 Report of the Academic Review Team that included a Nobel Prize Laureate, as “State of the Art”, and established its infrastructure. He chaired the Inter-Faculty
Committee and coordinated the pan-university Graduate Environmental Sciences program (1994-2000). He established the environment core research analytical chemistry facility.

After his appointment from 1984-1994 at the College of Physicians and Surgeons (P&S) of Columbia University in New York City, initially as Visiting Associate Professor of Biochemistry and then as Associate Professor of Clinical Medicine, he pursued his research career and established a distinguished research record in Biochemistry and Pharmacology. He received the Ludwig Schafer Award (1984-85). From 1990 to 1994, he also served as Director of the Par-ental Nutrition Service at the Columbia Presbyterian Medical Center. He actively participated in basic and clinical teaching.

Dr. Cortas received his MD degree at AUB in 1967. He completed residency training in Internal Medicine at AUBMC, and three years of postdoctoral fellowship in Pharmacology and Endocrinology at the Johns Hopkins University School of Medicine in Baltimore MD (USA), 1969-72. In 1972, he joined the FM at AUB and rose to the rank of Professor. He chaired the committee that changed the pre-medical requirements to enable students from all disciplines to be admitted to the FM. During the mid 1970s, Dr. Cortas was active in developing the discipline based curriculum with significant increase in non-didactic interactive teaching and introduced the lecture free module of Endocrinology.

Dr. Cortas is very active in his community and has chaired and served on the Governing Boards of two of the well-known not- for- profit k-12 schools in Lebanon, Ahliyah and Brummana High School. He currently chairs the Ahliyah Board of Trustees and has effected a major restructure resulting in NEASC and CIS accreditation. He served on committees of the Ministry of Health in Lebanon and as a World Hemesalth Organization (WHO) consultant.

Abstract

The rapid pace of breakthroughs in discoveries and technology during the last half a century resulted in major disruptions in the steady states of traditional education systems. Methods involving process analysis, quality assurance and performance improvement became too slow to incorporate rapidly generated relevant knowledge and new technology while eliminating the obsolete. This produced redundancies and omissions in medical education programs, which in addition to the costs of new technology incorporation, resulted in a very high rate of increase in the cost of education. Tuition fees increased at the AUB Faculty of Medicine (AUB-FM) from $700 per year in 1962-63 to $1,570 in 1990-91 (2.24 fold in 29 years), to $18,599 in 1999-2000 (12 fold in 10 years), to 24,208 in 2008-09 (1.30 fold in 9 years) and to 39,755 in 2018-19 (1.64 fold in 9 years). The tuition fees increased 56-fold from 1962-2018 while the per capita gross domestic product (GDP) in Lebanon increased by about 2-3-fold and the GDP purchase power parity (GDP-PPP) by about 2-fold in that period. To attenuate the rate of rise of tuition fees, the number of students per class had to be increased from 40 students in the 60s, to 60 students in the 70s through the 90s, to
80 students by 2008-09 and 112 students by 2018-19. The marked increase in tuition fees diminished if not eliminated, socioeconomic diversity and significantly reduced the potential pool of applicants to medicine. In the US, where students have access to loans, the increased amount of debt at graduation, shifted specialization choices by necessity to money generating fields resulting in shortages in highly needed less money-making specialties. New York University (NYU) declared in 2018 that it built an endowment of $600 millions (m), to generate at 4% annual utilization, the tuition fees for its 600 medical students as of next year, and the College of Physicians and Surgeons at Columbia University (P&S) built an endowment of $ 250 m to eliminate the need for prohibitive student loans.

At AUB-FM, for example from 1995-2000, recruiting the number of faculty members required for adaptation to new realities and to post-war peace rapidly increased the cost of education, with annual faculty salaries going up from $4 m to 7.5 m and, plus benefits from 5.2 m to 9.8 m. This would have necessitated an unsustainable increase of tuition fees to $34 m to cover the cost of educating 240 medical students. The rate of increase in costs became significantly higher than the rate of revenue generation and the structural deficit threatened the future of the medical enterprise at AUB. As of 1995, a process of observation, prototyping, sketching and brainstorming was launched to define clear targets in education, research and patient care focusing on human needs of all stakeholders with the objective of achieving a plan for major restructuring in each area, aligning human needs with what is feasible and sustainable.

The process started with determining the optimal number of students to be enrolled and what they would need in terms of resources: human, facility and other, including inpatient and outpatient training activity. The following questions emerged: What are the services required in the medical centre to meet all stakeholder’s needs and make it financially sustainable? What is the desirable research enterprise and how will it be funded? What is the time frame needed to achieve the targets? The common denominator for all is the professional faculty. Recruited primarily from the USA, they expected to be given the opportunity to achieve a post-tax take home compensation, what they would have made as per the regularly published American Association of Medical College (AAMC) scales. In return, they will utilize and grow AUBMC inpatient and outpatient services to satisfy the needs of all stakeholders and achieve financial sustainability.

As a result, a Medical Practice Plan (MPP) was proposed, tried as mock in 2001-2002 and adopted in 2002-2003 as the locomotive that will drive growth and be the centerpiece of the Faculty of Medicine and Medical Center (FM/AUBMC) recovery plan and future sustainability. It was established to: a) attract and retain qualified physicians, b) indemnify equitably all faculty members, c) form group practices to improve medical care and physicians’ skills, d) make academic physicians assume ownership of medical practice, and bear its costs e) link clinical growth to revenue generation, and thus
diminish AUB’s liabilities for salaries, fringe benefits and professional fee receivables and f) support the academic mission of the Faculty of Medicine. The plan makes each physician contribute 300-600 hours per year for teaching and administration. Data will be presented to show that from 2002-2008, the plan incentivized physicians to increase collected professional fee revenue from $16,721,876 to $24,525,027, reduced the liability of the University for salaries and benefits by $27,802,204 and contributed about $6.9 million to support the operation of the FM/AUBMC, $1.5 million for research, and $2 million for faculty development and conference travel.

The MPP generated money to recruit on an average 10 faculty members per year each of whom made their costs within 2-3 years. The increased patient loads generated $5-7 m in additional revenue per year that contributed to the gradual reduction of the FM/AUBMC deficit. The teaching and academic administration compensation was clamped at 60 full time equivalents (FTEs), required for teaching the medical curriculum and made it possible to control the increase in tuition to about 3-4% per year. A critical mass evolved that made it possible to establish research and clinical multidisciplinary centers of excellence, revive the research enterprise, develop a critical mass of investigators to unfreeze the PhD program in biomedical sciences and achieve the required accreditations for its programs.

Data will be presented to show that the model may achieve further reductions in the costs of medical education if planned mergers of healthcare centers are achieved and didactic teaching is replaced by illustrated automation, complemented by team-based learning, other interactive methodologies and well-defined electives.
Abstract

To succeed in academia, faculty members have to constantly envision what and how new knowledge can be produced. They need to assume the leadership and responsibility for acquiring the tools as required to generate that knowledge, which forces them to go through a process of seeking financial support and continuously reinventing themselves and reshaping their field of interest. They also must recognize that any developed knowledge will remain of limited value unless it is integrated within a broader domain that covers issues that are most likely not confined to a specific discipline. Through working with colleagues and graduate students, faculty members should develop a special appreciation of the importance of teamwork and collaboration for the realization of new knowledge. As a faculty member, I learned of these needs through experience. Yet, their relation to entrepreneurship became clearer
when I had the chance to invite entrepreneurs to speak to graduate students about their experience. More than often, start-ups based on new products fail for different reasons including immaturity of the idea, breadth of application platform, lack of a marketing strategy, financial resources and support, etc. Successful inventions find their application in a different platform than originally conceived. Changing directions and timely decisions can lead to either success or failure. Acquiring comprehensive knowledge that covers more than one discipline is of immense importance for success. Teamwork, collaboration and willingness to share are necessary ingredients. In this talk, I will discuss approaches taken for teaching entrepreneurship in graduate education and give an experience-based perspective on introducing graduate students to the concept of entrepreneurship.
R&D Challenges and Opportunities in the Arab World, the Case of Kuwait Institute for Scientific Research (KISR)

Samira Omar
Kuwait Institute for Scientific Research
Safat, Kuwait

Dr. Samira Omar holds a PhD in Wild-land Resource Sciences from the University of California, Berkeley in 1990 and an MS in Range Management from the University of California, Berkeley in 1979. She attained her BSc in 1972 in Botany and Chemistry from the University of Kuwait.

Dr. Omar joined the Kuwait Institute for Scientific Research (KISR) in 1973. She has more than 40 years of experience in Research & Development (R&D) related to biological sciences and environment with focus on plant ecology and biodiversity conservation. Since 2016, she has been the Director General of KISR and member of the Board of Trustees (BOT), a leading institute in R&D in the areas of petroleum, energy, building, food, environment, water and techno economics. In the period from 2001-2013, she was Division Director of the Food Resources and Marine Sciences Division (FRD), managing six research programs related to agriculture, biodiversity, food, nutrition, marine sciences, aquaculture and biotechnology. From 2011-2014, Dr. Omar successfully managed the Kuwait Environmental Remediation Program (KERP) awarded by the United Nations Compensation Commission (UNCC) for remediation and restoration of war-damaged ecosystems.

Dr. Omar has national, regional and international recognitions and was elected as member of the Executive Board for the Arab States in the Organizations for Women in Science for the Developing World (OWSD) (2012-2016) and Regional Councillor for West Asia Region/International Union for Conservation of Nature (IUCN) (2012-2016). Currently, she is Fellow at the World Academy of Sciences (TWAS) and member of the Council and Treasurer of TWAS (2016-2018). She was elected member of the Board of Directors for the Society for Ecological Restoration (SER/Asia Region) (2010-2016) and Member of the Board of Trustees of ICARDA (2015-2016). Since 2016 she became member of the BOT of Hamad Bin Khalifa University (HBKU). Dr. Omar published and contributed to more than 100 publications and participated in a 126 local, regional and international conferences, workshops and symposia.

Abstract

KISR was established in 1967 to conduct R&D in the fields of petroleum, energy, environment, water and food security. For more than five decades, KISR has supported the implementation of the nation’s development strategy and served as a steward for Kuwait’s science and technology heritage. In 2010, KISR developed a transformational strategy that required the initiation of new thrust areas, prioritize current ones and rethink the way that it conducts its current R&D activities. This required the development of a new organizational structure whereby KISR’s research and technology capabilities were organized into four centers: Petroleum, Energy & Building, Environment and Life Science and Water Resources.
The focus of these centers is to contribute to the solutions of national challenges through an open innovation system with other like-minded regional and international institutions. Implementation of the strategic transformation was met with several challenges including: difficulties in attracting experts and young scientists due to the market competitiveness, both local and regional, upgrading of R&D infrastructure, and insufficient government R&D funding due to lower oil prices and inadequate client contributions to R&D activities. Commercialization of research outcomes has been a strategic drive; however its implementation has been met with many challenges by the government due to the lack of a legal instrument that has been taking many years to achieve. Political pressure has also created some hindrance to move forward in the development and funding of international strategic alliances. It has become obvious that the role of R&D in development is not clearly understood and/or supported by the legislative sector creating uncertainty at the decision maker level.

The development of the 7th Five-Year Strategic Plan (KISR transformation 2010-2015) created a new opportunity for the institute to move forward with a focus on technology and innovation and the potential creation of Scientific Parks and Centers of Excellence. Strategic partnerships, particularly with the Kuwait Foundation for Advancement of Science (KFAS), Kuwait Petroleum Cooperative (KPC) and Kuwait University (KU), guided the institute in its long-term planning to meet the industrial research needs, required funding and capacity building requirements. Local, regional and international alliances (MoUs with a number of research and academic institutions) provided access to international laboratories and exchange of expertise in specific areas of mutual interest.

Infrastructure development (labs and research facilities and stations) were designed and developed to meet the expanding R&D activities and technical client service’s needs. Legal instruments were developed to support the system of project management and administration. In respect to the commercialization potential, a holding company was proposed to develop three ready for commercial production technologies (potable water, date palms tissue culture and petroleum technical services). Efforts were exerted to issue new policies and procedures to guide and support the efficient implementation of R&D activities. Two new sectors were developed. The S&T sector was developed to lead the development and implementation of KISR’s technology strategy, the institute’s Quality Management System and Innovation initiatives. The Marketing and Commercialization Sector sets up procedures for the intellectual property and commercialization of KISR innovative products/services as well as marketing its R&D and technical service activities. At the same time, KISR continued conducting its well-reputed annual training programs for students (university, high schools and elementary students).
The future perspective of KISR is to direct its R&D activities towards achieving knowledge economy, seeking business opportunities based on its R&D long experience and expertise, driving the spirit of its staff and cultivating the culture of entrepreneurship as well as developing a new line of leadership and young scientists. The institute initiated the establishment of a Supreme National Committee on R&D and S&T in Kuwait that will underline and emphasize the role of R&D in national development.

Dr. Mane Al-Sudairawi is the Executive Director of the Science and Technology Sector at Kuwait Institute for Scientific Research (KISR). He holds a PhD in Civil Engineering and has more than 30 years of experience in scientific research with management and leadership qualifications. Dr. Al-Sudairawi provided orientation in the areas of R&D management, environmental engineering, civil engineering, and atmospheric science. He Initiated and led scientific research projects in Environment, Radionuclide, Air Pollution, Coastal Management, and Crisis Decision Support Program.

Dr. Al-Sudairawi published over 30 scientific papers in national and international referred journals, proceedings and conferences.
Imperatives to A Successful Technology Transfer Model; A Perspective from the Arab World

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Dr. Sami Bashir has been working for over 15 years in technology and research commercialization in industry and academia. Dr. Bashir started his career working in industry R&D, introducing advanced materials and products to various markets related to renewable energy, catalysis and coatings. After that, he took a leading role in industry R&D engaging in business growth activities related to the licensing-in/-out of new technologies, venture merger and acquisition of new businesses. Dr. Bashir has also successfully led industry-university consortia and projects to establish new products that can achieve EU regulatory targets in relation to emissions of toxic gases and renewable energy applications.

Dr. Bashir became responsible of the intellectual property (IP) strategy in a major chemical industry (Cristal Global) and became part of the corporate’s function on Innovation & Strategy. In this role, he was responsible of IP protection and monetization, IP competitive positioning, and IP future market and industrialization.

Prior to joining Khalifa University of Science & Technology, Dr. Bashir spent over six years in King Abdullah University of Science & Technology (KAUST). Working under the economic development mission, he was responsible for the management and commercialization of the IP portfolio, building a technology transfer platform, and as a result many technologies found their way to the market through the licensing and creation of startups.

Dr. Bashir obtained his Masters in Law (LLM - Technology & Intellectual Property) from the University of Liverpool and PhD in Materials Nanochemistry from the University of Central Lancashire.
Abstract

Technology transfer has always been akin to mechanisms and tools that can be deployed in pushing university research discoveries from the laboratory to the market. In developed countries where university research management is advanced, various technology transfer models have been introduced and adopted, and still evolving, with measurable success. In contrast, here in the Arab World, adoption of a technology transfer model that can effectively contribute to the overall innovation ecosystem is still finding its way with very few successful stories.

Now, and to realize the university research intellectual potentials on the betterment of the society, it is becoming critical to establish a technology transfer model that can support innovation and creation of university-research products that can have positive impact on peoples’ life. This paper will discuss necessary aspects of performing successful technology transfer model here in the region giving real examples of some of the challenges facing the technology transfer processes and proposing some solutions to address these challenges.
SESSION IV

Chair: Nessar Ahmed
Dr. Nessar Ahmed is a Reader in Clinical Biochemistry at the Centre for Biomedicine, School of Healthcare Science, Manchester Metropolitan University, UK. He is an Adjunct Professor at the Panjwani Centre for Molecular Medicine and Drug Research, University of Karachi and a Visiting Scientist at the King Abdul Aziz University, Jeddah, Saudi Arabia.

Dr. Ahmed received his postdoctoral training at the New York Medical College, USA and University of Birmingham, UK. Dr Ahmed is a Fellow of the Institute of Biomedical Science and holds membership of the Biochemical Society, Association for Clinical Biochemistry, Diabetes UK, Diabetes and Obesity Research Network and the International Maillard Reaction Society, USA.

He received the British Muslim Award 2014 for Services to Sciences & Engineering and in 2013, he was a top-cited author for the journal Diabetes Research and Clinical Practice. In 2010, Dr Ahmed received the MMU Teaching Award for Best Supervisor by MMU Student’s Union.

His research interests include; glycation of proteins in diabetic complications, identification of natural products with antiglycation, antioxidant and antiangiogenic properties and lead and manganese levels in childhood iron deficiency. He has supervised four postdoctoral fellows and over 24 PhD students.

He is the author of over 100 publications and this includes six highly regarded textbooks used worldwide on biomedical science programmes. These include Biology of Disease published in 2007 by Taylor and Francis, Clinical Biochemistry and Biomedical Science Practice both published in 2016 by Oxford University Press and Blood Science: Principles and Pathology published in 2014 by Wiley-Blackwell.
A Culture of Innovation and an Entrepreneur’s Journey in the Agriculture and Food Sciences Educational and Research Programmes

Nabil Nemer
Holy Spirit University of Kaslik
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Dr. Nabil Nemer is the Associate Dean and Associate Professor at the Faculty of Agricultural and Food Sciences at the Holy Spirit University of Kaslik. Before joining USEK in 2011, he has coordinated and managed a number of projects funded by the French Agency for Development (AFD), the German Agency for Technical Cooperation (GIZ), and the United Nations Environment Program (UNEP). He has also been actively teaching in many universities like AUB, USJ and Cottbus University in Germany.

Dr. Nemer obtained his PhD from University Paris XI and his MSc in Entomology form the American University of Beirut. His research interests are in the field of chemical communication systems including studies on sex pheromone systems of insects, studies of plant-insect interactions as well as studies on biological control, integrated pest management of insect pest, forest ecology and pesticide residues. He has in his records over 45 publications in international scientific journals in that respect.

He is also a member of the ABET Accreditation Committee, and other academic committees at the Holy Spirit University of Kaslik. He has been member of Nature Reserves Committees in Lebanon and Ministerial Committees since 1999. He has served as consultant for FAO projects related to forest insects as well as many NGOs in and outside Lebanon. His work on the Cedars of Lebanon and particularly the discovery of new insects attacking the cedars is recognized nationally and internationally.

Abstract
The educational and research programs in agriculture and food sciences has seen a growing share of agricultural and food processing innovation and entrepreneurship. This paper traces the evolution of the innovation systems framework within the agricultural and food sciences educational programs at the faculty of agricultural and food sciences. Both the agricultural ecosystems innovations and the food processing innovations are two concepts that are being used nowadays in our education programs to promote the agriculture and/or food entrepreneurship journey. Two cases are used in this study to demonstrate the promotion of entrepreneurship in agricultural and food sciences higher education are derived from the agriculture/forest ecosystem and the food sectors. The first one considers the innovation systems in insect trapping methods and the second one considers the evolution of a traditional food, the freekeh wheat. In both cases, the identification of barriers towards the promotion of innovation and entrepreneurship are exposed. The study considers the interconnectedness of the innovation systems and the job markets and analysis of the agriculture and food sciences research and development in Lebanon. Finally, the areas of investment and conclusions are presented.
The Arab Innovation Academy:  
A Case Study on Hands-on Entrepreneurship Education

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Mrs. Hayfa Ahmed is the Innovation Director at Qatar Science & Technology Park. She is in charge of the support programs for tech entrepreneurship in connection with the regional and global tech innovation ecosystem. Hayfa has gained extensive experience in management, ICT, and tech-based entrepreneurship while working at QSTP, Qatar Petroleum and Qatar University. She is a board member at Qatar Mobility Innovation Center (QMIC), an innovation center focused on smart mobility systems and she is also a business writer and blogger.

Hayfa earned a Bachelor of Computer Sciences and Master of Business Administration (MBA) from Qatar University. She is a certified Project Management Professional, Business Analyst, and Incubation Manager.

Abstract

“The Arab Innovation Academy (AIA) is a 2-week long experimental educational program that teaches students how to build and launch innovation-driven startups. The first edition of AIA was delivered in Doha in January 2018. This talk will discuss the objectives and contribution of the Arab Innovation Academy to the Arab region and will highlight key lessons learned and next steps”.

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Innovation in the Post Novel 2018 Economic Prize: A Hate and Love Relationship between Politicians, Academicians and Practitioners

Maan Barazy
Entrepreneurs Ventures Network Holding SAL
Beirut, Lebanon

Mr. Maan Barazy is the President of the National Council for Entrepreneurship and Innovation as well Founder Managing Partner and CEO of the Entrepreneur Ventures Network Holding SAL.

He is Managing Partner and CEO of Data and Investment Consult-Lebanon and was a Representative of CIBAFI and AAOIFI in Lebanon.

Mr. Barazy is a professional trainer and mentor to certified management and risk diplomas – Masterclass Leader SMI – Financial Modeling For PPP/PF – CFA – FRM- CIA - AAOIFI and CIBAFI standards. And he is the head of the SME alliance initiative.

His experience includes consulting services and analysis of complex financial transactions, supporting financial advisory projects and rating modeling systems. With more than 20 years of consulting, finance, valuation and business valuation experience, specializing in matters regarding business intelligence analysis and investments, asset allocations, and fiduciary responsibilities.

He is a member of the Association of Certified Anti-Money Laundering Specialists and the Global Association of risk Professionals.

He published research papers on macro analysis and entrepreneurial best practices and is currently working on a PhD degree towards understanding the new role of cryptocurrencies in an evolving world.

Abstract

The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2018 was divided equally between William D. Nordhaus “for integrating climate change into long-run macroeconomic analysis” and Paul M. Romer “for integrating technological innovations into long-run macroeconomic analysis.” Economic theory posits that, as finite resources are consumed their prices should go up. Yet, one of the laureates points out that over the past 200 years economies have grown while the prices of most commodities—including aluminum, copper, lead, tin, zinc, and crude oil—have remained relatively flat. More productive, efficient, and innovative economies have been able to squeeze more growth out of the same inputs over time.
This lecture will explore digital social innovation, while respecting ethical and commercially fair practices. This issue is timely given first that the Nobel prize of Economics 2018 was delivered to innovation and change and second because the 2030 UN Agenda for Sustainable Development reflects an understanding that an open Internet and the spread of global interconnectedness can enable economic development and cross-border commercial activities that can bridge the digital divide and expand societal inclusion.

Digital innovation offers underserved individuals diverse opportunities to develop bottom-up ICT-enhanced solutions to help address issues, such as inequality, marginality, and social exclusion.

With a focus on the MENA region as an arena for innovation, this paper will discuss how multi-stakeholder communities — including businesses, governmental departments, and non-governmental organizations — can work together to foster sustainable and innovative-embedded solutions. As essential prerequisites for digital social innovation, this paper will evaluate contingent factors that challenge access to ICT infrastructure and the capacity to develop skills for innovation.

The recommendation will investigate what’s become known as endogenous growth theory, one of the Nobel laureates suggests that human ingenuity has allowed us to extract ever more value from a limited amount of resources. This is where innovation is needed and this where entrepreneurs should lead the way. By discussing digital innovation in the context of emerging economic opportunities, the conclusion will provide a critical examination of the cross cultural atmosphere of innovation in the Academia and Entrepreneurship ecosystems of the MENA region and the changing nature of regulation, digital participation, open innovation, and digital inequalities.
SESSION V
Final Discussion and Recommendations

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