1. Introduction

The Modernization of Institutional Management of Innovation and Research in South Neighboring Countries (MIMIr) project aims to develop institutional capacity for innovation and research management in the Arab world, in particular in Morocco and Jordan. To this end, the project engages European, Moroccan and Jordanian higher education institutions in a structured dialogue on the transfer and implementation of European good practices. Jordan is represented by three universities, namely The University of Jordan , Al-Balqa Applied University, Jordan University of Science and Technology, and the Association of Arab Universities

The project was first conceived and is being developed against the background of the Euro-Mediterranean Partnership and its emphasis on innovation and research. Against this background, the project furthers the European Union (EU) opening the European Research Area (ERA) and transferring its innovation and research practices to the rest of the world, starting with its neighboring countries.

This report summarizes the current status of research and innovation and the impact of MiMiR on Jordan University of Science and Technology and highlights a number of challenges and opportunities in this direction. Also, this report presents Jordan's participation in the project and the impact of the tour visits and interaction with the universities of Sapienza in Italy, KU Leuven in Belgium, and Barcelona in Spain, where a selection of European innovation and research management practices have been presented with the purpose of facilitating their successful transfer to the Arab world.

This report is being prepared in accordance with the MIMIr final work package, providing an overview of several activities and events and the MiMiR platform status.

2. Current State of Research and Innovation in Participating Jordan Universities

The current state of research and innovation in Jordan is exemplified by the participating universities, Jordan University of Science and Technology, Al-Balqa Applied University, and the University of Jordan. Several indexes are chosen to describe the status of research and innovation. The information is provided below and summarized in Table 1.

a. Jordan University

3. Number of faculty members : **1800+**
4. Number of publications per year per faculty member (over 5 years period) : **0.7**
5. Number of graduate programs at the university

   a. Ph.D. programs: **30+**
   b. MS programs : **120+**
6. Number of research institutes and/or centers at the university: **(< 10)**
   a. Disciplines covered by the centers: **Energy, Environment, Water, Basic Sciences, Social Sciences, among many others**
   b. Total revenue produced by the centers (if any): **N/A**
7. Total research budget per year allocated for research project funding:
   a. University funding: **500'000+ JoD**
   b. National funding: **200'000+ JoD**
   c. International funding: **300'000+ JoD**
8. Number of research awards received by faculty members of the university
   a. Areas of the award: **N/A**
   b. Money value of the award: **N/A**
9. Number of journals issued by the university: **10 Journals**
   a. Disciplines covered by the journals: **Medical Sciences, Pharmaceutical Sciences, Business, Social Sciences, Agriculture, Religious Studies, Law Studies, Economics, Archeology**
   b. Indexing of the journal: **SCOPUS, EBESCO, Ulrich**
10. Number of conferences organized by the university: **20+**
11. Ranking of the university
   a. National ranking : **QS: 1**
   b. Regional ranking : **QS: 8**
   c. International ranking : **QS: 550-600**
12. Number of spinoff companies created by each university: **N/A**

a. Al-Balqa Applied University

1. Number of faculty members: N/A
2. Number of publications per year per faculty member (over 5 years period): 485 in 2015
3. Number of graduate programs at the university
   a. Ph.D. programs: None
   b. MS programs: 20 Program
4. Number of research institutes and/or centers at the university.4
   a. Disciplines covered by the centers: Water, environment, energy, training of trainees, commuter, consultations
   b. Total revenue produced by the centers (if any): N/A
5. Total research budget per year allocated for research project funding
   a. University funding: N/A

   b. National funding: 2459135 JDs (projects only)
      International funding: 274665 USD and 2796222 Euro (International projects only)
6. Number of research awards received by faculty members of the university: N/A
   a. Areas of the award
   b. Money value of the award
7. Number of journals issued by the university
   a. Disciplines covered by the journals
   b. Indexing of the journal
8. Number of conferences organized by the university
9. Ranking of the university
   a. National ranking
   b. Regional ranking
   c. International ranking
10. Number of spinoff companies created by each university
11. Number of patents: 7
12. Number of international students: 1099
13. Number of faculties: 18 distributed over the country
14. Number of students in 2016L29017: 32872
15. Number of Memorandum of Understandings and agreements: 91

a. Jordan University of Science and Technology

1. Number of faculty members: **920+**
2. Number of publications per year per faculty member (over 5 years period): **0.61**
3. Number of graduate programs at the university: **97 programs**
   a. Ph.D. programs: 00
   b. MS programs: **97**
4. Number of research institutes and/or centers at the university: **10 centers**
   a. Disciplines covered by the centers
      i. Academic Development and Quality Assurance Center
      ii. Center of Excellence for Innovative Projects
      iii. Consultative Center for Science and Technology
      iv. Computer and Information Center
      v. Dental Teaching Clinics
      vi. Pharmaceutical Research Center
      vii. Queen Rania Al-Abdullah Center for Environmental Science and Technology
      viii. Language Center
      ix. Princess Haya Biotechnology Center
      x. Nano-Technology Academy
   b. Total revenue produced by the centers (if any): **700,000 + JD**

5. Total research budget per year allocated for research project funding: **3.5+ million**
   a. University funding: **2.0+ million JD per year (5 years period)**
   b. National funding: **0.75+ million JD per year (5 years period)**
   c. International funding: **0.68+ million JD per year (5 years period)**
6. Number of research awards received by faculty members of the university: **160+**
   a. Areas of the award: Engineering, **Medicine, Architecture, Pharmaceutical, IT**
   b. Money value of the award: **.26+ million JD**
   c. Number of patents**: 13**
7. Number of journals issued by the university: 3
   a. Disciplines covered by the journals: **Civil engineering, Pharmacy, Medical Sciences**
   b. Indexing of the journal: **Scopus, ISI**
8. Number of conferences organized by the university: **9**
9. Ranking of the university
   a. National ranking:
   b. Regional ranking: **QS (10), Green Metric (1)**
   c. International ranking: **QS (601-650); Times (600-800), Green Metric (49)**
10. Number of spinoff companies created by each university: **1 spinoff**

Table 1: Summary of Research and Innovation Metrics

Metric		Jordan University	Al-Balqa Applied University	JUST
Faculty Members		1800	??	920
# Publications/year/faculty		0.7	485 in 2015 ??	0.61
# Ph.D. Programs		30	00	00
# MS Programs		120	20	97
# Research centers		10	4	10
Revenue from research centers		NA	NA	700,000
Total research budget per year		1,000,000	2,877,000	3,500,000
	University funding	500,000	NA	2,000,000 +
	National Funding	200,000	2,459,135	750,000

	International Funding	300,000	415,000	680,000+
# Research awards received by faculty		NA	NA	160 260,000 JD
# Patents		NA	7	13
# Journals published		10	NA	3
# Conferences organized		20	NA	9
Ranking	QS National	1	NA	NA
	QS regional	8	NA	10
	QS International	550-600	NA	601-650
	Times	NA	NA	600-800
# Spinoffs		NA	NA	1
# International Students		NA	1099	4500

11. Tour Visits

Members of the participating Jordanian universities have participated in three tour visits to selected European universities.

a. Sapienza University, Italy.

Teams from Jordan universities were invited to participate in two tour visits to Sapienza university in Italy. The team was introduced to various avenues of research and innovations at Sapienza. This included

1- Sapienza strategic plan (2016-2021)
2- Research priorities
3- Research Focus
4- Research culture and performance
5- Internationalization
6- Developing research force
7- Innovation and technology transfer
8- Research labs and centers
9- Spin-offs/ Start-ups

b. KU Leuven Visit

Teams from Jordan universities were invited to participate in two tour visits and a conference at KU Leuven University in Belgium. The study visit included several presentations

from key university personnel and visits to several research and innovation centers. Following are some highlights of the study visit:

- KUL research budget in 2015 was 825 million Euros.
- KUL received 551FP7 grants totaling 264 M Euros, and 211 Horizon 2020 projects totaling 117 million euros.
- KUL received 118 million euros from licensing of patents.
- KUL has 125 spinoff companies during the last 15 years, at a rate of ~8 spinoffs per year.
- KUL ranks 35 at a global level.
- 5000 Ph.D. candidates are sustained at anytime

KUL philosophy: Focus on research, innovation, and excellence. Ranking is a byproduct of productivity. Internationalization is key for the success of Ph.D. programs. Without international Ph.D. students, the successful research and innovation program dries out.

The office of research and development LRD is key for supporting research, innovation, spinoffs and relations with industry. The office of internationalization is key for the successful research and innovation programs.

c. Barcelona University Visit

Teams from Jordan universities were invited to participate in two tour visits at Barcelona University. The study visit included several presentations from key university personnel and visits to several research and innovation centers. Following are some highlights of the study visit:

- Science Park is one of the most important stops, where we got to educate ourselves about the actual business model there, and how the industry work in harmony with academia to support the innovation in research.
- Union for the Mediterranean (UFM) is another significant segment of this study tour where we got to learn about different platforms for cooperation, the different priorities, the promoters. Also, we got familiar on the UFM Climate Action and many other areas of interest and how it helps to improving resilience and investing in future in innovative manners

12. Impact of MiMiR Project on Jordan Universities

Despite the tremendous growth in higher education experienced by Jordan during the last few decades, there needs to be more focus and strengthening on key areas in the domain of research and innovation. The interaction with partners from EU universities and Morocco have crystalized some of the areas, which must remain at the focal point of higher education institutions.

a. Sustainable research programs

Sustainability of research programs, as learned from the study visits to EU universities, is key parameter which must remain a focal point at all times. The main pillars of sustainability include

1- A continuous supply of graduate students for the various programs at affordable cost. All universities, which we have visited, agree that internationalization is key for sustaining a good supply of graduate students.
2- A stable and qualified faculty members who can lead various research programs. EU universities, represented by the visited universities, do not suffer serious brain drain problem, which is a major problem in Jordan and Morocco. For sustainable research programs, there has to be a national strategy to deal with the brain drain issue. A very significant number of students, who study abroad and attain their higher education degrees, fail to return to Jordan. This is more true for students who attain their graduate degrees from the USA, rather than Europe. Besides, many faculty members may leave Jordan for other countries in search for better salaries, better life style, or more research opportunities.
3- A stable and sufficient funding for research projects. Compared to universities, we have visited in Europe, the amount of funding available for research projects in Jordan universities is marginal. A national strategy for funding as well as a per-university strategy is required. It is interesting to note that faculty promotion in the universities we visited is strongly impacted by the ability of a faculty member to attract local and international grants. This remains to be incorporated into Jordan institutions. The experience of ICREA in Catalonia is of extreme importance for funding sustainability.

b. Collaboration with industry

Collaboration with industry is two faceted.

- **The first facet** is collaboration with existing industries in order to enhance the research programs, involve faculty in the process of solving real problems, and adding value to the knowledge based economy. All universities we have visited enjoy industrial parks, where real industries exist in the same vicinity of the universities. Each and every one of the universities we visited has an office responsible for collaborations with industry. At KU Leuven, the office conducts all negotiations with industry, prepares the contracts, protects the faculty members and insures sustainability. The collaboration with industry is a major source of funding, as well as of research ideas and themes for new graduate students.
- **The second** facet is the university role in creating new industries through the concept of spinoffs/startups. KU Leuven has a very strong record of spinoffs averaging almost 10 spinoffs/startups per year over the last 15 years. Sapienza is more recent in this endeavor but has a very good rising curve in the number of

spinoffs. Spinoffs and startups are a major supplier of research funding and revenue for KU Leuven totaling 125 million Euros per year.

In Jordan, both facets are at their infancy and yet to be highly developed and emphasized. We believe that a national strategy ought to be in place for this area.

c. Internationalization

For EU universities we visited, internationalization means two things. First, a continuous supply of graduate students. Second, obtaining research money from granting offices, especially from the EU (FTP 7, Erasmus +, Horizon 2020).

For Jordan, internationalization should focus as well on

1- International students, where students from the Middle East, Africa, Europe and possibly Asia can join graduate research programs in Jordan. In this regard, emphasis can be placed on disciplines which can easily compete for graduate students. Fields should be identified on the basis of a national strategy. For example, Jordan can be a leader in studies related to humanities, Arabic language, Islamic religion, middle east politics, world peace, archeology, pharmaceutical studies, among others.
2- International funding, where research funding is obtained from the EU, Asia, USA and other places. In this regard, statistics show that the majority of funding obtained by Jordan faculty members is in the area of capacity building and very little is for scientific research and innovation. A well defined strategy has to be created to boost research funding. One of the key success stories exhibited by KU Leuven is its capability of attracting more than 400 million Euros in external funding per year.
3- International collaboration with key universities. It is well noted that each and every of our three universities had signed hundreds of MOU's with universities across the world. But the idea learned from our visits is that a collaborative program has to be well defined in a specific area for a specific goal. For example, a collaborative program with Sapienza can be in the area of civil engineering (for example) to create a joint MS/PhD programs where students and faculty in both universities can jointly supervise research programs, and can jointly write proposals for funding, and can jointly work to spinoff a new startup.

d. Vision

It is amazing how a good and clear vision can lead to wonders in the process of managing innovation and research. One thing we learned during the tours is a vision held by KU Leuven (for example), where the university leadership views each faculty member (among 1980) is a potential innovative project. With 2.6 Ph.D and 4 MS students per faculty, it is feasible that this small group can be a nucleus for a good startup company. The result of this vision is an average of 10 startups per year. Of course, the university has built a strong infrastructure and many tools to cater for this vision.

It is not far fetch from reality to device a vision for Jordan participating universities as well as others to expect 1% of the total faculty (6000) to develop an innovative project into a successful startup, which could lead to 60 startups per year. Even half of this number is a good success, and should be viable

Transfer of Knowledge to JUST

JUST has already started a center of excellence for innovative projects. The center mandate is to develop technology and business incubators. As a direct feedback of the MiMiR project, the center has already begun focusing on startups and spinoffs. It has developed close relationship with Shamal Star, an EU funded organization, which provides technical, legal, and financial support for innovation and entrepreneurship. The center has found synergy with iPark, a non-profit organization which acts as an accelerator of startups, providing space, marketing opportunities, and help attract investors.

A direct impact of MiMiR on JUST will be the utilization of the MiMiR platform for better organizing research and innovation, for creating a database of researchers, research funding opportunities, project tracking, and strategy development for sustainable research, and funding. Researchers at JUST are engaging more enthusiastically with EU funding agencies for funding original research as well as capacity building.

More recently the JUST MiMiR team members have contributed towards the organization of a conference on “Commercialization of Innovation in the MENA region” to be held in October 2018.

Conclusions

In conclusion, the MiMiR project until this point has produced a very impressing results. Our faculty members who participated in this program have gained a good insight into the various tools, labs, ideas, strategies, practices, and philosophy which allowed key EU universities to achieve good performance in terms of research, innovation, and industrialization. There is yet more to learn and incorporate into our institutions, and more importantly there is a dire need for the participation of policy makers, decision makers, and administrators to be involved in the movement for the modernization of institutional management of innovation and research. Finally, common challenges include centralized versus decentralized research. While we need centralized research approach and infrastructures, individual researchers are not supported, and some efforts needed in this regard. Also, access to funding is not clear for a high percentage of researchers.