



# MOSAIC

## MOSAIC

Cooperation with Mediterranean Partners to build Opportunities around ICT and Societal And Industrial Challenges of Horizon 2020

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<b>Abstract</b>	This document is the analysis of the ICT sector for Lebanon.
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## **Section 1 - Introduction**

### **1.1 Purpose**

This document compiles the analysis of the ICT sector in Lebanon.

The objective is to identify in Lebanon the critical mass per specific Information and Communication Technology where it is suitable to create Working Groups within the future Technology Platform of Mashriq.

### **1.2 Scope of the document**

This document is produced as part of WP2 - Information and data intelligence analysis and identification of MED key stakeholders.

This document is produced as an outcome of:

- Task 2.1 Definition of methodology for the study and interviews
- Task 2.2 Collection of country information and analysis of collected data
- Task 2.3 Consolidation and harmonisation of the analysis

### **1.3 Structure of the document**

The document is structured as follows:

- Overview of the ICT Sector in the country.
- Analysis per Technologies following the ETP model.
- List of contributors / stakeholders.

## Section 2 - Lebanon

### 2.1 *Situation for ICT*

The surveys we conducted convey an important strength and an important weakness in the Lebanese ICT sector. The Lebanese ICT workers are highly skilled and rank high in the scale of ICT professionals mainly due to a very robust and rich education system in the country that adapts to the latest theories and uses relevant and relatively up to date technologies. However, the lack of a vision and consequently the lack of a clear and transparent governmental plan in the ICT and the energy/power generation sectors hinders the vivid private sector related to ICT, confuses its decision makers, and forces them to subsidize technology and power initiatives and workarounds that may become obsolete by later governmental actions.

Good sources of information:

<http://css.escwa.org.lb/ICTD/3272/2-4.pdf>

<http://www.weforum.org/reports/global-competitiveness-report-2013-2014>

[http://investinlebanon.gov.lb/en/sectors\\_in\\_focus/telecommunication](http://investinlebanon.gov.lb/en/sectors_in_focus/telecommunication)

[http://investinlebanon.gov.lb/en/sectors\\_in\\_focus/information\\_technology](http://investinlebanon.gov.lb/en/sectors_in_focus/information_technology)

[http://www.itu.int/dms\\_pub/itu-d/opb/ind/D-IND-ICTOI-2013-SUM-PDF-E.pdf](http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ICTOI-2013-SUM-PDF-E.pdf)

#### 2.1.1 General overview

ICT sector in Lebanon has many advantages, including skilled workforce, established advertising firms, media content providers and web portals, competitive Internet service providers, and well developed GSM cellular networks. Software developers are considered among the best in the Middle East. Few sectors are growing as fast as the IT sector, with ever-expanding employment opportunities, especially in software development. Lebanon is well positioned to expand the ICT sector, on both local and regional levels.

The ICT sector continues to be significant, resilient and productive despite the political instability and challenging economic environment. The industry has sustained its overall size and level of activity due to a focus on exports. The average growth rate of the Lebanese ICT sector is around 13-15% annually. The annual turnover is estimated at USD 400m, in the private sector and the annual revenues coming from the sector to the state budget are USD 1.2bn.

Mobile Telecom penetration has reached 28% of the population only with 2 mobile operators (MTC Touch of Zain group and Alfa of Orascom). The characteristics of the Lebanese mobile market indicate great long-term potential. These include high usage at an average of 399 minutes per month compared to 142 in Jordan and 125 in Egypt. The telecom revenues are the second source of income after the VAT and officials believe that this sector can fetch a good price if it will be privatized.

Internet penetration rate is at 37.7% up by 11.4% on a yearly basis. Software development has grown steadily in the past few years mostly expertise in banking, insurance, hospital and healthcare packages and offer installation and customization.

The Government of Lebanon has plans to regulate and upgrade its outdated and costly ICT infrastructure that could offer significant opportunities for foreign companies. Current Minister of Telecom is implementing new regulations and working to establish and operate international call centers in Lebanon; to install fibre optic cables over a distance of 4,700 Km and at a cost of USD

62m, aiming at boosting the capacity of Internet networks in Lebanon and eventually at reducing the prices of DSL subscriptions.

### Position in the world ranking (indicators if any)

Lebanon has recorded IDI value of 5.37 and has ranked 52nd in the ICT Development Index in 2012, improving from 61st in the previous year. Regionally, Lebanon ranked 5th following Qatar (31st worldwide), UAE (33rd worldwide), Bahrain (39th worldwide), and Saudi Arabia (50th worldwide) (Bank Med Report, 2014). Lebanon is one the top six Arab states with high IDI and making great progress in 2012. Lebanon ranks 103 in the global competitiveness index of 2013-2014 with a score of 3.77 on a scale of 1 to 7 while it ranked 101 in 2012-2013 according to the world economic forum.

### Potential for growth / forecasts (indicators if any)

The last few years have been detrimental to the ICT sector and its related sectors in Lebanon. The political turmoil in Syria lead to the withdrawal of capital from ICT technologies and investments as seen in the following estimates by the World Bank. However, lately, and since 2013, the ministry of telecommunication and information is leading a venture project to restore the ICT sector. No measurable outputs have been declared yet, but our survey shows that anecdotal evidence from students who managed to open startup companies using the initiative are promising. They listed several examples such as the following.

- Brand Industries: ICT solutions to automate tuning musical instruments. Already with a successful product called RoadiTuner.
- Tari'ak: online driving directions solution to manage traffic in Beirut
- Via mobile offers a solution that renders the mobile phone as a personal bill management system,
- Yellow Distributed Technologies which offers a bitcoin like solution for Lebanon,

### Spending of GDP in ICT (World data bank, website database)

DEVELOPMENT INDICATORS	2009	2010	2011	2012
<b>GDP</b>	\$39,100,000,000	\$42,000,000,000	\$45,400,000,000	\$49,500,000,000
<b>Total exports of goods and services (\$ US)</b>	\$4,187,000,000	\$5,021,000,000	\$5,664,000,000	\$ 5,615,000,000
<b>ICT goods exports (% of total goods exports)</b>	2.9	7.1	0.9	0.6
<b>ICT goods exports</b>	<b>\$121,423,000</b>	<b>\$356,491,000</b>	<b>\$50,976,000</b>	<b>\$33,690,000</b>
<b>ICT goods exports (% of GDP)</b>	<b>0.31%</b>	<b>0.85%</b>	<b>0.11%</b>	<b>0.07%</b>

<b>Total imports of goods and services (\$ US)</b>	\$16,574,000,000	\$18,460,000,000	\$20,750,000,000	\$21,945,000,000
<b>ICT goods imports (% total goods imports)</b>	3.2	2.8	2.3	2.2
<b>ICT goods imports</b>	<b>\$ 530,368,000</b>	<b>\$ 516,880,000</b>	<b>\$ 477,250,000</b>	<b>\$ 482,790,000</b>
<b>ICT imports (% of GDP)</b>	<b>1.36%</b>	<b>1.23%</b>	<b>1.05%</b>	<b>0.98%</b>
<b>ICT service exports (% of service exports, BoP)</b>	55.4	26.7	48.1	56.8

## 2.1.2 Situation of research and innovation

Main funding organizations for research and innovation programs:

- CNRS (National Council for Scientific Research):** a public sector entity which aims at supporting and enhancing scientific research through partial or full funding. The main research areas considered include agricultural sciences, basic sciences, environmental sciences, medicine and public health, human and social sciences and science technology. Funding takes place under two specific annual programs:
  - Yearly Academic Research Unit (ARU) program:** grants awards for research units across universities that concentrate on an area of research relevant to the priorities of CNRS.
  - Yearly Grant Research program (GRP):** grants partial or full funding to full-time faculty working on research in any of the areas above mentioned.
  - Science, Technology and Innovation Policy (STIP):** launched by CNRS in 2006, this policy led to the formulation of priority scientific research programs and emphasized the cooperation of all stakeholders to identify socio-economic societal needs and qualified human capital available in Lebanon.
- Central Bank of Lebanon (BDL):** issued a circular to help boost the technology sector in Lebanon by providing financial incentives for commercial banks to invest in start-ups, incubators, and funds. With \$400 Million allocated to support start-ups, BDL guarantees up to 75% of commercial banks' investments in start-ups.
- Berytech Fund:** Start up fund which invests in early growth Lebanese companies involved in the field of ICT, in exchange for equity ownership
  - Speedup your startup:** provides startups with funding up to \$50,000

- **Kafalat:** provides three types of loan guarantees. One guarantee is for loans of up to USD 400,000 granted by commercial banks to SMEs engaged in specific economic sectors. Another guarantee is through a \$30 million fund established by the World Bank for equity investments in SMEs. The third guarantee is to support innovative start-ups.
  - **Kafalat Plus:** is a partnership between the EU and Ministry of Economy and Trade (MoET), offering loan guarantees to SMEs and conventional Startups, up to LBP600 million for a maximum period of 7 years.
  - **Kafalat Innovative:** partnership between EU and MoET which offers loan guarantees to start-up businesses of less than two years for investments in fixed assets and working capital needs.
  - **Kafatlat Startups:** partnership with the European Union and the Presidency of Council of Ministers for innovative enterprises and startups in Lebanon. It provides loan guarantees up to LBP 650 million for a period up to 7 years.
- **FARO:** a newly set-up seed capital, development and orientation fund that aims at supporting SMEs in Lebanon and finances up to \$20,000 per eligible SME innovative products or services. This fund was launched by the Beirut and Mount Lebanon Chamber of Commerce, Industry & Agriculture (CCIB) in 2011.
- **Wamda:** a platform for creative entrepreneurs in the MENA region, offering a media site for promoting new initiatives and developments, a fund for early startups, support services and programs for startups to launch and maintain their growth in the market.
- **Ibdaa:** is an initiative launched since 2012 by the Arab Gulf Fund for Development addressing SMEs, micro companies and women. It provides loans and services through different programs, bringing together investors and businesses.
- **Bader Lebanon:** is a young entrepreneurs program established since 2005. It provides startups and young entrepreneurs with investments, monetary prizes for student innovation, in addition to bringing the stakeholders and investors together through a networking program.
- **Economic and Social Fund for Development:** Started in 2003 to reduce poverty in Lebanon by providing SMEs with credits through commercial banks. With minimal loan guarantee requirements, and a loan ceiling of 75 million LBP, the fund also provides business advisory services.
- **Middle East Venture Fund:** In 2014, Middle East Venture Partners (MEVP) announced the launch of the IMPACT Fund, a \$50 million venture capital fund that will invest between one and five million dollars per operation in knowledge-based startups, with ICT and creative industries as primary sectors
- **ISME World Bank Fund:** A \$30 million fund recently earmarked by the World Bank to the Lebanese government to finance seed and early growth companies. Kafalat is the entity responsible to manage this fund.
- **Cedrus Ventures:** is a venture capital and private equity firm that target Lebanese companies by providing investors with access to wide local market opportunities.
- **Riyada Enterprise Development (RED):** is both a pan-MENA platform and an SME initiative for providing SMEs with long-term capital for high growth, entrepreneurial enterprises. This

platform operates through teams in Lebanon, Jordan, Palestine, Egypt, Dubai, Tunisia, Morocco and Algeria.

- **The Association of Sciences and Research:** it has been organizing science competitions for school students since 2004 throughout all the Lebanese areas. Projects vary from models to research on robotics, ICT, interactive technologies, illustrative technologies and others.
- **Euro-Lebanese Center for Industrial Modernization (ELCIM):** initiated in 2001 by the Lebanese government, this center is part of the EU ISSP program aimed to support SMEs in terms of legislative, financial and business services. In association with ALSI, ELCIM established a business cluster of software companies to discuss, plan, and work on issues related to improving the software industry. It is well connected to professional organizations such as academic institutions, public institutions, and professional associations and syndicates.
- **Association of Lebanese Software Industry (ALSI):** established since 2002, the association brings together the software companies in Lebanon to address software industry issues and plan ahead for its growth and development. ALSI conducts software discussion forums, contributes to setting national strategies for the software industry, works closely with the ministries to enhance the competitiveness of the software industry, in addition to importing expertise through ALSI delegations to conferences around the globe.

### ***Future initiatives and roadmap***

In 2013, Minister Sehnaoui led the Lebanon digital roadmap steering committee to ensure the execution of a 400 million USD equity investment that aims to turn Lebanese banks into venture capitalists in partnership with the Lebanese central bank (banque du Liban (BDL) ). The initiative is well documented and detailed in BDL circular 331 which invited banks and investment institutions in general to invest in startup companies, incubators, accelerators, and companies interested in investing in startups. The initiative declared several incentives such as seven years interest free facilities from BDL.

The CIRCLE 331 is an initiative support by Banque du Liban to further the reach of the Lebanese digital infrastructure and reduce its end user cost. The plan lays a roadmap to increase the wireless internet connectivity across the country, better its bandwidth, and decrease its cost. The plan also lays a similar roadmap for the wired and the fiber optics network in the country. It is foreseen that the first phase of the roadmap be completed by the end of 2015, and that continuous work will take place on the same lines.

### **2.1.3 Situation of Academia**

According to the directorate general of higher education, there are 31 universities in Lebanon, three university institutes of technology, three university institutes and colleges, in addition to four university institutes for religious studies. The number of research centers, technology centers is considerable, but not official numbers could be reached. There is no specific statistics on the number of researchers in Lebanon. This requires research on a center-by-center basis. For example, since 2007, CNRS has funded research for 184 researchers. Moreover, since 2006, Balamand University has funded more than 62 internal researches, for groups of 3-5 researchers, hence a total of 180-300 researchers. Accordingly, there is no one source of information on the number of publications and researchers in Lebanon.

In Lebanon there is one public university, the Lebanese university, and 31 licensed private universities as of September 2013. Lately, the number of licensed universities raised to around 64 (no official report but source is from news reports). We list below the most important universities with the highest enrollment rates and that house ICT related programs.

### ***Lebanese University***

The Lebanese University is the only public official institution in Lebanon that provides public higher education and research. It was found in 1951 and until the date of today it has the following faculties: Faculty of Science, Faculty of Human Science, Faculty of Engineering, Faculty of Documentation and Information, Faculty of Economic Sciences and Business Administration, Faculty of Health Science, Faculty of Denture Medicine, Faculty of Agriculture, Institute of Technology, Faculty of Education, Faculty of Arts, Faculty of Sociology, Faculty of Laws and Political and Administrative Sciences, Faculty of Medicine, Faculty of Pharmacy, and Faculty of Tourism and Hospitality management.

### ***The American University of Beirut (AUB)***

The American University of Beirut is a private university founded in 1866. A teacher center research university, AUB has around 800 instructional faculty (538 full time and 274 part time) and a student body of around 8,000 students. The University, which was granted institutional accreditation in June 2004 by the Commission on Higher Education of the Middle States Association of Colleges and Schools in the United States and reaffirmed in June 2009, includes six faculties: Agricultural and Food Sciences, Arts and Sciences, Engineering and Architecture, Health Sciences, Medicine (which includes the Rafic Hariri School of Nursing), and the Suliman S. Olayan School of Business.

In 2008, the Department of Electrical and Computer Engineering at the American University of Beirut launched a new two-year graduate program in Information and Communication Technology (ICT). The new program, which leads to a Masters of Engineering degree, was developed with a \$700,000 grant from the European Union's TEMPUS program in collaboration with Munich Technical University in Germany, the University of Southampton in Britain, and German multinational Siemens AG.

### ***The Lebanese American University (LAU)***

The Lebanese American University is a private university founded in 1853. It operates under a charter from the Board of Regents of the University of the State of New York and is accredited by the New England Association of Schools and Colleges. In the fall 2013 semester, LAU had more than 8,100 students enrolled. The university has around 312 full time faculty and 446 part time faculty.

Students in the computer engineering program develop an in-depth knowledge of digital systems, computers, software, networks, and communications systems. In addition to the core topics in electrical and computer engineering, students are exposed to subjects including microprocessors, operating systems, computer architecture, database systems, networks, electronics, control systems, software engineering, reconfigurable computing, communications systems, and telecommunications.

### ***Saint Joseph University (USJ)***

Saint Joseph University is a private university founded in 1875. The Lebanese state officially recognizes the university and the diplomas it grants in accord with the law organizing higher education in Lebanon. The university is a member of the Association of Arab Universities, the International Association of Universities, the Association of French speaking universities (AUPELF) the International Federation of Catholic Universities, the European Federation of Catholic Universities, the Association of Jesuit Institutions of Higher Learning in Europe and Lebanon and

the Euro-Med University (Téthys). The university comprises over 1,880 professors of various rank; over 500 employees and workers in general services and laboratories; and over 11,000 students.

### ***Beirut Arab University (BAU)***

Beirut Arab University is a Lebanese private university located in Beirut, Lebanon. It was founded by the Lebanese El-Bir and Ihsan Society in 1960. The university is officially accredited according to article (17) of the Lebanese Higher Education Law issued on 26 December 1961. Beirut Arab University has around 1000 academic staff and more than 15,000 students in the four campuses: Beirut, Debbieh, Tripoli and Bekaa.

The Faculty of Engineering at Beirut Arab University offers a Bachelor of Engineering Degree in Civil and Environmental Engineering, Communications and Electronics Engineering, Computer Engineering, Electric Power and Machines Engineering, Industrial Engineering, Mechanical Engineering and Petroleum Engineering.

The first EE class graduated in 1980. Due to the Lebanese market demand a third program, following the same procedure and policy, was added in 1995 to the EE department, which was the Computer Engineering Program. In 2002, the Computer Engineering Program become a separate entity and a new department was established under the title of the Computer Engineering and Informatics (CEI). In 2006 the university adopted the credit-hour system whose first class graduated in 2010. In 2010, the two departments EE and CEI merged into a single department now called **Electrical and Computer Engineering (ECE) department**. This ECE department comprises now three separate and distinct programs entitled: Communications and Electronics Engineering Program, Computer Engineering Program, Electrical Power and Machines Program

### ***Islamic University (1966)***

It has nine faculties as well as a center for research and publishing. Since 2010, a semi-annual magazine was launched to publish the researches, in both Arabic and English.

### ***Lebanese International University (2001)***

It has nine academic schools in addition to labs and academic research centers for students.

### ***Balamand University (1988)***

It has eight faculties and two institutes, in addition to seven centers for research and studies. Specifically, there is a center for engineering and environmental studies as well as a center for engineering technology and industrial innovation. In 2006, the “Balamand Internal Research Grants” program was established and has since provided a total of 62 grants for tis internal researches.

### ***Notre Dame University (1987)***

It has seven faculties and six research centers; namely the Water Energy and Environment Research Center, Digitization and Preservation Center, and Center for Applied Research in Education.

### ***Main geographic locations where ICT is developed***

ICT companies are mainly concentrated in the greater Beirut district due to the lack of fast, reliable, and inexpensive internet access in other areas.

## 2.1.4 Situation of Industry

According to a 2012 report from ALSI, Lebanon houses around 105 operational ICT related companies. Half of the companies are small companies with 5 employees on average. A quarter of them range between 20 and 30 employees, 22 percent of them have an average size of 80 employees, and around three percent of them have above 100 employees each.

## 2.2 Sectorial analysis and indicators

### 2.2.1 Software & Services

The Lebanese software sector has been growing relatively, with more than 300 software companies operating mostly in Beirut and Mount Lebanon Governorates and employing 7,000 employees. The software companies operate in three main areas: software programming, mobile applications, and web solutions. The improvements in the ICT infrastructure contributed to relative developments in software production and application. Hence, industrial innovations and competitiveness were promoted. According to the Investment Development Authority of Lebanon (IDAL), there has been a considerable shift in the number of software companies from software development to retail and wholesale. In response to market changes, a cluster of software companies was established by the Euro-Lebanese Center for Industrial Modernization (ELCIM) and the Association for Lebanese Software Industry (ALSI). This cluster aims at promoting collaboration between the different software companies operating in Lebanon, in addition to helping in exporting Lebanese software products and outsourcing software services, mainly to Europe.

N°	Indicator - Political Support	Indicator	Results
1	National or State Policies	PO-01	There are not national or state policies for this ICT area. Very few respondents believe it is foreseen
2	Funding mechanisms to support ICT research	PO-02	Yes, there are such funding programs, though mostly by private sector initiatives and very few by the public sector.
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Yes, there are and it is a growing area of interest especially with the quality of researchers working in this area.
4	Support to MED-TPs	PO-04	Yes
N°	Indicator - Industrial support	Indicator	Results
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Although there are no statistics available, it is estimated that the number of medium to medium-high; nearly 160 companies.
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	This is estimated to be low-medium, mainly operating in Beirut
7	Involvement in European funded projects	IN-03 (1-5)	Most indicated involvement is low-medium, with indications of lack of accurate statistics
8	Independence of local industry	IN-04 (1-5)	Since most ICT companies working in this are export-oriented, they are mostly responsive to external demand.

9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	This is low to medium-low, with most responses indicating it is low
10	Market Demand	IN-06	There is high internal demand for software and services
11	Number of Patents	IN-07 (1-5)	This is very low, with some indicating there are none.
12	Support to MED-TPs	IN-08	Yes
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Yes
<b>N°</b>	<b>Indicator - Academic support</b>	<b>Indicator</b>	<b>Results</b>
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Low
15	Researchers operating in the targeted field	AC-02 (1-5)	Medium low-Medium
16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	Low
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	Yes
21	Innovation policy and/or initiative	GE-02	Yes

## 2.2.2 Networked Electronic Media (Contents)

<b>N°</b>	<b>Indicator - Political Support</b>	<b>Indicator</b>	<b>Results</b>
1	National or State Policies	PO-01	No, but is foreseen by many.
2	Funding mechanisms to support ICT research	PO-02	Most say that there are, though some believe there aren't any while others indicated that it is foreseen
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Yes while many others see that it is foreseen
4	Support to MED-TPs	PO-04	Yes
<b>N°</b>	<b>Indicator - Industrial support</b>	<b>Indicator</b>	<b>Results</b>

5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low, while others indicated lack of information
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Medium to Medium-high
7	Involvement in European funded projects	IN-03 (1-5)	Low to Medium-low, lack of information
8	Independence of local industry	IN-04 (1-5)	Independent
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low-medium
10	Market Demand	IN-06	Yes
11	Number of Patents	IN-07 (1-5)	Low
12	Support to MED-TPs	IN-08	Yes
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Yes
<b>N°</b>	<b>Indicator - Academic support</b>	<b>Indicator</b>	<b>Results</b>
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Low to medium-low
15	Researchers operating in the targeted field	AC-02 (1-5)	Medium-low to medium
16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	n/a
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	N/a
21	Innovation policy and/or initiative	GE-02	n/a

### 2.2.3 Telecommunications

Telecommunications industry has been witnessing considerable growth in the past few years in terms of services and investments. This growth was driven by the developments and policy initiatives aimed at modernizing the sector, including but not limited to: improving the infrastructure, network accessibility, regulating telecom services, decreasing telecommunication costs, and improving coverage. The Telecommunications sector is governed by four main entities: Ministry of Telecommunication as a regulatory body, OGERO institution for fixed telephone services and DSL

services, and two mobile companies (Touch and Alpha). According to IDAL 2012 report, improvements in telecommunication sector included:

1. Improved mobile penetration from 6.75 in 2011 to 17.2% in 2012
2. Highest fixed line subscription rate in the region; 21% in Lebanon compared to 9.6% in the region
3. Improved average speed of mobile broadband; 70 kb in 2011 to 1.2 Mb in 2012

There is considerable amount of research and projects on telecommunication in Lebanon as this industry is continuously thriving. The Ministry of telecommunications is working on introducing fiber optic in Lebanon to be made accessible to most households. It is worth mentioning that the ministry has been working on increasing internet speed by signing agreements with neighboring countries, namely Cyprus and Syria, to share their capacity of internet cables.

N°	Indicator - Political Support	Indicator	Results
1	National or State Policies	PO-01	Is foreseen
2	Funding mechanisms to support ICT research	PO-02	Yes
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Yes
4	Support to MED-TPs	PO-04	Yes
N°	Indicator - Industrial support	Indicator	Results
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Medium to Medium-high
7	Involvement in European funded projects	IN-03 (1-5)	Yes
8	Independence of local industry	IN-04 (1-5)	Yes, while some believe they are not.
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low-medium
10	Market Demand	IN-06	Yes
11	Number of Patents	IN-07 (1-5)	Low to Medium-low
12	Support to MED-TPs	IN-08	Yes
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	n/a
N°	Indicator - Academic support	Indicator	Results
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Low to Medium-low
15	Researchers operating in the targeted field	AC-02 (1-5)	Medium-low to Medium

16	Number of yearly scientific publications	AC-03 (1-5)	Low to medium-low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	n/a
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	n/a
21	Innovation policy and/or initiative	GE-02	Yes

## 2.2.4 High Performance Computing

High performance computing is an emerging area in Lebanon where that interests several players including researchers from AUB, the steering committee for the offshore Oil and Gas discovery and the Munib Masri Foundation. This came evident in the 2013 Big Data, Big Computing, and the Oil Industry conference that addressed issues on Big data analysis for seismic data that might originate from oil and gas related discoveries on Lebanese offshore.

However, in general, this area does not partake market share of the Lebanese economy since it does not exist as a sectorial entity, but rather as a number of activities. Much research and student projects are being done in this ICT area; however, application is relatively low. Low application is related to the quality of the infrastructure and internet speed in Lebanon. Despite the developments initiated by the Ministry of Telecommunication in infrastructure and internet speed, these developments remain very modest for high performance computing. Nevertheless, there are personal initiatives taking place in this area. For example, in 2013, the American University of Beirut announced it was taking steps to become a high performance computing center by establishing a High Performance Computing cluster to encourage leading research initiatives. Big data research is taking place through online cloud systems, rather than developing local cloud systems. Accordingly, this industry is dependent on outsourced services, research and few personal initiatives.

<b>N°</b>	<b>Indicator - Political Support</b>	<b>Indicator</b>	<b>Results</b>
1	National or State Policies	PO-01	No, is foreseen
2	Funding mechanisms to support ICT research	PO-02	No, is foreseen
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Is foreseen
4	Support to MED-TPs	PO-04	Yes
<b>N°</b>	<b>Indicator - Industrial support</b>	<b>Indicator</b>	<b>Results</b>
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low-medium
6	Presence of Research and	IN-02 (1-5)	Low

	Innovation Intensive SMEs		
7	Involvement in European funded projects	IN-03 (1-5)	Low
8	Independence of local industry	IN-04 (1-5)	Independent
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low
10	Market Demand	IN-06	No, the internal market is not mature for application in this area
11	Number of Patents	IN-07 (1-5)	Low-none
12	Support to MED-TPs	IN-08	Yes
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Foreseen, few believe there is while few others do not believe there is a cooperation
<b>Nº</b>	<b>Indicator - Academic support</b>	<b>Indicator</b>	<b>Results</b>
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Low
15	Researchers operating in the targeted field	AC-02 (1-5)	Low
16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	n/a
18	Existing cooperation with EU countries	AC-05	n/a
19	Support to MED-TPs	AC-06	Yes
<b>Nº</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	n/a
21	Innovation policy and/or initiative	GE-02	Yes

### 2.2.5 Photonics

This industry has very low profile due to the lack of fiber optic in Lebanon and the expensiveness of the material required for application and research. Very few projects have been done in this area; mainly student projects. However, government efforts are being targeted to providing efficient fiber optic services throughout all Lebanese territory.

<b>Nº</b>	<b>Indicator - Political Support</b>	<b>Indicator</b>	<b>Results</b>
1	National or State Policies	PO-01	No

2	Funding mechanisms to support ICT research	PO-02	No, is foreseen
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Is foreseen
4	Support to MED-TPs	PO-04	Yes
<b>N°</b>	<b>Indicator - Industrial support</b>	<b>Indicator</b>	<b>Results</b>
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Low
7	Involvement in European funded projects	IN-03 (1-5)	Low
8	Independence of local industry	IN-04 (1-5)	Is foreseen
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low
10	Market Demand	IN-06	No
11	Number of Patents	IN-07 (1-5)	Low-none
12	Support to MED-TPs	IN-08	Yes
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Is foreseen
<b>N°</b>	<b>Indicator - Academic support</b>	<b>Indicator</b>	<b>Results</b>
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Low
15	Researchers operating in the targeted field	AC-02 (1-5)	No clear reply
16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	n/a
18	Existing cooperation with EU countries	AC-05	n/a
19	Support to MED-TPs	AC-06	Yes
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	n/a
21	Innovation policy and/or initiative	GE-02	n/a

## 2.2.6 Nanoelectronics

The existence of this sector is extremely shy in Lebanon; hence, limited to few research papers and student algorithmic projects, but no physical applications. The equipment required for this sector is expensive and the market is not equipped to operate such advanced technology.

N°	Indicator - Political Support	Indicator	Results
1	National or State Policies	PO-01	No, is foreseen
2	Funding mechanisms to support ICT research	PO-02	No, is foreseen
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Foreseen
4	Support to MED-TPs	PO-04	Yes
N°	Indicator - Industrial support	Indicator	Results
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Low
7	Involvement in European funded projects	IN-03 (1-5)	Low
8	Independence of local industry	IN-04 (1-5)	Is foreseen
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low
10	Market Demand	IN-06	No, is foreseen
11	Number of Patents	IN-07 (1-5)	Low
12	Support to MED-TPs	IN-08	Yes
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Is foreseen, few say there is
N°	Indicator - Academic support	Indicator	Results
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Low
15	Researchers operating in the targeted field	AC-02 (1-5)	Low to Medium-low
16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	n/a
18	Existing cooperation with EU countries	AC-05	Yes

19	Support to MED-TPs	AC-06	Yes
N°	Indicator - General	Indicator	Results
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	n/a
21	Innovation policy and/or initiative	GE-02	n/a

## 2.2.7 Smart Systems Integration

This industry is shy in Lebanon in terms of its volume of operations and market size. Despite the availability and affordability of microelectronic devices, implementation is rare unless for manufacturing companies and few appliances. Demand for this industry, as well as the research on such topic, remains low. No plans are seen in the near future for developing this industry.

N°	Indicator - Political Support	Indicator	Results
1	National or State Policies	PO-01	No, is foreseen
2	Funding mechanisms to support ICT research	PO-02	No
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Yes
4	Support to MED-TPs	PO-04	Yes
N°	Indicator - Industrial support	Indicator	Results
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Low-medium
7	Involvement in European funded projects	IN-03 (1-5)	Low
8	Independence of local industry	IN-04 (1-5)	Is foreseen
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low
10	Market Demand	IN-06	No, while few say it is
11	Number of Patents	IN-07 (1-5)	Low
12	Support to MED-TPs	IN-08	Yes
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Yes
N°	Indicator - Academic support	Indicator	Results
14	Number of Universities, Research Centres and Higher Education	AC-01 (1-5)	Low

	Institutions		
15	Researchers operating in the targeted field	AC-02 (1-5)	Medium-high
16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	n/a
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	n/a
21	Innovation policy and/or initiative	GE-02	n/a

## 2.2.8 Embedded Intelligence and Systems

<b>N°</b>	<b>Indicator - Political Support</b>	<b>Indicator</b>	<b>Results</b>
1	National or State Policies	PO-01	No research policy although around 14% might have heard something about it (answered by foreseen)
2	Funding mechanisms to support ICT research	PO-02	There are some funding programs but many haven't heard of it
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	No
4	Support to MED-TPs	PO-04	Yes, most of respondents are willing to support.
<b>N°</b>	<b>Indicator - Industrial support</b>	<b>Indicator</b>	<b>Results</b>
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Yes
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Yes
7	Involvement in European funded projects	IN-03 (1-5)	Few
8	Independence of local industry	IN-04 (1-5)	Local ICT industries are mainly not independent, supply is as a response to inputs from other countries.
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	No development centers

10	Market Demand	IN-06	Yes
11	Number of Patents	IN-07 (1-5)	Number of patents filled is low
12	Support to MED-TPs	IN-08	Yes, most of respondents are willing to support.
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Yes although foreseen by few
<b>N°</b>	<b>Indicator - Academic support</b>	<b>Indicator</b>	<b>Results</b>
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Medium
15	Researchers operating in the targeted field	AC-02 (1-5)	Medium
16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	Low
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes, most of respondents are willing to support.
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	Medium to low
21	Innovation policy and/or initiative	GE-02	Yes there is innovation initiatives in Lebanon but many haven't heard of it

### 2.2.9 Robotics

The existence of this sector is extremely shy in Lebanon; hence, limited to research papers and students' projects but no physical applications. The equipment required for this sector is expensive and the market is not equipped to operate such advanced technology.

We couldn't find evidence of existence of Robotics industry in Lebanon. At the level of research, students in the faculty of engineering in many universities prepare researches in their final year projects on robotic (AUB, LAU, BAU, USEK..), In the health sector, robots are used only as an application but not developed, and there are many future plans for encouraging the domain of robotics. In addition, the Ministry of Education and Higher Education launched this year the Fifth national championship in educational robot in Lebanon.

In 1998, a partnership between education and technology organization *FIRST* and toy manufacturer *Lego* gave birth to the *FIRST Lego League*, an international annual competition that aims to teach young people about robotics in a way that is both exciting and educational. People we interviewed gave us the following results:

N°	Indicator-Political Support	Indicator	Results
1	National or State Policies	PO-01	No
2	Funding mechanisms to support ICT research	PO-02	Answers are inconsistent
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Yes, many researches are conducted on robotics
4	Support to MED-TPs	PO-04	Yes, most of respondents are willing to support.
N°	Indicator - Industrial support	Indicator	Results
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Medium to low
7	Involvement in European funded projects	IN-03 (1-5)	Low
8	Independence of local industry	IN-04 (1-5)	Is foreseen, some answered that local industry is not independent
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low
10	Market Demand	IN-06	No
11	Number of Patents	IN-07 (1-5)	Low to non
12	Support to MED-TPs	IN-08	Yes, most of respondents are willing to support.
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Yes
N°	Indicator - Academic support	Indicator	Results
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Very few
15	Researchers operating in the targeted field	AC-02 (1-5)	Medium to low
16	Number of yearly scientific	AC-03 (1-5)	Very low

	publications		
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	No
18	Existing cooperation with EU countries	AC-05	yes
19	Support to MED-TPs	AC-06	Yes, most of respondents are willing to support.
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	Medium to low
21	Innovation policy and/or initiative	GE-02	yes

## 2.2.10 ICT for Energy

### ICT for wind energy

The CEDRO Company is a pioneer in Lebanon in this field. They are currently in their third stage of implementing their wind energy project. They installed two projects in Ras Baalbeck and EIMkhayteah to compensate for the excessive blackouts and the diesel generators. They installed a micro wind turbine, a charge controller, an inverter and a battery bank for storing extra energy produced. Currently they've installed three micro wind turbines in two schools and one in a community center.

*Wind Energy. (n.d.). Retrieved from [http://www.cedro-undp.org/projects/7/Renewable\\_Energy/12](http://www.cedro-undp.org/projects/7/Renewable_Energy/12)*

### ICT for Photovoltaic energy

Lebanon has recently started on their path to large-scale renewable energy, and their most promising renewable energy source comes from Photovoltaic Energy (PV) using rooftop applications and large open field solar power plants.

A study by Cedro measured several aspects of PV and its usability, constraints, and economic costs.

“Technical focus is placed on the following aspect of PV power development:

- Characterization of plants and components, from panels, to switchgears, structures, and standards;
- PV power development, such as site assessments and solar resource estimations (site selection), sizing of equipment, and design and operation parameters,
- Environmental and safety considerations,
- Regulatory and planning requirements,
- Grid capacity, voltage, and frequency parameters and implications.”

CEDRO implemented over 71 applications of PV in schools and centers of rural towns and is planning to implement new hybrid PV-diesel applicators in early 2015, mainly in factories.

Photovoltaic Energy. (n.d.). Retrieved from [http://www.cedro-undp.org/projects/7/Renewable Energy/11?pvtype=large scale](http://www.cedro-undp.org/projects/7/Renewable%20Energy/11?pvtype=large%20scale)

Vallvé, X. et al. (2013). PHOTOVOLTAIC PLANTS in LEBANON. Retrieved from [http://www.cedro-undp.org/content/uploads/publication/141003044411593~Photovoltaic Power Plants in Lebanon.pdf](http://www.cedro-undp.org/content/uploads/publication/141003044411593~Photovoltaic%20Power%20Plants%20in%20Lebanon.pdf)

### **ICT for Electricity energy**

The state utility of Lebanon, Electricite Du Liban (EDL), is transforming the way the grid works through a complete system overhaul, starting with an extensive metering program. The metering program is step one of the smart grid transformation. Beginning in June 2014, the EDL will roll out 1.2 million smart meters as part of a \$400 million program to re-engineer, expand and improve the network. The 'distribution service provider' project is a program that will outsource electricity utility services to the private sector, for better customer service, collection management, energy balancing and financial flows.

A pilot project with 25 sites was tested before implementation on a national scale. Even though it caused a delay, it was needed to upgrade the project before mass production of meters. Smartness can't be developed on a poorly operated grid which is why it will be linked to network updates, such as data communications and processing.

Dr. Yehia, M. (2014). LEBANON'S DISTRIBUTION SERVICE PROVIDER PROJECT. *Meteing.com*. 4 (4), 30-32.

### **ICT for Biofuels**

A 2012 Bioenergy study by Cedro reports that Lebanon has abundant bioenergy resources as approximately one third of the country is arable, especially along the coastal strip and the Beqaa valley. Traditional use of bioenergy fuel is intensive in rural area but hasn't met the goals set for the development of sustainable bioenergy. The government has set a goal for the year 2020 that 12 percent of their energy needs will be biofuel energy. A potential 23 streams have been found as a potential resource for energy production, they have been grouped according to their source of origin:

1. Forestry
2. Wood and paper industries
3. Agriculture
4. Energy crops
5. Food processing industry
6. Municipal solid waste and non-hazardous industrial waste

A full evaluation assessed the quantity, energy potential, competition with other uses in Lebanon. Remote sensing data and statistical research have been combined to identify the biostream with the most potential for biomass fuel.

*National Bioenergy Strategy for Lebanon*. (2012, January 1). Retrieved from [http://www.cedro-undp.org/Publications/National Studies/2](http://www.cedro-undp.org/Publications/National%20Studies/2)

### **ICT for Renewable Heating & Cooling**

Solar powered water heaters have been implemented as far back as 2006 in Lebanon. Both the Chinese and Swedish governments with collaboration with the Lebanese center for Energy

Conservation (LCEC) donated the technology to Lebanon. 500 solar water heaters were donated by the Chinese government and 200 by the Swedish government. The Chinese government is going to donate an extra 600 solar water heaters of similar capacity and type of phase 1 solar water heaters.

Planned Pilot Projects. (2011, January 1). Retrieved from <http://www.lcecp.org.lb/pilotprojects.php?li=5&pproject=1>

N°	Indicator - Political Support	Indicator	Results
1	National or State Policies	PO-01	No, is foreseen by few
2	Funding mechanisms to support ICT research	PO-02	No, is foreseen by few
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Is foreseen
4	Support to MED-TPs	PO-04	Yes, most of respondents are willing to support.
N°	Indicator - Industrial support	Indicator	Results
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Medium to low
7	Involvement in European funded projects	IN-03 (1-5)	Low, many haven't heard about it
8	Independence of local industry	IN-04 (1-5)	No
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low, many haven't heard about it
10	Market Demand	IN-06	Percentages are equal
11	Number of Patents	IN-07 (1-5)	Low to none
12	Support to MED-TPs	IN-08	Yes, most of respondents are willing to support.
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Mainly yes
N°	Indicator - Academic support	Indicator	Results
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Few
15	Researchers operating in the targeted field	AC-02 (1-5)	Medium to low
16	Number of yearly scientific publications	AC-03 (1-5)	Low

17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	No
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes, most of respondents are willing to support.
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	Medium to low
21	Innovation policy and/or initiative	GE-02	Yes

### 2.2.11 ICT for Health

E-Health foundation actions build an enabling environment for the use of ICT for health. These include supportive eHealth policy, legal and ethical frameworks; adequate funding from various sources; infrastructure development; and developing the capacity of the health work force through training.

Hospitals in Lebanon are mainly responsible for improvement of ICT in health domains, so they work in this domain such as the American University of Beirut Medical Center (AUBC), Clemenceau Medical Center, Hotel Dieu de France, and Saint George Hospital. We interviewed Dr. Joe Wakim from the AUBMC and we got the following results:

<b>N°</b>	<b>Indicator - Political Support</b>	<b>Indicator</b>	<b>Results</b>
1	National or State Policies	PO-01	No, is foreseen by few
2	Funding mechanisms to support ICT research	PO-02	No, is foreseen by few
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Yes there is some
4	Support to MED-TPs	PO-04	Yes, most of respondents are willing to support.
<b>N°</b>	<b>Indicator - Industrial support</b>	<b>Indicator</b>	<b>Results</b>
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low to none
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Low, some don't know about it
7	Involvement in European funded projects	IN-03 (1-5)	Low, some don't know about it
8	Independence of local industry	IN-04 (1-5)	Is foreseen
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low, some don't know about it

10	Market Demand	IN-06	Percentages are almost equal
11	Number of Patents	IN-07 (1-5)	Low to none
12	Support to MED-TPs	IN-08	Yes, most of respondents are willing to support.
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Yes, is foreseen by few
<b>N°</b>	<b>Indicator - Academic support</b>	<b>Indicator</b>	<b>Results</b>
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Low to none
15	Researchers operating in the targeted field	AC-02 (1-5)	Low to none
16	Number of yearly scientific publications	AC-03 (1-5)	low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	No
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes, most of respondents are willing to support.
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	Medium to low
21	Innovation policy and/or initiative	GE-02	yes

## 2.2.12 ICT for Transport

### ICT for Road

The Telecommunications Regulatory Authority (TRA) is working with related Ministries, NGOs and Stakeholders to promote road safety in Lebanon by developing the latest ICT standards for Intelligent Transport Systems and Driver Safety as well as improving driving performance by eliminating the straying factors related to the use of ICT while driving. A reported 1.3 million people die each in traffic accidents, the common factor in a lot of the accidents is texting or manually using gps systems or car technology while driving. The TRA along with the Ministry of Telecommunications (MOT), held a workshop about ICT and Road Safety in 2013. It brought together a large number of stakeholders including both the private and public sector and representatives from the Internal Security Forces, the telecommunications sector, engineers, universities and several NGOs. The workshop dealt with how people were misusing ICT while driving. They came up with solutions on how to safely use ICT while driving to reduce accidents. Such as hands free phone use, spread awareness among people who drive, incorporate teaching the new generation safe measures while learning how to drive by using ICT responsibly.

### ICT for Aviation

Tourism and aviation are interlinked in the aviation business, E-commerce is very important to all businesses, small and medium sized businesses should use e-commerce in order to be able to compete with larger businesses by using a revised ICDT model “ to explore how tourism enterprises are exploiting the internet spaces and to measure the level of sophisticated use of internet among tourism SMEs (small and medium tourism enterprises)”.

### ICT for Rail

Construction of railways, roads and highways is an ongoing process in Lebanon. For safety reasons manual inspection has to take place even with all the available technologies and ICTs. The Knowledge-Based Systems (KBS) is used to diagnose R.C tunnel lining crack damage to replace human experts. The proposed system should be constructed on a knowledge base that incorporates “with the gathered information in the form of rules which is suitable to implement in an expert system environment to diagnostic advisory nature”, resulting in a faster and easier way.

### ICT for Logistics

ICTs are pervasive to all industrial sectors facing a sustainability paradox in using fewer resources while maintaining economic growth. The technology is available but the problem is there is a lack of understanding on how best to utilize it. There is a “multi-disciplinary strategic research agenda (SRA) for ICT-enabled energy efficiency developed by the REViSITE (Roadmap Enabling Vision and Strategy for ICT-enabled Energy Efficiency) EU funded project covering migration pathways from the state of the art to a common vision of ICT for energy efficiency (ICT4EE)”. They target four sectors: (1) building, (2) grids, (3) manufacturing, (4) and lighting, which are responsible for delivering infrastructures and environments for production, service and business.

### ICT for repairing Infrastructure

Since Lebanon is constantly repairing its infrastructure ICTs can be a big help. Physical infrastructure, technology and humans are all parts of the infrastructure. ICTs are used in different ways to repair damaged infrastructure. Infrastructure is the underlying framework of a structure or system. Physical infrastructure are the roads, buildings, bridges, grids and water pipes etc. The technological infrastructure refers to the computing infrastructure supporting communication and the sharing of information, consisting of routers, servers, computers, wireless connectivity, landlines, satellites, cell phones etc. There is the human infrastructure which is the “underlying foundation of a social system constituted by the pattern of relationships of people through various networks and social arrangements”. A new use of ICTs for a range of activities such as responding to threats and creating new structures for education. An example is the use of SMS to warn about incoming missiles. Meeting on the web instead of face to face as well as offering medical information online.

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Nº	Indicator - Political Support	Indicator	Results
1	National or State Policies	PO-01	No
2	Funding mechanisms to support ICT research	PO-02	No
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	No
4	Support to MED-TPs	PO-04	Yes
Nº	Indicator - Industrial support	Indicator	Results
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Low, most of them have no idea about it
7	Involvement in European funded projects	IN-03 (1-5)	n/a
8	Independence of local industry	IN-04 (1-5)	Is foreseen
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low
10	Market Demand	IN-06	No
11	Number of Patents	IN-07 (1-5)	Low to none
12	Support to MED-TPs	IN-08	Yes
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Yes
Nº	Indicator - Academic support	Indicator	Results
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Low to none
15	Researchers operating in the targeted field	AC-02 (1-5)	Low

16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	No
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	Low
21	Innovation policy and/or initiative	GE-02	Yes

### 2.2.13 ICT for Environment

Without ICT we would not be able to gather data on a national level and be able to analyze the corresponding data in a short amount of time to produce fast and effective results. Since the incorporation of ICT there has been a great improvement in almost every sector, especially when it comes to the environmental health sector. With the help of ICT data has been gathered rapidly and from countries using them for the first time there has been an accurate representation of data and analysis. Some research papers and studies would not have been published if it weren't for the use of several ICTs.

Lebanon faces major environmental problems:

- deterioration in natural resources
- depletion in natural resources
- land degradation
- environmental pollution
- air pollution
- decrease of availability and usability of water supply
- marine pollution from untreated discharges
- global warming

What role can the ICT play to fix those problems? Education for sustainable development (ESD) in the Arab World. Education for sustainable development (ESD) is “a process of learning how to make decisions that consider the long-term future of the economy, ecology, and the equitable development of all communities”. Education in the arab world has several problems. They do not encourage “critical thinking and analysis”, they stifle creativity, foster a “knowledge deficit” associated with stagnation in the field of scientific research, which hinders the development of technical and vocational skills. The Arab World has recently started implementing ESD but only in primary and secondary schooling.

Many higher education institutions throughout the world started committing to ESD, including AUB. IGESP, the interfaculty graduate environmental sciences program of the American University of Beirut was launched in 1997 “in order to address the complex and interlocked environmental and sustainable development problems of Lebanon and the Arab region”. By offering courses in multiple departments it allows the students to expand their knowledge and enhance their

competencies to include “human dimensions and social sensitivity”, which are not usually taught in higher level universities.

ESD has raised over a million USD in interdisciplinary research and development grants and contracts. This has led to the publication of over 300 articles in a 10 year period. They usually address multiple facets such as:

- sustainable development
- sustainable environment
- livelihoods and policy

ESD has led to intervention at a community level, graduates have been elected to ministry positions as well as creating the Ministry of Environment. There are several other high job positions also filled in the UN and other big organizations in different countries. ESD is always monitored and evaluated due to the rapidly changing external and internal conditions.

“The programme is regularly subjected to five types of evaluations:

1. Internal evaluations conducted by the Interfaculty Coordinating Committee on a yearly basis during especially dedicated meetings.
2. Student evaluations conducted through an exit interview administered to graduating students. It is to be noted that programme courses are also routinely evaluated at the end of every term.
3. Administrative evaluations conducted yearly by the university provost.
4. End-user evaluations, in which feedback from the employers and academic supervisors of PhD students is collected. This activity takes place informally throughout the year.
5. External evaluations carried out by a recognised scholar from an independent university or academic centre. This is carried out every 5 years. The latest external evaluation took place in 2005 and was conducted by Professor Donna Mergler of the Institute for Environmental Sciences, Université du Québec à Montréal (Canada). The next external evaluation is planned for 2010.”

This evaluation has resulted in a constantly evolving program which is why the program is successful and helped create a new generation of socially and environmentally aware individuals with the power to cause change for the sustainability of our planet. The majority of Arab countries have not implemented ESD on a university level, therefore more universities should join and implement ESD programs of their own.

The population–environment–development dynamics in the Arab world cannot keep working for much longer, because of the disconnect between policies about health, development and population. The Arab world is expanding at a rapid rate and the biocapacity of the cities are over 150% making it undergo a decline of environmental resources. The threats are in three domains (1)urban expansion, (2)water, and (3)land and food. Rapid urbanization is leading to upheavals in the Arab world, water shortage is a real problem for most countries and most of the land available is arid and desertified.

ICT helped gather the statistical data of each country and how through projections they can decrease health problems and environmental ones if health practitioners worked with policy makers.

A different use of ICT can be data collection and analysis to raise awareness for an environmental issue that people might not be aware of. Water pipe tobacco smoking is very popular in the Middle East and is a centuries old practice. In Lebanon particularly, most households have Water pipes and almost every outdoor and indoor cafes provide water pipes on demand. Water pipes have been gaining popularity in the West recently, yet there hasn't been enough studies and research done on the side effects of long term use, both for the people and environment. Water pipes

contain tobacco covered in flavored sugared syrup called “Mouassal”, and because of its sweet taste it has become more popular with young adults and teenagers. In Lebanon teenagers as young as 11 and 13 years old start smoking the water pipe. The demographic for water pipe smoking has expanded yet there is a lack of research and studies on the subject, there are only 38 studies done and only four are national level studies, not to mention that all of them were done preceding the year 2011.

ICT is very useful in this case. There is an international survey called The Global Adult Tobacco Survey (GATS), which is a part of the Global Tobacco Surveillance System that monitors adult tobacco use and helps countries design and implement tobacco control interventions. GATS is a household survey of adults 15 years of age and older that uses face-to-face handheld computers to conduct their questionnaires and collect data. From 2008 to 2010 GATS accumulated data from over 13 countries that completed the GATS. They were able to get the percentage of people who used waterpipes and the frequency of usage as well as perceptions and awareness of health effects. Despite the limitations of the few published scientific studies, GATS was successful in producing nationally representative data on waterpipe use from 13 countries many of which were participating for the first time. The data helped with the analysis cross-country as well as within country and with GATS more studies can be made. As GATS continues to expand, national representative waterpipe estimates will be available for more countries as well as providing comprehensive data to determine the impact and prevalence of waterpipe smoking.

The Ministry of Environment has several ongoing projects, two of their most important projects deal with renewable energy and climate change. The CEDRO UN 4 step project will focus on achieving renewable sustainable energy, energy efficiency and renewable energy applications. The project works on three steps:

1. The implementation of model end-use energy efficiency and renewable energy demonstration projects for public sector buildings and facilities
2. The setup of an enabling environment for the conversion of other public sector building and facilities into energy efficient modalities
3. The development of a national sustainable energy strategy and action plan

As part of their Energy Efficiency they have implemented the first stage, Green Roofs, which is a hydroponic intensive green roof on one of the building of the Central Bank of Lebanon in Hamra. The plantation is a collection of native species of plants from Lebanon.

Their second project deals with replacing the lightbulbs on the streets to solar powered light bulbs and LED bulbs for less electrical footprint and efficient energy usage.

For Cedros Renewable Energy they have several projects:

1. Solar Water Heater
2. Wind powered application
3. Ground Source Heat Pump
4. Hydro Power
5. Hybrid Solar-Wind
6. Biomass

All projects have been implemented with great results and feedback. They estimate that by 2020 there will be more usage of Renewable energy than diesel fuel. The Full length studies and several publications are available on their website for more indepth information. ICT is central to all the projects because CEDRO is a joint effort with the UN to help countries achieve efficient and renewable resources and sharing the data is very important to the implementation process. The studies, articles and various publications are also made public so anyone can view them, which

helps with raising awareness and influencing people to reduce their energy usage and adopt greener alternatives.

Climate change deals with reducing carbon footprint as much as possible as well as various other projects. They currently have 4 projects, two directly with the UN and the other two deal with low-emission capacity building and mainstream climate change in Lebanon's development agenda. ICT helps reduce GHG by "a series of mitigation technologies that have been identified under the Technology Needs Assessment (TNA) project in order to reduce emissions from the energy sector. Combined-Cycle Gas Turbines (CCGT), hydropower, Photovoltaic cell (PV) and wind power technologies have been prioritized for Lebanon based on their GHG reduction potential, their initial and operation and maintenance cost, their sustainability as well as their societal and economic benefit".

Nº	Indicator - Political Support	Indicator	Results
1	National or State Policies	PO-01	No
2	Funding mechanisms to support ICT research	PO-02	No
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	No
4	Support to MED-TPs	PO-04	Yes
Nº	Indicator - Industrial support	Indicator	Results
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	n/a
7	Involvement in European funded projects	IN-03 (1-5)	n/a
8	Independence of local industry	IN-04 (1-5)	No, Is foreseen by few
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low
10	Market Demand	IN-06	No
11	Number of Patents	IN-07 (1-5)	Low to none
12	Support to MED-TPs	IN-08	Yes
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Yes
Nº	Indicator - Academic support	Indicator	Results
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Low to none
15	Researchers operating in the targeted field	AC-02 (1-5)	Low

16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	No
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	Low
21	Innovation policy and/or initiative	GE-02	Yes

### 1.2.14 ICT for Food and Plants

ICT in the agro-food industry plays an important role in several key operations:

- Reducing overhead especially labor costs
- Increase production
- Improve safety and hygiene standards
- Reduce food wastage
- Control and monitor production
- Provide a mechanism for traceability and distribution

Several Agro-food industries in Lebanon are currently implementing ICT. These companies are mainly medium to large enterprises due to the cost usually associated having such systems in place. Few examples of such companies include but are not limited to: Balkis – fresh pasteurized juice producer; Liban Lait – dairy company; Abdul Rahman Hallab – sweets manufacturer; WilcoPM – poultry production; among others

<b>N°</b>	<b>Indicator - Political Support</b>	<b>Indicator</b>	<b>Results</b>
1	National or State Policies	PO-01	No
2	Funding mechanisms to support ICT research	PO-02	No
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Yes, is foreseen by few
4	Support to MED-TPs	PO-04	Yes
<b>N°</b>	<b>Indicator - Industrial support</b>	<b>Indicator</b>	<b>Results</b>
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	n/a

7	Involvement in European funded projects	IN-03 (1-5)	n/a
8	Independence of local industry	IN-04 (1-5)	No, Is foreseen by few
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low
10	Market Demand	IN-06	No
11	Number of Patents	IN-07 (1-5)	Low to none
12	Support to MED-TPs	IN-08	Yes
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Yes
<b>N°</b>	<b>Indicator - Academic support</b>	<b>Indicator</b>	<b>Results</b>
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Low
15	Researchers operating in the targeted field	AC-02 (1-5)	Low
16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	No
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes
<b>N°</b>	<b>Indicator - General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	Low
21	Innovation policy and/or initiative	GE-02	Yes

### 2.2.14 Other ICT domains

<b>N°</b>	<b>Indicator - Political Support</b>	<b>Indicator</b>	<b>Results</b>
1	National or State Policies	PO-01	No
2	Funding mechanisms to support ICT	PO-02	No

	research		
3	Future Plans, Priorities and Strategies in ICT R&D	PO-03	Few
4	Support to MED-TPs	PO-04	Yes, most of respondents are willing to support.
<b>N°</b>	<b>Indicator - Industrial support</b>	<b>Indicator</b>	<b>Results</b>
5	Presence of Large ICT Industry doing Research and Innovation	IN-01 (1-5)	Low to none
6	Presence of Research and Innovation Intensive SMEs	IN-02 (1-5)	Low to none
7	Involvement in European funded projects	IN-03 (1-5)	Few, some haven't heard about it
8	Independence of local industry	IN-04 (1-5)	Is foreseen
9	Foreign Direct Investment (FDI) and presence of development centres	IN-05 (1-5)	Low, many haven't heard about it
10	Market Demand	IN-06	Percentages almost equal
11	Number of Patents	IN-07 (1-5)	Low to none
12	Support to MED-TPs	IN-08	Yes, most of respondents are willing to support.
13	Already existing commercial cooperation with European industries	IN-09 (1-5)	Percentages almost equal
<b>N°</b>	<b>Indicator - Academic support</b>	<b>Indicator</b>	<b>Results</b>
14	Number of Universities, Research Centres and Higher Education Institutions	AC-01 (1-5)	Medium to low
15	Researchers operating in the targeted field	AC-02 (1-5)	Medium to low
16	Number of yearly scientific publications	AC-03 (1-5)	Low
17	Previous participations in FP6-FP7 R&D projects in the ICT priority	AC-04 (1-5)	No
18	Existing cooperation with EU countries	AC-05	Yes
19	Support to MED-TPs	AC-06	Yes, most of respondents are willing to support.
<b>N°</b>	<b>Indicator – General</b>	<b>Indicator</b>	<b>Results</b>
20	Previous participations in FP6-FP7 R&D projects in the ICT priority	GE-01 (1-5)	Medium to low
21	Innovation policy and/or initiative	GE-02	Yes

### 2.3 List of contributors

The following table compiles the list of contributors to the analysis (data collected by interviews or by email campaign).

No.	Name	Organization	Type
1	Maryam Mohanna	Assafir Newspaper	SME
2	Guy and Karim	Entrepreneurs	Startup
3	Nidal Mawas	American University of Beirut	Academic
4	Joe Wakim	American University of Beirut Medical Center	Health
5	Ziad Eid	Universite Saint Esprit du Kaslik (USEK)	Academic
6	Ziad Boustany	Sescom	SME
7	Jacques Ekmekji	SeeCosm	SME
8	Mohamad Nasser	Nokia	Large
9	Hussein Rifai	MDIC	SME
11	Hasan Charif	National Council for Scientific Research (CNRS)	Government
12	Gabriel Deek	Internet Society-Lebanon	SME
13	Antoine Abou-Samra	Euro-Lebanese Center for Industrial Modernization (ELCIM)	Government
14	Firas Abi Nassif	VC Technology Group	SME
15	Dr. Fadl Bdeir	Al-Akhbar Newspaper	SME
16	Eng. Ramzi Jaber	Lebanese University	Academic
17	Dr. Ali Ataya	OMSAR (Office of the Minister of State for Administrative Reform)	Government
18	Issam Maarouf	Complete IT Solutions (CITS)	SME
19	Jamil Kobrossi	Balamand University	Academic
20	Dr. Walid Shatila	Beirut Arab University	Academic
21	Dr. Wassim El-Hajj	American University of Beirut	Academic
22	Hania Dimassi&Dr. Nibal Idlebi	ESCWA	Large
23	Dr. Imad El-Hajj	American University of Beirut	Academic
24	Omar Christidis	Arabnet	SME
25	Dr. Rached Zantout	Lebanese American University	Academic
26	Dr. Sanaa Sharafeddine	Lebanese American University	Academic
27	Imad Hoballah/TRA	Telecommunication Regulatory Agency	Government

28	Dal Hitti	ALSI (Association of Lebanese Software Industries)	SME
29	Lina Abou Mrad	Ministry of Public Health	Government
30	Mahmoud Bdeir	Al-Akhbar Newspaper	SME

(\* ) Industry (large), Industry (SME), Academic, Government

## Section 3 - Conclusions

As a conclusion, the main sectors in Lebanon with critical mass and with high societal impact worthy of engagement with ICT initiatives are the following:

1. **The health sector:** Along with Jordan, Lebanon is acting now as a health services hub for the area and the health services require plenty of ICT work and support. Also governmental policies, monitoring and control require ICT engagement.
2. **The food sector:** The agriculture based food industry is also a key sector in Lebanon that can largely benefit from ICT initiatives.
3. **The software development sector:** The software development sector in Lebanon can also benefit from ICT initiatives. It is worthy to note however that several such initiatives have been launched lately to cover the software industry especially to support startup and entrepreneurship initiatives.
4. **Telecommunications:** Most players are in services from the industry and government side. There is however a good volume in companies providing mobile application development for those companies and for companies outside the country.
5. **Environment and Energy:** The bodies are very few including universities, a governmental entity, and few private companies.

## Annex I - Acronyms

<b>Term / expression</b>	<b>Description</b>
ETP	European Technology Platform
ICT	Information and Communication Technology
LatAm	Latin America
LATP	Latin America Technology Platform
SRIA	Strategic Research and Innovation Agenda
TP	Technology Platform