

Future Skill-Shortages and Educational Reforms: Lessons from the Engineering and Architecture Education

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PACOME IN BRIEF

- The project aimed to launch an Observatory for the Labor market at USJ
- The Observatory is dedicated to study skill-shortages, future occupations and future career opportunities in Lebanon with one major concern: How to reduce the skill-mismatch between the supply of skills (universities and training centers) and the skill-demand on the employment and labor market?
- Case study: How to tailor current curricula in the architecture and engineering education in order to fit the requirements of future jobs (next 5 years)?

HOW TO ADDRESS THE SKILL-MISMATCH?

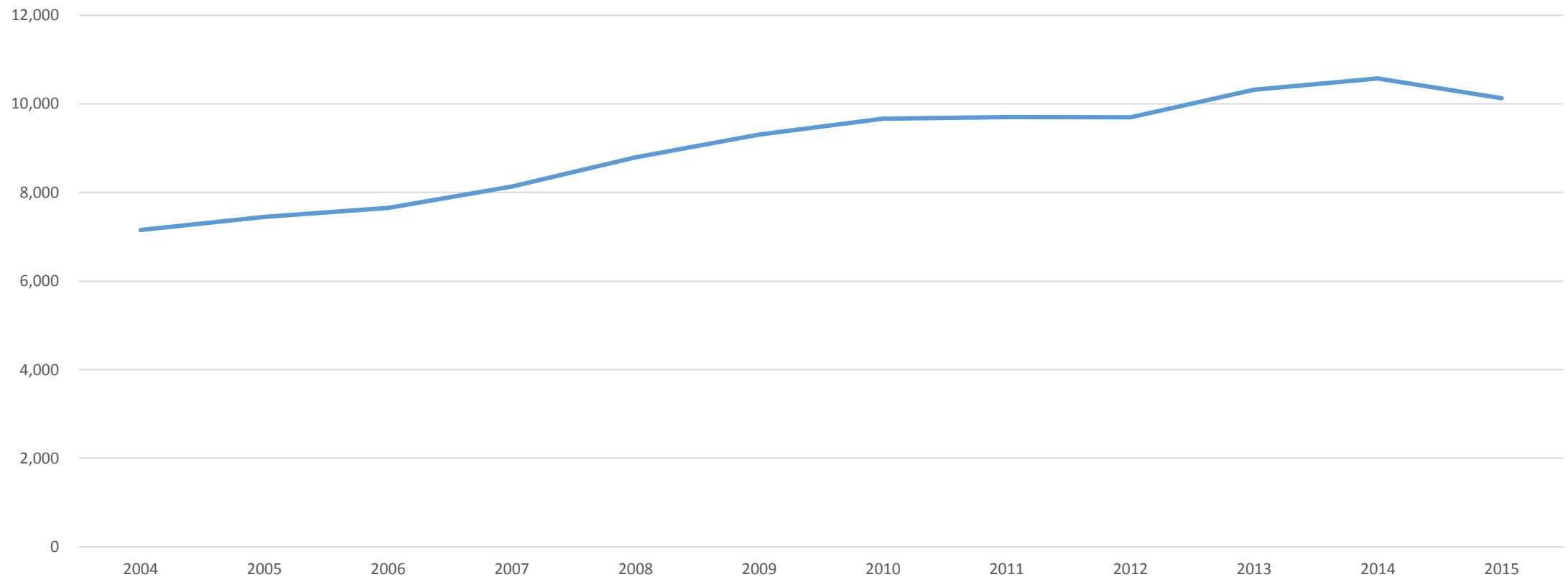
- Main Focus: Evolution of the Construction Sector is calling for a reform of Engineering and Architecture Education
- Main questions:
 - How to anticipate the evolution of the sector and future career opportunities within these professions? (**Structural effect**: market structure and morphology)
 - How to predict future occupations, future skill-needs and skill-shortages in the engineering and architecture professions? (**Occupational effect**: jobs, tasks and activities)
 - What are the major recommendations to **reform curricula and competencies framework** in order to reduce the skill-gap within these professions?

METHODOLOGY: PROMENIA: prospective analysis of employer's needs

- 1- Desk research: Morphology of the sector
- 2- Focus group with experts: Identify the major “factors of influence” (**Structural effect**)
- 3- Survey: Identify core competencies needed in key-positions and high-values activities, identify future skills needed (**occupational effect**)
- 4- Competencies framework: **tailoring curricula to future needs**

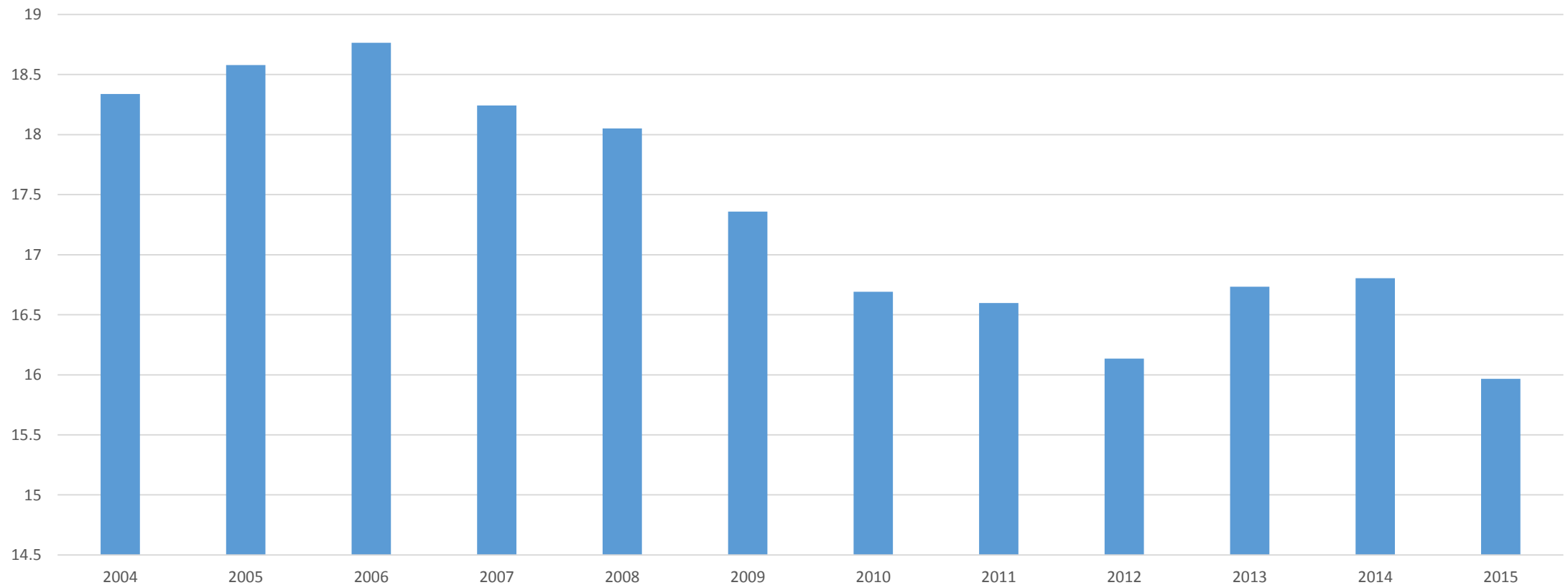
1- Morphology of the construction sector

Evolution of Real estate and Construction sector (billions LBP) – National Accounts 2015



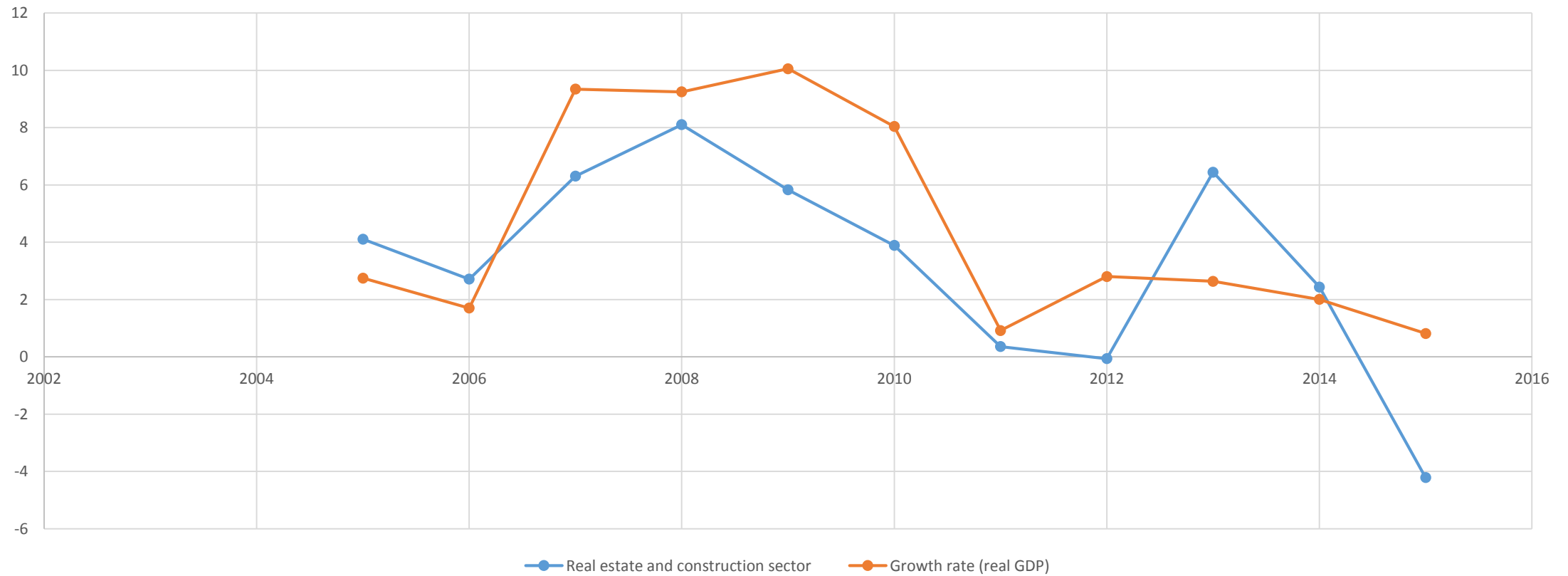
1- Morphology of the construction sector

Real estate and Construction/GDP (%) – National Accounts 2015



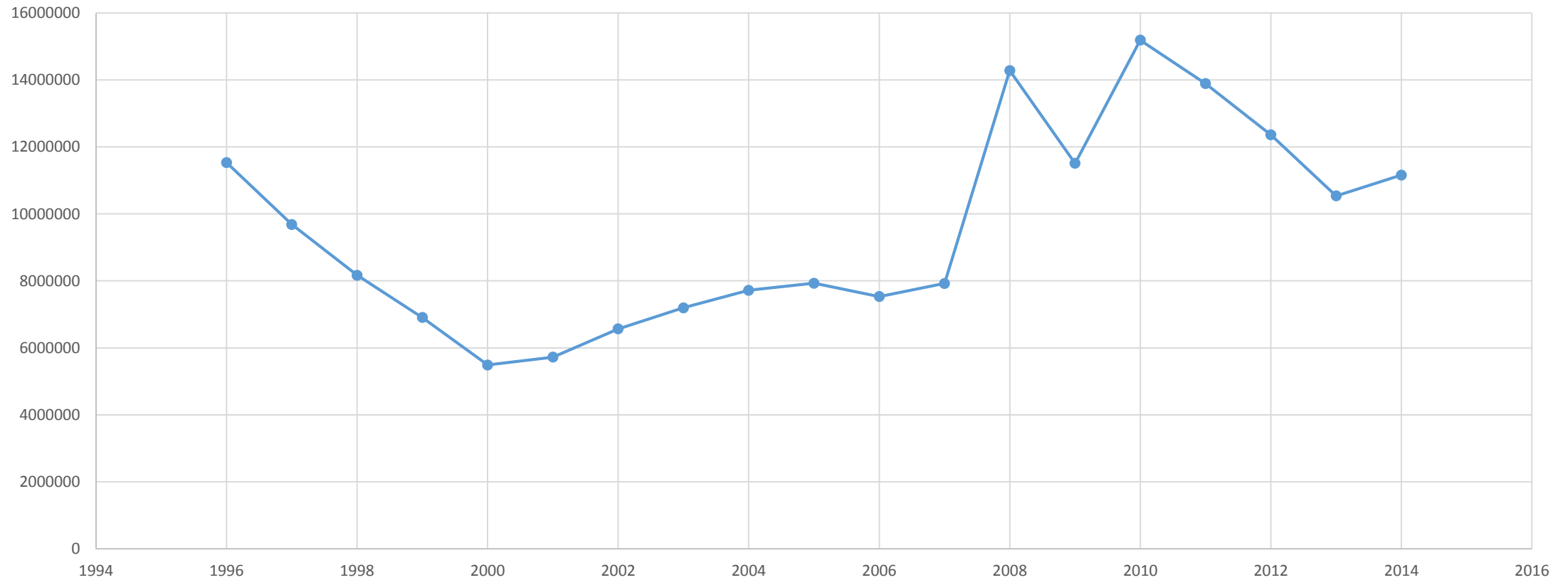
1- Morphology of the construction sector

Evolution of Real Estate and Construction Sector and the Real Economic Growth (2004-2015) – our calculation



1- Morphology of the construction sector

Construction permits. m2 (1996 - 2014) – CAS 2014



1- Morphology of the construction sector

Firm Category	Excellent	first	2nd	3rd	4th
number of firms	107	173	178	394	308

Table 1- Number of firms by category in Lebanon – CCIA-BML, 2014

1- Morphology of the construction sector

CODE	ACTIVITIES
45110	Demolition & wrecking of buildings, earth moving
45120	Test drilling and boring for construction
45210	Construction of buildings & civil engineering works
45230	Construction of highways, roads, airfields & sport facilities
45240	Construction of water projects
45260	Construction of water systems
45270	Electrical contracting
45311	Installation of electrical wirings and fitting
45320	Installation of thermal and sound insulation in buildings
45451	Construction of swimming pools
74210	Civil engineering, architecture & Construction studies
74220	Mechanical engineering studies
74230	Topographic & geotechnical studies
74843	Interior design and decoration

2- The structural effect: 3 factors of influence

- 3 factors are radically transforming the professions of architects and engineers:
 - **technological innovation** (in materials science, nanotechnology, or biotechnology etc.)
 - **global outsourcing of construction services** (changing legislations and rules, new working environment, rapid growth of small subcontractors)
 - **organizational shift toward a more fluid work environment:** every corporation work closely within a global network of suppliers and clients, through various types of alliances and partnerships
- CONSEQUENCE:
 - core competencies and strategic skills to keep-in-house and to build-on
 - vs.
 - Peripheral skills to be outsourced

3- Occupational effect: future skills needed

- GENERAL REMARKS

- Architects and engineers are more and more assuming the fluid and not-well-defined tasks of managers, team leaders and negotiators
- Increase need for flexibility and creativity in the new corporate model
- The emergence of unprecedented fields of expertise
- Intercultural and environmental concerns are increasing the future need for creative architects and engineers in leadership position, especially for female professionals

3- Occupational effect: future skills needed

- **FUTURE TASKS (common for architects and engineers)**

- - To protect the **public's health**, safety and security;
- - To understand and to **respect regulations, local practices and international standards**;
- - To control and to execute parts of a project, **including design criteria**, analysis methods, and material selection, in collaboration with co-workers and teams;
- - To communicate and to discuss with colleagues and teams, with various stakeholders, especially legal advisors and public sector officials;
- - To participate in collaborative work with different teams, and to communicate architecture and/or engineering requirements and expectations, in order to achieve the project goals or solve technical problems;
- - To create and evaluate alternatives in order to **provide cost-effective, sustainable solutions**, adjusting each project to the clients' needs
- - To **minimize the environmental impacts of projects**, while satisfying the cultural, legal, and environmental standards.
- - To supervise or to prepare plans, specifications, and reports;
- - To address questions related to decisions and requirements, **acting as a creative authority** during the planning and the design phases, while acting as a technical authority during the construction phases;
- - To initiate and maintain collaborations with key engineers, architects from different departments or other partner/alliance companies, as well as officials in order to facilitate negotiation and consultation.

4- Competencies framework: tailoring curricula to future needs

Insufficient training	Lack of analytical skills	Lack of presentation skills	Lack of administrative skills	Insufficient knowledge of rules	Insufficient knowledge of markets needs	Lack of language mastering
59%	41%	35%	65%	58%	76%	41%

Table 6- Lacking skills of freshly graduates – PACOME, 2015

4- Competencies framework: tailoring curricula to future needs

Studying the specialized knowledge and skills in architecture and engineering programs, we may divide the competences framework into 5 major components:

- 1- Analytical knowledge and skills such as calculation, simulation and modeling.
- 2- Factual knowledge and skills that are required from architects and engineers for problem-solving.
- **3- Creative skills.**
- **4- Computing skills.**
- **5- Interpersonal and intercultural communication skills and attitudes.**

4- Competencies framework: tailoring curricula to future needs

- The first two components are related to hard-skills and basic knowledge, thus they refer to standardized skills that are common to most graduates, leaving little room for uniqueness, originality and personal talent.
- The last three components are largely qualitative, and they are marginalized in the curricula (integrated into few courses and associated with other teaching objectives, **receiving a small part in the teaching credits**)

4- Competencies framework: tailoring curricula to future needs

- **1- HEI should integrate more creative design in their curricula and emphasize more on engineering creativity (88% of the respondents in our survey considered design as the main task required from an engineer or an architect in Lebanon)**

The evolutionary design and the formal design evaluation methods are for example still lacking in the Lebanese curricula, while considered as core skills of the profession. New competence frameworks should integrate routine design, with design engineering, and inventive design and inventive engineering.

4- Competencies framework: tailoring curricula to future needs

- 2- HEI also need to revise their programs, in order to integrate **computing and programming fundamentals**, as well as the fundamental conceptual understanding of creative tools and software.

learning **programming** and mastering other computer graphic software for 3D animation and design (to adapt existing software to professional needs)

4- Competencies framework: tailoring curricula to future needs

- Young engineers and architects need a better understanding of the global dimension of their actions. With the uprising integration with the Arab Labor market and the Gulf trend, their programs should emphasize more on the common cultural values and intercultural communication skills
 - key attributes that freshly graduates may lack on their first day of work: team building, strategic thinking, effective communication skills, ethics and respect for other collaborators from different cultural backgrounds

FINAL RECOMMANDATIONS

- 1) On the local level, firms and Higher Education Institutions need to strengthen cooperation, for them to compete and survive in a highly integrated regional and global market.
- 2) Firms are shifting from a vertical organization to a more horizontal, fluid division of tasks. Consequently, skills that are largely needed are those that are most likely to reinforce coordination and trust among teams within the internal components of the organization, and to deepen the cooperation with partners' networks.
- 3) HEI should incorporate in their curricula more creative courses and tools, such as creative design, computing and programming fundamentals, as well as courses related to globalization, with a specific emphasis on intercultural communication skills and attitudes.

THANK YOU!!