Embedding Employability Skills in Computer and Information Science Program Curriculum

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Abstract—The paper discusses possible approaches of embedding the development of employability skills in the program curriculum. This paper contains analysis of the problem areas raised by employers regarding new graduates' readiness to join workforce, the ways of possible improvements, and the actions required from different stakeholders. The case discussed in the paper is related to Computer and Information Science (CIS) Program offered at Higher Colleges of Technology (UAE).

Keywords—Curriculum Design, Employability Skills, Employers, Graduates.

I. INTRODUCTION

THERE are multiple reasons why High School graduates are choosing to continue their studies at colleges and universities: interest in the chosen subject area and drive to explore the subject area in depth, desire to experience different style of life and to enjoy student community spirit. Nevertheless, the main purpose of studies is to have interesting, fulfilling, engaging, productive, and financially secure professional, personal, and social life after graduation. This is why potential students are selecting educational institutions based on reputation related successful job placement of the graduates.

It is also important to take into account that the working environment of the 21st century reflects volatile nature of economies and as result, it is unstable, rapidly changing, and demanding. It adds some more pressure on Educational Institutions to shape employability skills which make graduates fit in the working environment:

- Previously known comfortable concepts "jobs for life" and "planned career path" are replaced by life-long learning, constant self-development, initiative, and personal motivation to stay employable;
- In order to be successful at work place graduates are required to demonstrate additional set of skills, such as negotiation, communication, networking, self-confidence, self-awareness, adaptability, and ability to cope with uncertainty and constant changes.

The report produced by the Institute for Prospective Technological Studies identifies major drives of the job market trends and demands: demography, globalization, immigration, technology, and the labor market itself. The report states that Education and training institutions "will need

to react more efficiently and promptly to changing job requirements and trends" [1].

In this paper we'll examine:

- what are the skills which define employability in the 21st century from the perspective of employers and potential graduates and the level of preparedness of graduates to enter the job market;
- what actions are expected from all stakeholders (government, society, employers and Higher Education institutions) in order to minimizing the gap between graduates' and employers' expectations and to ensure that new generations of graduates will meet employability requirements of the 21st century:
- Commitment to life-long learning and self-development;
- Practice effective communication, negotiation, collaboration, and the teamwork;
- Create and apply innovative problem solving approaches;
- Apply knowledge to real-life problems/tasks/situations encountered in the workplace and society;
- Demonstrate ability to take personal responsibility and initiative;
- Address global issues and appreciate cultural differences.

II. EMPLOYERS' PERCEPTION OF EMPLOYABILITY SKILLS

Several studies confirm [5]-[8] that there is a gap in employers' expectations and graduates' perception of employability skills, career development and professional progression. Defining employability as "a set of achievements – skills, understandings and personal attributes – that make graduates more likely to gain employment and be successful in their chosen occupations which benefit themselves, the workforce, the community, and the economy" [2] allows us to specify and analyze the set of attributes required and look for solutions which might reduce the gap in the perceptions. Special focus is on the role of Higher Education in improving and enhancing employability skills and making graduates more successful on the modern job market.

On the positive side, employers prefer to hire new talents regularly because of the following reasons:

- New graduates are enthusiastic and motivated;
- It provides an opportunity to develop future leaders in the organization;
- New graduates have modern job-specific skills and fresh, creative and innovative ideas;
- New graduates will accept lower salaries.

Nevertheless, it is commonly known fact that employers quite often report lack of required employability skills in new

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hires. Employers are stating that high GPA is not sufficient to ensure the job and successful career development. Employers give preference to graduates from the institution where traditional in-class learning environment is expended and enhanced by work-based learning, learning-by-doing or any other innovative teaching and learning practices which build work-related students' experience.

Globalization of economies, internationalization of companies, and integration of markets add requirements for new employability skills and forces graduates and relevant educational institutions to adopt these requirements. The Research conducted by CIHE states that graduates "must be able to work across national borders, manage complex international and intercultural relationships, and understand global aspects of the world of work." [3] This report ranks 14 global competencies placing on the top of the list:

- Collaboration with teams of people from different backgrounds and countries;
- Excellent communication skills (speaking and listening);
- high degree of drive and resilience;
- Embracing and appreciation of multiple perspectives.

Another research conducted by Dr. Kaye Bowman [4] defines how modern life characteristics, such as mobility, technological changes, environmental, social and economic pressures impact necessity for development new skills in addition to technical skills related to major of studies:

- Competence in information management through the use of technology;
- Creativity;
- Self-management;
- Teamwork;
- Intercultural understanding;
- Ethical behavior;
- Social competencies.

According to the report produced by National Association of Colleges and Employers [5], employers have rated 21 employability skills and they placed at the top of the rated list:

- Communication skills;
- Strong work ethics;
- Teamwork skills;
- Analytical skills;
- Initiative;
- Problem solving skills.

Technical skills related to graduates' major are placed in the middle of the rated list - 12th position.

Least importance is given to creativity, strategic planning skills, entrepreneurial skills, and sense of humor. Most probably, these characteristics will become more valuable and significant after new employees settle in the company and gain initial work experience.

The report produced by National Association of Colleges and Employers 2 years later in 2013 [6] introduces some new employability skills:

- Ability to plan, organize, and prioritize work (productivity);
- Ability to obtain and process information;

- Ability to analyze quantitative data.

It means that an ideal employee of 2013 is a capable decision maker with strong analytical, problem solving, communication and teamwork skills.

III. GRADUATES' INTERPRETATION OF EMPLOYABILITY

Graduates' perception of employers, employability skills, and their readiness to enter the world of work was addressed in research projects and respective reports [7], [8]. The report "Great Expectations" [7] identifies key criteria used by graduates to find the ideal employer:

- Reputation of the employer;
- People-friendly institutional culture which supports healthy balance between work and life(flexible working hours, possibility to work online from home, day care centers, sports facilities, special offers);
- Opportunities for career development, professional growth, and employment security;
- Good salaries and compatible benefits.

The report produced by Carrie Du Preand Kate Williams [8] presents data related to graduates' perspective of their employability skills. According to graduates rating, top employability skills are: work ethics, friendliness, teamwork, problem solving, flexibility/adoptability, and sense of humor. It seems that 50% of the top-rated skills are common between employers and graduates. Other 50% define the gap in perceptions of both parties and it shows that potential graduates are lacking sufficient exposure to work environment, its requirements and operations.

IV. FINDING WAYS TO IMPROVE EMPLOYABILITY SKILLS

Improving employability of graduates requires combined and coordinated efforts of all stakeholders: governments, businesses, and Higher Education institutions. Government strategies should address new opportunities for graduates to possess required employability skills and compete successfully in the job market. It is important to point out that there is no single solution that works for all cases. Status of economy, its structure, traditions, culture, student recruitment patterns, job market status – all these factors are making each case unique.

Abu Dhabi (UAE) Economic Vision 2030 determines necessity of "increased national workforce participation and employability" and tasks the educational sector "to ensure that graduates have the skills and qualifications to drive economic growth". [9] This document also states that "employers will be encouraged to invest in employee training to further boost the productivity of their workforce".

The Master Plan for Higher Education in the UAE defined that "The academic programs and research efforts of the UAE system of higher education shall better link to national needs of the economy" [10] by developing and maintaining strong relationship with industry and offering the curriculum which is aligned with industry trends and developments. Employers should be closely engaged with Higher Education institutions on different levels of communications (senior management,

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career centers, academic programs) in order to facilitate the development of employability skills by offering experiential training, involving students and faculty in industry projects, supporting workplacement overseas, and providing internship opportunities.

Higher Education institutions have been addressing employability for very long time. It became common practice to develop and offer specialized programs which are directly linked to the employer's urgent needs and these programs in many cases are sponsored by relevant industry to encourage students to join the studies. It is considered as important responsibility of Higher education to analyze industry trends and developments and suggest effective procedures to conduct regular revision of program matrices and the related course contents to ensure compliance of the curriculum with global industry trends, country's economic development and job market requirements and professional fitness of graduates' in the future economic environment. All program curriculum components including content area, teaching and learning methodologies and assessment strategies should contribute in the development of employability skills.

There are different models for embedding employability skills in the curriculum [2]:

- Work-based learning incorporated in several modules within the curriculum;
- Including employability-related modules in the curriculum;
- Work-based/work-related learning in parallel with the curriculum;
- Employability in the core curriculum;
- Employability through the whole curriculum

The first three listed models support partial development of employability skills limited by specific courses and/or stand-alone work-based learning. There is no obvious integration with the subject areas. Additionally, work-based learning in parallel with the curriculum might affect the quality of the learning process and lead to expanding the duration of studies. Embedding employability in the core curriculum will help in building basics of employability skills without addressing specific needs of the professional area.

Employability through the whole curriculum represents the most comprehensive approach for development of required skills. It must be driven by institutional mission statement and graduate outcomes with reflection in the program outcomes, course content, teaching and learning approaches, and relevant assessment strategies.

V. ADDRESSING EMPLOYABILITY IN CIS PROGRAM CURRICULUM

Curriculum of Computer and Information Science program at Higher Colleges of Technology (HCT) is aligned with the College Mission statement and the HCT Strategic Plan [11]. Both documents highlight employability of graduates as a highest priority of the institution and it can be summarized as follows:

- Providing opportunities for graduates to meet career and

professional goals;
- To graduate students in professional fields to meet the workforce needs;
- Maintaining strong alignment of the offered programs with the changing and emerging needs of business and industry.

CIS program curriculum addressed the above mentioned requirements by:

- Curriculum design which allows to start introduction of the employability basics from the core courses and moving further to discipline specific courses;
- Introducing several Liberal study courses which support development of employability skills: communication, leadership, work ethics, organizational behavior, and career planning;
- Reflecting the HCT Educational Philosophy – Learning-by-doing in individual course outlines to highlight practical nature of the courses and to open opportunities to integrate industry projects in the course work;
- Individual course outlines include innovative teaching, learning and assessment strategies which support collaboration, teamwork, innovative and creative thinking, problem solving, time management and project discipline with extensive use of education technology tools.

Work-related learning, capstone projects, and Project management courses are linked directly with specific industry areas and students' presence at work place builds better exposure to the work environment. Curriculum also supports student awareness of new trends and developments in the industry by:

- Introducing specialized course on emerging technologies;
- Regular revision of the course outlines in order to keep up with dynamic changes in the industry.

In order to analyze how students are developing their employability skills and what are the areas of adjustments and improvements, employers are asked to provide their feedback on students' employability skills immediately after completion of work placement. Fig. 1 shows employers evaluation of employability skills for female students studying CIS program.
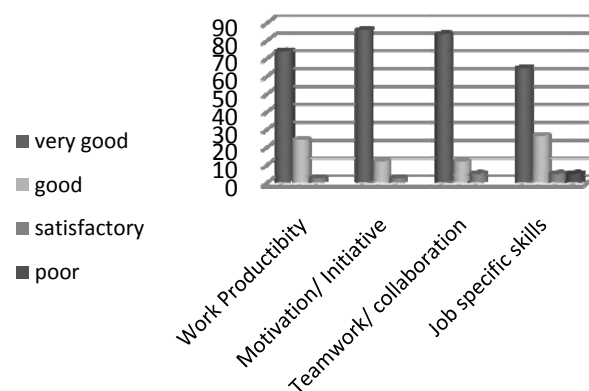

Fig. 1 Employers' feedback on key employability skills

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It seems that employers are quite satisfied with student motivation, collaboration and team work. Job specific skills and work productivity are on weaker side – higher percentage of students has satisfactory and even poor skills. Employers also provided their recommendations by identifying strengths and weaknesses of key employability skills (Fig. 2) which help us to identify areas of adjustments and improvements in the curriculum.
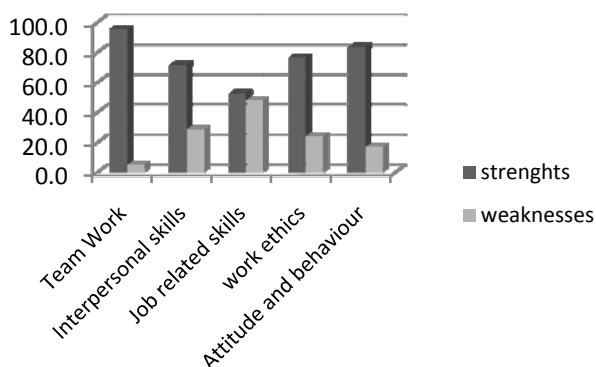

Fig. 2 Strengths and weaknesses of students' employability skills

Obviously, job related skills, interpersonal skills, and work ethics are the areas of improvement and it needs to be addressed in the curriculum and/or in the relevant course outlines. There are also objective reasons why the level of job related skills does not satisfy employers:

- Job related skills required by employers might be very specific and cover very narrow technology areas in which students do not have sufficient knowledge;
- Employers prefer to deal with "ready for work" students who do not require investments in terms of training and guidance;
- Students' performance level in the program is also different, so major specific or technical skills differ among students.

It is important to realize that development of employability skills is not supported by curriculum only – there are different extracurriculum activities which can contribute substantially in preparing students for the work place. Short survey was conducted among year 4 students to identify where students are getting information about employers, work environment and work opportunities. Fig. 3 represents student rating of the possible sources of information.

Internships/workplacements	1
Career Fairs	2
Career service departments	3
Company websites	4
Guest lectures and workshops conducted by industry professionals	4
Site visits	5
Alumni	6
Conferences, seminars	7

Fig. 3 Student rating of the Information sources

Students consider that Internships, workplacements, and work-based learning contribute at most to their understanding of world of work since they are getting real-life experience and practical applications of the skills they learnt. The result of the survey shows that career fairs, services offered by career departments, companies' websites, and guest lectures and workshops are listed as most important sources of information. These sources of information and respective activities are not linked directly to the program curriculum but they contribute effectively to the development and enhancement of employability skills and provide relevant support to the curriculum.

VI. CONCLUSION

Development of employability skills in CIS program is important and challenging task taking into account very dynamic and ever changing world of Information and Communication technology. Employability skills can't be developed successfully if program curriculum does not support respective skill development from the first semester of studies. Development of employability skills does not happen on the basis of occasional industry-related events, it requires consistent and planned approach and the involvement and cooperation of different departments in the educational institution supported by strong links the with industry partners. Development and improvement of employability skills is the process which requires regular revision and tuning based on feedback from industry and graduates and changes in technology, economy, and global environment.

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