Analysis of Employability skills for Civil Engineers in New Zealand

Madhvi Sharma[1], Dr Gregory De Costa[2] and Daymon Heyzer[3]
[1, 2] Department of Civil Engineering, Unitec Institute of Technology
[3]Whiteria Auckland
Email: sharma.madhvi12@gmail.com

Abstract

Background
The transition from university to a career in civil engineering is a challenging process. This study examined the perceptions of engineering graduates regarding the difficulties they encountered in their transition from the university to the workplace. Recent practising graduates were surveyed to identify their current employment situation and their attitudes toward their academic preparation. Factor analysis revealed three main challenges facing engineering graduates: communication; responsibility; self-confidence. Seventeen interviews were conducted to gather information on ways to facilitate this transition. Also this paper discusses employer expectations & required employability skills in potential engineers. It does it through presenting research in which over 20 employers in Auckland were asked to record their perceptions of graduates in respect of their employability. The findings suggest that employers nowadays place emphasis on soft skills and give emphasis to a set of generic skills such as communication skills, problem solving and interpersonal skills.

Purpose
Employability upon graduation is a major priority for most engineering students. New engineering graduates these days are confronted with more challenges and competition in getting employed when compared to graduates of the past. Therefore, the excellent academic degrees alone are inadequate as employers require potential engineers to possess “competencies and capabilities” in generic skill. The objectives of this paper are: firstly, to examine the various engineering employability skills that have been identified after several interviews. Secondly, to collect feedback on whether graduates were employed in their career of choice or in relatively unskilled positions.

Approach
A literature survey along with primary data collection using a survey and interviews was undertaken. The researchers undertook exploratory research work and using two questionnaires to collect the primary data; one of them was for employees to know their perception towards employability skills and the other was to identify graduates transition challenges. The findings were analysed to come up with a synthesized framework.

Anticipated outcome
It is anticipated that this study will assist in developing a framework that will give both the employer, and prospective graduates the skill supply and skill requirement needed by industry, and thereby identify gaps. Ideally then these gaps that need to be addressed by the tertiary institutes prior to graduation.

Conclusion
Findings presented in this report will suggest.
- challenges to make engineering an attractive occupation in New Zealand
- Framework that could be used by the engineering sector in its future engagements with the education sector
- To inform strategic and workforce planning.

Keywords

Analysis of Employability Skills for Civil Engineers in New Zealand.

BACKGROUND

The university-to-work transition is a vital period in the lives of young graduates. During this transition, graduates apply their academic knowledge and vocational skills to become productive professionals. However, when graduates begin working in their profession, they are confronted with the realities of sustained full time work, including the work environment, job security and non-technical tasks. Furthermore, specific skills and knowledge are needed for high productivity, but they must manage the potential disappointment resulting from unmet expectations. Most students are not aware of the dramatic differences between the educational and corporate environments. Succeeding at university does not imply success at work. While engineering curricula ensure that graduates possess the technical knowledge to begin a career, the transition from student to an employee is not well understood. Engineering students complete a highly structured curriculum, but a professional engineer works in a highly unstructured environment and preforms multi-dimensional tasks. The core of the engineering community is defined by participation and commitment, leading to expertise and mastery. Because university and the workplace differ significantly in purpose and activity, several skills critical for employment are not developed during the university years. Therefore, the transition from university to the workforce incorporates a number of challenges for newcomers on this trajectory before they reach the core. Therefore this study investigates the employability skills requirement.

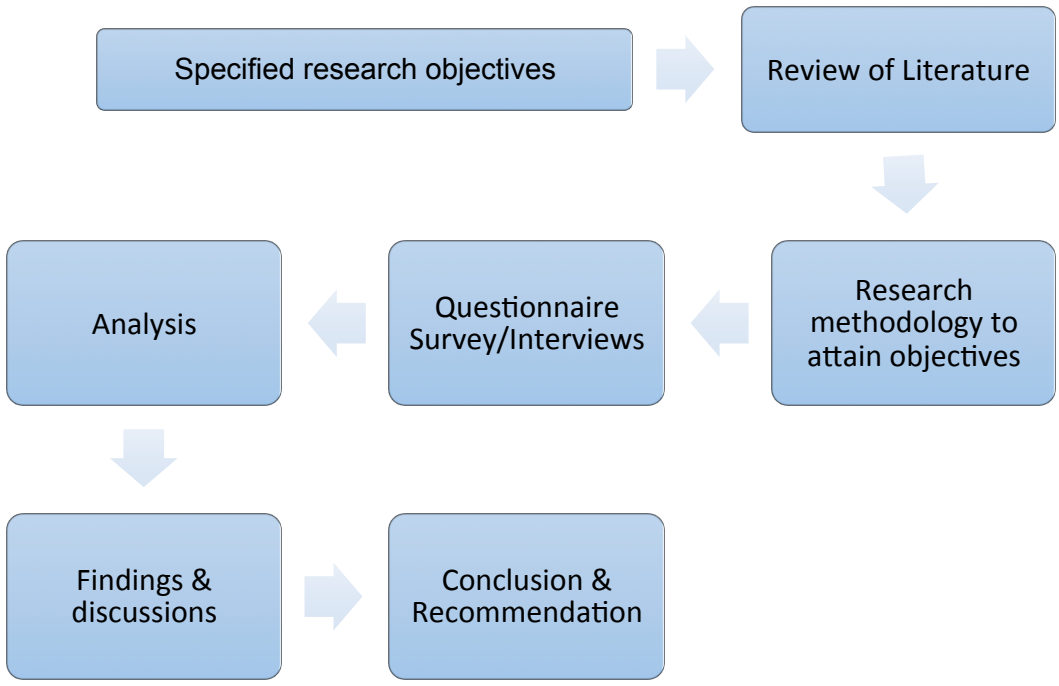

Figure 1. RESARCH STRUCTURE

METHOD AND DATA COLLECTION

A mixed method approach is used to understand the transition of engineers from university to career. Email addresses of practising engineers were collected from university staff and alumni lists. An online questionnaire was sent to 25 engineers who had been practising for no more than 5 years. Of the 25 emails sent, 17 engineers completed the survey. The questionnaire included 10 open & closed questions. The first section gathered participants information related to the process of locating a job (see Table 1). The second section asked to rate using a 5-point Likert scale. In last section, they were asked to rate different challenges they faced at the beginning of their career. Along with this another questionnaire

was prepared for Industry Employers, who have been employing graduates for many years. They were asked to provide their expectations or qualities they look for when a graduate is being interviewed. These employers were sent online questionnaire, also requests were sent for face-to-face interview. Few requests were returned due to unavailability and remaining employers participated in the survey online & interacted in the direct interview. See Table 2 which lists 10 employability skills with detailed description.

At the end of the surveys, a total of 37 participants provided their opinions and expressed their interest to answer more questions if needed. After quantitatively analysing the survey results, interviews were carried out to provide a better understanding of the demand and supply situation in the current market. Also enabled graduate participants to comment on their personal transition experience. The interviews consisted of four main questions: Do employers believe that in this particular field Higher Education is sufficient enough to address the employability skills? Does higher Education provided in the New Zealand Universities address the employer's needs? Does the use of internships and work based learning enhance the employability aspects of the graduate Civil engineers? Should higher Education universities have to employ additional employability awards and programs? (Shown under results section in tabular form)

Descriptive statistics were used to obtain the measures of central tendency and the measures of variability for each of the items. The majority of the participants were male (89%); only 11% of the participants were female.

Table 1. Data Collected

QUESTIONS	MEAN	S.D.
How helpful was the summer school training?	4.20	1.20
How helpful was the graduation project?	3.30	1.00
How helpful were the professional societies?	1.20	0.80
How helpful was the professional certificates?	1.20	0.90
How effective were the career centres?	1.70	1.70

The survey asked participants to rate the assistance that they received from internships, graduation projects, professional societies, career centres and professional certificates, using a 5-point Likert scale (1= not helpful at all, 5= very helpful). The findings show that internship experiences (summer school training) and graduate projects were the most helpful, with mean scores of 4.2 and 3.3 respectively. However, professional societies and professional certificates received a low rating as did career centres. The survey also asked to reflect on the challenges they faced when starting their careers based on 10 criteria.

CHALLENGES CRITERIA	MEAN	S.D.
1. Working under pressure	4.33	1.00
2. Taking responsibility	4.60	1.00
3. Working by yourself	4.20	0.90
4. Responsible for results	4.30	1.00
5. Working with people from different background	4.70	1.10
6. Afraid of failure	3.00	0.90
7. Dealing with your superiors	4.20	1.10
8. Not knowing enough	4.00	1.20
9. Language problems	2.00	1.10
10. Learning on your own	4.20	1.10

On assessing graduate's perception it could be seen that they are compelled to under pressure taking responsibility while working with people from diverse backgrounds which in turn requires higher level of soft skills. There are hardly any concerns with language skills

Engineering Employability Skills Required By Employers

Below are listed ten (10) most important generic skills acquired by the engineering graduates. The skills are based on criteria emphasized for professional skills from the Accreditation of Engineering Programmes (EAC) Manual. The finding on engineering employability skills is summarised in Table 1 according to the importance of employability skills expected by employers.

SKILLS	
COMMUNICATION	the ability to present ideas with confidence and effective through aural, oral and written modes, not only with engineers but also with the community at large
COMPETENT IN APPLICATION AND **PRACTICE**	the ability to use the techniques, skills, and modern engineering tools
INTERPERSONAL OR TEAM WORKING **SKILLS**	the ability to function effectively as an individual and in a group with the capacity to be a leader or manager as well as an effective team member
ENGINEERING PROBLEM SOLVING **AND DECISION MAKING SKILLS**	the ability to function effectively as an individual and in a group with the capacity to be a leader or manager as well as an effective team member
APPLY KNOWLEDGE OF SCIENCE **AND ENGINEERING PRINCIPLES**	the ability to acquire and apply knowledge of engineering fundamentals
COMPETENT IN SPECIFIC **ENGINEERING**	the ability to acquire in-depth technical competence in a specific

DISCIPLINE	engineering discipline
UNDERSTAND PROFESSIONAL , SOCIAL AND ETHICAL RESPONSIBILITIES	the ability to understand the social , cultural, global and environmental responsibilities of a professional engineer, and commitment to professional and ethical responsibilities
LIFELONG LEARNING	the ability to recognize the need to undertake lifelong learning, and possessing / acquiring the capacity to do so
ENGINEERING SYSTEM APPROACH	the ability to utilize a systems approach to design and evaluate operational performance
KNOWLEDGE OF CONTEMPORARY ISSUES	the ability to continue learning independently in the acquisition of New knowledge, skills and technologies. Nowadays, the use of information, communication and computing technologies are very Essential in the knowledge-based era.

Table 2: Engineering Employability Skills developed by Ministry of Higher Education

RESULTS

Higher Education provided in the New Zealand Universities is able to address the employer's needs						
	Percentage	Employers ⬇				
Strongly agree	80-100					
Agree	60-80		70		70	70
Indifferent	40-60	50		50		
Disagree	20-40					
Strongly Disagree	0-20					
Total	**62%**					

Employers believes that in this particular field Higher Education (theory base learning) is sufficient enough to address the employability skills						
	Percentage	Employers ↓				
Strongly agree	80-100					
Agree	60-80			70		70
Indifferent	40-60	50	50		50	
Disagree	20-40					
Strongly Disagree	0-20					
Total	**58%**					

Use of internships and work based learning enhanced the employability aspects of the graduate Civil engineers						
	Percentage	Employers ↓				
Strongly agree	80-100					
Agree	60-80		70	70	70	70
Indifferent	40-60	50				
Strongly Disagree	0-20					
Total	**66%**					

On the other hand, studies on industry employers found out that these employers' requirements are grouped into two sections. First, the requirement for scientific knowledge obtained by graduates. Second, the requirement for employable personal qualities possess by graduates. It indicates that communication skills, responsibility and initiative were among the employers' most required personal qualities in potential employees.

According to one employer: It is extremely important for professional engineers to be able to communicate effectively. In today's job market, there is a strong need for a proficiency in

communication that makes engineers more competent. Poor communication skills can cost the company money. The majority of employers expressed their interest to provide internships to graduates will greatly enhance their interpersonal skills. One of them suggested, students should undergo several training sessions, more than just once during the summer and probably for longer time periods to experiments with practical environment because university and academic life teaches nothing about the working environment. Many participants repeatedly mentioned the role of collaboration between industries and academia is of utmost importance. There is a gap between academia and industry where both parties should work together on educational grounds. Such collaboration can enhance the visibility of the university's education to meet industry's goals.

CONCLUSION

Labour market conditions for engineering graduates today are particularly tough due to globalisation and competition as the numbers of graduates are continuously increasing. To prepare the graduates for the world of tomorrow, higher education must develop and utilise appropriate learning tools to the latest technology.

Preparing necessary programme to develop those employability skills into students profile certainly requires proper planning and preparation. While students seem to have no difficulty locating jobs due to high demand, it is evident that engineering graduates confront critical issues during the transition. These issues included taking on new responsibilities, performing under pressure, dealing with superiors and communication with people from diverse backgrounds. Participants' comments suggest that cooperation between the engineering industries and academic institutions would have facilitated their transition. Future studies are needed to offer additional support for these findings. The workplace is an excellent environment in which to apply knowledge, talent and values. Professional growth remains one of the key features of any successful career.

REFERENCES

Cassidy, S. (2006). Developing employability skills: Peer assessment in higher education. *Education+ Training*, 48 (7), pp. 508--517.

Consultancy, P. & Others (2007). Graduate employability skills. *Precision Consultancy*.

Downs, P. (2003). Vietnam and bluebell: The Royal New Zealand Electrical and Mechanical Civil engineers in Vietnam, soldier-tradesmen tell their story.

Sc, Ura, T. A. & Williams, E. A. (2000). Research methodology in management: Current practices, trends, and implications for future research. *Academy Of Management Journal*, 43 (6), pp. 1248--1264.

Wye, C. & Lim, Y. (2009). Perception differential between employers and undergraduates on the importance of employability skills. *International Education Studies*, 2 (1), p. 95.

Zaharim, A., Omar, M., Yusoff, Y., Muhamad, N., Mohamed, A. & Mustapha, R. (2010). Practical framework of employability skills for Civil Engineering graduate in Malaysia. pp. 921--927