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Industry Based Learning Improves Skills and Training of Undergraduate Engineering Programmes in Kenya: Case Study of the University Of Nairobi

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ABSTRACT

Employers, especially those in industries, have lately been complaining on the preparedness of university engineering graduates to take up employment. This is despite the fact that universities require engineering undergraduates to undertake Industry Based Learning which is a form of attachment that introduce them to field of work and practical skills while still undertaking their undergraduate course. An investigation into the perceptions of alumni of University of Nairobi and their employers on the effectiveness of the Industrial Based Learning programme was made. Alumni who graduated with Bachelor of Science in Electrical and Electronic Engineering degree between 2007 and 2011 participated in the study. Using case study survey designs, a sample of 265 respondents was accessed from a population of 417 graduates through snowball method. Thirty employers were purposefully sampled and 20 were accessed. In addition,5 out of 48 academic and technical staff of Department of Electric and Electrical Engineering answered the questionnaires. Questionnaires were self-administered to the respondents at their place of work. For respondents who were in far-flung areas, questionnaires were emailed followed with telephone discussions. The alumni rated the Industry Based Learning as unsatisfactory largely due to the University's inadequate assistance in securing attachments for students and failure of lecturers to adequately supervise students during attachments. The employers perceived Industry Based Learning as a critical experience that improved employees' productivity. One of the conclusions was that undergraduate attachment was important for it provided a valuable opportunity for gaining necessary skills and training for subsequent use in employment. A major recommendation was the need to formulate an Industry Based Learning/internship policy in the University.

Key words: Industry Based Learning, Attachment, Internship Policy, Skills, Curriculum, Profession

INTRODUCTION

The relationship between higher education and employment is about the extent to which graduates apply knowledge, skills and attitudes acquired while in a training institution to the world of work. Universities contribute to economic development by providing skills, knowledge, and attitudes needed by high-level professional, technical, and managerial workers (Woodall, 1992). Therefore, investment in education is investment in the productive capacity of the people (Becker, 1964). Besides providing skills for performing different vocational tasks, education provides social values for a society and acts as a screening device to select individuals for jobs (Stiglitz, 1975). Levine (1987) adds that most jobs and occupations have educational requirements for entry and advancement and organizational forms of schooling correspond closely with the organizational forms of work. Moreover, academic attainments represent an important mechanism for determining social and occupational mobility (Solmon, 1987).

Over the years, the Organization for Economic Cooperation and Development (OECD) has conducted research on various themes on youth education and employment. The studies were premeditated by sharp rises in unemployment over several decades (OECD, 1993). Research findings led to formulation of a set of policy recommendations intended to reduce joblessness and improve labour market performance (OECD, 1994a, b). The resulting document had ten recommendations three of which impinged on education and training. One was to enhance the creation and diffusion of technological expertise. Another was about nurturing an entrepreneurial climate by eliminating impediments to, and restrictions on, the creation and expansion of enterprise. Yet another targeted improvement of labour force skills and competences through wide-ranging changes in education and training systems. In addition, The World Economic Forum in 2017 published an annual global human capital report on core skills for graduate employment and listed the top five skills as complex problem solving, critical thinking, creativity, people management, and coordinating with others in that descending order.

Manifestations of the dichotomy between universities acquired knowledge, skills and work tasks requirements are usually reflected through employers' emphasis on soft or social skills, attitudes and motivation in the recruitment of graduates. Employers advocate for modes of experiential learning such as internships aimed at solving practical problems (Republic of Kenya, 2012). Therefore, this tracer study was carried out to assess the external efficiency of the education and training provided to the University of Nairobi Bachelor of Science Electrical and Electronic Engineering graduates who completed their studies between 2007 and 2011.

Objectives of the Study

The following objectives guided the study:

1. To establish the jobs occupied by graduates of Bachelor of Science Electrical and Electronic Engineering of the University of Nairobi in the job market.
2. To assess the perceptions of the graduates of Bachelor of Science Electrical and Electronic Engineering towards the curriculum they underwent in the University of Nairobi.
3. To determine employers' perceptions on the curriculum offered to graduates of Bachelor of Science Electrical and Electronic Engineering at the University of Nairobi.

LITERATURE REVIEW

Available literature is replete with emphasis on apprenticeship as a mode of teaching and learning. Under preindustrial Europe, exposure to work tasks began at an early age and placement in local work apprenticeships were the dominant forms of preparation for work (Levin, 1987). The tradition continued during the Industrial Revolution (Zeev, Mokyr & van der Beek, 2017) and well into the twentieth century (Cowman, 2014). Today, apprenticeship continues in a more refined manner due to educational advancements reflected through cooperation between higher education and world of work leading to internship of students prior to or during the course of study (Teichler, 1997).

Researchers have demonstrated the critical role of Industry Based Learning (IBL) towards graduates' procurement of jobs. The Gallup Organization's survey that covered 27 European Union member states as well as Croatia, Iceland, Norway and Turkey revealed that 30 percent of respondents recommended the inclusion of practical experience in courses at higher education institutions to enhance the employability of their graduates (Gallup Organization, 2010). The University of Glasgow in the United Kingdom corroborated the continental Europe employers' opinions on employability skills of new graduates. They reiterated the importance of placements and the recognition of experiential learning by proposing that experiential learning be conducted under effective, sustained and equitable partnerships between higher educational institutions and employers (Lowden, Hall, Elliot & Lewin, 2011). Similarly, in a study conducted in Austria, Germany, Italy, Poland, Slovenia and Turkey, students and academics agreed that a practical orientation, cooperation with industry and internship were fundamental tools for enhancing graduates' employability. Employers concurred and stressed the need to acquire more actual work experience during higher educational studies (Melink & Pavlin, 2012).

Higher educational institutions in Australia offer well laid out activities under the Australia Wide Personnel IBL Programme (Australia Wide Personnel Pty. Ltd., 2006). The programme offers benefits to students such as enhanced learning ability and understanding on return to academic studies; paid professional experience and development in a real-world environment; potential ongoing work and future offers of employment; and real work-readiness on graduation. Advantages to placement providers include opportunity to have projects/tasks completed in the workplace; gaining fresh ideas and insights from talented and enthusiastic students; a chance to closely assess a potential new employee over an extended period; and satisfaction of contributing to the professional development of new entrants to their profession.

In Asia, several tracer studies highlight on the role of Industry Based Learning towards the acquisition of skills for employment. Vong (2014) researched on the Royal University of Phnom Penn and recommended that a short training programme on work skills before undergraduates left the University was necessary to give graduates a big advantage in the job market. Internships were also important to enable graduates understand the labour market needs. A tracer study at was conducted at Visvesvaraya Technical University in Bangalore focusing on undergraduates' exposure to practical work and experience gained from projects. The alumni were happy about the interaction during attachment between the industry and the institution. They advocated for additional laboratory exposure and hands on experience. They strongly believed that such refinements were to augment employability in the corporate world (Murali & Rajaram (2015)

The theme of Industry Based Learning is prevalent, too in inquiries into the relationship between higher education and world of work in Africa. A British Council in 2016 commissioned an investigation on 'Universities Employability and Inclusive Development' that covered four countries and several universities therein. These were: Ghana - University of Ghana, Kwame Nkrumah University of Science and Technology, University for Development Studies, Ashes University; Kenya - University of Nairobi, Moi University, Daystar University; Nigeria - Imo State University, University of Ibadan, Bingham University; South Africa - University of the Witwatersrand, University of the Free State, Nelson Mandela Metropolitan University, and University of Venda. Among the pivotal recommendations that arose was transforming the higher education experience through an integrated approach. The

proposal was to be achieved in part by enabling students to access placements outside the university to develop life and workplace experience.

Various tracer studies have availed data on the significance of internship. In a study on agricultural graduates in Ghana, Taabazuing (2010) found that there was need to make agricultural training more responsive to market demands. Agricultural training institutes were urged to establish strong linkages with industries for students to have longer practical attachments. Similar findings were recorded by Nengomasha and Chiware (2009) in their study at the University of Namibia, Department of Information and Communication Studies. Employers strongly recommended practical attachments and internship for exposure and experience for enhanced success in the job market. Additionally, in Zimbabwe Open University, alumni from over 60 degree and diploma programmes in the faculties of Arts and Education, Applied Social Science, Science and Technology, and Commerce and Law laid great emphasis on multiple and practical skills acquisition (Rupande, 2015).

In Rwanda, the Higher Education Council commissioned an alumni survey of higher learning institutions and employers' satisfaction of graduates' competences (LG Consult Ltd, 2015). Respondents were, among others, drawn from the fields of Accounting, Economics, Business Administration, Management, and Engineering. The alumni suggested strengthening of industrial linkages and internships to fortify practical skills. Employers affirmed that graduates lacked practical skills. An earlier study by Mbabazi (2013) had also emphasised on the need for a closer relationship between education and work particularly in form of attachment.

Universities in East Africa drawn from Kenya, Rwanda, Tanzania and Uganda participated in a market survey sponsored by the Nation Media Group (Infotrak, 2015). Most employers' findings related to unsatisfactory levels of technical skills. Universities were accused of imparting theoretical knowledge at the expense of practical skills. A lack of adequate internship opportunities was found prevalent. In Kenya, it was found that there were too few applications for vacancies requiring technical and specialized qualifications such as engineering, information technology, health and financial services. A recommendation was made that university graduates were to focus on gaining appropriate work experience and job knowledge through attachment or internship (Corporate Staffing Services, 2015). Kaijage (2000) in a study comprising Bachelor of Commerce graduates of University of Dar es Salaam found that 98.0 percent of Accounting major students were of the feeling that attachment was a fundamental component of the programme. A similar study assessing the effectiveness of Bachelor of Education programme of the graduates of University of Nairobi revealed that teaching practice was the second most commonly applied professional skill acquired during studies by the practicing teachers (Kimani & Kinyanjui, 2001). Graduates of medicine of Makerere University equally rated internship highly (Ndungutse, 2005).

Available literature shows that most of Kenya's public universities have entrenched IBL in their curricular. Differences, however, prevail among universities and even within departments of an institution in terms of identification of organizations for attachments, students' facilitation, supervision and evaluation. Among universities with elaborate IBL programmes is the Jomo Kenyatta University of Agriculture and Technology (Magoha & Alugongo, 2003) and Technical University of Kenya (Technical University of Kenya, 2013).

A number of Kenya's educational blueprints have underscored importance of IBL. Sessional Paper No. 1 of 2005 on a Policy Framework for Education, Training and Research identified the challenge of mismatch between skills acquired by university graduates and the demands of industry (Republic of Kenya, 2005). To address the problem, universities were required to review all professional programmes and incorporate internships into academic courses. A report of the Public Universities Inspection Board recommended that each university should have an internship policy (Republic of Kenya, 2006). Promotion of internships was also among strategies for improving university-industry linkages and partnerships, according to the National Strategy for University Education 2007-2015 (Republic of Kenya, 2007). Weak linkages between the competences acquired in some programmes and the demands of the market were singled out as a challenge to quality and relevance of university education in Sessional Paper No 14 of 2012 on a Policy Framework for Education and Training (Republic of Kenya, 2012a). The Public Service Commission of Kenya also recognizes the important component of education and training played by both industrial attachment and internship (Republic of Kenya, 2015b)

To facilitate implementation of internship policy, the Government of Kenya has introduced a monetary incentive to employers. In the 2015/2016 National Budget, a tax rebate was introduced for companies which hired at least ten interns (Republic of Kenya, 2015). An employer was to deduct a tax rebate equal to 50 percent of the amount of

salaries and wages paid to at least ten apprentices. The inducement was ushered because corporations were reluctant to recruit interns because of the cost of training. Consultations with the Federation of Kenya Employers revealed, however, that the tax rebate incentive was ineffective. Most companies were small or medium sized and so could not afford to hire the minimum number of ten interns.

From the foregoing literature, it is quite evident that Industry Based Learning is essential in the acquisition of knowledge and skills for procuring jobs. It is against this background the current paper sought to assess the effectiveness of IBL at the University of Nairobi's Department of Electronic and Electrical Engineering.

Theoretical Framework

Industry Based Learning is grounded in the learning theory of Constructivism whose thesis is the need for the learner to be actively engaged in the process of learning (Tanner & Tanner, 2007). John Dewey and Jean Piaget are identified as constructivists (Mussen, 1970; Phillips, 2000 and Webber, 2001). Neither, however, used the term constructivism itself in any systematic manner (Tanner & Tanner, 2007). Closely related to Constructivism is Kolb's Experiential Learning Style Theory which postulates that learning is the process whereby knowledge is created through the transformation of experience (Kolb, 1984). Kolb modeled his theory by a four-stage learning cycle in which the learner touched all the bases: concrete experience (doing/having an experience); reflective observation (reviewing/reflecting on the experience); abstract conceptualization (concluding/learning from the experience); and active experimentation (planning/trying out what you have learnt). As can be noted, Industry Based Learning is aligned to both constructivist and experiential learning style theories.

METHODOLOGY

Research Design

The study adopted case study survey design to collect data once across all the study participants. The design was suitable for the study because according to Bryman (2016), case study design entails the detailed and intensive analysis of a single case or programme. In the study, the researcher investigated Bachelor of Science Electrical and Electronic Engineering graduates of the University of Nairobi. Kothari (2004) further explains that surveys are concerned with describing, recording, analyzing and interpreting conditions that exist or existed; and are usually appropriate in case of social and behavioral sciences. Data were collected through questionnaires that were largely adapted from the work of Schomburg (2003) on tracer studies. Cronbach alpha was used to test reliability of the questionnaires.

Target Population and Sample Size

A population of 417 engineering students who graduated between 2007 and 2011 was obtained from the University of Nairobi graduation handbooks. Their contacts were provided by the Department of Electrical and Information Engineering. The study further targeted 30 employers and 48 academic and technical staff in the Department of Electrical and Electronic Engineering. A sample size of 300 Engineering graduates was determined using Yamane's (1967) formula. However, the accessible sample, using snowball sampling method, was 262 alumni.

RESULTS

Out of the accessible 262 alumni, 251(95.8%) filled out the questionnaires. In addition, 20(66.6%) of the employers completed the instruments. However, a very low response rate of 5(10.4%) was achieved with the academic and technical staff. The response rate achieved was nevertheless considered adequate for data analysis. More males (88.4%) than females (11.6) were in the electrical and electronic engineering profession. Most of the engineers were youthful with age ranges between 26 and 30 years (26.0%) and 31 to 35 years (63.0%).

Jobs BSc. Electrical and Electronic Engineering Graduates held in the Labor Market

The first objective sought to establish the jobs graduates of UoN in Bsc. Electrical and Electronic Engineering held in the labour market. Electrical and electronic engineering programmes are of two broad types: heavy electrical current and light electrical current. Heavy current focuses on electrical power systems as well as power electronics and variable machine drives. The light current option concentrates on telecommunications, microwaves and antennae. Table 1 provides the findings on the alumni's specialisations.

Table 1
Engineering programmes by graduation numbers, percentages and year

Year	Program			
	Heavy Current		Light Current	
	Frequency	Percent	Frequency	Percent
2007	26	43.0	34	57.0
2008	22	55.0	18	45.0
2009	36	60.0	24	40.0
2010	29	76.0	9	24.0
2011	46	69.0	21	31.0
Total	**159**	**60.6**	**106**	**39.4**

Table 1 shows that on average, in the five year period under study, more engineers graduated in the heavy electrical current programme (60.6%) than in the light electrical current one (39.4%). A follow up question revealed that majority (53.8%) of the graduates worked in the public sector compared to 43.0 percent in the private sector and 3.2% who were self-employed. The findings relate to a World Bank survey that showed that young graduates prefer public sector jobs (Ministry of Higher Education, Science and Technology, 2012). It was further revealed that the leading three employers in the public sector were Kenya Power Company (28%), Ministry of Lands, Housing and Urban Development (6%) and Kenya Electricity Transmission Company (4%). In the private sector, Safaricom (7%), Huawei Technologies (3%) and Schneider Electric East Africa (2%) were the largest employers. All the employers except Safaricom and Huawei Technologies are in the heavy electrical current.

The jobs performed by Bachelor of Science Electrical and Electronic Engineering alumni were grouped under the nature of occupation (Kenya National Bureau of Statistics, 2017). Table 2 presents the findings.

Table 2
Distribution of employed graduates by nature of occupation

Nature of occupation	Frequency	Percent
Electrical/Electronics	104	39.2
Information and Communication	87	32.8
Construction	43	16.2
Banking and Finance	13	4.9
Education	12	4.5
Manufacturing	6	2.3
Total	**265**	**100**

Table 2 indicates that Electrical and Electronic Engineering was the occupation most (39.2%) of the alumni were involved in. Following were those who worked in the information and communication subsector (32.8%). This finding was similar to the findings of Rizal Technological University graduates (Cruz & Alcantara, 2014).

Perceptions of BSc. Electrical and Electronic Engineering alumni towards curriculum

The second objective was to determine the perceptions of the Bsc. Electrical and Electronic Engineering alumni on the curriculum they underwent in the university. This was necessary because according to Schomburg (2016) the fundamental purpose of a tracer study is to gather feedback for curriculum development and improvement of other aspects of the academic discipline, equipment and facilities. Table 3 is a summary of the alumni's responses.

Table 3
Alumni's views on the aspects that contributed to their employment

Curriculum Aspect	Rating									
	Veryhigh extent		High Extent		Average		Low Extent		Not at all	
	F	%	F	%	F	%	F	%	F	%
Field of Study	114	43.7	78	29.9	54	20.7	14	5.4	1	0.4
Area of specialization	113	43.5	74	28.5	62	23.8	6	2.3	5	1.9
Role of course	117	44.2	92	34.7	40	15.1	10	3.8	6	2.3
Variety of courses	76	28.7	10	40.0	67	25.3	6	2.3	10	3.8

Table 3 indicates that 43.7 percent of the alumni felt that during recruitment, employers to a very high extent emphasised on the field of study subject area/specialization (43.5%) and course content (44.2%). A similar finding was realized in a tracer study of mathematics graduates from Kwame Nkrumah University of Science and Technology where respondents acknowledged that course contents of their programme were relevant to their career requirements (Osei, Dontwi, Otchere & Singye, 2015). This shows that Bsc. Electrical and Electronic Engineering alumni had positive perceptions towards the curriculum they had undertaken at UoN.

The alumni were further requested to rate the areas of the curriculum and related issues that needed improvement using a 7 – point Likert scale: 1-Absolutely inadequate (AI); 2 – Inadequate needs improvement (IIN); 3- Inadequate needs minor improvement (IMIN); 4 - Adequate as expected (AE); 5 - Better than adequate (BA); 6 – Example of good practice; and 7 – Excellent (E). Table 4 provides a summary of the responses.

Table 4
Graduates' ratings on curriculum areas requiring improvements

Curriculum area	Ranking													
	AI		IIN		IMIA		AE		BA		GP		E	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Student advice and support	16	6.0	102	38.3	72	27.1	17	6.4	2	0.8	0	0.0	0	0.0
Facilities/ infrastructure	89	33.5	99	37.2	12	4.5	4	1.5	3	1.1	1	0.4	1	0.4
Student evaluation	52	19.5	62	23.3	55	20.7	35	13.2	8	3.0	1	0.4	0	0.0
Curriculum design	154	57.9	47	17.7	10	3.8	1	0.4	0	0.0	0	0.0	0	0.0
IBL (Student assistance)	76	28.6	104	39.1	22	8.3	7	2.6	1	0.4	0	0.0	0	0.0
IBL (Lecturer supervision)	59	22.2	8	3.0	39	14.7	5	1.9	0	0.0	0	0.0	0	0.0

The areas that had high composite rating on absolutely inadequate and inadequate from the alumni were curriculum design (75.6%); facilities/infrastructure (70.7%) and Industry Based Learning (67.7%) where alumni complained that facilitation towards IBL was either absolutely inadequate (28.6%) or inadequate (39.1%). The lecturers hardly assisted them to access industrial attachment. The finding confirmed an earlier investigation in which public university students complained about long periods of searching for internship opportunities (Republic of Kenya, 2006). A similar problem was reported in a survey of graduate engineers of Visvesvaraya Technological University in India. In a ranking of 20 attributes of competencies provided by the University, industry interaction was second last (Murali & Rajaram, 2015). Inadequate industry based learning was likewise reported in the study of Zimbabwe Open University Mashonaland East Region (Rupande, 2015). Inadequate hands-on skills compromised an engineering graduate's opportunities in the labour market.

Another problem articulated by 70.7 percent of respondents (33.5% as absolutely inadequate and 37.2% as inadequate) was in connection with facilities and infrastructure particularly computers. A similar shortfall had also been observed in some universities in Europe resulting in a call for more computer and internet facilities (Lazetic, Zivadinovic & Noller, 2014). In the revamped basic education system, ICT takes centre stage due to its enhancement of the teaching learning process (Kenya Institute of Curriculum Development, 2017). According to the Report of the Public Universities Inspection Board (Republic of Kenya, 2006) the pervading influence and utilization of ICT in economic development makes it essential that universities take lead in imparting ICT skills and knowledge so that graduates acquire competency in this vital area.

Employers' perceptions of the BSc Electrical and Electronic Engineering curriculum

The third objective was to examine the perceptions of employers on curriculum offered to Bsc Electrical and Electronic Engineering graduates. An underlying theme was recognition that higher education in general and university education in particular is a stepping stone to a good job (Lowden, Hall, Elliot, & Lewin, 2011). Therefore, an employer's positive perception of a graduate's knowledge, skills and attitudes guarantees job placement. The views of employers on the curriculum of Bsc. Electrical and Electronic Engineering of the University of Nairobi were analyzed under three broad areas: scientific and technical knowledge; knowledge of methods; and knowledge of non-technical areas. Responses were based on a five-point Likert scale: 1-Very important; 2 - Important; 3 - Average; 4 - less important; and 5 - not important and presented in Table 5.

Table 5
Employers` rating of scientific and technical knowledge

Area	Rating									
	Very Important		Important		Average		Less important		Not important	
	F	%	F	%	F	%	F	%	F	%
Mathematics	13	65.0	6	30.0	0	0.0	0	0.0	1	5.0
Operations, measurement and control technology	13	65.0	5	25.0	0	0.0	1	5.0	1	5.0
Applied technical fields	10	50.0	8	40.0	0	0.0	0	0.0	2	10.0
Natural and material sciences	9	45.0	5	25.0	2	10.0	3	15.0	1	5.0
Theoretical basics of engineering science	10	50.0	6	30.0			2	10.0	2	10.0

Employers rated highly the section of the syllabus on operations, measurement and control technology. A total of 90.0 percent of respondents viewed this as either 'very important' (65.0%) or 'important' (25.0%) area. Knowledge and skills in operations, measurement and control technology are applicable to jobs in both heavy current (electrical) and light current (electronic) sectors. 0ut of the 20 employers, 65.0 percent regarded mathematical knowledge and skills as very important and another 30.0 percent considered it important.

Natural sciences contribute to improved engineering functions. Application of physics concepts is core to operations in engineering branches such as telecommunications (Singh, 2004). Chemistry is regarded as the center of science and that the more chemistry an engineer understands, the more beneficial it is (Yen, 2008). Material science deals with the study of the characteristics and uses of the various materials that are employed in science and technology. Employers (70.0%) who participated in this research were of the opinion that both natural and material sciences were very important and important to their graduate engineers from the University of Nairobi. Employers' ratings on employees' knowledge on methods are presented in Table 6.

Table 6
Employers` rating of employees' knowledge of methods

Curriculum	Rating									
	Very Important		Important		Average		Less important		Not important	
	F	%	F	%	F	%	F	%	F	%
System analysis and optimization	13	65.0	5	25.0	0	0.0	0	0.0	2	10.0
Planning, design, calculation and construction	13	65.0	5	25.0	0	0.0	1	5.0	1	5.0
Experimental/ Practical	11	55.0	7	35.0	1	5.0	0	0.0	1	5.0

Most of the respondents (65.0%) viewed performance arising from system analysis and optimization as very important. The portfolio of graduate electrical and electronic engineers includes planning, design, calculation and construction activities. Employers (65.0%) regarded this aspect as very important. Graduates' expertise in these areas draws attention of employers who reciprocate by offering jobs.

Three curriculum components of knowledge in non-technical areas were investigated; project management, communication skills and entrepreneurial skills as indicated in Table 7.

Table 7
Employers' rating of knowledge of non-technical areas

Curriculum area	Rating									
	Very Important		Important		Average		Less important		Not important	
	F	%	F	%	F	%	F	%	F	%
Communication skills	9	45.0	5	25.0	3	15.0	1	5.0	2	10.0
Project Management	6	30.0	11	55.0	2	10.0	0	0.0	1	5.0
Entrepreneurial Skills	4	20.0	9	45.0	2	10.0	3	15.0	5	10.0

A broad summary from Table 7 reveals that 45.0 percent of the employers were of the view that communication skills component was very important while 55 percent rated project management skills as important. Project management skills include an understanding of cost, quantities and magnitude, knowledge of technical standards, code of practices and awareness of legal and other regulatory constraints. Prowess in the subject matter convinces employers to offer job placements. Generally, the employers held positive perceptions towards the curriculum offered to graduates of the University of Nairobi.

DISCUSSIONS

From the views of the alumni and the employers, it is evident that the role of Industry Based Learning in orienting students to field of work need not be emphasised. A strong foundation in the engineering profession, through IBL, boosts a nation's economic growth and development. In the European Union, innovations in the field of engineering play a fundamental role for economic development and growth (Melink & Pavlin, 2009). Innovations are credited for technical progress, which is a foundation of economic growth and prosperity. Innovations also enhance a country's competitiveness in world markets, which promote growth. Indeed, Europe's 2020 strategy is driven by engineers (Fuchs, 2010). The aim is to turn Europe into a smart, sustainable and inclusive economy. Engineers' contribution is in creating new jobs, securing clean energy supply, sustaining natural resources and taking the challenges associated with climate change. Kenya Vision 2030 is likewise considerably depending on engineers for the attainment of the three pillars; economic, social and political. The aim of the economic pillar is moving up the value chain so that a sustained growth of 10.0 percent is maintained for the country. Vision 2030 is anchored on ten foundations three of which, infrastructure, energy and science, technology and innovation call for direct intervention of engineers.

Improvement of curricula through IBL is most essential in the education and training of engineers. Universities in general and engineering departments in particular however lack an industrial attachment policy. The Transformation of Higher Education and Training in Kenya to Secure Kenya's Development in the Knowledge Economy blueprint explicitly recommended that each university should have an internship policy (Republic of Kenya, 2006). The matter was endorsed as part of students' welfare in the National Strategy for University Education 2007-2015 (Republic of Kenya, 2007).

An IBL policy is vital in the accomplishment of the programme and consequent improvement of engineering skills. Its features include mission and vision statements, goals and objectives. Insurance, health and safety issues and programme location and duration are explained. Designated staff members are also described besides management and control instruments. Among these are industrial attachment documents on student's guide; introduction letter, company capacity questionnaire, student's appraisal form, lecturer's visitation assessment form, marking guide, and student's response. Student's discipline is also an important ingredient of the policy.

The Government of Kenya introduced a tax rebate for employers who hire at least 10 new university graduates as interns. The situation arose from a long campaign of the Federation of Kenya Employers for the fiscal incentive as an attempt towards graduates' capacity building (*Business Daily*, June 11, 2015). Intermittent complaints about graduates general lack of skills and experience to perform tasks led to the circumstance. The Cabinet Secretary for the National Treasury eventually formalized the financial inducement through Legal *Notice No. 97* (Republic of Kenya, 2016). Employers were to seek the written permission of the Director-General of the National Industrial Training Authority (NITA) before they engaged the graduates. The contract between the employer and the intern was then to be registered with NITA for it to be registered.

One of the obstacles facing the success of Legal Notice No. 97 is the limited size of most companies which put a restriction to hiring the minimum number of 10 interns. Availability of companies offering attachment at any one given period is not always guaranteed. Indeed, most organizations have personal preferences. Another obstacle is the sequencing of programmes to match opportunities. The implication of such drawbacks is the preponderance of mounting IBL courses at the departmental level.

During attachment, undergraduates are presented with opportunities to expand their competencies in wider areas. Knowledge of their study background or discipline and in other fields such as communication in English increases. In addition, personal competences or personal attributes improve including problem solving, creativity, time management, loyalty and integrity (Lowden, Hall, Elliot & Lewin, 2011 Sitepu, 2011). Interpersonal competencies such as teamwork, leadership and persistence are also enhanced. These are among skills in high demand by employers (Gallup Organization, 2010).

CONCLUSION

From the study, it can be established that IBL programmes are a panacea for expertise in engineering profession. Bachelor of Science in Electrical and Electronic Engineering alumni of the UoN perceived the curriculum offered including internship positively. Employers also highly rated the inclusion of apprenticeship in the curriculum. Formalizing internship in the curriculum should therefore be the norm in every department particularly those of engineering.

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