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Impact of Lifelong Learning on Engineers

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Abstract

Lifelong learning has been at the center of many national education reforms in the past decade and higher education policy has been considerably shaped by it. At a policy level, a simple, elegant vision of integration and mutual dependence between learners, industry and higher education institutions (HEIs) is prescribed. In terms of this prescription, study programmes at HEIs are aligned to industry's skills and knowledge requirements and learners actively select and pursue educational opportunities in order to make and keep themselves employable. This paper describes a study of learner perspectives on lifelong learning and construction industry skills requirements in Estonia. The findings suggest considerable diversity in learner perceptions of what constitute current and future industrial requirements, a dissatisfaction among learners regarding the adequacy of HEI responses to industry needs and reluctance to conform to the prescribed role of lifelong learner, all of which challenge the prescribed model.

Keywords- Lifelong learning, Engineering education, Construction Industry

Introduction

A. The Current incarnation of Life Long Learning – Lifelong learning strategy is defined as ,"All activities undertaken throughout life, with the aim of improving knowledge ,skills and competence within a personal , civic, social and employment related perspective either formally or non-formally or informally." The current incarnation of lifelong learning and its associated policies have been posited as a response to the challenges faced by modern societies from structural unemployment, globalization, the envisaged knowledge economy and rapid technological change. They promise to revolutionize all education as lifelong learning becomes the guiding principle for the provision and participation in education and training. The dominant discourse has been the relationship between education and work. The transition to a knowledge-based economy would require higher overall levels of education and qualification and changes to the ways in which education and training are provided so that people can participate in learning throughout lives. The implications for higher education institutions (HEIs) include pressure to admit a higher proportion of the population from a variety of different educational backgrounds as well as to restructure their courses to make them part-time and modular and thus more readily available to the full time employed

However, lifelong learning is not being seen as simply and necessarily positive. There is evidence that the increased demand for learning in recent years has been largely socially inspired and independent of an economic demand for skills. Labor forces seem disproportionately highly educated when compared to the skills demands of the currently available work so that underemployment is a growing problem. Similarly, the flexibilisation of the labor market makes individual life planning riskier and threatens to replace unemployment with generalized, risky and underemployment.

B. University responses to Lifelong learning –One interpretation of the emerging higher education system envisages a 'lifelong university' where HEIs continuously interact with their students over the course of their lives. The lifelong university would provide graduates with further education and training in response to their changing requirements and would also draw on their graduates relationships with industry to enrich the learning experiences of other students. So that for example, alumni might actively participate in the teaching, advising and monitoring of other students.

Higher Education Reforms-Since 1996 Madhya Pradesh has thoroughly recognized its higher education system in line with employability and lifelong learning. Reforms have been generally oriented towards

economic imperatives with emphasis placed upon perceived benefits arising from 'knowledge –based economy', alignment of education with labor force engaged in lifelong learning. These have included:

- A transition to competence-based study programmes;
- The inclusion of employers in the development of study programmes;
- Measures to make higher education more accessible and to open distance education centers.

The emerging higher education arrangement promises a high degree of integration between curricula, qualifications, professional standards and labor market requirements and appears relatively coherent and compact. This paper reports findings from a survey of students' perceptions of skills requirements of the construction industry both currently and in future, their opinions in terms of how HEIs are responding to these skills requirements and their attitudes towards lifelong learning in general.

Problem Formulation

In this paper three way comparison between an individual's competence, education provision and industry needs which employment –related lifelong learning implies. The individual learner must assess industrial requirements, relate these to their existing knowledge and skills and, in turn, assess the available education options in order to address any gap between their existing knowledge and skills status and the requirements of industry. The context is one of the mutual dependence where learners rely on industry for employment opportunities and education institutions to provide the necessary knowledge and skills to maintain their employability. Educational institutions rely on learners as their customers and on industry to provide the marketplace in which their programmes are valued. Industry, in turn, relies on produce suitably knowledgeable and skilled graduates as well as in the development and adaptation of the technology which industry depends upon. In this way, an education systems based on lifelong learning imposes obligations on learners and education institutions alike to consider and respond to the knowledge and skills requirements of the industry.

Objectives of the Study

This research is intended to address;

(1) How learners perceive the knowledge and skills requirements of industry and how common or diverse are these perceptions.

(2) What learners' perceptions are with regard to how effectively education institutions are responding to these same requirements?

Survey Methodology

A questionnaire survey was developed to elicit the opinions of students of construction-related higher education study programmes. The questions addressed the three areas of enquiry set out above as follows:

Their assessment of industry skills needs – specifically which of a list of skills were currently **:**

- most in demand;
- would become more important in the future;
- would become less relevant in the future.

Their HEI's responses to industry needs -students were asked:

- Did they think universities respond effectively to industry skills needs?
- How realistic the picture of industry was that they were given while studying.
- How much job-related training they received as part of their study-programmes.
- To what extent they learnt to develop practical solutions to real problems.
- How confident they were that the skills and knowledge they had acquired were sufficient to meet market requirements.
- How confident they were that completing their programme of study would improve their career prospects.
- To what extent they acquired generic skills as part of their study programme.

Engineering students as lifelong learners-

- How they respond to a perceived demand for skills which are either not offered or not covered

to the required depth within their programme of study.

- How they have responded to perceived demands for further knowledge and skills in the past.
- The types of employers they would prefer after graduating.
- Which institutions/organizations they had been in contact with regarding their future career and the extent of this communications
- Their expectations with regard to pursuing further studies after completing their current courses.
- How they benefited from the knowledge and skills obtained from their study programmes in terms doing their jobs.
- What incentives they perceived for pursuing lifelong learning.

Result of the Study

A. Description of the Survey Respondents

123 questionnaires were completed by respondents at different stages of construction-related study programmes. The majority of respondents (118) were students of the Rajeev Gandhi Prodhyogiki Vishwavidhyalay. Of these, 113 were full time students, 3 were part time students and 2 students did not declare their mode of study. 5 respondents were enrolled in full time study programmes at the private college of Engineering. 116 respondents were enrolled in integrated (bachelors + masters) 5-year engineering studies courses, 3 respondents were in 2-year master's degree courses, 2 in 4-year courses (these were international exchange students), 1 was enrolled in a part time 7 year programme of study and I did not respond to this question.56 respondents were in year 1 or 2 of their study programmes, 29 respondents in year 3, and a further 32 respondents were in years 4 or higher of their study programmes. (6 respondents did not reveal their current status in this regard).35 respondents were currently employed while 88 respondents were not.

B. Students 'Perceptions of Industrial Skills and Knowledge Requirements

Tables 1. summarize the survey results which reflect students' options of the specific knowledge and skills areas which industry requires currently and in the future.

Table 1 : Learner's Perceptions of the Relative Importance of Generic Skills to Industry

	Currently Most in Demand	More important in Future	Less Important in Future
Technical Skills			
Technical design skills	72%	69%	15%
Technical supervision skills	30%	33%	36%
Management skills			
Forecasting and Planning	47%	57%	7%
Organizing and Coordinating	55%	53%	16%
Controlling	36%	32%	24%
Leadership	38%	25%	21%
General skills			
Teamwork/collaboration skills	71%	59%	3%
Problem solving	71%	50%	2%
Dealing with uncertainty and ambiguity	27%	24%	12%
Network skills	15%	33%	11%
Organizing information	26%	29%	15%
Decision-making	41%	34%	5%
Interpersonal communication	41%	30%	9%
Managing one's time	47%	46%	4%
Awareness of ethical, cultural and ecological issues	6%	31%	20%
Presentation skills	15%	24%	24%
Study skills	26%	25%	11%

C. Students' Perceptions of HEI Responses to Industrial Skills and Knowledge Requirements

Table 2 and 3 reflect student opinions of the effectiveness of their HEIs' responses to perceived industrial knowledge and skills demands.Table 2 shows questions and responses relating to overall perceptions of HEI responses to industry requirements.

Table 2: Perceptions of HEI Responses to Industry Knowledge and Skills Requirements

Questions	Responses		
Do you thing HEIs respond effectively to industry skill needs?	Yes	Moderately	No
	10%	59%	29%
How realistic is the picture of industry you are given while studying?	Realistic	Somewhat realistic	Unrealistic
	8%	67%	23%
How much job-related training do you receive as part of your study-programme?	More than sufficient	Sufficient	Less than sufficient
	2%	27%	70%
To what extent do you learn to develop practical solutions to real problems?	More than sufficient	Sufficient	Less than sufficient
	2%	38%	57%
How confident are you that the skills and knowledge you have acquired are sufficient to meet market requirements?	Very Confident	Mildly confident	Not confident
	7%	55%	37%
How confident are you that completing your current programme of study will improve your chances of getting a suitable job?	Very Confident	Mildly confident	Not confident
	28%	53%	20%

Respondents' opinions with regard to the degree to which they acquire generic skills as part of their study programmes are shown in Table 3 below.

Table 3: Student's Opinions of the Sufficiency of Generic Skills Acquisition

To what extent do you acquire the following generic skills as part of your study programme?	More than sufficient	Sufficient	Insufficient
Teamwork/collaboration skills	2%	53%	41 %
Problem solving	4%	63%	30 %
Dealing with uncertainty and ambiguity	4%	50%	41 %
Organizing information	13%	66%	17 %
Decision-making	3%	68%	26 %
Interpersonal communication	8%	54%	35 %
Networking skills	3%	29%	64 %
Managing one's time	3%	68%	26#
Study skills	16%	74%	5%
Presentation skills	2%	47%	48 %
Awareness of ethical, cultural and ecological issues	3%	41%	48 %

D. Students as Lifelong Learners

Table 4-11 provide insight into student perceptions of lifelong learning and the extent to which the surveyed students conform to the learner model suggested by the proposed model.Table 4 and 5 show student responses, to perceived knowledge and skills demands. Table 5 refers only to those students who were employed in fields relevant to their current study programmes.

Table 4 : Students' Responses to Perceived Knowledge and Skills Demands

If you perceive a demand for skills which are either not offered or not covered to the required depth within your programme of study what do you do ?	#	%

(Note : multiple responses allowed)		(/123)
Enrol for further instruction at other institution	65	53%
Expect your employer to provide the necessary training	82	67%
Request changes in course content from your HEI	3	2%
Other	5	4%
No response	4	3%

Table 5: Students' Responses to Perceived Knowledge and Skills Demands

In the past, when you have noticed a need for obtaining further knowledge and skills what remedial measures have you taken ?	#	%
(Note : multiple responses allowed)		(/22)
Self-directed study	13	59 %
Own firm course	9	41 %
Professional institution courses	7	32 %
HEI courses	7	32 %
Other	1	5%

Table 6 and 7 refer to students' employer preferences and preferred strategies should they find employment to be unavailable.

Table 6 : Preferred Employers

For which of the following types of employers would you most like to work after graduating?	#	%
(Note : multiple responses allowed)		(/22)
Government agency	10	8%
Private sector design firm	33	27%
Private sector construction firm	54	44%
University	2	2%
Self-employment	31	25%
No Preference	16	13%
Other	3	2%
No response	1	1%

Table 7: Students' Contact with Institutions Outside their HEIs

Which of the following institutions/organizations have you been in contact with regarding your future career and what has been the extent of this communication?					
	Regular	**Irregular direct**	**Indirect**	**No contact**	**No response**
Careers advisors	2%	6%	29%	62%	2%
Professional Institutions	0%	2%	26%	72%	1%
Professional standards agency	0%	3%	20%	76%	2%

The intensions of respondents with regard to engaging in lifelong learning are shown in Table 8 below.

Table 8: Intentions with Regard to Further Studies

After completing your current course, do you expect to pursue further studies ?	#	%
		(/123)
Yes	44	36%
No	77	63%
No response	2	2%

Table 9 and 10 show the responses elicited from students regarding the benefits to their careers which they expected to derive from learning. The benefits from their current study programmes as perceived by employed students (who were employed in a field relevant to their study programme) is given in Table 9. Table 10 refers to the general benefits from engaging in lifelong learning perceived by all responding students.

Table 9: Employed Students' Perceived Benefits of Receiving Training While Employed

How do you benefit from the knowledge and skills obtained from your study programme in terms doing your job?	#	%
(Note : multiple responses allowed)		(/22)
Increased confidence	17	77%
Improved promotion prospects	13	59%
Higher salary	8	36%

Table 10: Perceived Incentives for Pursuing Lifelong Learning

What incentives do you perceive for pursuing lifelong learning	#	%
(Note : multiple responses allowed)		(/123)
Improved earnings	76	62%
Greater diversity of employment opportunities	101	82%
Other	15	12%

Data Analysis and Discussion of Findings

Where a large difference between the percent of respondents indicating a skill as being more important in the future compared to the % of respondents indicating that the same skill is less relevant in the future, this implies agreement or commonality in perception among a majority of the respondents. This is particularly noticeable with regard to the skills "technical design skills", "forecasting and planning", "English", "teamwork/collaboration", "problem solving", and "managing one's time" all of which are perceived by a large majority to be more important in the future.However, there is also evidence of the diversity of learner perceptions as illustrated when a similar number of respondents indicate that a particular skill will have more importance in the future to those indicating that the same skill will have less relevance in the future (as is the case with, for example, "technical supervision skills", "leadership", "Swedish" and "presentation skills".) With reference to the findings in Table 2: Perceptions of HEI responses to industry knowledge and skills requirements, it is notable (and concerning) that high proportions of respondents consider that HEIs do not respond effectively to industry skills needs (29%) and are of the opinion that the picture of industry given while studying is unrealistic (23%). 70% of respondents considered that there was insufficient knowledge and skills to meet market requirements. 1 to 5 respondents expressed a lack of confidence that completing their study programme would improve their career prospects. In addition, high proportions of respondents indicated that their acquisition of generic skills was insufficient (Table 3: Student's opinions of the sufficiency of generic skills acquisition). Particularly worryingly, 50% of respondents reported that the extent to which they acquire "awareness of ethical, cultural and ecological issues" was insufficient. The overall impression, therefore, is that a considerable proportion of the students questioned are of the opinion that their HEIs' responses to industry requirements are inadequate. This may also reflect students' feelings of insecurity with regard to their future employment. The survey responses shown in Table 4-10 reflect the multi-faceted and complex nature of the surveyed engineering students as learners. On one hand, the students appeared to have astute insights into some of the lifelong learning issues, for example, in both Table 9: Employed students' perceived benefits of receiving training while employed, and Table 10: Perceived incentives for pursuing lifelong learning, responses indicated that students did not expect that additional learning would translate into higher earnings so much as greater confidence in doing one's job and increased flexibility in employment. On the other hand, the majority of responses indicated a passive rather than active approach towards their own learning as evidenced, for example, in Table 4: Students' responses to perceived knowledge and skills demand, where adequate skills and/or knowledge then they would expect their future employer to provide them. In similar vein, most respondents had no contact with institutions/organizations beyond their own HEI (Table 7) and 63% of respondents indicated that they did not

expect to undertake further studies once they had completed their current study programmes (Table 8).

Further analysis of the data was carried out by disaggregating the responses according to :

(a) the respondents' year of study (into 3 categories of years 1& 2; year 3; year 4 & higher)
(b) the respondent's employment status (into 2 categories of employed and not employed)

Applying Chi square testing to determine whether responses from students within these categories were significantly different from each other. Table 11 shows only those instances where a significant difference (at – 0.01) in responses from students in different categories was revealed. Significant differences ($p<0.01$) were noted in responses regarding the importance of technical supervision skills in the future where 62% of respondents in year 3 of their study programmes considered technical supervision skills likely to be more important in the future compared to 30% of respondent in year 1 and 2 and only 16% of respondents in year 4 and higher.

Conclusions

The survey results underline the challenges faced by HEIs in attempting to respond to the knowledge and skills requirements of industry in general as well as the individualized interpretations of the same by individual learners. To some extent, the modularization of curricula, greater flexibility and choice may cater for the diversity among learners (and, very likely, the diversity of skills needs among industry employers too) but these changes tends also to detract from a co-coordinated development of the generic skills and theoretical fundamentals which enable students to efficiently acquire additional knowledge and skills as and when they need to. The higher education reforms which have recently been introduced in Estonia have given an impression of integration of education curricula, professional qualifications and employment in industry. Yet this model's simplicity implies considerable standardization when, as evidenced by the findings of the labour force are expected to replace the 'front-end model' of traditional higher education systems with attempts to respond to 'demands' and these demands are diverse rather than standardized. The extent to which there can be a common understanding of industry requirements is questionable. The findings of this survey suggest there is some, limited commonality of perceptions among learners with regard to particular skills but the overall picture is characterized by the diversity of learner perspectives and this challenges the model of simple integration portrayed at policy level.

In the opinion of the learner's questioned, HEI responses to perceived need of industry appear to be inadequate suggesting that HEI reform efforts should both address any underlying alignment issues between graduate competence and industry requirements as well as coherently communicate to stakeholders the envisaged role of the HEIs with regard to this alignment. In addition, the various types of HEI offer a range of levels of education and each of these levels might align differently with industrial needs. Whereas technical colleges may be expected to be focused on providing graduates with specific skills applicable in industry, universities might be expected to offer a more general education imparting a broader knowledge and systematic understanding to students (focusing more on answering questions of 'why' than of 'how'). Lifelong learning calls for a balance between these while catering to the individual need of the learner. This may just as well involve the broadening of understanding of learners already possessing skills as the skilling of with prior understanding or the provision of both. The diversity in student responses clearly indicates that the spectrum of learner's needs will be wide. The survey findings further indicate that the students themselves do not generally conform with the ideal of the 'lifelong learner' suggested by the comparative model (shown in Fig. 1). This implies a need for better articulation of the envisaged role of the learner within the lifelong learning system- even (or perhaps especially) if this role is unpalatable or unacceptable to learners themselves (and therefore society in general). This would encourage valuable public debate in terms of the appropriateness of the emerging educational system which, at a practical, implementation level, does not give the impression of coherence.

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