

# Lifelong Learners in Engineering Education – Students’ Perspectives

Emlyn Witt and Irene Lill

**Abstract**— Lifelong learning has been at the centre 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 a reluctance to conform to the prescribed role of lifelong learner, all of which challenge the prescribed model.

**Keywords**— Engineering education, lifelong learning, construction industry, Estonia.

## I. INTRODUCTION

### A. The Current Incarnation of Lifelong Learning

The Estonian Ministry of Education and Research defined lifelong learning in its Lifelong Learning Strategy 2005-2008 thus: “*All learning activities undertaken throughout life, with the aim of improving knowledge, skills and competences within a personal, civic, social (social cohesion) and/or employment-related perspective either formally, non-formally and [sic] informally*” [1]. The underlying concept is not new having been effectively established early last century by authors including Lindeman (1926) [2] and Yeaxlee (1921) [3].

In terms of national and supranational policy, recent developments in lifelong learning follow an earlier wave of initiatives marked by the UNESCO report “Learning to be: the world of education today and tomorrow” [4] which received only a modest reaction at national government level [5]. The current wave of policy development commenced with a European Commission white paper “Growth, Competitiveness,

Employment” [6] and includes a UNESCO follow-up to the earlier Faure report “Learning to be” entitled “Learning: The Treasure Within” [7], the European Commission’s “Memorandum of Lifelong Learning” [8] and further policy documents from the Organization for Economic Co-operation and Development (OECD) and the Group of Eight (G8). These have inspired a “veritable inflation” of national policies with lifelong learning at their centre [5].

Whereas Yeaxlee’s vision in *An Educated Nation* was inspired by global social upheaval in the aftermath of the First World War and Faure’s “Learning to be” was framed in the context of the scientific-technological revolution, 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 (particularly amongst the least-qualified), globalization, the envisaged knowledge economy and rapid technological change [3], [4], [8], [9]. They promise to revolutionize all education as lifelong learning becomes the “guiding principle for [the] provision [of] and participation” in education and training [8]. According to Field (2004) this “*amounts to a full-blooded, head-on challenge to the front-end model that underlies all the assumptions underpinning our existing education system*” [9].

A dominant discourse has been the relationship between education and work [10], [11], [12]. The European Commission’s “Memorandum on Lifelong Learning”, suggests that 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 their lives [8]. The implications for higher education institutions (HEIs) include pressure to admit a higher proportion of the population from a variety of different (and non-traditional) 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 [11].

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. Labour forces seem disproportionately highly educated when compared to the skills demands of the currently available work so that underemployment is a growing problem [9], [13], [14], [15]. Similarly, the “*flexibilisation*” of the labour market makes individual life planning riskier and threatens to replace

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unemployment with generalised, risky underemployment [5], [16].

### 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 (adult) lives [17]. 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 mentoring of other students. (It should be noted, however, that the term ‘lifelong university’ does not carry only this meaning. It has also been used to describe some universities’ general knowledge programmes which are not directly associated with academic qualifications – an example of this is the Sorbonne University’s Lifelong University programme).

An alternative, less radical conception is the incorporation of lifelong learning units, institutes or offices within the university organization to facilitate the additional requirements of lifelong learning while the university retains its traditional structure. An example would be the Lifelong Learning Institute Dipoli at the Helsinki University of Technology (described by Ojala, 1994) [18].

### C. Estonian Higher Education Reforms

Since 2005, Estonia has thoroughly reorganized its higher education system in line with the resulting European Union policy initiatives. Reforms have been generally oriented towards economic imperatives with emphasis placed upon perceived benefits arising from a “knowledge-based” economy, alignment of education with labour market requirements and a flexible labour force engaged in “lifelong learning”. These have included:

- Referencing study programmes to the Estonian qualification framework and relevant professional standards;
- 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 include non-traditional learners;
- Measures to take into account previous studies and work experience as a significant part of completing study programmes [19].

Similar reforms have been effected in many European Union member states (for example, Romania [20], and under the auspices of the Bologna agreement, (see Gibergans-Báguena and Ortego, 2007) [21].

The emerging higher education arrangement promises a high degree of integration between curricula, qualifications, professional standards and labour market requirements and appears relatively coherent and compact.

There are, however, remaining challenges regarding the superseding of legacy systems (in terms of previously existing education systems and professional qualifications

frameworks). Additionally, the social and cultural roles of the Estonian higher education system in the continuation of the independent national status of Estonia and in the maintenance and development of the Estonian language could come into conflict with its economically aligned objectives.

### D. The BellCurve Project

The Built Environment Lifelong Learning Challenging University Responses to Vocational Education (BellCurve) project was inspired by the reported mismatch between graduates’ competencies and labour market skills requirements which has been identified as one of the main factors behind graduate unemployment and employer dissatisfaction in the construction industry [22]. It brings together researchers from the University of Salford (in the United Kingdom), Tallinn University of Technology (in Estonia) and Vilnius Gediminas Technical University (in Lithuania) to investigate this mismatch and to develop solutions to it within the framework of the lifelong university concept.

This paper reports findings from a survey of students’ perceptions of the skills requirements of the construction industry both currently and in the future, their opinions in terms of how HEIs are responding to these skills requirements and their attitudes towards lifelong learning in general. The survey is one of a series of BellCurve project studies underway investigating the reported skills mismatch.

## II. PROBLEM FORMULATION

In a previous paper, the authors’ proposed a model of the three-way system of comparison between an individual’s competence, education provision and industry needs which employment-related lifelong learning implies [15]. This is shown in Fig. 1.

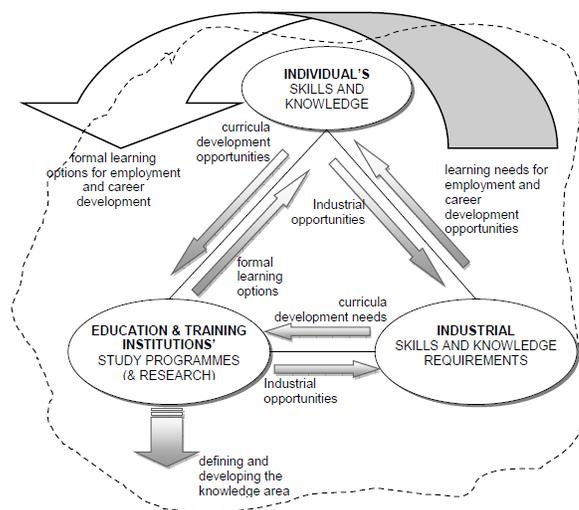


Fig. 1: Comparisons between Individual competence, Education provision and Industrial needs. Source: Witt & Lill (2010)[15]

The individual learner must assess industrial requirements (a prerequisite for the individual to secure their desired employment), relate these to their existing knowledge and

skills and, in turn, assess the available education options in order to address any gaps between their existing knowledge and skills status and the requirements of industry. The context is one of mutual dependence where learners rely on industry for employment opportunities and education institutions to provide the necessary knowledge and skills to maintain their employability. Education institutions rely on learners as their customers and on industry to provide the marketplace in which their study programmes are valued. Industry, in turn, relies on learners as its operatives and on education institutions to 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 / employment system based on lifelong learning imposes obligations on learners and education institutions alike to consider and respond to the knowledge and skills requirements of industry. This is not to suggest that individuals or education institutions should be subordinate to or in the service of industry or that the role of universities is limited to ensuring the employability of graduates. The proposed model simply attempts to relate these 3 stakeholders in employment to each other. (Tetrevova & Sabolova (2010) provide an analysis of the wider role of universities and university stakeholders) [23]. Ojala (1994) offered a co-operative model of lifelong learning implementation (shown in Fig. 2) similarly relating these stakeholders [18]. Her model differs in that it emphasizes the perceived benefits of co-operation rather than the practicalities of relating knowledge and skill demands to their supply.

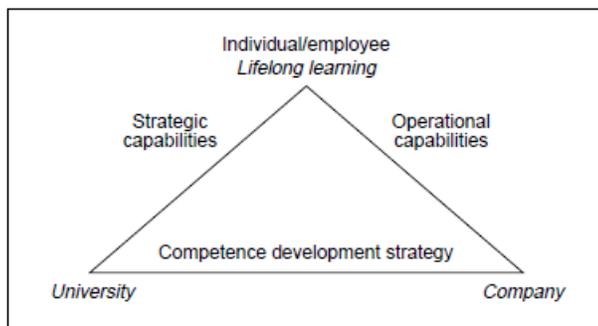


Fig.2: Co-operative model of lifelong learning implementation. Source: Ojala (1994)[18]

With reference to the comparative model in Fig. 1, this research is intended to address:

- How learners perceive the knowledge and skills requirements of industry and how common or diverse are these perceptions.
- What learners' perceptions are with regard to how effectively education institutions are responding to these same requirements.

The extent to which Estonian engineering students conform to the expectations of (active, lifelong) learners implied by this model.

### III. 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:

1. 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.
2. Their HEIs' 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.
3. 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. (This question was asked only of those students who were currently employed in the same field as their study programme).
  - The types of employers they would prefer after graduating.
  - Should they not find employment within the Estonian construction industry when they graduate, then what their favoured alternative options would be.
  - Which institutions / organizations they had been in contact with regarding their future career and the extent of this communication.
  - 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. (This question was asked only of those students who were currently employed in the same field as their study programme).
  - What incentives they perceived for pursuing lifelong learning.

IV. RESULTS OF THE SURVEY

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 Tallinn University of Technology (the main provider of construction-related study programmes in Estonia). 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 Tallinn College of Engineering.

116 respondents were enrolled in integrated (bachelors + masters) 5-year engineering studies courses, 3 respondents were enrolled in 2-year masters 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 1 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 1a and 1b summarize the survey results which reflect students' opinions of the specific knowledge and skills areas which industry requires currently and in the future.

	Currently Most in Demand	More important in Future	Less Important in Future
<b>Technical skills</b>			
Technical design skills	72%	69%	15%
Technical supervision skills	30%	33%	36%
<b>Management skills</b>			
Forecasting and planning	47%	57%	7%
Organising and coordinating	55%	53%	16%
Controlling	36%	32%	24%
Leadership	38%	25%	21%
<b>Language skills</b>			
Spanish	1%	6%	28%
English	84%	67%	6%
Mandarin	2%	37%	22%
Swedish	9%	20%	18%
German	17%	30%	8%
Finnish	46%	38%	17%
Russian	80%	56%	23%

Table 1b: Learners' perceptions of the relative importance of particular skills to industry

	Currently Most in Demand	More important in Future	Less Important in Future
<b>Generic skills</b>			
Teamwork / collaboration skills	71%	59%	3%
Problem solving	71%	50%	2%
Dealing with uncertainty and ambiguity	27%	24%	12%
Networking skills	15%	33%	11%
Organising 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%

Table 1b: Learners' perceptions of the relative importance of generic skills to industry

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

Tables 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.

Questions	Responses		
Do you think 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%

Table 2: Perceptions of HEI responses to industry knowledge and skills requirements

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.

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%
Organising 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%	50%

Table 3: Students' opinions of the sufficiency of generic skills acquisition

#### D. Students as Lifelong Learners

Tables 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.

Tables 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.

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 4: 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 courses	9	41%
Professional institution courses	7	32%
HEI courses	7	32%
Private training firm courses	10	45%
Other	1	5%

Table 5: Employed students' past responses to perceived knowledge and skills demands

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

For which of the following types of employers would you most like to work after graduating?	#	%
(Note: multiple responses allowed)		(/123)
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 6: Preferred employers

If you do not find employment within the Estonian construction industry when you graduate, which of the following options would be the best alternative in your view?	#	%
(Note: multiple responses allowed)		(/123)
Working abroad	82	67%
Alternative employment in Estonia	50	41%
Further education	24	20%
Other	7	6%

Table 7: Preferred strategy when employment is not found in Estonia

Table 8 shows the extent to which the responding students had had contact with organizations beyond their HEIs with regard to their future careers.

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%

Table 8: Students' contact with institutions outside their HEIs

The intentions of respondents with regard to engaging in lifelong learning are shown in Table 9 below.

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: Intentions with regard to further studies

Tables 10 and 11 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 10. Table 11 refers to the general benefits from engaging in lifelong learning perceived by all responding students.

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: Employed students' perceived benefits of receiving training while employed

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%

Table 11: Perceived incentives for pursuing lifelong learning

## V. DATA ANALYSIS AND DISCUSSION OF FINDINGS

With reference to Table 1: Respondents' perceptions of the

relative importance of particular skills to industry, the responses show some commonality of perception (for example with regard to the current importance of English and Russian language skills).

Where a large difference between the % 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").

As we might expect then, the importance and relevance of any particular skill is not universal, it is dependent on the specific context in which the individual learner exists. (Swedish language skills may be of paramount importance to one learner while absolutely irrelevant to another). The responses summarised in Table 1 provide insight into the diversity of the learners surveyed.

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 job-related training within their study programmes, 57% were of the opinion that the extent to which they learnt to develop practical solutions to real problems was insufficient while 37% were not confident that they had acquired sufficient knowledge and skills to meet market requirements. 1 in 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: Students' 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 Tables 4-11 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 10: Employed students' perceived benefits of receiving training while employed, and Table 11: 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 students mostly indicated that, if their HEI did not provide adequate skills and /or knowledge then they would expect their future employer to provide them. In a similar vein, most respondents had had no contact with institutions / organizations beyond their own HEI (Table 8) and 63% of respondents indicated that they did not expect to undertake further studies once they had completed their current study programmes (Table 9). Finally, there were also findings which somewhat challenged the assumptions inherent in the comparative model shown in Fig. 1. For example, the most common response to past knowledge / skills needs faced by employed students had been dealt with through self-directed study (Table 5). Similarly, the high proportion of students indicating a preference for self-employment (Table 6) and both 'finding employment outside Estonia' and 'finding employment in a different economic sector within Estonia' were considerably more popular strategies than pursuing further education (Table 7).

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; years 4 & higher)
- b) the respondents' employment status (into 2 categories of employed and not employed)

and applying Chi Square testing to determine whether responses from students within these categories were significantly different from each other. Table 12 shows only those instances where a significant difference (at  $\alpha=0.01$ ) 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 respondents in years 1 and 2 and only 16% of respondents in years 4 and higher.

Mandarin language skills were considered as likely to be more important in the future by 57% of respondents in years 1 and 2 while only 31% of year 3 respondents and 16% of respondents in years 4 and more concurred.

Description of Responses	Respondent Categories			Chi Square test
<b>Technical supervision skills will be more important in the future</b>				
	Years 1&2	Year 3	Years 4 & more	
Number of 'Yes' responses	17	18	5	
Implied number of 'No' responses	39	11	27	$p=0.0005$
<b>The language skill: 'Mandarin' will be more important in the future</b>				
	Years 1&2	Year 3	Years 4 & more	
Number of 'Yes' responses	32	9	5	
Implied number of 'No' responses	24	20	27	$p=0.0004$
<b>The language skill: 'Russian' will be less relevant in the future</b>				
	Not employed		Employed	
Number of 'Yes' responses	26		2	
Implied number of 'No' responses	62		33	$p=0.0045$

Table 12: Significant differences ( $\alpha=0.01$ ) between respondent categories

Russian language skills were valued significantly more highly by employed respondents than by respondents who were not employed. 30% of respondents who were not currently employed were of the opinion that Russian language skills would be less relevant in the future, only 6% of employed respondents shared this view.

## VI. 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 individualised interpretations of the same by individual learners. To some extent, the modularisation 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 tend also to detract from a co-ordinated 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 standardisation when, as evidenced by the findings of this research, the lifelong learning agenda and 'flexibilisation' 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 standardised. 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 characterised by the diversity of learner perspectives and this challenges the model of simple integration portrayed at policy level.

In the opinion of the learners' questioned, HEI responses to perceived needs 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 needs of the learner. This may just as well involve the broadening of understanding of learners already possessing skills as the skilling of those with prior understanding or the provision of both. The diversity in student responses clearly indicate that the spectrum of learners' 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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