

A COLLABORATIVE APPROACH TOWARDS HIGHER EDUCATION QUALITY IMPROVEMENT: CAS-LBUS PARTNERSHIP IN VIEW OF COMPETENCE DEVELOPMENT

Eva-Nicoleta, BURDUSEL¹, Liviu, BALAN², Lacramioara, DARABAN³

¹Faculty of Letters and Arts, "Lucian Blaga" University of Sibiu, Sibiu, România eva.burdusel@ulbsibiu.ro

²Continental Automotive Systems SRL, Sibiu, România, liviu.balan@continental-corporation.com

³Continental Automotive Systems SRL, Sibiu, România, lacramioara.daraban@continental-corporation.com

ABSTRACT: The aim of the paper is to provide a new perspective on the transition from higher education to employment by conducting a survey in order to identify the strengths and weaknesses in the public-private cooperation. The study is meant to highlight an employer's perspective of the current ability of higher education institutions to meet the demands of the competitive market; identify to what an extent educational suppliers manage to keep up with the latest advances in R&D departments; as well as to focus on the joint activities and new study programs / courses introduced in the curriculum entailed by the Conti-LBUS partnership

KEY WORDS: public-private partnership; higher education and employment; curriculum enhancement

1. RATIONALE FOR PUBLIC-PRIVATE PARTNERSHIP IN VIEW OF COMPETENCE DEVELOPMENT

The aim of the Lisbon Strategy – an action and development plan set out in 2000 – was to help make the EU “the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment by 2010.” [2] The Lisbon Agenda is heavily based on the economic concepts of: innovation as the vector of economic change; the learning economy; as well as social and environmental renewal. The learning economy is a relatively new concept whose core idea is knowledge as an essential element for the development of both society and economy, thus entailing a new and more dynamic vision of society. Thus the Lisbon Strategy places great emphasis on adaptivity (evinced by flexibility and quick decision making processes) as an essential skill for coping with the information society associated with advanced education and training in view of preparing human resources for the knowledge economy in view of competitive market and higher employability. As regards research, the Lisbon Treaty, which came into force on 1 December 2009, advocated the establishment of a European Research Area in which researchers, knowledge and technology circulate freely.

In this context, the science triad / knowledge triangle, as an integrated approach to education, focuses on the interdependence among the cycle components: higher education – research – innovation. (figure 1) High-quality research, innovation and creativity, pushing the frontiers of knowledge – all these are common denominators of both academia and industry, although their vision and values may differ to a greater or lesser extent; high-performing economies are usually associated with top-ranking higher education institutions. “Innovation implies change in order to take full advantage of existing knowledge ... In a static environment (structures) innovation depends on the implementation of existing knowledge that defines the technological and organizational frontier; in a dynamic world (processes) it is possible to push the frontier out thanks to research and due to

the development of human capital through education.” [3] Innovation is also “the development of new knowledge and ideas, new processes and new methods, and applying these for economic and societal benefit.” [5]

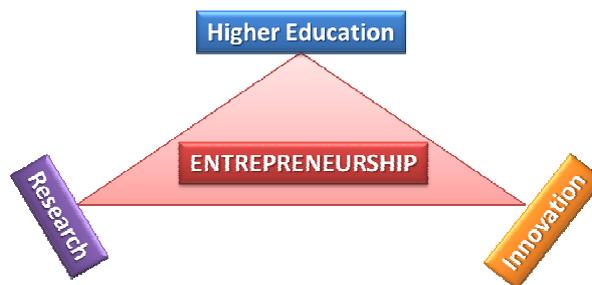


Figure 1. The knowledge triad

The expansion of higher education lately has entailed implications for all levels of society: social cohesion and integration of citizens on the labor market; social equity and widening access to tertiary education, as well as economic policies. Nowadays, Higher Education Institutions (HEIs) are open and dynamic organizations whose mission and role – on the local, national, regional and international context – have changed as education has become largely available to citizens due to the widening participation strategy. Furthermore, universities hold an enhanced role in the knowledge society and the global change economy. In this context, “higher education and research have become inextricably linked to the notion of progress and innovation, both for the individuals and society.” [1]



The partnership between university and industry is also meant to facilitate and improve the transition from invention to innovation – of products, services or processes – in view of attaining growth, profitability, increased visibility, competitive advantage and market stability.

A prerequisite for meeting the objectives of the Lisbon Agenda is to redesign the interaction between higher education and society. HEIs need to focus outwardly, since knowledge is no longer merely a private good but also a public good and a

commodity, a tangible asset that helps the advancement of society and the attainment of competitive edge for industrial and non-industrial organizations.

The present study is meant to further analyse the relevance of a public-private partnership, more specifically an examination of HEIS engagement with community and the diversity of stakeholders. We have previously looked at the theoretical background and practical outcomes of the collaboration between an academic institution and an industrial organization.

Therefore, in the present paper the authors have set the task of an in-depth analysis of the partnership between HEI and an engineering organization (automotive) from the vantage point of employee, i.e. university graduate, and employers. In this respect, we have designed and conducted a questionnaire-based survey in order to identify the strengths and weaknesses in such public-private cooperation. The aim of the case study is to increase and improve graduate employability, enhance awareness of graduate positioning in relation to employability and entrepreneurship, as well as to identify solutions for harmonising the academic curriculum with the current market demands.

2. VALUE CHAIN ANALYSIS

On the basis of the above-mentioned considerations, let us call attention to the topicality and relevance of the Humboldtian university pattern, recently “revived” as the most successful solution for academic competitiveness in the current context. The Humboldtian principles advocated: unity of teaching and research as well as the unity of science and scholarship. Nowadays, the major components of the knowledge triad are integrated in the prerequisite functions of the university and its generated relevance to the society. More specifically, both academic organizations and teaching staff need to become actively involved and engage themselves in: teaching activities able to provide key competencies and continuously correlated with the requirements of the contemporary labor market; research projects meant to foster and promote creativity and innovation particularly highlighted by the partnership between university and industry. Industrial and non-industrial organizations engage in a great number of activities in the process of converting input to output by means of educational processes and training programs meant to provide key competencies enabling individuals to compete on the market.

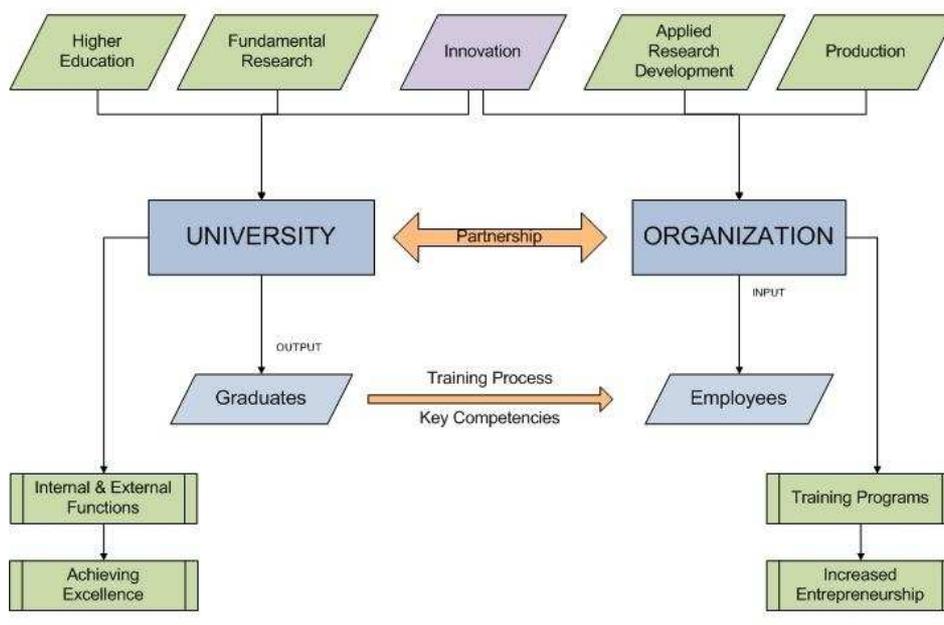


Figure 2. The interaction between academic and industrial organizations - value chain analysis

3. BEST PRACTICE IN PUBLIC-PRIVATE PARTNERSHIP: LBUS-CAS COLLABORATION

Suffice it to say that there is still great untapped potential in the public-private cooperation. However the present paper aims to shed more light on one of the most successful partnerships initiated and effectively developed between an academic institution and an industrial organization. The added value of such an analysis is that it transgresses the boundaries of theoretical approaches and assumptions. Instead it highlights the benefits of an existing and mutually rewarding partnership – academic/industry cooperation – that, in the long run, rendered the following outcomes:

- developing joint research projects
- focus on competence development and curriculum design, correlated with the demands of the market
- promoting excellence

This section is meant to highlight best practices of a win-win partnership - grounded on the cooperation contract concluded between Lucian Blaga University of Sibiu and Continental Automotive Systems – that “has successfully brought together academia and industry to foster development and transfer of ideas and to provide specialized and special-focused training for undergraduate and graduates enrolled at LBUS and CAS employees, as well”. [2]

Here is a summing up of collaborative activities jointly initiated, supported and developed by Continental Automotive Systems and Lucian Blaga University of Sibiu as well as the significant outcomes:

- Company presentations – meant to strengthen students technical know-how; promote company opportunities and recruit qualified students for the summer practice program; such an activity represents an alternative to traditional methods of recruitment, thus giving the employer the chance to train future job applicants during a brief period of internship

- Job shops – promoting employment opportunities and recruiting suitable candidates for available jobs or internships
- Open door activities – LBUS students visit the Conti location
- Student summer practice – organizing a 3-month internship for students during the summer holiday
- Graduation projects – LBUS students may undertake research for completion of their graduation projects and they are employed at Continental for 5-6 months
- Curriculum design and development
 - Applied Electronics – BA study program designed to meet the needs and requirements of Continental Automotive Systems (graduating its first class in 2011)
 - Courses – included in the compulsory curriculum - delivered by Continental Sibiu specialists:
 - Communication techniques and public relations
 - Embedded systems
 - Technologies and equipment used in electronics
 - Digital electronics
 - Analog integrated circuits
 - Courses delivered by LBUS professors to Continental employees:
 - Image processing
 - Optional/extra-curricular courses included in the additional Continental curriculum
 - Microprocessors in automotive (30 graduates in 2010)
 - Embedded software (12 graduates in 2010)
 - Electronic hardware in automotive (50 graduates in 2010)
- Conti info centre – a permanent info stand in universities
- Conferences – participation at a number of international conferences by scientific presentations
- Sponsorship – sponsor different events (e.g. academic competitions, conferences)
- Conti scholarship – award scholarship to best performing students
- Supporting Conti employees in continuing education – MA study programmes at LBUS
- Academic competitions – Continental as main partner in organizing different academic competitions
 - Implement a road recognition vehicle: 12 teams of 40 students from 4 universities (Sibiu, Brasov, Cluj, Craiova) designed and implemented an embedded application to control a car on a predefined route
 - Conti mechanical design contest: teams of students from 3 universities designed an embedded application to control a car on a predefined route, evaluating CATIA competences
 - Hardware and software engineering: Computer Science students present their SW- and HW-related projects to a technical committee; the first prize is awarded by Continental as main partner of the competition
 - Student competition organized by the Technical University of Civil Engineering of Bucharest: Continental sponsored 2 teams from LBUS which ranked 1st and 2nd in the national competition and 13th 23rd in the European competition
- Conti day – recruitment event organized by Conti Sibiu in the main lobby of the Hermann Oberth Faculty of Engineering including stand, company presentations and other student-related activities; the main goals are: promoting the company as a major partner of LBUS as well as promoting company

opportunities and recruiting the best qualified students for internship programs

- Conti lab
- Conti-funded teaching loads: 1 professorship and 1 assistantship

4. CASE STUDY: QUESTIONNAIRE INTERPRETATION / SURVEY ANALYSIS

See survey results – 2 annexes

5. CONCLUDING REMARKS

An important criterion in the field of educational effectiveness of an academic organization is the degree of capitalizing learning results and academic degrees, i.e. acquired knowledge, skills and abilities/competencies in view of a better integration into the labor market, enabling graduates to continue their professional development and encouraging entrepreneurship. Furthermore, higher education performance indicators are better and more fluently met by alleviating gaps between theoretical and practical knowledge. Connecting academia to industry highlights the relevance and of higher education system and its added value to the community so that it wins the support of all stakeholders.

“Universities in many countries are now being encouraged by government to adopt a more corporate type of organization, with a stronger central administration, better ties to external stakeholders, and greater independence in the management of their internal affairs – entrepreneurial university”. [4]

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Hermann Oberth Faculty of Engineering
Graduates Satisfaction Survey

Analysis Report



Contents

- Introduction
- Answers interpretation
 - Relation between theoretical knowledge and the tasks assigned(Q1)
 - Satisfaction with the study programs(Q2)
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 - Desire for further university study programs(Q6)
 - Satisfaction toward assigned work activities(Q7)
 - Added value work assignments(Q8)
 - Education level compared with other universities(Q9)
- Conclusions



Introduction

- The survey took place between December 15th, 2010 and January 24th, 2011.
- The response rate for the graduates is 85%, in total.
 - For Plant, the response rate is 78%
 - For R&D, the response rate is 90%.
- The current report contains analysis for each question presented in the same order like in the questionnaire.
- At the end, the conclusions for both surveys are presented.



Relation between theoretical knowledge and the tasks assigned

- The ULBS graduates seem to have difficulties in solving day to day work activities.
- For 55% of the respondents it is sometimes difficult to solve daily tasks using the knowledge gained in the university while 20.69% declared that they have this problem often. Also, 20.69% do not seem to have this problem at all.

FREQUENCY TABLES				AVERAGE	MODE
Q1 – Since you graduated have you had any work experience that you could not solve using the knowledge gained during your academic studies?					
Answers	Answers code	Number of responses	% of responses		
Very often	4	1	3,45%	2,07	2
Often	3	6	20,69%		
Sometimes	2	16	55,17%		
Almost never	1	6	20,69%		



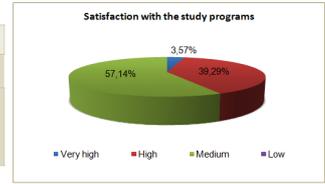
- From the comments of the respondents we summarize that there were some difficulties in solving daily work activities using the knowledge gained in the university, mainly in case of some big development projects or very complex tasks.



Satisfaction with the study programs

- For more than half from the respondents (57%) satisfaction with the study programs is medium, while for almost 40% of them the satisfaction is high, or very high for 3,57%.

FREQUENCY TABLES			AVERAGE	MODE
Q2 – To what an extent did the study programs (especially in terms of curriculum design) meet your expectations?				
Answers	Answers code	Number of responses	% of responses	
Very high	4	1	3,57%	2,46
High	3	11	39,29%	
Medium	2	16	57,14%	
Low	1	0	0,00%	



- The participants with a medium satisfaction toward the study programs argue that “courses are too much focused on theory and less supportive for real world projects”. Also, they expect more practical oriented curricula (labs & seminars to cover what is presented in the class).



Relevant courses to professional activity

- Here are the most relevant courses for the graduates:
 - Microcontrollers and microprocessors
 - System and computer architecture
 - Analog electronics
 - Digital electronics
 - Power electronics
 - Graphic design and technical drawing
 - Embedded systems
 - CAD/CAM/CAE
 - Artificial intelligence
 - C/C++ programming languages and techniques
 - Others (see complete list here)



Necessary courses graduates wished they had been offered

- Embedded computing
- Microcontroller programming
- C++ builder programming
- Introduction to programming languages
- Courses on new/emerging technologies
- Automation
- System development (software design, implementation, integration and requirement)
- Graphics (a real approach)
- Web-based courses (a real approach)
- Multimedia and hardware
- Databases (stored procedures, LinQ, DB maintenance)
- Scripting (Perl, JavaScript, ActionScript)
- Testing
- Compilers
- Communication
- Logistics
- Server management
- Mechatronics
- Robotics
- Automation
- Applied mathematics
- Physics
- Applied electronics
- Embedded programming
- Microcontroller architecture
- Microcontroller programming
- Quality processes and methods in computer science

Courses offered in different study programs!



Key competencies students lacked and would have been helpful for professional assignments

- Here are the most mentioned competencies:
 - Electronics
 - More experience in Embedded Systems
 - Hydraulics
 - C++ programming
 - Project management
- Others competencies mentioned:
 - Communication skills
 - Testing
 - Quality Management Systems
 - Graphics
 - Web based App
 - Mechatronics
 - SAP
 - Time Management; Negotiating skills; Leadership
 - Mechanics
 - SW development process
 - Measuring devices
 - Test adaptors & test systems
 - Computer assembling
 - Practical experience
 - Industrialization in HW realization



Willingness to attend further academic study programs

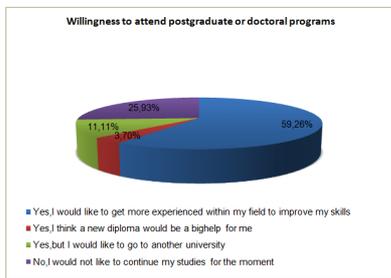
- Almost 60% from the respondents said that they would like to continue their professional development by attending further training programs. Those respondents are open for continuous improvement and they see the university as a way of improving skills & vision.

FREQUENCY TABLES				AVERAGE	MODE
Answers	Answers code	Number of responses	% of responses		
Yes, I would like to get more experienced within my field to improve my skills	4	16	59.26%	2.96	4
Yes, I think a new diploma would be a big help for me	3	1	3.70%		
Yes, but I would like to go to another university	2	3	11.11%		
No, I would not like to continue my studies for the moment	1	7	25.93%		



Willingness to attend further academic study programs

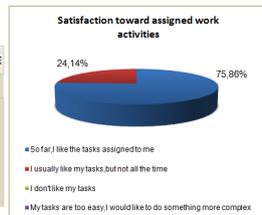
- On the other side 26% from the respondents would not like to continue their studies being based on the idea that ULBS uses the same courses for faculty & master programs, or that the specialized courses offered by the big companies are much better.
- 11% would like to continue their studies in another university



Satisfaction towards assigned work activities

- 80% from the graduates are satisfied with the tasks assigned;
- From the comments we see that they like their job very much, being in a new field is both a challenge and an opportunity to learn something new.
- The other 20% usually like their tasks, but they would like to get more complex tasks or to get rid of the administrative tasks.

FREQUENCY TABLES				AVERAGE	MODE
Answers	Answers code	Number of responses	% of responses		
So far, I like the tasks assigned to me	4	22	75.86%	3.76	4
I usually like my tasks, but not all the time	3	7	24.14%		
I don't like my tasks	2	0	0.00%		
My tasks are too easy, I would like to do something more complex	1	0	0.00%		



Added – value work assignments

- Identify any work-related assignments that added value to your educational background and/or work experience
- Tolerance calculation
- Working with ECU's → improved knowledge in electronics
- Team-working
- In general, all tasks added value
- Trainings
- Other experiences (working with microcontrollers, total productive maintenance, customer relationship, electrical measurements, practical experience, SAP, SW development for embedded controllers, process sheets, improvement ideas, reducing cycle time).

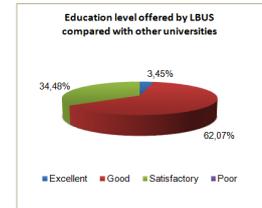


Education level offered by LBUS compared with other universities

Q9: How do you rate/estimate the level of academic education compared to your colleagues who graduated from other universities?

- For most of the graduates (62%) the education level offered by LBUS is good, while for 34% it is satisfactory.
- They would like to have better prepared practice programs and better equipped laboratories

FREQUENCY TABLES				AVERAGE	MODE
Answers	Answers code	Number of responses	% of responses		
Excellent	4	1	3.45%	2.69	3
Good	3	18	62.07%		
Satisfactory	2	10	34.48%		
Poor	1	0	0.00%		



Conclusions

- Both graduates and team-leaders acknowledge that there are sometimes difficulties in solving tasks mostly due to the lack of practical knowledge, electronics, C++ programming;
- Overall the graduates are satisfied with the education level offered by ULBS which they consider good or satisfactory. This fact is also reflected in the team-leaders opinion which are satisfied with the overall professional/scientific background of the LBUS graduates.
- Graduates are satisfied with the assigned work activities, their willingness to learn new things & develop within their field is also visible in their desire to attend further training programs in the university and it is also supported by the team-leaders opinion which confirms their good integration into teams.
- The most important opportunity for improvement observed by graduates and also team-leaders is the focus on practical courses which could bring better electronics knowledge, measuring devices handling, C++ programming.



Employer Satisfaction Survey Regarding Hermann Oberth Faculty of Engineering Graduates

Analysis Report



Contents

- Introduction
- Answers interpretation:
 - Lack of practical expertise of LBUS graduates;(Q1)
 - Desired competences when joining company;(Q2)
 - LBUS curricula relevance;(Q3)
 - Relevance of automotive/electronic courses;(Q4)
 - LBUS ability to prepare graduates;(Q5)
 - New entries ability to integrate;(Q6)
 - Overall professional & scientific background of the employees(LBUS graduates);(Q7)
 - Company approach towards lifelong learning;(Q8)
 - Ovn approach towards lifelong learning.(Q9)



Introduction

- The survey took place between December 15th, 2010 and January 24th,2011.
- The response rate for the team-leaders is 74% , in total.
 - For Plant, the response rate is 81%
 - For R&D, the response rate is 73%.
- Please note that there is a null response (submitted, but with zero answers chosen) which was not excluded from the response rate calculation(segregated: R&D, Plant) due to the fact that the survey was anonymous and we do not know if the response was from Plant or from R&D.
- The current report contains analysis for each question presented in the same order like in the questionnaire.



Lack of practical expertise of LBUS graduates

- The lack of practical expertise of the LBUS graduates is evident for most of the team-leaders (61,54%);

- They claim the lack of practical expertise in:

- C++
- C programming
- Basic electronics, Hardware knowledge
- Electronic CAD software

- As well as the graduates, they suggest more practical courses based on current requirements.

FREQUENCY TABLES				AVERAGE	MODE
Q1: Lack of practical expertise of ULBS graduates					
Answers	Answers code	Number of responses	% of responses		
Very often	4	4	15.38%	2.54	2
Often	3	6	23.08%		
Sometimes	2	16	61.54%		
Almost never	1	0	0.00%		



Desired competences when joining company

- There are several competences mentioned by the team-leaders as a "must have" for the young graduates:

- Basic electronics knowledge
- Measuring devices (e.g. oscilloscopes, multimetres, etc)
- C/C++ knowledge
- Practical electronics/electro mechanics
- Microcontrollers (architecture & programming principles, signal processing)
- Electronic CAD SW
- Embedded systems
- Matlab / Simulink / TargetLink software development know how
- Basic UML
- Practical experience
- Others (CAN, Catia V5, Automation, Database/Networking, Basic Radar, Scripting: Phytton, Java, Matlab, PCB design)



Curriculum relevance

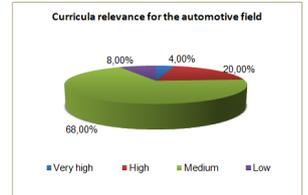
- Conti team-leaders think that the LBUS curricula has a medium relevance for the automotive field (68%).

FREQUENCY TABLES				AVERAGE	MODE
Q3. Curricula relevance					
Answers	Answers code	Number of responses	% of responses		
Very high	4	1	4.00%	2.20	2
High	3	5	20.00%		
Medium	2	17	68.00%		
Low	1	2	8.00%		

- Also here we notice the lack of the specific knowledge of the LBUS graduates.

- Suggestions from comments:

- More automotive specific courses to be introduced as optional
- More specific knowledge (e.g. knowing ECU types, communication protocols, etc)
- Advanced C knowledge, C++, UML, Matlab, Phytton, Java, basic radar knowledge;
- More focus on practical applications.

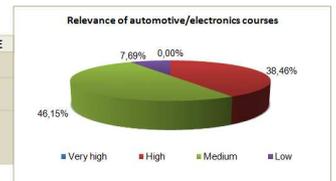


Relevance of the automotive/electronics courses

- The relevance of the specializes courses is seen as medium for 46% of the respondents

- There is also an important part (38%) which find it high.

FREQUENCY TABLES				AVERAGE	MODE
Q4. Relevance of automotive/electronic courses					
Answers	Answers code	Number of responses	% of responses		
Very high	4	0	0.00%	2.46	2
High	3	10	38.46%		
Medium	2	12	46.15%		
Low	1	2	7.69%		

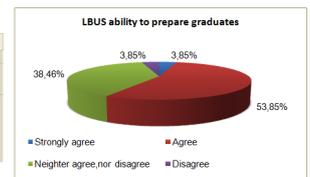


LBUS ability to prepare graduates

- Most of the people (53%) agree that LBUS is able to prepare graduates for the employability.

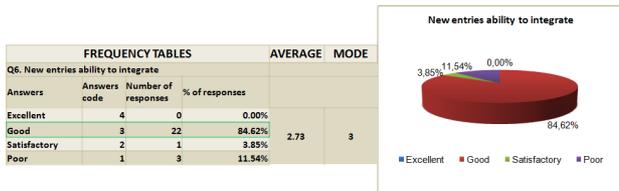
- Almost 40% do not have an opinion regarding this aspect.

FREQUENCY TABLES				AVERAGE	MODE
Q5. LBUS ability to prepare graduates					
Answers	Answers code	Number of responses	% of responses		
Strongly agree	4	1	3.85%	2.58	3
Agree	3	14	53.85%		
Neither agree, nor disagree	2	10	38.46%		
Disagree	1	1	3.85%		



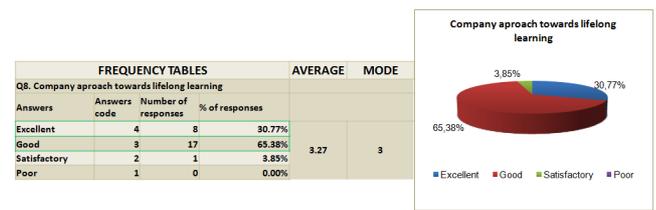
New entries ability to integrate into teams

- LBUS graduates proved good integration abilities (85%);



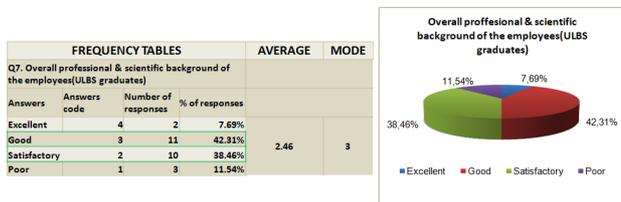
Company approach towards lifelong learning

- Conti has a good to excellent approach towards lifelong learning;
- People appreciate the internal/external training program, offered master courses.



Overall professional & scientific background of the employees(LBUS graduates)

- LBUS graduates have good or satisfactory scientific background



Own approach towards lifelong learning

- Good approach towards lifelong learning from the team-leaders.

