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WP2: Enhancing Entrepreneurship Education and Skills Development

D 2.1 Report on status quo on entrepreneurship education, labour market requirements and knowledge/skills mismatches

Namangan Institute of Engineering and Technology, Uzbekistan

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1. Introduction

The present report provides an overview of the status quo of entrepreneurship education at **Namangan Institute of Engineering and Technology** in **Uzbekistan** and aims to identify related labour market requirements and possible knowledge/skills mismatches of university graduates. The report was developed as part of Work Package 2 on "Enhancing Entrepreneurship Education and Skills Development" (WP2) of the Erasmus+ Capacity Building in Higher Education Project "Triggering innovative approaches and entrepreneurial skills for students through creating conditions for graduate's employability in Central Asia" (TRIGGER).

The history of the institute dates back to 1970s when it was founded as a branch of a Tashkent Textile Institute. In 1992 it became independent taking the name of Namangan Institute of Engineering and Economics. In 2011, the institute was turned into Namangan Institute of Engineering and Technology. All changes were made on the basis of governmental decision, which were made stemming from needs and available opportunities in the country. The textile and light industry sphere of the institute still makes it unique in Fergana Valley (consists of Andijan, Fergana and Namangan regions), and one of 3 in Uzbekistan. Spheres such as chemical technology, technology of agricultural products, food technology, automation, energy were later established and have been developing. Institute had high reputation during 1992-2011 thanks to its spheres of economics such as finance, banking, marketing and economics. In 2011 education of the institute was directed to more engineering. And as a result of reforms in higher education sector of the republic in the last 3-4 years, the sphere of economics is also expanding again at the institute and marketing, economics, accounting have started prospering again. Specialities of banking and finance are also expected to open in near future.

The institute has been cooperating with industries in order to develop skills of students practically and with several universities abroad in order to update teaching processes.

The report first provides an overview of the current offer in entrepreneurship education at the university. Second, relevant results of an HEI self-assessment are provided which was conducted based on the HEInnovate[1] tool in WP1.[2] For the requirements of WP2 the present report specifically looks at the self-assessment findings of the university for the HEInnovate dimensions "Entrepreneurial Teaching and

[1] For further details see: https://heinnovate.eu/en
[2]For further detail seeDeliverable 1.1 on"The Methodology for the Analyses of HEI preparedness for future challenges" of Work Package 1.

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Learning" and "Preparing and Supporting Entrepreneurs".[3] Third, results of a survey among employers and graduates are provided to identify labour market qualification requirements and possible skills mismatches for graduates in the field of entrepreneurial skills. The survey was implemented by the university in spring 2021 as part of WP2. Fourth, a summarizing discussion of the identified gaps and skills mismatches is provided. In sum, the mentioned aspects allow for comprehensive audit of the state of entrepreneurship education at the university. Finally, conclusions for the further development of entrepreneurship education at the university are derived.

Before digging deeper into the status of entrepreneurship education at the university, this section closes with a summary on the notion of entrepreneurship education as adopted in the TRIGGER project:

- **Entrepreneurship Education** (EE) seeks to provide students with knowledge, skills and motivation to create ideas in entrepreneurial action in different environments, both as self-employed entrepreneur and as employee in established organisations (EC 2015, Lackéus et al. 2020).
- **Entrepreneurship** is a key competence for all learners, supporting personal development, active citizenship, social inclusion and employability (see European Commission et al. 2016: 21).
- **Organizational change** of HEIs is needed, since„ the capacity to implement the entrepreneurship and innovation agenda depends on the governance arrangements, organisational capacity and the institutional culture of HEIs as well as characteristics of the surrounding economy" (OECD 2019: 12).

2. Overview of current offer in entrepreneurship education at the HEI

This section provides an overview of the status quo of entrepreneurship education at the university, looking at BA, MA, and PhD levels.

[3]For further results of the self-assessment along all 8 HEInnovate dimensions see Deliverable 1.2 "The Report on HEI preparedness for future challenges in CA countries" of Work Package 1.

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2.1. Existing entrepreneurship education offer at BA level

Economics Department of NIET pursues the course of “small business and entrepreneurship” for BA students only in Economics program.

Lecture topics of “Small business and entrepreneurship” course:
Topic 1. The nature and content of small business and entrepreneurship
Topic 2: Types and forms of small business and entrepreneurship
Topic 3: Organization and management of small business and entrepreneurship
Topic 4: Organization of marketing in small business and entrepreneurs
Topic 5: Small business and entrepreneurship planning
Topic 6: Entrepreneur ethics and culture
Topic 7: Assessment of export potential of small business and entrepreneurs
Topic 8: Prospects for small business and entrepreneurship development in Uzbekistan

Professors of Marketing Department of NIET also have strong concerns on teaching marketing and entrepreneurship for all the programs throughout the institute. This initiation is strengthened by the reality that the existence and prosperity of all productions and services depend on their market. Needs of consumers can be followed and can also be led. It would be helpful if a specialist/engineer has entrepreneurial mindset as he/she understands the product/service. It gives the opportunity of establishing a new venture or making innovations in a company where the specialist is functioning. Professors also consider that entrepreneurship is the reflection of marketing in practice. Currently, marketing is taught for BA students of marketing, economics, accounting and audit, and management programs.

To summarize the above-mentioned, it can be said that at BA level NIET does not currently run entrepreneurship education for spheres other than economics. The fact, that marketing professors are concerned about teaching marketing to students at all different fields, may not be appropriate in this regard as entrepreneurship and marketing are different concepts, but this interest of the department can be directed, in our view, to organizing entrepreneurship education. It was the institute’s marketing professor who initiated and organized the above-mentioned existing entrepreneurship education at the institute at the very beginning.

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2.2. Existing entrepreneurship education offer at MA level

NIET does not offer yet entrepreneurship courses at MA level.

2.3. Existing entrepreneurship education offer at PhD level

NIET does not offer yet entrepreneurship courses at PhD level

2.4. Other activities in entrepreneurship education

NIET does not currently run entrepreneurship activities research centres, incubators, industrial liaison offices.

2.5. National/institutional regulations to implement changes at the course level and to initiate new extra-curricular activities

In case of implementing or a course as an optional one, NIET can act independently.

In case of implementing a compulsory course, NIET needs approval of the Ministry of Higher Education of the Republic of Uzbekistan. Normally, some university programmes are selected as samples and all other universities follow the same sample program for producing their own working program. Gradually autonomy is being given to universities in terms of developing educational programs, curricula and courses.

3. Results of the HEInnovate self-assessment for the dimension “Entrepreneurial Teaching and Learning” and “Preparing and Supporting Entrepreneurs”

As part of WP1 a NIET self-assessment was conducted based on the HEInnovate tool. For the requirements of WP2 this section specifically looks at the self-assessment results of the university for

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the HEInnovate dimensions “Entrepreneurial Teaching and Learning” and “Preparing and Supporting Entrepreneurs”.[4]

3.1. Dimension “Entrepreneurial Teaching and Learning”

Referring to results of survey on WP1 self-assessment at NIET followings can be highlighted in “Entrepreneurial Teaching and Learning”.

The HEInnovate tool offers following categories on HEI could do ““Entrepreneurial Teaching and Learning”:

1. The HEI provides diverse formal learning opportunities to develop entrepreneurial mindsets and skills.
2. The HEI provides diverse informal learning opportunities and experiences to stimulate the development of entrepreneurial mindsets and skills.
3. The HEI validates entrepreneurial learning outcomes which drives the design and execution of the entrepreneurial curriculum.
4. The HEI co-designs and delivers the curriculum with external stakeholders.
5. Results of entrepreneurship research are integrated into the entrepreneurial education offer.

Categories above were then divided into sub-categories for conducting survey. The survey results for NIET are as follows:

Category no.	Sub-categories	Mean
1	Support curriculum change to stimulate and develop entrepreneurial mindsets and skills through new pedagogies, student-centred, cross-disciplinary and practice-based learning (e.g.living labs, the use of case studies, games and simulation)	4,7
	Provide support and training to staff in creating new curriculum related to entrepreneurship	4,8
	Provide mechanisms for students to engage in review and feedback on courses	4,7
	Introduce new mechanisms for supporting students, including experiencing starting new ventures within the students’ formal education or delivering entrepreneurship education with practising entrepreneurs	4,7

[4]For further results of the self-assessment along all 8 HEInnovate dimensions see Deliverable 1.2 “The Report on HEI preparedness for future challenges in CA countries” of Work Package 1.

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2	Support access to student enterprise clubs, awards and societies	4,9
	Organise networking events between students and entrepreneurs / businesses	4,9
	Engage students in business idea / plan competitions as part of their extracurricular opportunities	4,8
	Formally recognise extracurricular activities	4,8
3	Codify the expected entrepreneurial learning outcomes in relation to knowledge, skills and competences in all degree programmes	4,6
	Ensure students have a clear understanding of the entrepreneurial learning outcomes expected and achieved	4,9
	Validate entrepreneurial learning outcomes at the institutional level	4,9
	Recognise entrepreneurial learning outcomes in the students' records of achievements	4,8
4	Regularly review and assess the involvement of external stakeholders in course design and delivery	4,8
	Provide a mechanism for staff to work with external stakeholders to develop and deliver high quality course content	4,8
	Integrate external stakeholders' experience and expertise into the development and delivery of extracurricular learning activities and support services	4,8
	Support a diversity of collaborative partnerships with local communities and organisations, local and regional governments, chambers of commerce, industry and HEI alumni	4,7
5	Encourage staff and educators to review the latest research in entrepreneurship education	4,8
	Provide a forum whereby staff and educators can exchange new knowledge and ideas, incorporating the latest research	4,8
	Provide access to inspiration from other HEIs through networking and sharing good practices	4,8

The sub-categories highlighted with pale-grey are those which were rated as the lowest (although still high). That's to say, in order to develop entrepreneurial mindset of students NIET should consider followings:

- Support curriculum change to stimulate and develop entrepreneurial mindsets and skills through new pedagogies, student-centred, cross-disciplinary and practice-based learning (e.g.living labs, the use of case studies, games and simulation);
- Provide mechanisms for students to engage in review and feedback on courses
- Introduce new mechanisms for supporting students, including experiencing starting new ventures within the students' formal education or delivering entrepreneurship education with practising entrepreneurs
- Support a diversity of collaborative partnerships with local communities and organisations, local and regional governments, chambers of commerce, industry and HEI alumni

3.2. Dimension "Preparing and Supporting Entrepreneurs"

Referring to results of survey on WP1 self-assessment at NIET followings can be highlighted in "Preparing and Supporting Entrepreneurs".

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The HEInnovate tool offers following categories on HEI could do “Preparing and Supporting Entrepreneurs”:

1. The HEI increases awareness of the value of entrepreneurship and stimulates the entrepreneurial intentions of students, graduates and staff to start-up a business or venture.
2. The HEI supports its students, graduates and staff to move from idea generation to business creation.
3. Training is offered to assist students, graduates and staff in starting, running and growing a business.
4. Mentoring and other forms of personal development are offered by experienced individuals from academia or industry.
5. The HEI facilitates access to financing for its entrepreneurs.
6. The HEI offers or facilitates access to business incubation.

Categories above were then divided into sub-categories for conducting survey. The survey results for NIET are as follows:

Category no.	Sub-categories	Mean
1	Provide conducive framework conditions for start-up, such as enabling staff to own shares,work part-time, take sabbaticals, and the possibility for students to extend the duration of their study programmes to support starting a new venture whilst studying	4,7
	Make effective use of communication channels to raise awareness of opportunities and showcase entrepreneurship among staff and students across all parts of the institution	4,9
	Celebrate and recognise successes of student, graduate and staff entrepreneurs	4,9
	Provide opportunities for students to be involved in research projects leading to entrepreneurial opportunities and to take up internships with entrepreneurs	4,9
2	Offer entrepreneurial team building support and conflict management	4,8
	Provide intellectual property assistance for potential start-ups	4,8
	Create an expert advisory panel for early-stage concepts	4,9
	Organise interdisciplinary idea generation activities (e.g. start-up weekends)	4,7
	Organise idea and start-up pitch prizes	4,8
	Offer funds to support market feasibility studies	4,7
3	Offer tailored entrepreneurship courses across all subject areas and levels of study	4,7
	Actively recruit students and staff to training activities and monitor levels of engagement	4,7
	Involve entrepreneurs and key actors from the entrepreneurship ecosystem	4,8
	Use up to date teaching methods focused on learning-by-doing and critical reflection	4,8
	Implement mechanisms to increase rates of take-up by diverse groups	4,8
4	Organise visible, accessible and good-quality mentoring and personal development activities	4,8

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	Actively recruit mentors and provide them with training, resources (e.g. IP assistance), formal recognition and rewards	4,8
	Facilitate matchmaking of mentors and protégés	4,8
	Provide feedback mechanisms on the contributions from entrepreneurs	4,7
	Provide opportunities for peer-to-peer mentoring, such as entrepreneur clubs, where members help each other	4,8
5	Offer financial education to entrepreneurs and potential entrepreneurs to better understand financial concepts and how to apply them	4,8
	Organise networking and financing events for aspiring entrepreneurs to pitch their ideas to investors and to get feedback	4,8
	Offer microfinance instruments such as grants, prizes, loans and equity	4,9
	Utilise its network of potential investors for crowd-funding	4,7
	Closely link access to financing activities with training, mentoring and incubation	4,7
6	Host their own incubators or facilitate easy access to external incubators	4,7
	Ensure that their incubators offer a full range of soft support (networking, mentoring, etc.) as well as physical infrastructure	4,7
	Promote the incubator widely across campus and host events that engage potential entrepreneurs	4,8
	Embed the incubation facilities with the research and education infrastructure of the HEI to enhance synergies	4,8

The sub-categories highlighted with pale-grey are those which were rated as the lowest (although still high). That's to say, in order to prepare and support entrepreneurs, NIET should consider a number of followings:

- Provide conducive framework conditions for start-up, such as enabling staff to own shares,work part-time, take sabbaticals, and the possibility for students to extend the duration of their study programmes to support starting a new venture whilst studying;
- Organise interdisciplinary idea generation activities (e.g. start-up weekends);
- Offer funds to support market feasibility studies;
- Offer tailored entrepreneurship courses across all subject areas and levels of study;
- Actively recruit students and staff to training activities and monitor levels of engagement;
- Provide feedback mechanisms on the contributions from entrepreneurs;
- Utilise its network of potential investors for crowd-funding;
- Closely link access to financing activities with training, mentoring and incubation;
- Host their own incubators or facilitate easy access to external incubators;
- Ensure that their incubators offer a full range of soft support (networking, mentoring, etc.) as well as physical infrastructure.

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4. In-depth survey (employers, alumni)

As part of WP2 the university conducted a survey among employers and graduates to identify labour market qualification requirements and possible skills mismatches for graduates in the field of entrepreneurial skills.

In this chapter, results from the online survey of employers and alumni are presented. The rationale of the survey was to identify the skills gaps in terms of skills needed and the actual skills state of university graduates as perceived by companies and alumni.

The survey was conducted in May and June 2021. Each TRIGGER partner in Kazakhstan, Uzbekistan and Tajikistan distributed the same questionnaire independently in order to gain comparable data. The questionnaire was developed based on the Entrepreneurship Competence Framework[5] and other studies on entrepreneurship.[6]

In total, the questionnaire comprised 130 items on three EntreComp dimensions „Ideas“, „Resources“ and Actions“ and in four dimensions on „Digital Skills“, „Financial Skills“, „Marketing Skills“ and „Skills in Innovation Management“, plus 8 questions on demographic variables, such as position of the survey participant in the company, company size, and sector of company/professional activity. All items were presented with a five-point Likert scale anchored with 1 = not at all important to 5 = very important.

[5] Bacigalupo M., Kampylis P., Punie Y. and Van Den Brande L. (2016) EntreComp: The Entrepreneurship Competence Framework. Luxembourg (Luxembourg): Publications Office of the European Union; Online: https://publications.jrc.ec.europa.eu/repository/handle/JRC101581 (accessed 2021-02-02).

[6] The dimension on „Digital Skills“ was developed from Carretero, S. / Vuorikari, R. / Punie, Y. (2017). DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use, doi:10.2760/38842; the further dimensions were built on Loué, C. & Baronet, J. (2012) Toward a new entrepreneurial skills and competencies framework: a qualitative and quantitative study. In: International Journal of Entrepreneurship and Small Business, Vol. 17, No. 4, pp. 455-477.

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4.1. Dimension "Ideas"

Microsoft Excel - Data set_Namangan Institute of Engineering and Technology.xlsm

Table 1: Dimension "IDEAS"	Employer							Alumni						
	Importance			Graduate level			I ± GL	Importance			Graduate level			I ± GL
	N	Mean	SD	N	Mean	SD		N	Mean	SD	N	Mean	SD	
Items														
Identifying, creating and seizing opportunities.	22	4,0	1,0	22	2,8	0,5	-1,2	22,0	4,3	0,6	22	2,8	0,7	-1,5
Uncovering the needs of customers and other stakeholders.	22	4,1	1,1	22	2,6	0,7	-1,5	22	4,5	0,6	22	2,8	1,0	-1,7
Analysing the contexts where value can be created.	22	3,7	1,0	22	2,8	0,7	-1,0	22	4,2	0,5	22	2,7	0,7	-1,5
Developing ideas and opportunities to create value.	22	3,7	1,2	22	2,6	0,7	-1,1	22	4,5	0,7	22	2,8	0,8	-1,7
Developing better solutions to existing and new challenges.	22	3,9	1,2	22	2,9	0,6	-1,0	22	4,4	0,5	22	3,0	1,0	-1,4
Exploring and experiment with innovative approaches.	22	4,0	1,0	22	2,8	0,7	-1,2	22	4,5	0,5	22	2,9	1,0	-1,7
Developing a vision to turn ideas into action.	22	3,8	1,0	22	2,7	0,6	-1,0	22	4,3	0,6	22	2,7	0,9	-1,6
Judging what value is in social, cultural and economic terms.	22	3,8	1,1	22	3,0	0,7	-0,9	22	4,5	0,7	22	3,0	0,7	-1,5
Recognising the potential an idea has for creating value.	22	3,8	1,2	22	2,8	0,7	-1,0	22	4,2	0,4	22	2,7	0,6	-1,5
Identifying suitable ways of making the most out new ideas.	22	4,0	1,1	22	2,9	0,8	-1,0	22	4,5	0,6	22	2,9	0,8	-1,6
Assessing the consequences of ideas that bring value on the target community, the market, society and the environment.	22	3,7	1,1	22	2,9	0,8	-0,8	22	4,4	0,5	22	2,7	0,6	-1,7
Reflecting on how sustainable long-term social, cultural and economic goals are.	22	3,7	1,1	22	2,8	0,7	-0,9	22	4,3	0,6	22	2,8	0,8	-1,5
Acting responsible.	22	4,2	1,1	22	3,0	0,9	-1,2	22,0	4,4	0,5	22,0	2,5	0,6	-2,0

For all the items in "Ideas" dimension, it can be stated that the gap between the importance of a skill and graduate's level in employers' consideration is narrower than the one in alumni's consideration.

In this dimension 5 skills that were given by employers the highest importance are "Acting responsible" (4,2), "Uncovering the needs of customers and other" (4,1), "Identifying, creating and seizing the opportunities" (4,0), "Exploring and experimenting with new approaches"(4,0), and "Identifying suitable ways of making the most out new" (4,0).

Although all skills in this dimension were considered by alumni to be highly important, the top highest ones among them can still be identified: Uncovering the needs of customers and other", "Identifying, creating and seizing the opportunities", "Developing ideas and opportunities to create value", "Exploring and experimenting with new approaches", "Judging what value is in social, cultural and economic terms", and "Identifying suitable ways of making the most out new", where each of these skills was graded with 4,5 by alumni in terms of importance.

Despite the fact that there are no matches of opinions in terms of grading the importance of skills, there are 7 exact matches of employer and alumni opinions in grading the levels that graduates have for those skills. Thus it can be stated that, in general, opinions of employer and alumni on importance of skills within "ideas" are quite different, whereas their view on actual possession of the skills are relatively similar: Total importance - employer vs alumni: 50,4 vs 57,0, total graduate level – employer vs alumni 36,6 vs 36,1.

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Closest matches between the views of employer and alumni, in terms of I ± GL, can be seen in items of "Identifying, creating and seizing opportunities (-1,2 vs -1,5 respectively)" and "Uncovering the needs of customers and other stakeholders", constituting (-1,5 vs -1,7 respectively). Biggest gap between the views of employers and alumni is on item "Assessing the consequences of ideas that bring value on the target community, the market, society and the environment", as alumni gives much higher importance to this skill (4,4) compared to employer's grade (3,7), although they have close mean grades for graduate level foryh this skill (employer 2,9, alumni 2,7).

4.2. Dimension "Resources"

Table 2: Dimension "Resources"	Employer							Alumni						
	Importance			Graduate level			I ± GL	Importance			Graduate level			I ± GL
	N	Mean	SD	N	Mean	SD		N	Mean	SD	N	Mean	SD	
Items														
Reflecting on your needs, aspirations and wants in the short, medium and long term.	22	3,7	1,0	22	2,9	0,6	-0,8	22	4,4	0,7	22,0	2,9	0,5	-1,5
Identifying and assess one's own individual and group strengths and weaknesses.	22	3,7	1,0	22	2,7	0,8	-1,0	22	4,3	0,6	22,0	2,7	0,9	-1,6
Believing in one's own ability to influence the course of events, despite uncertainty, setbacks and temporary failures.	22	3,8	1,0	22	3,1	0,8	-0,7	22	4,5	0,6	22,0	2,6	0,8	-1,9
Being determined to turn ideas into action and satisfy one's own need to achieve.	22	3,7	0,9	22	2,6	0,8	-1,1	22	4,2	0,6	22,0	2,9	0,8	-1,4
Being prepared to be patient and keep trying to achieve long-term individual or group aims.	22	4,0	1,1	22	2,7	0,8	-1,3	22	4,4	0,5	22,0	2,6	0,7	-1,8
Being resilient under pressure, adversity, and temporary failure.	22	3,9	1,0	22	2,9	0,8	-1,0	22	4,3	0,6	22,0	2,6	0,9	-1,7
Getting and managing the material, non-material and digital resources needed to turn ideas into action.	22	4,0	1,1	22	2,6	0,7	-1,3	22	4,6	0,5	22,0	2,8	0,9	-1,9
Making the most of limited resources.	22	4,1	1,1	22	2,8	0,8	-1,3	22	4,4	0,5	22,0	2,8	0,7	-1,6
Getting and managing the competences needed at any stage, including technical, legal, tax and digital competences through suitable partnerships, networking, outsourcing and crowd-sourcing.	22	3,8	1,0	22	2,5	0,7	-1,2	22	4,2	0,5	22,0	2,6	0,8	-1,6
Estimating the cost of turning an idea into a value-creating activity.	22	3,7	0,8	22	2,7	0,6	-1,0	22	4,2	0,6	22,0	2,7	0,9	-1,5
Planning, putting in place and evaluating financial decisions over time.	22	3,8	1,0	22	2,7	0,8	-1,1	22	4,5	0,5	22,0	3,0	0,6	-1,5
Managing financing to make sure my value-creating activity can last over the long term.	22	3,9	1,0	22	2,9	0,8	-1,0	22	4,3	0,6	22,0	2,9	0,8	-1,4
Inspiring and enthusing relevant stakeholders.	22	3,9	1,1	22	3,0	1,1	-0,9	22	4,3	0,5	22,0	2,9	0,7	-1,4
Getting the support needed to achieve valuable outcomes.	22	3,9	1,1	22	3,0	0,9	-0,9	22	4,5	0,6	22,0	2,8	0,9	-1,7
Demonstrating effective communication, persuasion and negotiation.	22	4,0	1,0	22	3,0	1,0	-1,0	22	4,5	0,5	22,0	2,9	0,7	-1,6
Demonstrating effective leadership.	22	4,1	1,0	22	2,9	0,9	-1,3	22	4,2	0,6	22,0	2,8	0,8	-1,4

In "Resources" dimension analysis are carried out on 16 skills.

In Employers' point of view, making the most of limited resources, demonstrating effective leadership, being prepared to be patient and keep trying to achieve long-term individual or group aims, getting and managing the material, non-material and digital resources needed to turn ideas into action. demonstrating effective communication, persuasion and negotiation skills are of top importance. All other skills are also considered important enough as all exceed grade 3,7 where the max. is 5. Graduates' level on 16 skills in "resources" dimension are all lower than the grade given to importance, the highest grade being equal to 3,1, which is "believing in one's own ability to influence the course of

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events, despite uncertainty, setbacks and temporary failures". Three more skills are next on top: Grades of three more skills are on top among 16 in terms of graduates' level:

Inspiring and enthusing relevant stakeholders, getting the support needed to achieve valuable outcomes, demonstrating effective communication, persuasion and negotiation. Employers gave the least grade (2,5) to graduates' level on the skill of "getting and managing the competences needed at any stage, including technical, legal, tax and digital competences through suitable partnerships, networking, outsourcing and crowd-sourcing".

According to employers, biggest gaps between I and GL correspond to the skills which are graded as highest in terms of importance, i.e. these skills need more attention in preparing the specialists.

Alumni gave higher **importance** to all listed skills in "Resources" dimension (each skill graded 4,2 or higher). Alumni consider that the most important skill is (graded 4,6) "Getting and managing the material, non-material and digital resources needed to turn ideas into action". Next important skills are (all graded 4,5) "Believing in one's own ability to influence the course of events, despite uncertainty, setbacks and temporary failures", "Planning, putting in place and evaluating financial decisions over time", "Getting the support needed to achieve valuable outcomes", "Demonstrating effective communication, persuasion and negotiation".

As to grading **graduate level** for the skills in "Resources" dimension, alumni considered the lowest level corresponds to "Believing in one's own ability to influence the course of events, despite uncertainty, setbacks and temporary failures", "Being prepared to be patient and keep trying to achieve long-term individual or group aims", "Being resilient under pressure, adversity, and temporary failure" and "Getting and managing the material, non-material and digital resources needed to turn ideas into action" (each graded 2,6). Compared to other skills in the dimension, graduates are doing relatively better in "Planning, putting in place and evaluating financial decisions over time" (grade 3,0).

In column I+/-GL the highest gap (-1,9) corresponds to "Believing in one's own ability to influence the course of events, despite uncertainty, setbacks and temporary failures" and "Getting and managing the material, non-material and digital resources needed to turn ideas into action". I.e. these skills should be paid more attention by universities in preparing specialists.

Employer and alumni do not have same opinion about the levels of **importance** of skills in this dimension, grades of alumni being higher than those of employer for all skills. Some exact matches can be noticed between employer and alumni in terms of grading GL, i.e. they have the same opinion on **graduates' level** on "Reflecting on your needs, aspirations and wants in the short, medium and long term" and "Identifying and assess one's own individual and group strengths and weaknesses". In terms

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of I+/-GL, employer and alumni have close opinion for the skills of “Demonstrating effective leadership”. Although the grades are not critical for this skill, this match shows the value as more realistic.

4.3. Dimension “Actions”

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Table 3: Dimension "Actions"	Employer							Alumni						
	Importance			Graduate level			I ± GL	Importance			Graduate level			I ± GL
	N	Mean	SD	N	Mean	SD		N	Mean	SD	N	Mean	SD	
Items														
Initiating processes that create value.	22	3,5	0,9	22	2,8	0,7	-0,7	22	3,9	0,6	22	3,0	0,8	-0,9
Taking up challenges.	22	3,7	0,9	22	2,7	0,6	-1,0	22	4,4	0,8	22	2,8	0,9	-1,5
Acting and working independently to achieve goals, stick to intentions and carry out planned tasks.	22	3,6	1,0	22	2,8	0,9	-0,8	22	4,1	0,5	22	2,6	0,6	-1,5
Setting long-, medium- and short-term goals.	22	3,8	1,0	22	2,8	0,8	-1,0	22	4,5	0,7	22	2,8	0,9	-1,6
Defining priorities and action plans.	22	4,1	1,0	22	2,8	0,8	-1,3	22	4,1	0,8	22	2,7	0,8	-1,5
Adapting to unforeseen changes.	22	3,9	1,0	22	2,8	0,9	-1,0	22	4,5	0,6	22	2,8	0,7	-1,8
Making decisions when the result of that decision is uncertain, when the information available is partial or ambiguous, or when there is a risk of unintended outcomes.	22	3,8	1,0	22	2,9	0,9	-1,0	22	3,9	0,6	22	2,6	0,8	-1,3
Testing ideas and prototypes from the early stages to reduce risks of failing.	22	4,0	1,0	22	2,7	0,7	-1,3	22	4,3	0,8	22	3,1	0,7	-1,1
Handling fast-moving situations promptly and flexibly.	22	4,0	1,0	22	2,9	0,7	-1,0	22	4,2	0,7	22	2,9	0,9	-1,3
Working together and cooperate with others to develop ideas and turn them into action.	22	4,0	1,0	22	2,7	1,0	-1,3	22	4,5	0,7	22	2,8	0,8	-1,7
Networking with others to organise skills and expertise needed for goal attainment.	22	4,0	1,0	22	3,1	1,0	-1,0	22	4,3	0,8	22	2,7	0,9	-1,6
Solving conflicts and facing up to competition positively when necessary.	22	4,1	1,0	22	3,0	0,9	-1,1	22	4,3	0,8	22	2,8	0,8	-1,5
Using any initiative for value creation as a learning opportunity.	22	3,7	1,0	22	2,9	0,8	-0,9	22	4,2	0,8	22	2,7	1,0	-1,5
Learning with others, including peers and mentors.	22	3,9	1,0	22	2,8	0,9	-1,0	22	4,3	0,8	22	2,8	0,8	-1,5
Reflecting and learning from both success and failure (your own and other people’s).	22	4,0	1,1	22	2,8	0,9	-1,2	22	4,1	0,8	22	2,8	1,1	-1,3

Employers’ view:

The most **important** skills are “Defining priorities and action plans” and “Solving conflicts and facing up to competition positively when necessary” (both graded 4,1). Next importance is given to “Testing ideas and prototypes from the early stages to reduce risks of failing”, “Handling fast-moving situations promptly and flexibly”, “ Working together and cooperate with others to develop ideas and turn them into action”, “Networking with others to organise skills and expertise needed for goal attainment” and “Reflecting and learning from both success and failure (your own and other people’s)”.

Graduate’s level for listed skills are relatively lower, the **highest** being on skills “Networking with others to organise skills and expertise needed for goal attainment” and “Solving conflicts and facing up to competition positively when necessary”., i.e. graduates are doing relatively well on these skills, although level are lower than required. **Lowest grades for GL** are given to skills “Taking up challenges”, “Testing ideas and prototypes from the early stages to reduce risks of failing”, and “Working together and cooperate with others to develop ideas and turn them into action”.

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Alumni consider that in "Actions" dimension **the most important** skills are "Adapting to unforseen changes" and "setting long-, medium, and short-term goals" (each graded 4,5). The least, although not low, importance is given to skills of "Initiating processes that create value" and "Making decisions when the result of that decision is uncertain, when the information available is partial or ambiguous, or when there is a risk of unintended outcomes"(each graded 3,9).

In terms of **graduate level** the highest grade corresponds to "Testing ideas and prototypes from the early stages to reduce risks of failing" (3,1) and "Initiating processes that create value" (3,0), i.e. among listed skills in "actions" graduates are doing relatively well in these 2 skills. The least figure corresponds to "Making decisions when the result of that decision is uncertain, when the information available is partial or ambiguous, or when there is a risk of unintended outcomes", i.e. both alumni and employer consider that this is the skill where graduates have the lowest level.

I+/-GL gap of alumni shows that attention should be given to the skill of "Adapting to unforeseen changes" (gap: -1,8) and "Working together and cooperate with others to develop ideas and turn them into action" (gap: -1,7). The lowest gap belongs to graduates' skill in "Initiating processes that create value" (gap: -0,9).

If we **compare** the opinions of **employer and alumni** there is one match in importance in skill "Defining priorities and action plans" both grading 4,1. And there is one match in graduate level as well in skill "Learning with others, including peers and mentors" both grading 2,8). Opinions of employer and alumni on importance of skill “Adapting to unforeseen changes” , and on graduate level of skill “Testing ideas and prototypes from the early stages to reduce risks of failing” are very different. Both employer and alumni to more extent agree with each other on the I+/-GL gaps in the skills of “Reflecting and learning from both success and failure (your own and other people’s)” and “Testing ideas and prototypes from the early stages to reduce risks of failing”.

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4.4. Dimension "Digital Skills"

Table 4: Dimension Digital skills	Employer							Alumni						
	Importance			Graduate level			I ± GL	Importance			Graduate level			I ± GL
	N	Mean	SD	N	Mean	SD		N	Mean	SD	N	Mean	SD	
Items														
Using data and information from digital environments to assess the potential of ideas.	22	3,7	0,9	22	3,4	0,9	-0,3	22	4,1	0,6	22	3,8	0,7	-0,3
Deploying digital media, apps or web-based tools for marketing.	22	3,8	1,0	22	3,4	0,9	-0,5	22	4,7	0,6	22	4,0	1,1	-0,7
Using knowledge on automation and artificial intelligence for improving products, processes and services.	22	3,8	1,0	22	3,5	1,0	-0,4	22	4,2	0,6	22	3,6	1,0	-0,6
Understanding and using information from the web and other digital sources to identify customer needs.	22	4,0	1,0	22	3,6	1,0	-0,5	22	4,7	0,5	22	3,9	1,0	-0,8
Using software apps and digital tools for managing collaboration with teams and partners.	22	4,1	1,1	22	3,5	0,9	-0,6	22	4,2	0,5	22	3,9	1,0	-0,4

Compared to other dimensions, in "Digital skills" dimension, graduates are doing better.

Employers' view: In importance, the highest important skill is considered "Using software apps and digital tools for managing collaboration with teams and partners" (4,1) and to "Understanding and using information from the web and other digital sources to identify customer needs." (4,0). In the latter graduates are relatively better as well. I+/-GL gap of this category shows that more attention should be given to improving graduate level for the skill which is of the highest importance: "Using software apps and digital tools for managing collaboration with teams and partners".

Alumni's view: Very high importance is given to "Deploying digital media, apps or web-based tools for marketing" and "Understanding and using information from the web and other digital sources to identify customer needs", both yielding 4,7 in grading. Graduates' level is highest in the former (4,0). Alumni consider that, the I+/-GL gaps show that graduate level should be increased for the skills mentioned above which are of highest importance.

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4.5. Dimension "Financial Skills"

Table 5: Dimension 'Financial skills'	Employer							Alumni						
	Importance			Graduate level			I ± GL	Importance			Graduate level			I ± GL
	N	Mean	SD	N	Mean	SD		N	Mean	SD	N	Mean	SD	
Items														
Knowing how to read and analyse a balance sheet.	22	3,9	1,2	22	2,9	0,9	-1,0	22	4,2	0,7	22	2,7	0,7	-1,5
Drawing conclusions and deriving potential courses of action from balance sheets.	22	3,7	1,2	22	2,5	0,7	-1,2	22	4,5	0,8	22	2,6	0,8	-1,9
Managing cash flow.	22	4,1	1,2	22	2,5	0,8	-1,6	22	4,2	0,8	22	2,9	1,0	-1,4
Identifying and meeting the organization's financial needs in the short and long term	22	4,0	1,2	22	2,9	0,8	-1,0	22	4,4	0,9	22	2,5	0,7	-1,8
Calculating costs, cost prices, and margins.	22	4,2	1,3	22	2,7	1,0	-1,5	22	4,2	0,7	22	2,6	0,9	-1,6

In "Financial skills" dimension again, like other dimensions except "digital skills" skill gaps are greater than average.

Employers' view: In terms of importance, employers' consider that "Calculating costs, cost prices, and margins" and "Managng cash flow" are the pointed skills, graded 4,2 and 4,1 respectively. Least importance is given to "Drawing conclusions and deriving potential courses of action from balance sheets". Graduate level for all skills are rated below 3,0, the lowest being "Drawing conclusions and deriving potential courses of action from balance sheets" and "Managing cash flow". I+/-GL. The biggest gap is in the skill of "managing cash flow" (-1,6) and "calculating costs, cost prices, and margins" (-1,5), which are the most important skills.

4.6. Dimension "Marketing"

Table 6: Dimension 'Marketing'	Employer							Alumni						
	Importance			Graduate level			I ± GL	Importance			Graduate level			I ± GL
	N	Mean	SD	N	Mean	SD		N	Mean	SD	N	Mean	SD	
Items														
Deploying sales arguments with a view to persuading clients to buy.	22	3,7	0,9	22	3,0	0,8	-0,6	22	4,0	0,7	22	3,1	0,8	-0,9
Negotiating while using specific techniques	22	3,7	1,1	22	2,6	0,8	-1,1	22	4,4	0,7	22	2,8	1,1	-1,6
Developing commercial strategies and means whereby to attract new clients	22	3,7	1,2	22	2,8	0,9	-0,9	22	4,2	0,7	22	3,1	0,7	-1,0
Using specific techniques to encourage client loyalty.	22	3,6	1,3	22	2,8	1,0	-0,8	22	4,1	1,0	22	2,8	1,0	-1,3
Creating a positive image of the firm, promoting an ethical image of the firm.	22	4,0	1,0	22	3,0	1,0	-1,0	22	4,2	0,6	22	2,9	0,8	-1,3
Building relationships of trust with clients and partners.	22	4,1	1,1	22	3,0	0,9	-1,2	22	4,6	0,6	22	2,9	1,0	-1,7

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In “marketing dimension” there are no positive differences, i.e. graduate level is not overrunning the importance of the skill. The highest gap in both employer’s and alumni’s view is on “using data and information from digital environments to assess the potential ideas”, difference of means constituting -1,2 and -1,7 respectively. Next big gap in means’ differences in this dimension belongs to “deploying digital media, apps or web-based tools for marketing”. Closest match of employers’ and alumni’s views can bee seen in “using knowledge on automation and artificial intelligence for improving products, processes and services”, values being -0,9 and -1,0 respectively.

4.7. Dimension “Innovation management”

Table 7: Dimension 'Innovation management'	Employer							Alumni						
	Importance			Graduate level			I ± GL	Importance			Graduate level			I ± GL
	N	Mean	SD	N	Mean	SD		N	Mean	SD	N	Mean	SD	
Items														
Developing innovation strategies.	22	3,9	1,2	22	2,8	0,7	-1,0	22	4,3	0,6	22	2,8	0,7	-1,5
Analysing the market potentials of ideas and concepts for new products, processes and services.	22	4,0	1,1	22	2,6	0,8	-1,4	22	4,6	0,6	22	2,5	0,7	-2,1
Planning, implementing and controlling innovation processes with project management methods.	22	3,9	1,1	22	2,8	0,9	-1,0	22	4,3	0,6	22	2,7	0,7	-1,6
Selecting and applying methods for exchange of ideas and knowledge in the innovation process.	22	3,8	1,0	22	2,7	0,8	-1,1	22	4,4	0,7	22	2,6	0,8	-1,8
Managing collaboration between customers, suppliers and development partners in the innovation process.	22	3,7	1,1	22	3,0	0,8	-0,7	22	4,3	0,6	22	2,5	0,7	-1,8

Employers' view: The most important skill is "Analysing the market potentials of ideas and concepts for new products, processes and services". And the lowest graduate level corresponds to the same skills. Therefore, the I+/GL gap is the highest for this skill (-1,4), meaning that universities need better attention to this skill in preparing specialists.

Alumni's view: Alumni give higher importance to skills compared to employers, the lowest figure being 4,3 which is higher than the highest figure given by employers in terms of importance. Alumni consider that the most important skill is "Analysing the market potentials of ideas and concepts for new products, processes and services" (4,6). Graduate level for the same skill is one of the lowest (2,5) leading to the biggest gap in I+/-GL (-2,1). I+/-GL gaps in alumni view, for this dimension, are bigger in alumni's view, the least gap constituting -1,5. It means, alumni's opinion on "innovation management" dimension is that universities should pay more attention to all the listed skills in preparing specialists.

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5. Identified gaps and skills mismatches

Table 1: Skills gaps as rated by employers and alumni

Main dimensions of competencies	Rated as skills gap by employer **and** alumni	rated skills gap by employers	rated skills gap by alumni
1. Ideas	• Uncovering the needs of customers and other stakeholders. • Exploring and experiment with innovative approaches.	• Identifying, creating and seizing opportunities. • Acting responsibly.	• Developing ideas and opportunities to create value. • Exploring and experiment with innovative approaches.
2. Resources	• Being prepared to be patient and keep trying to achieve long-term individual or group aims.	• Making the most of limited resources. • Demonstrating effective leadership.	• Believing in one‘s own ability to influence the course of events, despite uncertainty, setbacks and temporary failures. • Getting and managing the material, non-material and digital resources needed to turn ideas into action.
3. Actions	• Working together and cooperate with others to develop ideas and turn them into action.	• Defining priorities and action plans. • Testing ideas and prototypes from the early stages to reduce risks of failing.	• Adapting to unforeseen changes. • Networking with others to organise skills and expertise needed for goal attainment.
4. Digital skills	• Deploying digital media, apps or web-based tools for marketing.	• Using software apps and digital tools for managing collaboration with teams and partners.	• Understanding and using information from the web and other digital sources to identify customer needs.
5. Financial skills	• Calculating costs, cost prices, and margins.	• Managing cash flow.	• Drawing conclusions and deriving potential courses of action from balance sheets. • Identifying and meeting the organization’s financial needs in the short and long term.
6. Marketing	• Building relationships of trust with clients and partners.	• Negotiating while using specific techniques	• Using specific techniques to encourage client loyalty

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7. Innovation Management	• Analysing the market potentials of ideas and concepts for new products, processes and services.	• Selecting and applying methods for exchange of ideas and knowledge in the innovation process.	• Managing collaboration between customers, suppliers and development partners in the innovation process.

6. Conclusions: Steps to further develop entrepreneurship education at the university

Stemming from the results shown in chapter 5, it can be concluded that NIET should pay more attention in developing following capabilities in students:

- Uncovering the needs of customers and other stakeholders.
- Exploring and experiment with innovative approaches.
- Being prepared to be patient and keep trying to achieve long-term individual or group aims.
- Working together and cooperate with others to develop ideas and turn them into action.
- Deploying digital media, apps or web-based tools for marketing.
- Calculating costs, cost prices, and margins.
- Building relationships of trust with clients and partners.
- Analysing the market potentials of ideas and concepts for new products, processes and services.

NIET has BA programs of Design, Economics, Management, Marketing, Accounting and audit, Energetics, Electric Energetics, Metrology, Automation, Material science, Technological machines and equipment, Chemical technology, Packaging and printing, Light industry, Food technology, Natural fibre, Technology management systems, Technology of agricultural products, Decorative gardening. Majority of these programs can be suitable for courses enhancing entrepreneurship skills. For instance: Energetics: Specialist of this sphere in a company can look for ways of using energy more effectively and for the application of alternative means of energy which can save the currently used energy, leading to decreasing the cost of product/service. Same can be mentioned about Technological machines and equipment: Engineer could suggest changes to currently operating machine which could lead to increased productivity, convenience or to energy-efficiency, both again leading to decreased cost of product. Design: Our design program is designs of clothes, which requires entrepreneurial mindset even more. Specialists in this sphere could lead needs of customers by creating new designs taking into account different factors surrounding the consumers. Chemical technology: Productions using

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chemical technologies also always look for ways of decreasing the cost of material use and increase the product quality. Engineer with entrepreneurial mindset could see the available opportunity for it and give his suggestion to try. Besides making innovations in companies where they are functioning, these specialists with entrepreneurial mind could establish their own companies noticing the available resources and existing demand of people.

If we are to choose some programs for the start of applying entrepreneurship education, the programs of technological machines and equipment, natural fibre, chemical technology, electric energy and decorative gardening could be mentioned stemming from the potential of their departments.

It could be realised through the discussion between the professors of Marketing department and the professors of relevant department where the entrepreneurial mind is aimed to develop. Inviting the representatives of companies, which are immediate employers of institute's graduates and also representatives of other companies in general, to the discussion could be helpful in identifying the needs and possibilities. Upon discussion and coming to a decision, the course title and the course content could be developed in collaboration.

As to selection of how to integrate these skills into study programs, in our view, a course on entrepreneurship should be organised for specialities chosen above. If there is also a possibility to integrate those skills into existing technical courses of chosen programs, or to organize a new program which combines skills in both speciality and entrepreneurship there is a need to learn from the experience of EU universities.

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