WP1 Current Programmes in EU and Partner HEIs - State of the Art

ACT 1.3 Analysis of market needs

DELIVERABLE 1.3 BENCHMARK ON MARKET NEEDS

REPORT - MATRIX OF COMPETENCES

CASE STUDY OF THE NATIONAL UNIVERSITY OF ARCHITECTURE AND CONSTRUCTION OF ARMENIA (REPUBLIC OF ARMENIA)

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1. Introduction

This report was carried out by the team of NUACA as a part of the TACEESM Erasmus+ project within the requirement of WP1.3.

The report presented covers the results of employers' survey in the fields of architecture and civil engineering that has been done with the purpose to identify the skills and competences that have to be able to show the graduates of the study programs offered by the NUACA in the field of architecture and civil engineering, in their further career.

2. Survey Methodology

The survey methodology includes the steps below:

       Step 1. Questionnaire adaptation to local conditions.

       Step 2.Employers involvement principles.

       Step 3.Analysis of data collected.

       Step 4. Development of general and professional Competences Matrix

2.1 Questionnaire adaptation to local conditions

An appropriate Questionnaire was drafted by the WP1.3 team for employers survey and sent to NUACA for adaptation to the local conditions. The Questionnaire was discussed among the NUACA staff specialized in architectural and civil engineering fields. The minor changes have been done after adaptation, and final version of Questionnaire has been approved by the TACEESM team of NUACA.

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2.2 Employers involvement principles

The online Questionnaire has been spread by the NUACA team of TACEESM Erasmus+ project within the network of employers in the field of architecture and civil engineering. The employers of companies/organizations was informed preliminary about the survey, and the agreement on the engagement in the survey was confirmed by the employers. 32 employers have been involved in the online survey by these principles.

2.3 Analysis of data collected

The data collected through the online survey was analized by the NUACA team of the TACEESM Erasmus+ project and presenting report was elaborated.

## 3. Analysis of data

3.1 Employers' sample description

The sample of respondents includs 32 employers, some of which represents the architectural companies and some - civil engineering companies. The list of companies/organizations the representatives of which have been involved in the survey is presented in Table 1 below. All of participated companies/organizations are allocated in Armenia. The Figure 1 shows the breakdown of the companies/organizations in depending from their size.

Table 1. The general information about companies/organizations and positions of respondents involved in online survey

| ##	The name of comapny/organization	Specialization of company/organization	Position of Respondet
1.	«Hrachya Vardanyan» LLC	Urban development papers elaboration	Chief Architect
2.	«Shatvoryan School of Architecture and architectural self-developemnt» LLC	Architectural design and education	Head of Company
3.	«Magistral Project» LLC	Geodesy work	Director
4.	«Milestone Engineering Project» LLC	Design of Engineering infrastructure	Director
5.	"Development ways" LLC	Consultancy	Chief Engineer
6.	"MID Architecture" LLC	Architecture	Architect
7.	«Nesra Sar» LLC	Construction and Renovation work	Director
8.	«Arni» LLC	Design of structures, construction	Chief Engineer
9.	«Architectural Line Project» LLC	Architectural design	Architect Designer
10.	«Termoros Armenia» LLC	Design of Engineering systems	Chief Director
11.	«HAEKISHIN» CJSC	construction	Construction head
12.	«HAEKISHIN» CJSC	construction	Construction head
13.	«HAEKISHIN» CJSC	construction	Construction head
14.	«HAEKISHIN» CJSC	construction	Construction head
15.	«HAEKISHIN» CJSC	construction	Construction head
16.	«HAEKISHIN» CJSC	construction	Head of concrete enterprise
17.	«HAEKISHIN» CJSC	construction	Head of concrete enterprise
18.	«HAEKISHIN» CJSC	construction	Head of concrete

			enterprise
19.	«HAEKISHIN» CJSC	construction	Construction head
20.	«HAEKISHIN» CJSC	construction	Construction head
21.	«HAEKISHIN» CJSC	construction	Construction head
22.	«HAEKISHIN» CJSC	construction	Construction head
23.	MTS Armenia CJSC	Organization of telecommunication system	Head of department
24.	MTS Armenia CJSC	Organization of telecommunication system	Director of Department
25.	MTS Armenia CJSC	Organization of telecommunication system	Advanced specialist
26.	MTS Armenia CJSC	Organization of telecommunication system	Chief Responsible
27.	MTS Armenia CJSC	Organization of telecommunication system	Senior specialist
28.	MTS Armenia CJSC	Organization of telecommunication system	Chief specialist
29.	MTS Armenia CJSC	Organization of telecommunication system	Department Responsible person
30.	MTS Armenia CJSC	Organization of telecommunication system	Head of Department
31.	MTS Armenia CJSC	Organization of telecommunication system	Specialist of department
32.	MTS Armenia CJSC	Organization of telecommunication system	Coordinator of work

Figure 1.Breakdown of the respondent companies/organizations in depending from their size.

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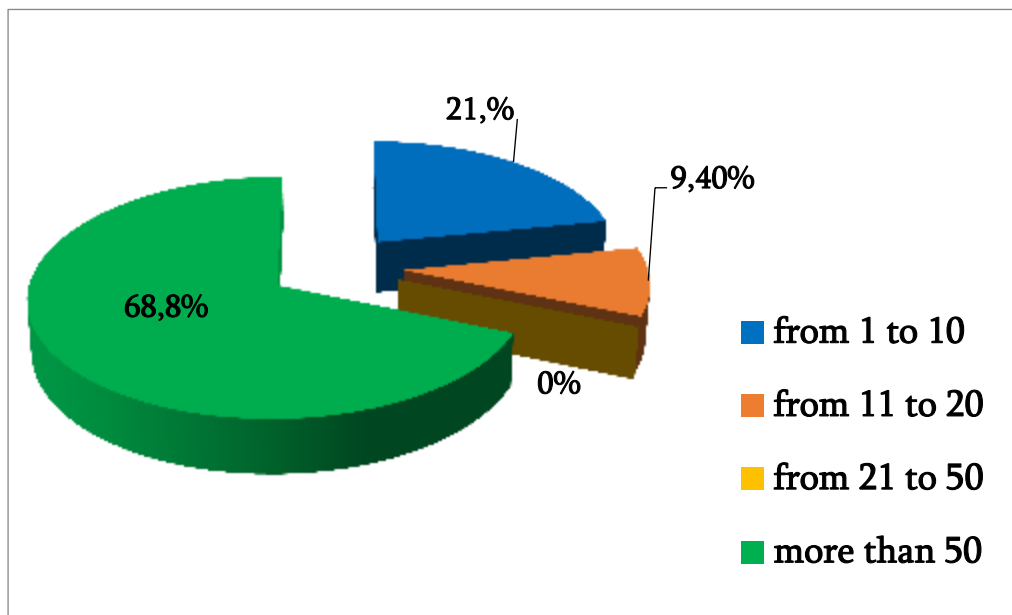
3.2 Summary of Responses regarding current practices and challenges of Market Needs

Q11. Do you think that architecture/civil engineering studies prepare students well for their professional life?
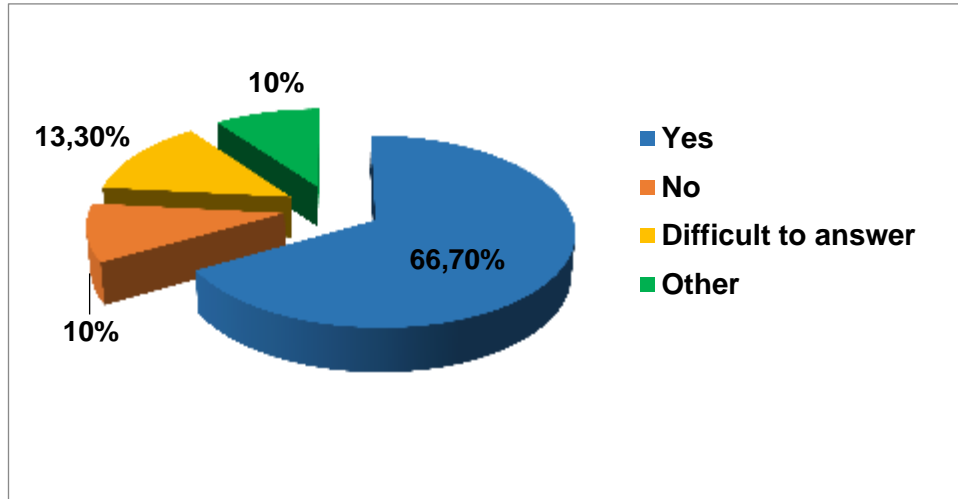
Q12. Using a five-digit scale (1-able, 2-able with extremely little volume, 3-able with little volume, 4-able, 5-able to fully), evaluate how well the architecture / civil engineering education is able to provide to students skills, knowledge and competencies in the following areas:

Skills	Number of notes				
	1	2	3	4	5
Visualization skills (e.g. hand drawing, model making, other media)	1		2	9	5
Knowledge on history and theories of architecture/civil engineering and the related arts, technologies and human sciences	1	1	2	11	15
Knowledge on sustainable development (e.g. physical problems and technologies, function of buildings, ecology, energy performance)	0	7	7	7	11
Knowledge of spatial processes, urban design and planning	1	6	3	12	9
Creative thinking (e.g. thinking out of box, solution-oriented, creativity)	0	3	5	11	12
Technical knowledge about buildings and construction (e.g. structural design, materials)	1	3	7	9	11
Knowledge of the fine arts as an influence on the quality of architectural design	1	1	7	13	9
Methods of investigation and preparation of the brief for a design project	2	3	8	9	8
Detail design preparation	3	2	6	11	8

Q13. Using the five-digit scale (1 - absolutely not developing, 2 - developing but very weak, 3 - developing, 4 - developing well, 5 - developing excellently), assess how well are the students trained within architectural/civil engineering education in:

Skills	Number of notes				
	1	2	3	4	5
Digital skills (e.g. proficient use of ICT tools and relevant programs)	0	2	6	6	17
Critical thinking	1	5	2	9	13
Research skills	1	5	5	11	8
Dealing with complexity	1	3	8	8	10
Decision making (e.g. taking a stance and making judgment)	1	4	10	7	8
Endurance (e.g. working under pressure, handling stress and deadlines)	2	4	6	8	10
Work ethic (e.g. self-discipline, willing to work hard)	3	5	5	9	8
Dealing with uncertainty	3	4	6	8	9
Determination (e.g. commitment, persistence, willingness to achieve)	0	6	7	7	9
Handling criticism	1	4	5	7	12
Working with clients	2	5	4	7	11
Business management skills	3	5	7	5	10
Collaboration skills/team work	2	3	7	8	10
Presentation skills	2	2	7	9	9
Mediating skills (e.g. negotiation, conflict mediation)	5	2	2	8	11
Project management skills	3	6	1	9	10

Q14. What kind of specific skills and competencies of employee do you value/seek most based on your market needs?

Skills and Competences	Number of notes
Honesty	3
Easy communication	1
Hard working	1
Ability to quickly navigation	1
Friendly approach	1
Resistance to hardship	2
Team work	1
Self-criticism	1
Self-orientation	1
Discipline	1
Education	3
The ability to think flexibly	1
Acquisition of professional skills and abilities	2
Motivation	1
Initiative	1
Mastering new technologies	1

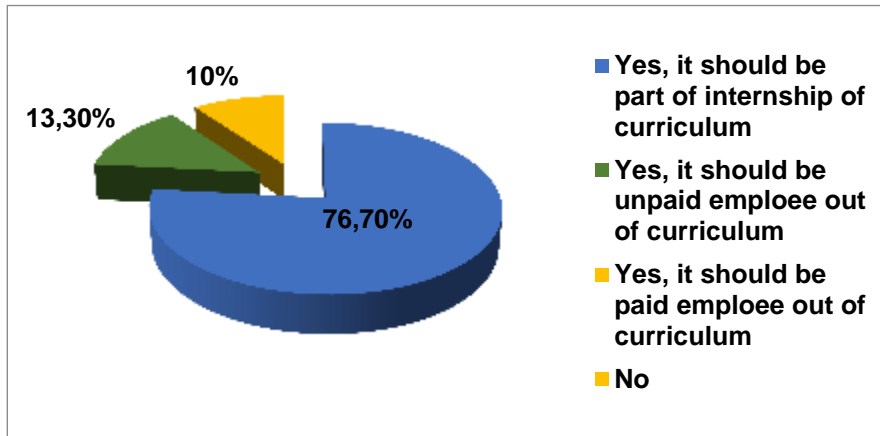|	
Sense of purpose	1
Commitment to the profession	2
Responsibility	5
Aim to learn	1
Creative thinking	2

Q15. What specific employee profiles do you think will be in demand in the near future?

Profiles/specialities	Number of notes
Those who know BIM	1
Qualified design developers/ creative authors	2
All specializations using modern technologies	2
All IT related professions	5
Disigners	1
Engineering specialties	5
Builders	2
Designers, hydraulic technicians, cost estimation makers	2
Marketing	1
Robotics	1
All profiles with creative ability	1
Economists	1

Q16. What specific training do you think will be required for professionals in the future according to the business sector requirements?
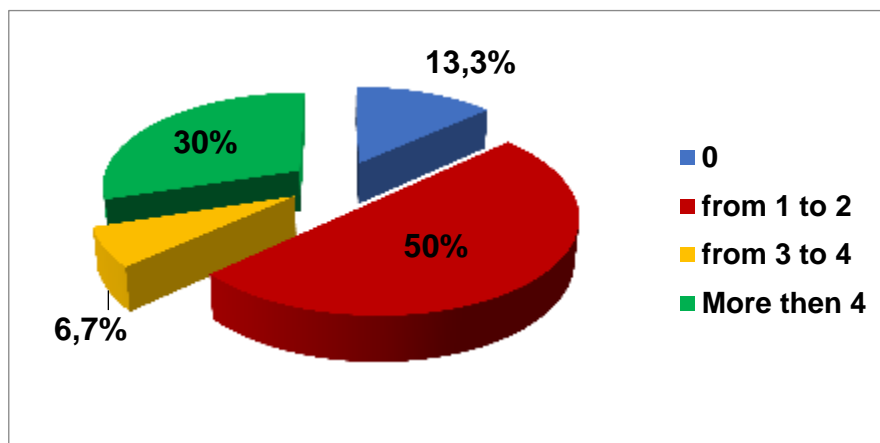
Courses (disciplines, modules)	Number of notes
Business mindset և planning	7
Business ethics	1
Management:	1
Norms learning	1
Narrow professional subjects (including short-term trainings)	3
Design practice in the educational process	1
Project management	3
Computer skills	2
Rhetoric skills	1
Entrepreneurship (including for engineers)	5
Deepening of composition courses	1
Startup Marketing and Management	3
Creative courses	1
Economics subjects	2
Foreign languages (including for professional subjects)	2

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Q17. Dou you think that students should gain some work experience in architecture/civil engineering practice during their studies?

- Yes, it should be part of internship of curriculum
- Yes, it should be unpaid emploee out of curriculum
- Yes, it should be paid emploee out of curriculum
- No

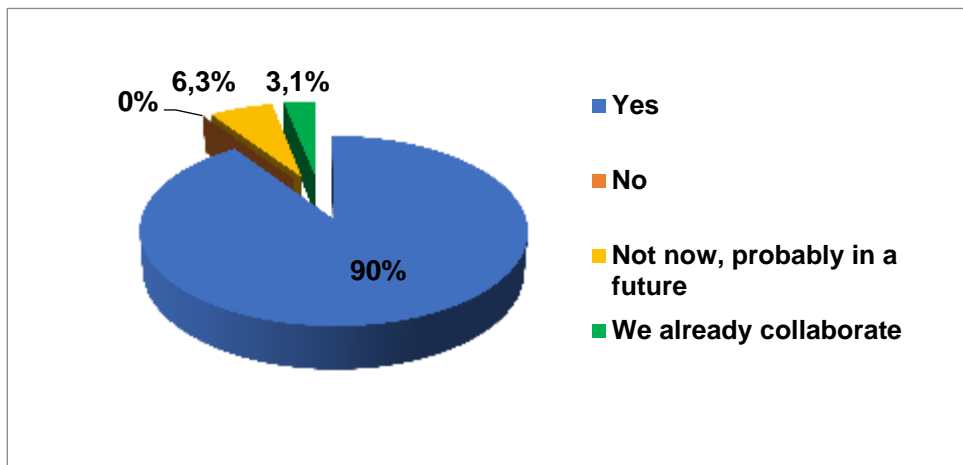**3.3 Summary of Responses regarding "University-Enterprise" collaboration**

Q18. With how many universities have you established collaboration?

- 0
- from 1 to 2
- from 3 to 4
- More then 4

Q19. Would your company be interested in collaborating with the university?

- Yes
- No
- Not now, probably in a future
- We already collaborate

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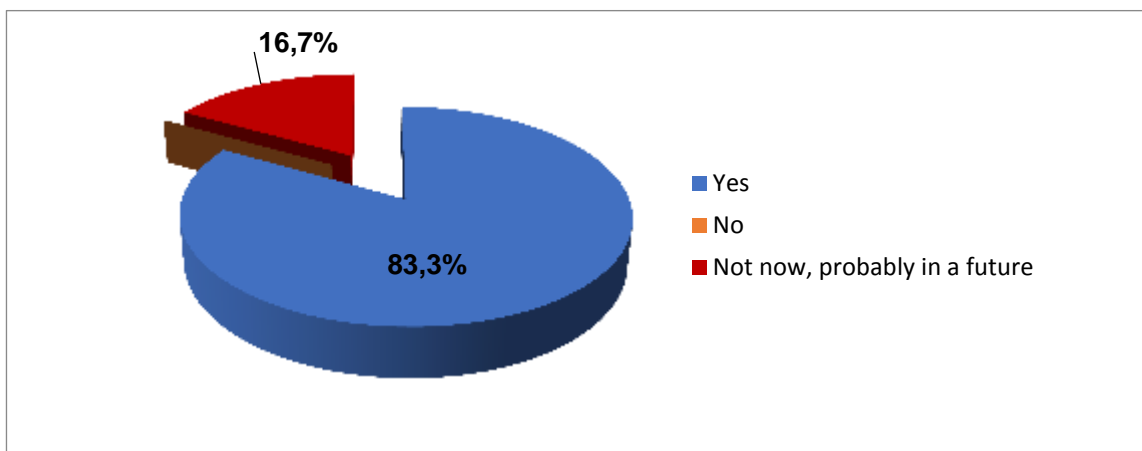
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Q20. If you have collaboration with a university, who initiated the collaboration?
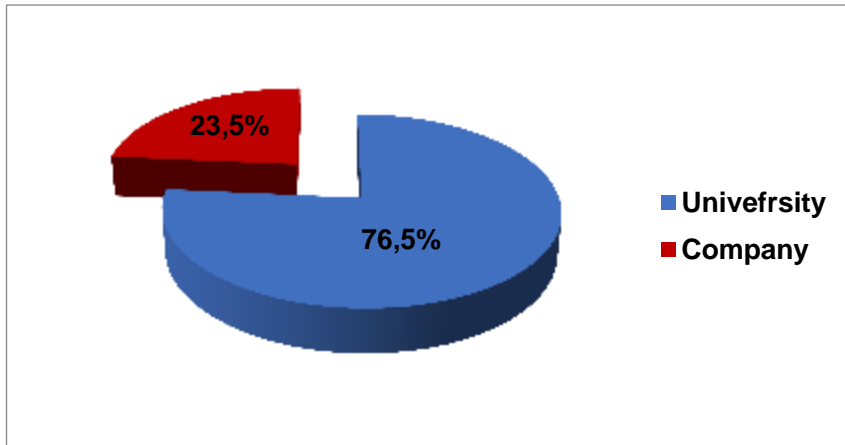
**Q21. Have you had previous experiences with student internships?**
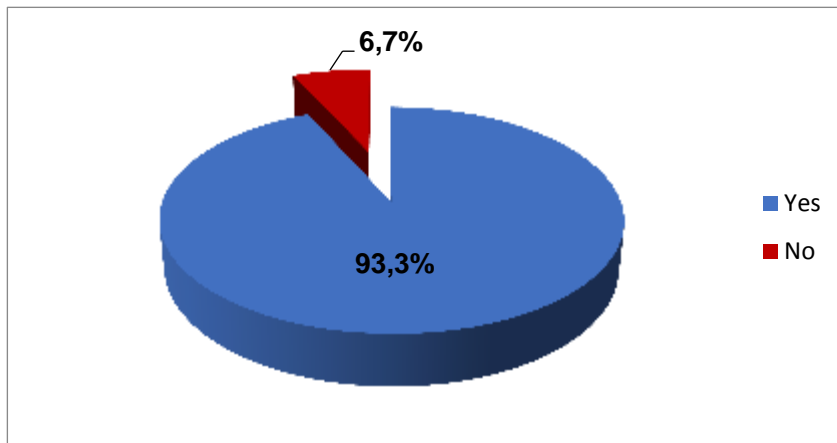
Q22. Would your company be interested in offering placements for student internships?

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Q23. What expectations do you have regarding student work?

Expectations	Number of notes
Become the best professionals of the future (competitive, flexible, market leader)	11
Develop their professional experience (develop their education)	3
Approach work responsibly	2
Be responsible and hardworking	1
Take work practice seriously	1
Save time	1
Be able to apply their knowledge in practice	1
Modern methods will be used	1
Be able to solve the most complex urban development problems	1
Demonstrate experiential skills	1

**Q24.Would you be interested in hiring university students?**
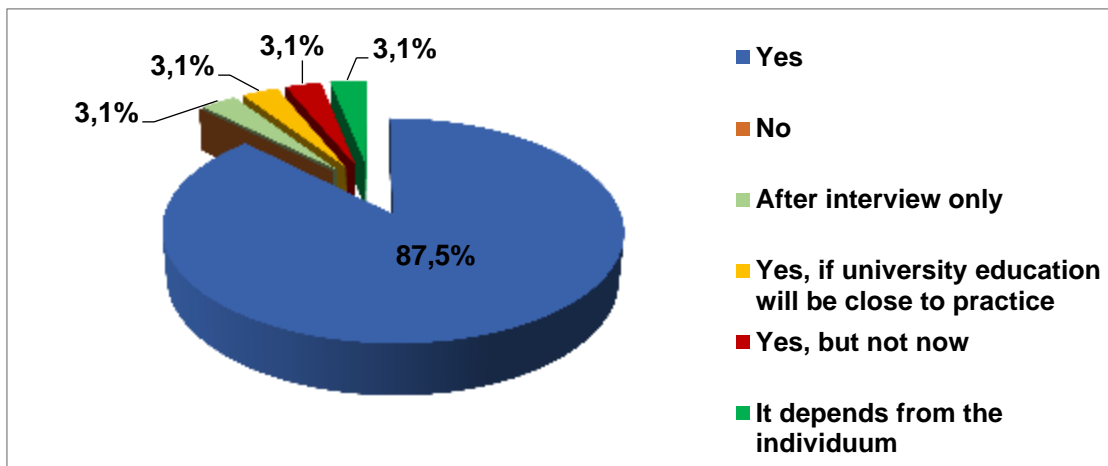
Q25.Would you find it useful having access to a platform - database of students who are looking for jobs/internships?
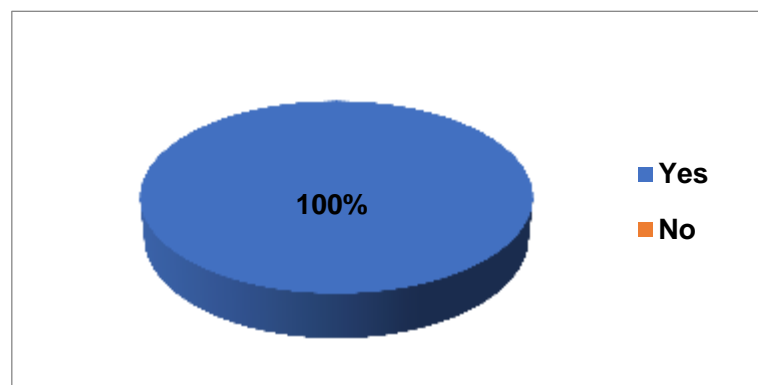
Q26. What type of information would you be interested in seeing in this database?

Data base information	Number of notes
Curriculum vitae (CV)	9
Data on knowledge, skills, experience (learning progress)	8
Grades (assessment results)	4
Video about students	2
Previous course work done	2
Working skills	1
Reference letter from the university	1
What kind of job student is looking for?	1
Leader's opinion	1
Friends' opinion	1
Internship in different organizations	1
Social network links	1

Q27. Would you be interested in collaborating with universities in the development of specific joint projects (university-companies) through the development of Master Thesis in master's programs?
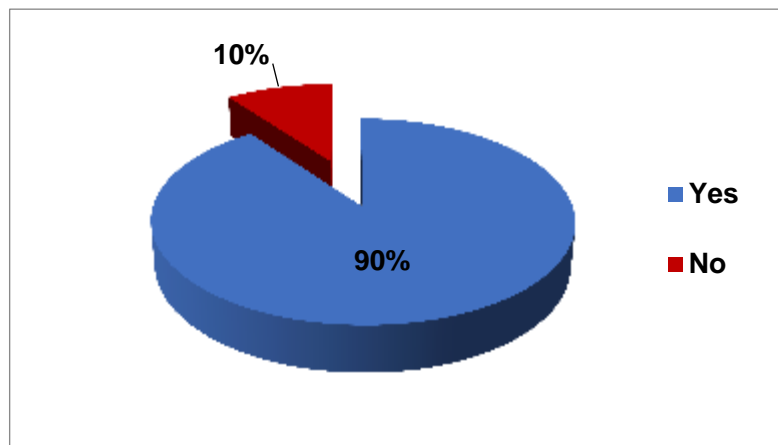
Q28. If so, what kind of projects would you be interested in? (Indicate one or more research topics of interest to your company)

hh	Projects/Scientific Themes	Number of notes
1.	Urban renovation	9
2.	Public area	7
3.	Landscape	5
4.	Mobility	7
5.	Energy and environment	8
6.	Bioclimatic design or passive design	6
7.	Social innovation և local community	10
8.	New technologies in architecture / civil engineering	12
9.	Heritage և cultural identity	6

10.	Architectural design	8
11.	New materials in architecture / civil engineering	8
12.	Product design	2
13.	Furniture design	5
14.	Interior design	7
15.	Steel structural design	3
16.	Structural design of wood	6
17.	Prefabricated elements in structural molding	5
18.	Bridge design	9
19.	Geotechnical design of the tunnel	7
20.	Design of urban road networks	6
21.	Design on unstable soils	10
22.	Design of hydroelectric power plants	5
23.	Other (please note)	5

Q29. Would you be interested in other types of collaborations and informal activities? (Choose one or more options)

Kind of collaboration	Number of notes
Joint curriculum development	9
Joint implementation of the training program (for example, guest lectures, expert from enterprise, jury member)	14
Continuing education for business people (e.g. internship education, field training and vocational training)	14
Consulting (for students by business professionals)	15
Student Entrepreneurship (e.g. Startup)	16
Shared resources (eg infrastructure, staff, equipment, documents)	8
Other (please note)	3

Q30. In your opinion, what are the top 3 success factors (facilitators) for effective collaboration? (rank them from 1 to 3, 1 being most important)

Success factors	Importance		
	1	2	3
Ability to work outside the institutional boundaries of staff	23	6	1
Willingness to provide time and resources from both sides	18	10	2
Mutual understanding between partners	15	13	3
Simple and effective communication between partners	17	8	5
Strong and trusted personal relationships	17	9	4
Shared vision, goals and tasks defined by clear expectations	15	12	3
Flexibility of partners	17	11	2
Existence of mutual obligation	19	10	1
The commercial orientation of the university	11	17	2
Short geographical distance between partners	12	15	3
Better integration of researchers into business	15	13	2

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| Better knowledge of collaboration opportunities | 13 | 17 | 1 |
| Other (please note) | 11 | 15 | 4 |

Q31. In your opinion, what are the top 3 barriers for effective collaboration? (rank them from 1 to 3, 1 being most important)

Troubles of collaboration	Importance		
	1	**2**	3
Lack of funding	20	7	3
The process seems difficult and complicated	13	14	3
Cooperation bureaucracy	11	17	4
Lack of awareness of opportunities arising from collaboration	14	13	3
Difficulties in finding a suitable partner for cooperation	11	14	6
Different incentives between universities և business և	10	18	2
Frequent exchange of staff within the university and business	18	9	3
Lack of interest of the other side	13	14	4
Fear of the negative impact this collaboration may have on research, teaching or business	10	14	6
There are no obstacles	10	15	5
Other (please note)	16	7	7

Q32. What would motivate companies to cooperate with universities?

The reasons of collaboration with the universities	Number of notes
Get more qualified graduates	18
Positive impact on society	10
Improving business reputation	17
Introduction to new technologies and knowledge	17
Improving research and innovation capabilities	10
Acquisition of personalized solutions for business	11
Acquisition of financing / financial resources	12
Access to higher educational institutions	9
Other (please note)	5

4. Conclusions and Recommendations

4.1 Conclusions

As a result of the survey of 32 employers conducted online, the following conclusions were made:

1. The majority of respondents (66.7%) believe that architecture / civil engineering education programs provide students with proper preparation for their professional life. 10% of respondents do not agree with this idea, and 13.3% found it difficult to express any opinion.

2. The employers who took part in the survey mentioned that architectural-engineering education is able to fully transfer to the students the knowledge of the history of the fields, theories, technologies, as well as the humanity science (number of notes is 15). It was noted (note number is 12) that architectural / engineering education develops students' creative thinking.

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3. Among the excellent traits developed by students in Architecture / Civic Engineering education, employers mentioned digital technologies skills (number of notes is 17), critical thinking (number of notes is 13) and use of criticism (number of notes is 12), work with clients (number of notes is 11) and mediation skills (number of notes is 11).

4. Among the employee's special skills an abilities as a priority the respondents mentioned most frequently responsibility (number of notes is 5), education (note number is 3), honesty (note number is 3), professional skills (note number is 2), commitment to the profession (note number is 2), creative thinking (number of notes is 2), coping with difficulties (number of notes is 2).

5. In the future, among the most popular profiles / professions, employers mentioned all the professions related to IT (number of notes is 5), engineering professions (number of notes is 5).

6. Employers mentioned most often "Business Mindset and Planning" (note number is 7) and "Entrepreneurship" (note number is 5) among the necessary courses for professionals in line with the requirements of the business sector.

7. 76.7% of employers think that students should gain some work experience during their studies in the field of architecture / engineering internship, 13.3% և 10% think that students should be respectively an unpaid and paid employee outside the curriculum.

8. 30% of employers stated that they cooperate with more than 4 universities, 6.3% with 3 to 4 universities, 50% with 1 to 2 universities. 13.3% of employers stated that they do not cooperate with any university.

9. 2. 90% of employers indicated that their organization is interested in cooperating with universities, 6.3% indicated that they would cooperate, but not now and 3.1% - indicated that they are already cooperating. 76.5% of the representatives of the already cooperating companies mentioned that the cooperation was initiated by the university. 93.3% of employers said they had internship experience, and 82.3% said their organization was interested in offering internships to students.

10. Most employers (number of notes is 11) expect students to become the best professionals of the future (competitive, flexible, market leader).

11. 86.7% of employers stated that they would be interested in hiring university students. All employers mentioned that it would be very helpful to have a database of students looking for job / internship. From the data included in such a database, the employers most often mentioned the following data: Curriculum vitae (CV) (number of notes is 9), data on students' knowledge, skills, experience (learning progress) (number of notes is 8), study grades (number of notes is 4).

12. 90% of employers stated that their organizations would like to collaborate with universities in developing joint projects with a master's thesis. As the most interesting the following topics were mentioned by employers: new technologies in architecture / civil engineering (number of notes is 12), design on unstable soils (number of notes is 10), social innovations and communities (number of notes is 10), bridge design (number of notes is 9), urban renovation (number of notes is 9), architectural design (number of notes is 8), use of new materials (number of notes is 8), energy and

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environment (number of notes is 8), public spaces (number of notes is 7), and topics related to mobility (number of notes is 7), landscape (number of notes is 5), etc.

13. Employers indicated that they would be interested in other types of collaboration, in particular student entrepreneurship (for example, startups) (number of notes is 16), counseling (students by business professionals) (number of notes is 15), joint implementation of the curriculum (number of notes is 14) , continuing education for business people (number of notes is 14).

14. According to employers, the most important preconditions for cooperation are the ability of staff to work outside the institutional boundaries (number of notes is 23), the existence of mutual obligation (number of notes is 19), willingness to provide resources from both parties (number of notes is 18).

15. Lack of funding was mentioned by employers as the most significant obstacle to cooperation (number of notes is 20).

16. According to employers, the availability of more qualified graduates (number of notes is 18) for business / industry may motivate companies / organizations to cooperate with universities.

4.2 Recommendations

The conclusions based on the opinions of employers served as a basis for proposing a matrix of general and professional competencies for students studying in the fields of architecture / civil engineering at the NUACA.

The matrix of general and professional competencies for students of architecture/civil engineering is presented below.

General	Professional
Critical thinking	Digital skills
Dealing with complexity	Research skills
Decision making	Professional knowledge, skills and abilities
Endurance (e.g. working under pressure, handling stress and deadlines)	Acquisition of BIM technology
Work ethic (e.g. self-discipline, willing to work hard)	Qualified design development
Dealing with uncertainty	Acquisition of IT technologies
Determination (e.g. commitment, persistence, willingness to achieve)	Business ethics
Handling criticism	Design norms knowing
Working with clients	Computer skills
Working with clients	Economic fundamentals in design
Business management skills	Foreign languages for architecture and civil engineering
Collaboration skills/team work	
Presentation skills	
Mediating skills (e.g. negotiation, conflict mediation)	
Project management skills	