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Curricula of the World Architectural Engineering Undergraduate Programs*

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The purpose of this article is to carry out a comparative analysis of the curricula of 33 Architectural Engineering (AE) undergraduate programs around the world that are labeled in the same way but present different perceptions of the label concept. We applied various types of analysis and evaluated the absolute and relative value of curricula by comparing: study length, number of credits, courses, electives, etc. We discuss our figures, findings, and conclusions in this paper. Not all regions of the world are represented equally, and interpretation of the curricula may be subjective, based on the selected approach. The findings reveal a large spectrum of opinions in academia regarding what constitutes Architectural Engineering, as demonstrated by differing study program contents around the world. Our data and analysis provide valuable insights and a springboard for academia, researchers and curriculum developers in the field of Architectural Engineering to reach consensus.

Keywords: architectural engineering; undergraduate; engineering study program; multiple objective analysis

1. Introduction

This paper presents a comparative analysis of the curricula of 33 Architectural Engineering (AE) undergraduate programs around the world labeled in the same way and offering similar degrees. Owing to differences in the perception of the concept 'architectural engineering' across regional and national boundaries (Section 3 below), the goal is to understand how the label 'AE' is perceived and applied differently in universities around the world. This paper will address differences in perception and content of AE programs. The AE program at VGTU in Lithuania was established in 2000. The authors work in the AE program at VGTU, which led them to explore programs with similar labels. The authors are open to sharing their findings with all interested parties. The data and findings may be of interest to academia as a whole, the faculty of AE programs, researchers analyzing similar programs, creators of new programs, and others interested in engineering programs. The study could foster discussion and collaboration among on those interested in differences across AE programs. The programs we examined are certified by different accreditation boards and have differing dates of establishment.

In the initial stage of the study more than 50 AE undergraduate degree programs were identified. 47 undergraduate programs were analyzed; this number was eventually reduced to 33 programs based on available information. We analyzed a wide range of program information gathered from the department personnel, websites and articles, as presented in the tables and figures. We examined the following characteristics: study duration in years, degree offered, credits required for graduation, average credits per course, average credits per year, average courses per year, courses required for graduation, credits for compulsory/elective courses, credits for courses, and credits for Architecture and Engineering courses. Moreover, we included information on values in the range from Q1 to Q3 (table values between the 1st and 3rd quartile), accreditation board/institution, and program title.

2. Research methodology

We have examined five papers on AE study programs; these are all in the United States apart from the King Fahd University program [1–5]. There is no research comparing study content of AE programs on a global scale; there is only one study comparing programs within the United States [6]. Even though there are currently 17 accredited undergraduate programs in the United States, different viewpoints persist among the faculty of the programs regarding the definition of AE design [7]. Estes and Estrada explore the wide range of program perception within this one country in Chapter 4 of their paper [6]; however, this paper will examine the even greater diversity in curricula of AE programs worldwide.

We gathered information from the websites of university programs, on-line course catalogues and university personnel to examine 33 curricula worldwide [8–40]. A larger number of criteria on a larger number of programs could have been employed in the study, but in fact the program websites often

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lack the relevant information, and when, in a number of cases, the authors requested information regarding some issues, no information was provided. The above mentioned facts presented significant challenges to our research.

We implemented a uniform approach with one individual carrying out a consistent assessment of all programs. The accuracy of the study allows us to effectively compare the similarities and differences among AE programs. We used statistical analysis to evaluate the strengths, weaknesses, opportunities, and threats related to the results. The credit values were presented in absolute numbers, because the meaning of one credit is different in different institutions: the authors know of cases where one credit equals 12 contact hours in a few institutions, 15 in another, and in VGTU it equals 40 contact hours.

The comparable values of the data were analyzed using quartiles because the 1 Sigma and coefficient of variation values insufficiently measured the dispersion of the results. 1st (Q1), 2nd (Q2), and 3rd (Q3) quartile values are presented below the table in Tables 1 and 2. Programs are easily comparable once the relative value of the course credits is determined. We chose this approach because it most efficiently and accurately allowed us to measure and compare programs. Courses that do not count for credit were not included in this study.

3. Definition

The titles 'architect', 'engineer' and 'architectural engineer' are applied differently across national and linguistic boundaries.

1. In some countries 'architectural engineering' is used in place of architecture to describe the act of providing architectural services.
2. In other countries such as Japan, the terms 'architecture' and 'building engineering' are used interchangeably.
3. In various countries, an 'architectural engineer' (ingegnere edile in Italy), entitled to practice architecture, is referred to as an architect and often works as a structural engineer.
4. In some languages such as Korean and Arabic, 'architect' is literally translated as 'architectural engineer'.
5. In countries such as Germany, Austria, Hungary and most Arab countries, architecture graduates receive an engineering degree (Dipl.-Ing., i.e. Diplom-Ingenieur) [41]. The perception in the United States is that 'Architectural Engineering deals with the design, construction and operation of engineering systems and engineering aspects of safe, functional, efficient, economical, aesthetically-pleasing building's performance' [6].

4. AE study program

The history of building construction reveals that after specializations appeared, architects often lacked knowledge and experience in other types of engineering, such as structural engineering. As the building industry became more complex, it was exceedingly difficult for one professional to maintain expertise across the wide spectrum of engineering practices. The emergence of this program was evidently influenced by the aforementioned trends. The oldest architectural engineering study program was founded at IIT in 1890 [42], while the oldest accredited architectural engineering study program was founded at Penn State University in 1910. It 'focused on preparing students and conducting research in the design, engineering, and construction of building projects' [43]. Numerous programs were established in the 21st century. Current trends show a continuous increase in architectural engineering specializations around the world.

5. Comparative analysis

5.1 Columns 1–12

AE undergraduate study programs were analyzed according to a number of criteria. Table 1 and Table 2 contain data representing the 33 AE programs analyzed in this paper and they are presented in quarters, trimesters or semesters and differ in structure, approach, course offerings, duration, and credit values. AE programs are established in differing departments around the world including Architectural Engineering, Architecture, and mostly Civil Engineering.

The programs in this study include: 17 from North America (the United States), 5 from the Middle East, 4 from Europe, 4 from Asia (South Korea), 2 from Africa (Egypt), and 1 from Australia.

Column 4—Program duration can be 3, 4, 4.5, 5 and 5.5 years. Twenty-one of the programs are 4 years long. Europe generally offers shorter programs, while the Middle East, Africa and the United States offer longer programs. **5**—The universities offer BSc (Bachelor of Science), BSc (Hons) (Honours), BAE (Bachelor of Architectural Engineering), BScAE, BEng. (Bachelor of Engineering) (Hons), BEng., BArch. (Bachelor of Architecture)/ BAE, BScAE/BT (Building Technology) degrees. For example, AE programs in the UK offering a BEng degree are more often accredited by professional institutions than those offering a BSc degree.

Table 1. Architectural Engineering Undergraduate Degree Program Curricula Data Columns: **1**—Alphabetical order; **2**—University; **3**—Country; **4**—Study duration in years; **5**—Degree; **6**—Credits required for graduation; **7**—Average credits per course; **8**—Average credits per year; **9**—Average courses per year; **10**—Courses required for graduation. The values that are in the range between Q1 and Q3 are highlighted (shaded). (Figure created by the authors.)

1	2	3	4	5	6	7	8	9	10
1	Alhosn U.	UAE	4	BSAE	138	3.14	34.5	11	44
2	Cairo U.	Eg	5	BScAE/BT	180	2.95	36	12.2	61
3	California P. S. U.	USA	4	BSc	204	5.37	51	9.5	38
4	Chung-Ang U.	Kor	4	BSc	101	2.97	25.3	8.5	34
5	Dong-A U.	Kor	5	BSc	140	2.3	28	12.2	61
6	Drexel U.	USA	5	BSAE	191.5	3.14	38.3	12.2	61
7	Hanyang U.	Kor	4	BSc	164	2.83	41	14.5	58
8	Illinois IT	USA	4	BSAE	136	3.02	34	11.3	45
9	Kansas State U.	USA	5	BSAE	158	2.93	31.6	10.8	54
10	King Fahd U.	SA	5	BSAE	132	2.36	26.4	11.2	56
11	Milwaukee Sch. of Eng.	USA	4	BSAE	197	3.28	49.3	15	60
12	Missouri U. of Sc&T.	USA	4	BSAE	138	3.14	34.5	11	44
13	North Carolina U.	USA	4	BSAE	128	2.46	32	13	52
14	October 6 U.	Eg	4	BSAE	169	2.82	42.3	15	60
15	Oklahoma State U.	USA	5	BAE	157	3.34	31.4	9.4	47
16	Penn State U.	USA	5	BAE	160	2.96	32	10.8	54
17	Qatar U.	Qa	4	BSAE	131	2.52	32.8	13	52
18	Sultan Qaboos U.	Om	5.5	BEng	160	2.76	29.1	10.5	58
19	Szent István U.	Hu	4	BSAE	240	3.69	60	16.3	65
20	Tennessee State U.	USA	4	BSAE	128	2.51	32	12.8	51
21	Texas A&M U.	USA	4	BSAE	132	2.64	33	12.5	50
22	U. of Colorado at B.	USA	4	BSAE	128	3.12	32	10.3	41
23	U. of Incheon	Kor	4	BSc	178	2.7	44.5	16.5	66
24	U. of Kansas	USA	5	BSAE	165	3.59	33	9.2	46
25	U. of Miami	USA	4	BSAE	129	2.8	32.3	11.5	46
26	U. of Mons	Be	3	BEng	180	3.91	60	15.3	46
27	U. of Oklahoma	USA	4	BSAE	129	3.23	32.3	10	40
28	U. of Texas at Austin	USA	4	BSAE	126	2.93	31.5	10.8	43
29	U. of Wyoming	USA	4	BSc	132	3.07	33	10.8	43
30	U. of Leeds	Eng	3	BEng	300	11.5	100	8.67	26
31	United Arab Emirates U.	UAE	4.5	BSAE	168	2.33	37.3	16	72
32	Victoria University	Au	4	BEng(AE)	384	8	96	12	48
33	Vilnius GTU	Lt	4	BCivEng	160	2.67	40	15	60
34	Mean value		4.2		165.6	3.42	40.2	12.1	51
35	1st quartile (Q1)		4		132	2.7	32	10.8	44
36	2nd quartile (Q2)		4		158	2.96	33	11.5	51
37	3rd quartile (Q3)		5		178	3.23	41	13	60

Few universities also offer dual Architecture/ AE degrees (University of Miami BSc AE/ MSc Arch. program, and 6 years Texas at Austin university BSc AE/ BSc Arch program). It is a good opportunity for students that are undecided about their professional future. **6**—Programs offer anywhere from 101 to 384 credits, which demonstrates the disparity in credit values and national standards. Credits are presented in absolute values. **7**—Average credits given for one course range from 2.3 to 11.5. **8**—Average credits per year range from 25.3 to 100. European universities have the highest values for average credits per program and average credits per year. **9**—Average courses per year range from 8.5 to

Table 2. Architectural Engineering Undergraduate Degree Program Curricula Data Columns: **1**—Alphabetical order; **11**–**12**—Credits for compulsory/elective courses, %; **13**–**15**—Credits for A, B, C block courses, % (also see Fig. 1); **16**–**17**—Credits for C block courses: Architecture, Engineering, % (also see Fig. 2); **18**—Values in range Q1 to Q3; **19**—Accreditation Board/Institution; **20**—Program title, where it is not AE. The values that are in the range between Q1 and Q3 are highlighted (shaded). (Figure created by the authors.)

1	11	12	13	14	15	16	17	18	19	20
1	89.13	10.87	10.87	60.87	28.261	69.231	30.769	6	MHESR	
2	91.111	8.8889	4.4444	68.889	26.667	77.083	22.917	2	UIAR	AE & BT
3	95.588	4.4118	8.8235	51.961	39.216	21.25	78.75	1	ABET	
4	20.792	79.208	0	61.386	38.614	46.154	53.846	3	ABEEK	
5	92.857	7.1429	8.5714	62.857	28.571	40	60	5	ABEEK	
6	94	6	13.577	58.486	27.937	52.336	47.664	4	ABET	
7	100	0	5.4878	59.756	34.756	47.368	52.632	4	ABEEK	
8	80.15	19.85	13.235	64.706	22.059	30	70	2	ABET	
9	86.71	13.29	12.658	63.291	24.051	34.211	65.789	4	ABET	
10	93.182	6.8182	18.939	48.485	32.576	55.814	44.186	5	ABET	
11	89.34	10.66	12.183	62.437	25.381	24	76	3	ABET	
12	84.78	15.22	14.493	60.145	25.362	28.571	71.429	4	ABET	
13	86.72	13.28	10.938	60.156	28.906	45.946	54.054	7	ABET	
14	90.533	9.4675	0	44.97	55.03	84.946	15.054	2	ERAA	
15	93.89	6.11	10.191	44.586	45.223	54.93	45.07	3	ABET	
16	88.12	11.88	3.75	61.25	35	50	50	6	ABET	
17	88	12	12.977	57.252	29.771	58.974	41.026	5	ABET	
18	91.875	8.125	10	60.625	29.375	70.213	29.787	5	ABET	
19	95.833	4.1667	0.4167	64.167	35.417	11.765	88.235	1	HAB	Arch
20	88.29	11.71	18.75	56.25	25	37.5	62.5	5	ABET	
21	84.09	15.91	15.909	62.121	21.97	34.483	65.517	3	ABET	
22	78.91	21.09	7.0313	60.156	32.813	21.429	78.571	3	ABET	
23	71.348	28.652	10.156	31.25	58.594	60	40	1	MEST	
24	84	16	7.2727	46.061	46.667	44.156	55.844	3	ABET	
25	86.05	13.95	9.3023	58.915	31.783	31.707	68.293	7	ABET	
26	100	0	4.4444	55.556	40	58.333	41.667	2	IARME	
27	93.02	6.98	11.628	60.465	27.907	33.333	66.667	4	ABET	
28	80.95	19.05	9.5238	60.317	30.159	31.579	68.421	5	ABET	
29	84.091	15.909	9.8485	53.03	37.121	18.367	81.633	4	ABET	
30	90	10	0	21.667	78.333	34.043	65.957	2	ICE, ISE	
31	94.643	5.3571	7.1429	56.548	36.31	75.41	24.59	3	ABET	
32	100	0	0	65.625	34.375	18.182	81.818	3	EA	
33	93.75	6.25	11.31	47.024	41.667	47.143	52.857	4	MES	
34	87.326	12.674	8.9052	56.099	34.996	43.893	56.107	3.7		
35	84.78	6.25	5.4878	53.03	27.937	31.579	44.186			
36	89.34	10.66	9.8485	60.145	32.576	44.156	55.844			
37	93.75	15.22	12.183	61.386	38.614	55.814	68.421			

16.5. **10**—Programs offer anywhere from 26 to 72 courses. **11**–**12**—Credits for electives range from 0% to 79%. Four universities offer no electives, while three Korean universities offer the most electives.

5.2 Columns 13–20. A, B, C course blocks

All courses in the undergraduate engineering program in Lithuania according to national regulations are divided into three course blocks as follows:

block A (basic university) courses, block B (basic specialization) courses, and block C (main specialization) courses [44]. In this model, particular courses belong to specific blocks. Block C courses are divided into architectural (arts) and engineering (mostly structural) courses in this study (Table 1 and Table 2, and Fig. 2). Vilnius Gediminas Technical University (VGTU) A, B, and C course blocks are as follows:

- A block courses include: Humanities (Philosophy), State History, Foreign language, Communication in Engineering, Professional language, Physical training, Free electives.
- B block courses include: 1.1. Mathematics, Geometry, Statistics Physics, Chemistry, Biology. 1.2. Mechanics, Electronics, Material science, IT, CAD, Engineering graphics, Environmental issues, Sustainability. 2. Main subjects of the program: 2.1. Building architecture and its structural elements. 2.2. Materials and their qualities. 2.3. Structural design methodology. 2.4. Construction technologies, management and execution. 2.5. Geology, geodesy, soil mechanics, foundation engineering. 2.6. Building engineering and indoor environment systems. 3. Social Sciences (Political science), Communication, Linguistics, Law, Management, Economics. 4. Special program courses prepared by the department. 5. Industrial training/ Internship. 6. Final/ Capstone project (Structure, Engineering systems).
- C block specialization—Structural Engineering and Architecture—courses include: 1. AE Design; Structural Analysis, Design; Computer aided structural design; Building mechanics (not including soil, fluid mechanics, foundation engineering) related courses. 2. History and theory of architecture and arts, Architectural design, Architecture and Urbanism, Building codes, Drawing/ Graphics, Composition, Presentation tools, Landscape architecture, Final/ Capstone project (Architecture).

In this study, we identified and categorized the courses of AE undergraduate program curricula around the world using the VGTU course block model. This system allowed us to effectively compare and analyze various curricula.

Columns 13–15—Credits for A, B, C block courses, % (See Figs 1 and 2). 13) A block course credits range from 0% to 19%. Curiously, four AE university study programs do not include A block courses in their curricula, while the ten highest values are from the United States and the Middle East. **14**—B block course credits range from 22% to 69%. **15**—C block course credits range from 22% to 78%.

Columns 16–17—Credits for C block courses: Architecture and Engineering, % (See Table 2, Fig. 2). **16**—C block architecture course credits range from 12% to 85 %. The highest values represent programs that place a notable emphasis on architecture, despite the 'Architectural Engineering' title. The highest values are from Egypt. **13–17**—Course credits in block A, block C, and basic courses such as math and physics in block B are relatively similar around the world. However, universities emphasize differing engineering specializations, such as structural, electrical, mechanical, and

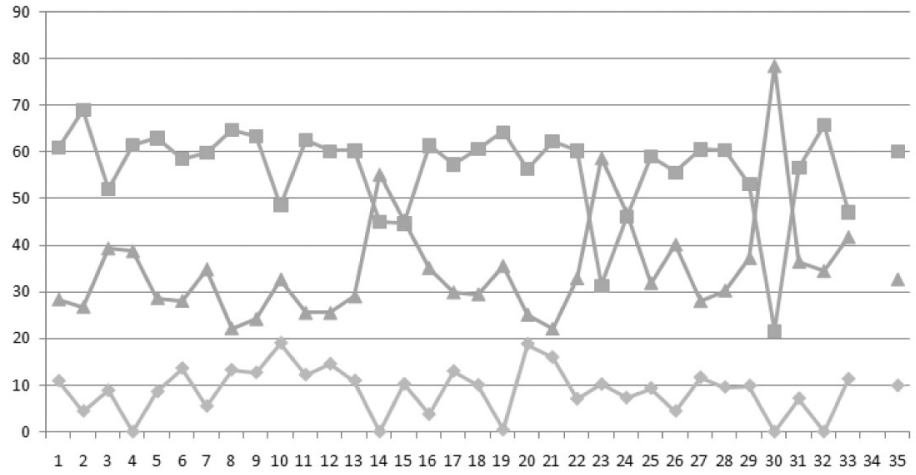

Fig. 1. Relative values (%) of A (rhombus), B (square) and C (triangle) block credits in the universities. X (horizontal) axis presents university (1–33) and Q2 (median) (35) values. The university numerical designations 1–33 come from Table 1. Y (vertical) axis presents percentage values (Figure created by the authors.)

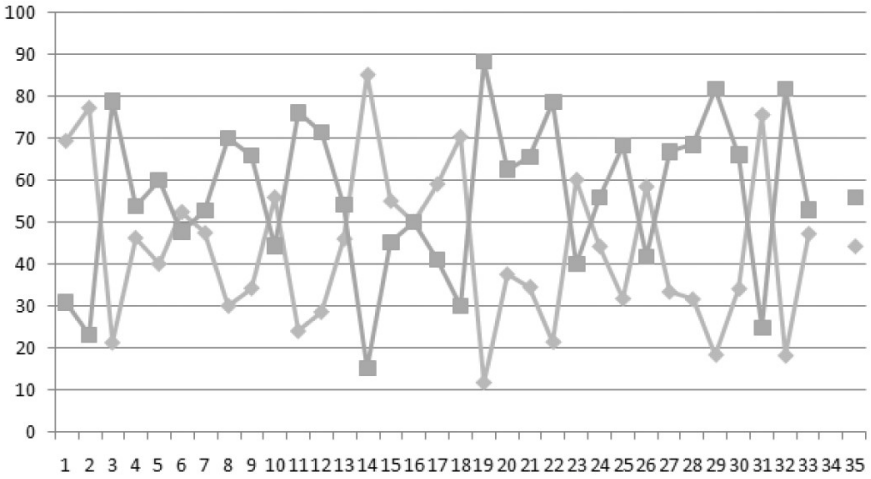

Fig. 2. Relative values (%) of Architectural (rhombus) and Engineering (square) C block course credits in the universities. X (horizontal) axis presents universities (1–33) and Q2 (median) (36) values. The university numerical designations 1–33 come from Table 1. Y (vertical) axis presents percentage values (Figure created by the authors.)

construction engineering or focus only on architecture. Architectural course credits in block C range from 12% to 85%, which again exemplifies the distinct curricula around the world.

Column 18—Amount of the relative values (%) present in the range between 1st (Q1) and 3rd (Q3) quartile in Columns **9**–**11**, **13**–**16**. The comparable values of the columns that are in the range between Q1 and Q3 ('Q1 to Q3 values') are highlighted (shaded). The analyzed programs have from 1 to 7 'Q1 to Q3 values'. The university that has the largest amount of 'Q1 to Q3 values' has the program curriculum with the largest amount of values close to the Q2 (median) value. There are 17, 20, 17, 17, 17, 17 and 17 'Q1 to Q3 values' in the comparable columns **9**–**11**, **13**–**16**. The amount of 'Q1 to Q3 values' in the columns is quite similar and equals in average of 17.43 with the Sigma value 0.73 and the coefficient of variation 4.21%. There are 17 universities with 7 to 4 values that fall inside the Q1 to Q3 range: two universities have 7, two universities have 6, six universities have 5, and seven universities have 4 'Q1 to Q3 values'. The 17 programs that have the largest number of 'Q1 to Q3 values' include: ten programs in the United States, four in the Middle East, two in Korea and one in Europe (Column 18, Table 2). There are three programs (Nos 2, 8, 14) that have no 'Q1 to Q3 values' in A, B, C block courses and C block credits for specialization architectural/engineering courses. It is worth noting that some programs have 'Q1 to Q3 values' in courses per program, while other programs have 'Q1 to Q3 values' in A, B, C block courses and credits for specialization architectural/engineering courses. Certain 'Q1 to Q3 values' are of greater importance, for example, A, B, C block courses and credits for specialization architectural/ engineering courses.

Column 19—Accreditation Board/Institution. Here is a list of Accreditation Board/Institution abbreviations: ABEEK—Accreditation Board of Engineering Education of Korea; ABET—Accreditation Board for Engineering and Technology; EA—Engineers Australia; ERAA—Egypt Regional Accreditation Agency; HAB—Hungary Accreditation Board; IARME—Institutional Accreditation or Recognition Ministry of Education; ICE—The Institution of Civil Engineers; ISE—The Institution of Structural Engineers; MES—Ministry of Education and Science; MEST—Ministry of Education, Science and Technology; MHESR—Ministry of Higher Education and Scientific Research; UIAR—The International Union of Architects Requirements.

Column 20—There are three programs that are not labeled 'Architectural Engineering': No. 2—AE and Building Technology, and No. 19—Architecture (Table 2). These programs were included in this study because they have 'AE' in the program name, content, or degree title. For instance, graduates of the Hungarian architecture program are granted a BSAE degree (No. 19).

6. Discussion and suggestions

The data presents numerous issues within AE curricula that must be carefully evaluated. The numbers indicate that programs vary widely around the world. Some programs resemble an architecture program while others resemble a Civil

Engineering program. Some programs, such as the American model, with focus on few engineering disciplines, i.e. structural, electrical, mechanical, HVAC engineering or construction/construction management, with few architecture courses for the ability to communicate with an architect [6]. Few programs (one of them is in VGTU) strike a balance between Architecture and Engineering courses.

There is wide disparity among programs within the same country across the spectrum of criteria. For example, the number of credits required for graduation ranges from 101 to 178 in Korea, and from 126 to 204 in the United States. Moreover, in Korea, 34 to 66 courses are required for graduation and credit for compulsory courses range from 21% to 100%. In the United States, the average credit value per course ranges from 2.5 to 5.4 and the study duration ranges from 4 to 5 years in the United States, Korea and Egypt. Credit block values also vary widely within countries. For example, block A credit values range from 3.8% to 18.8% in the United States, block B credit values range from 31.3% to 62.9% in Korea, and block C credit values range from 22.1% to 46.7% in the USA.

The study reveals that 16 universities have less than four 'Q1 to Q3 values' in their curricula. However, even the 17 programs that have 7 to 4 'Q1 to Q3 values' employ differing approaches and perspectives. The wide range in architectural course credits from 11.8% to 84.9% represents the disproportionate approach of many programs, emphasizing either architecture (arts) or structural engineering instead of implementing a more comprehensive approach. The universities numbered 14, 2, 31, 18 focus on architecture (arts) C block courses, while the universities numbered 19, 32, 29, 3 focus primarily on engineering (Table 2). The largest and the least difference between Q1 and Q3 results are in columns **12** and **11** respectively.

The AE programs are accredited by different boards that have different accreditation requirements. If accreditation requirements to the programs were similar, programs would have more in common, and it would foster experiential exchanges between educators and students. It is necessary for academia to agree upon universal definitions for the AE specialization, accreditation criteria, study program content and primary study objectives in order to promote greater consistency in the field. At the same time, it would be valuable for various national programs to retain slightly different emphases to enrich the field. Variances in secondary study program objectives, regulations, tutors, and culturally specific approaches are beneficial.

The suggestion is to make AE curricula more similar, which could include standardizing specific program components such as: compulsory credits in each course block (e.g. A block 9 %, B block 56%, C block 35%, similar to average values in Table 1 and Table 2); the amount of elective course credits (e.g. 11%); relative course credits for specific courses e.g. Calculus (Analytical Geometry, Differential Equations, Numerical Methods), or for specific type of courses (e.g. architectural) in a particular block, along with standardizing the course titles; amount of program courses and program length. 'Is the extra year of a five year program better or worse than a year of experience gained by those who graduate in four years? [6]'. The standard of living in different regions has an influence on the technological development, industry needs and investment, which has an influence on the level of education and graduates. This has an influence on the number of AE programs and their levels.

All the above mentioned fosters the creation of a global accreditation board in the future, and the programs accredited by it would have much more in common. The answer to the question 'Could and should programs with a similar label become more similar' would influence the next actions of the academia.

7. Conclusions

This research presents a comparative analysis of 33 AE undergraduate degree program curricula and identifies numerous issues that must be addressed.

1. There is a wide disparity in the curricula of AE undergraduate programs resulting from: a) Lack of a common perception of architectural engineering; b) Different national study program regulations and accreditation criteria; c) Varying departments, university practices, and date of program establishment; d) Differing standards of living and national needs for different professional specializations in the building industry; e) Application of language norms.
2. AE undergraduate degree study programs vary greatly; therefore, the abilities of AE graduates also vary, resulting in ambiguous standards for graduates in the field.
3. Research and discussion are necessary to develop a set of acceptable international standards. Within this framework, it would be easier to identify the strengths within each program and to overcome present obstacles such as licensure, standards and expectations for graduates in the field, and experiential exchanges of educators and students between different schools. Cooperation among academia is required to standardize or to make AE study program content as similar as possible. If

there were a desire to improve AE study programs or to make the programs more similar, Q1, Q2, and Q3 values from Table 1 and Table 2 of this research could be used. If programs were better regulated, it would be possible to create a global accreditation board in the future. Further research is needed in order to achieve the aforementioned goals.

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