Critical Factors Affecting Enrollment, Performance, and Retention & Graduation Rates of Construction Management Undergraduate Students

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Abstract: The shortage of construction manager and skilled construction workers is becoming one of the country's great-unsolved problems as the economic expansion has continued in USA because of various reasons, such as low students' enrollment in the construction management and related programs, poor academic performance of students, and low retention and graduation rates of students in US universities. Therefore, it is essential to identify possible factors that directly and indirectly influence students' enrollment, academic performance, and retention and graduation rates of students. By conducting an extensive literature review, this paper reports various factors that influence students' enrollment, academic performance, retention & graduation rates, and classifies these factors in the relevant clusters, such as university factors (academic & organizational factors), student factors, and family & social factors. In addition, this paper maps those factors in various clusters by applying the affinity grouping technique. Revelation of such factors can provide valuable insights to educators and students. It also helps to educators to formulate effective teaching strategies to achieve maximum outcomes. Moreover, the finding of this research not only contributes to the body of knowledge but also develop a foundation for designing the systematic strategy for effective educational policy in the country and addresses the lack of policy or strategy to resolve the skilled workforce shortage issues.

1. INTRODUCTION

With the improvement in the economy after recession, US Construction industry is growing and becoming one of the largest industries with expenditures reaching over 1,293 billion U.S. dollars (Wang, 2019). According to Bureau of Labor Statistics (BLS, 2019), employment of construction managers is projected to grow 10 percent from 2018 to 2028, which is faster than the average for all occupations. Similarly, there are huge demand of construction skilled workforce in various positions in the construction industry. The U.S. Census Bureau projects that the number of new jobs in construction industries will rise by 747,600 jobs between 2016 and 2026, which is about 11% growth. Meanwhile, the construction laborer shortage is becoming one of the country's great-unsolved problems as the economic expansion has continued. In this scenario, there is a big concern that "are all construction industry and academic sectors taking serious steps to resolve this issue?" Are they heading towards right direction to resolve this workforce shortage issue?

Certainly, some industry associations have identified this issue and have started collaboration with academic sectors to improve the number of graduates who are their future employees. Associated General Contractors Massachusetts (AGC-MA) and some other associations are already inline in this collaboration with universities in Massachusetts. AGC of America released a workforce development plan in 2014 to address this workforce shortage issue by preparing the next generation of skilled construction workers (Thompson, 2019). On the contrary, the number of students' enrollment, academic performance, and retention and the graduation rates in Construction Management program in most of USA universities are decreasing because of various seen and unseen factors. Revelation of these factors are critical in academic

as well as industry sectors because of their direct or indirect influences in the workforce shortage issue. Therefore, it is necessary to identify factors influencing students' enrollment, academic performance, and retention and graduation rates.

This paper reviews the literatures depicting what factors are critical to academic performance and graduation rate and why they play significant role in the preparation of educational strategy. After thorough investigation, author classifies and maps those factors into various clusters, such as university factors, student factors, and family & social factors. In addition, this research also uncover what factors are critical for students' enrollment and retention, selection of construction management major, and their performance in construction management major. The research finding contributes in the development of the systematic strategy for effective educational policy in the country. It also helps to identify and to address the lack of policy or strategy to resolve the workforce shortage issues.

2. RESEARCH FRAMEWORK

As today's Construction Management students are valuable workforce for tomorrow's construction industry, it is essential to assure that these students get required knowledge & skills and they perform well on study. The performance of students are influenced by various factors and the study of these factors are critical in developing effective teaching strategies and educational policy. Therefore, author conducted an extensive literature reviews by reviewing journal and peer-reviewed conference papers, books, and relevant documents. This paper extracted lists of factors influencing students' enrollment, academic performance, retention rate, and graduation rate from the following publications.

- Journal of Construction Education
- Journal of Professional Issues in Engineering Education and Practice
- Associated Schools of Construction (ASC) conference publications
- ASCE Construction Research Congress publications
- ASCE Leadership and Management in Engineering
- International Journal of Recent Research and Applied Studies
- Journal of Education and Practice
- Hindawi Education Research International
- Journal of International Students
- International Journal of Scientific Research and Engineering Development
- British Journal of Education
- International Journal of the Constructed Environment
- American Society for Engineering Education
- American Journal of Educational Research, and
- International Journal of Project Management (Elsevier)

Figure 1 shows various stages involved in this research. The author listed identified factors from literature reviews in the excel spreadsheet under three major topics discussed above which are: (i) factors affecting students' enrollment, (ii) factors affecting academic performance, and (iii) factors affecting retention and graduation rates. Then, those factors were classified into manageable groups by applying the affinity grouping technique, which creates and clusters factors into categories on the basis of their similarity. For example, ranking and reputation, location and accessibility of university, availability of infrastructures and labs, affordable fees, financial aid, and scholarship availability, competent faculty, extracurricular activities (students clubs activities), career opportunity (internships and jobs), academic advising & tutor service, hands-on activities, peer group, university learning environment, class size, effective teaching and training method, appropriate course load, and university management and staffs (Durdyev & Ihtiyar, 2019; Gregory 2014; Keller, 2012; Ostadalimakhmalbaf et al., 2019) are relevant to academic and organizational

factors, which are combined and classified into university factors. Family income and financial support, family crisis, motivation for learning or learning environment at home or in the society are family and society related factors (Yousefi, 2010). Lack of interest in a course, lack of concentration on study, lack of time management, fear & anxiety during exam, bad attitude towards school, lack of desire & motivation, laziness or apathy, and lack of decision & determination (Crosnoe et al., 2004; Koch, Greenan, & Newton, 2009; Olatunji et al., 2016; Osuizugbo, 2019) are some examples of student's psychological and behavioral factors, which are considered as student factors. After classification, these factors were mapped. A pilot study was conducted to assess this framework (Figure 1) and compared the results with outcomes from literature reviews.

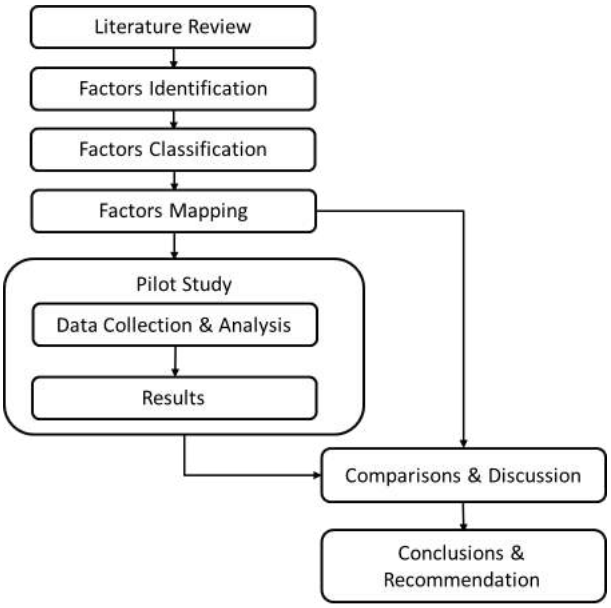

Figure 1. Research framework

3. PILOT STUDY

Though this research primarily relies upon an extensive literature reviews, the author further conducted a pilot study to test the research framework and also to determine influence of these factors on each affinity group. A survey questionnaire set was designed, which is explained in section 3.1. Data was collected and analyzed. The results from this pilot study was compared with outcomes from the literature reviews to evaluate and validate the research framework and outcomes from the research.

3.1 Questionnaire Design

Based on the expert opinions and discussion, a questionnaire survey sheet was designed, where 24 factors affecting students' enrollment, 53 factors affecting academic performance of students, and 21 factors affecting students' retention and graduation rates under appropriate affinity groups were listed as per clusters discussed above. The questionnaire was structured mainly in three sections. In first section, the respondents were asked to rank the factors affecting students' enrollment in construction management program on a 5-point Likert Scale; 1 being "strongly disagree" and 5 being "strongly agree." In the second section, they were asked to rank the factors affecting academic performance of students on same 5-point Likert Scale. In the third section, they were asked to rank the factors affecting students' retention and graduation rates. The justification for using a 5-point Likert scale type question is the fact that it is well

recognized as the most appropriate instrument for obtaining information about respondents' attitudes and perceptions or analyzing particular attributes (Baker, 2003; Sekeran, 2000).

3.2 Questionnaire Sampling

The questionnaire surveys were completed in a paper format because it is just a pilot study and the focus group for this initial survey were Fitchburg State University students and faculty. A total of 65 questionnaire sets were distributed in Engineering Technology Department. Most of respondents were Construction Management students. Out of 65, only 42 validated data were analyzed for this study which is about 64.62%.

3.3 Data Analysis and Results

As described above, the respondents were asked to rate the listed factors affecting enrollment, academic performance, retention rate, and graduation rate on a scale of 1 to 5. The frequencies for each factor from overall respondents are listed in Tables 2, 3, and 4. These scores were then transformed to Relative Importance Index (RII) based on the formula as shown in Eq. 1 (Kometa et al., 1994: Tam et al., 2000) to determine the relative of the factors.

$$[1] \text{ Relative importance index (RII)} = \frac{\sum W}{AN}$$

Where, W is the weightage given to each factor by the respondent, ranging from 1 to 5 likert scale, A is the highest weightage (5 in the study), and N is the total number of samples. The RII ranges from 0 to 1, closer to 1 being the significant (Tam et al., 2000). Table 2 shows the RII values based on overall responses (42 respondents), following Eq. 1, and based upon each identified factors. Then, those factors were ranked based upon RII values.

Table 1. University Related Factors Affecting Students' Enrollment in CM Program

University Factors (Academic & Organizational Factors)	Overall Frequency					Overall	
	1	2	3	4	5	RII	Rank
Career opportunity (Internships & jobs)	0	2	4	24	12	0.819	1
Affordable fees, financial aid, & scholarship	0	1	6	26	9	0.804	2
Ranking & reputation	1	4	9	12	16	0.781	3
Availability of infrastructures & labs	0	5	10	12	15	0.776	4
Competent faculty	0	4	12	12	14	0.771	5
Location & accessibility	2	1	7	25	7	0.762	6
Hands-on project activities	0	0	16	20	6	0.752	7
Peer recommendation	0	3	14	16	9	0.748	8
Extracurricular activities	1	7	9	18	7	0.709	9

This paper reports the data analysis and results for the university related factors that affect: (i) students' enrollment in construction management program, (ii) students' academic performance in construction management program, and (iii) students' retention and graduation rates in construction management program. Similar procedures were adopted for other clusters. Nine major university related factors were identified which influence students' enrollment in construction management program. Among them, career opportunity was ranked first as shown in Table 2. It means students enroll CM program if they see career opportunity, such as job growth, job demand, and internships availability in the construction industry. Affordable fees, financial aid, & scholarship availability and ranking & reputation of program and university are also major factors for the selection of university by students which are ranked second and

third, respectively as shown in Table 2.

Table 2. Factors Affecting Students' Academic Performance in CM Program

University Factors (Academic & Organizational Factors)	Overall Frequency					Overall	
	1	2	3	4	5	RII	Rank
Competent faculty	0	1	12	14	15	0.805	1
Effective teaching and training method	1	1	6	24	10	0.795	2
University learning environment	0	1	8	25	8	0.790	3
Availability of infrastructures and labs	1	3	10	14	14	0.776	4
Appropriate course load	0	4	12	12	14	0.771	5
Class size	0	3	16	8	15	0.767	6
Academic advising & Tutor service	3	0	6	26	7	0.762	7
Peer group	0	0	16	19	7	0.757	8
Career opportunity (internships, jobs)	0	5	10	19	8	0.743	9
Hands-on activities	3	4	21	5	9	0.662	10

As shown in Table 3, ten major university related factors that affect students' academic performance in construction management program were identified. The data analysis result shows that students' academic performance mainly depends upon faculty competency and effectiveness in teaching and training method, which are ranked first and second as shown in Table 3.

Table 3. University Related Factors Affecting Retention & Graduation Rates of Students

University Factors (Academic & Organizational Factors)	Overall Frequency					Overall	
	1	2	3	4	5	RII	Rank
University learning environment	0	0	9	16	17	0.838	1
Competent faculty	0	0	8	20	14	0.829	2
Affordable fees, financial aid, & scholarship	0	2	3	25	12	0.824	3
Availability of infrastructures and labs	0	5	9	12	16	0.786	4
Career opportunity (internships & jobs)	0	5	9	20	8	0.748	5
Hands-on project activities	0	0	22	11	9	0.738	6
Ranking & reputation	2	5	3	28	4	0.729	7
Extracurricular activities	0	0	20	18	4	0.724	8
Location & accessibility	0	7	10	21	4	0.705	9
Peer group	2	6	14	12	8	0.686	10

Table 4 shows the university related factors that affect the retention and graduation rates of student. This study shows that students will retain at same university and graduate from that university if they find a good learning environment and competent faculty. If students receive scholarships and if university's fees are affordable, it also helps to retain students at university. This paper only reports university related factors that affect students' enrollment in CM program, academic performance of students in CM program, and students' retention and graduation rates in tabular format. Similar approaches are implemented for other clusters or classified factors.

Once overall ranking of these factors were determined (shown in Tables 2, 3, & 4), these university related factors were mapped as shown in Table 5. It compares the factors mapping from literature reviews

with pilot study results. It shows that availability of infrastructures and lab, competent faculty, career opportunity, hands-on activities, and peer group recommendations are overlapped important factors that influence students' enrollment, academic performance, retention, and graduation rates in CM program. This finding indicates that university or academic institutes should give priority on these factors to improve students' enrollment, academic performance, and retention & graduation rates. For example, students do not prefer to enroll in such a university where there is lack of infrastructures and laboratory facilities. Also, research shows that most of the CM students prefer hands-on activities in their curriculum.

Similarly, student factors, family and social factors that influence students' enrollment, students' academic performance, students' retention & graduation rates in CM program are identified and mapped.

Table 4. Comparison of University Related Factors Mapping and Pilot Study Results

University Factors (Academic & Organizational Factors)	Ranking of Factors Affecting Students' Enrollment	Ranking of Factors Affecting Students' Academic Performance	Ranking of Factors Affecting Students' Retention & Graduation Rates
Ranking & reputation	3		7
Accessibility and location	6		9
Availability of infrastructures & labs	4	4	4
Affordable fees, scholarships, & financial aid	2		3
Competent faculty	5	1	2
Extracurricular activities	9		8
Career opportunity (internships, jobs)	1	9	5
Academic advising & tutor service		7	
Hands-on activities	7	10	6
Peer group recommendation	8	8	10
University learning environment		3	1
Class size		6	
Effective teaching & training		2	
Appropriate course load		5	

4. CONCLUSIONS

The construction workers shortage is becoming one of the country's great-unsolved problems as the economic expansion has continued. In such a scenario, this paper brought the potential reasons of workforce shortage in construction industry for discussion. Some of them are: low students' enrollment in CM and related programs, poor academic performance of students, low retention rate, low graduation rates, lack of training, and lack of resources and funding in construction industry for teaching and training to their construction employees. To address this critical issue, it is essential to carefully review how to improve students' enrollment, performance, and retention & graduation rates in CM program, which ultimately impact on the workforce production. This paper presented a framework to conduct the research on various factors affecting students' enrollment, academic performance, students' retention, and graduation rates in

CM program. After identifying factors, those factors were classified and mapped under appropriate affinity groups. A pilot study was conducted to test the research framework. Future opportunities aside, this research concludes that the framework described herein represent a successful first step in mapping these factors. Author will present the extended study for other factors with the large population in future publication. This research provides valuable insights to educators and students which helps to educators to formulate effective teaching strategies to achieve maximum outcomes.

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