External Forces Driving and Shaping a Construction Engineering & Management Technology Program.

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ABSTRACT

External forces drive and shape the Construction Engineering & Management Technology programs that are applying for reaccreditation in the 2015-2016 academic year. Programs will be forced to reframe them in order to gain reaccreditition. The main objective of this work is to describe/discuss all the external forces for the Construction Engineering & Management Technology (CEMT) programs that are in the assessment stage for accreditation or reaccreditation and find if room is left for innovation and/or improvement. The case analyzed is located on a regional campus in Indiana, USA, but similar situations can be seen in other places.

Keywords: Acreditation, Assessment, Construction, Engineering, Globalization

1. INTRODUCTION

The Construction Engineering & Management Technology (CEMT) program's mission is to provide a quality education to students; contribute to the advancement of technology engineering and education in general; and serve the needs of the surrounding communities. According to this mission, besides a contribution to the engineering, management and technology fields, the main focuses are on the students and the industry that hire graduates. To acomplish this mission, we have the obligation to provide a well-rounded education that makes students atractive to the employers in the area, and to ensure that they have the knowledge, skills and desire to serve the community where they live.The faculty in conjunction with the constituens: students and industry periodically review the program to adjust it to the advances in technology and their needs, since they are the pilars of the program.

A problem exists when faculty find that what they want to teach and what the university and all the entities expect the program to comply with do not match. This is not the only problem; a second one exists because the amount of time faculty needs to devote to those requirements keeps them away from their main job of teaching. When a new program is proposed to the university, it requires the approval of the main campus; here is the momment that the transformation begins. Some times new classes are imposed or taken away, otherwise the program cannot move to the following stage, and faculty have to accept it, if in reality they want to succeed.

On figure 1, a program is represented by the circle built with hidden lines. The blue circle represents what is left after external forces act over the original circle and all circles around it represent different entities that influence the program. The circle with a hidden line is a program that faculty and constituents would like to have, but unfortunatelly one is what the group wants and other's the external forces that change the shape of the desired program.The university itself is the first one to start changing its shape. It is important to mention that the university suffers a similar transformation to the one that will be described in this article for the CEMT program: external forces impose rules and conditions to get the accreditation or to be approved by commissions.

The following organizations: Indiana government; Indiana Commision of Higher Education; the Engineering Technology Acreditation Commission; the Applied Science Accreditation Commission; etc. are the entities that

start shaping the construction engineering programs. It is interesting to notice that when one organization requires any change, this must be approved by a new accreditation agency to guarantee it complies with the new rules.

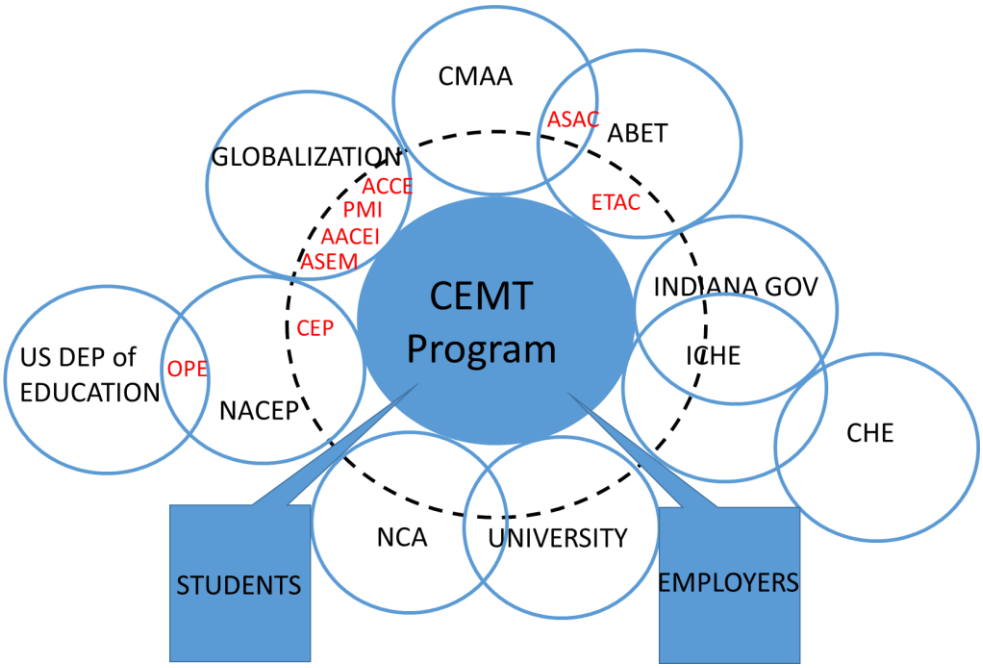

Figure 1: CEMT Program and its external driving forces

2. HIGHER LEARNING COMMISSION FOR THE NORTH CENTRAL ASSOCIATION OF COLLEGES AND SCHOOLS (HLC –NCA)

The Higher Learning Commission (HLC) is an independent corporation and one of two commission members of the North Central Association of Colleges and Schools (NCA) that accredits, and thereby grants membership and degrees for post-secondary educational institutions in the North Central region (HLC, 2014). In order for the university to be accredited, the university needs to be a member and follow the criteria delineated by the HLC, for example: the mission must be clear and articulated to its vision, values, plans and priorities. That the institution acts with integrity and its conduct is ethical and responsible. That it provides high quality education in a learning environment and evaluates their effectiveness through a continuous improvement, using the appropriate resources and planning for future challenges and opportunities. The maximum accreditation time is 10 years. To maintain its accreditation, the university needs to manage all programs to maintain the requirements of the HLC. Another reason why it is important to maintain the accreditation, is to ensure the institution is eligible for federal financial aide.

3. ENGINEERING TECHNOLOGY ACREDITATION COMMISSION FOR ABET (ETAC –ABET)

To be acredited by ABET (formely called Accreditation Board for Engineering and Technology), the program must fullfil two things: a general criteria and a program criteria. The general criteria has eight sections that includes students admision requirements; program educational objectives; student outcomes; continuous improvements; curriculum; faculty; facilities; and institutional support (ETAC-ABET, 2014). The program criteria contains the program objectives and outcomes that must be satisfied to be accredited or reaccredited, being the leading society the American Society of Civil Engineers (ASCE). Assessment reports to demosntrate the compliance with rules are required. Additionally, ABET requires at least one third of the total credit hours for the program, but no more than two thirds of the total credit hours be technical content, focusing on the applied aspects of science and engineering (ETAC-ABET, 2014). Maybe because organizations want to grow, ABET has

being associated with other organizations for their objective of accredition. In the case of construction engineering and management technology programs, ABET associated with the Construction Management Association of America.

4. CONSTRUCTION MANAGEMENT ASSOCIATION OF AMERICA (CMAA)

The Construction Management Association of America (CMAA) was admitted to ABET in October 2013 as a Member Society with curricular responsibility for the construction management discipline. Any program that includes "construction management" in their name has to be accredited through the Applied Science Accreditation Commission (ASAC), with evaluators from the CMAA. It is necessary to note that the CMAA is in the process of drafting the program criteria for construction management and similarly named programs to complement the ASAC general criteria.

ABET Policy and Procedure Manual (APPM) Section II.E.4.c.(4) states: "If a program name invokes review by more than one commission, then the program will be jointly reviewed by all applicable commissions, in this case ASAC and ETAC commissions will review the programs jointly starting in 2015-2016" (Weis, 2014). So, construction programs will need to comply with both the ASAC General Criteria and Program criteria provided by CMAA and with ETAC General Criteria and Program Criteria. Consequently, the construction management programs will have a team from both the ASAC and the ETAC commissions participating in the on-site review.

When comparing established general criteria for ETAC and ASAC differences appear for example, they require adjustments in the general criteria of the CEMT program and it is expected a similar thing will occur for the program criteria. At this point, CMAA is in the process of writing the criteria for the 2015-2016 round-visits and it is projected to be available in summer 2014. In a public letter sent by the CEO of the CMAA to their members, we can read: "I am proud to announce another important milestone. In recent years we have been urged by a number of prominent and respected academic institutions to step forward and lead an effort to create a new, dedicated academic accreditation for undergraduate programs in Construction Management, through ABET (formerly the Accreditation Board for Engineering Technologies). We agreed to take on this role and have now been accepted as an ABET member society and leader of a new accreditation program for Construction Management. As the lead society for Construction Management, CMAA now has the ability to develop program-specific criteria for the Construction Management profession. We will also be responsible for recruiting and selecting program evaluators to review Construction Management programs. We are just now beginning to organize the committee that will guide the development of our accreditation criteria and model curriculum. We hope to have the criteria and model curriculum completed as soon as possible so that the accreditation process will be operational for the fall 2016 academic year" (CMAA, 2013). Here, there is a contradiction between ABET and CMAA. The first institution announced to the schools about the changes that will occur in 2015, while the second institution announced the change for the year 2016. The problem is for those institutions that allready applied before January 31, 2014, for the accreditation in 2015-2016 because the rules for the program accreditation are not yet written or published by the CMAA or the ASAC commission.

At this point, we have two institutions to comply with, both with their own set of General Criteria and Program Criteria with the aggravating circumstance that the new institution is in the process of writing their own program criteria.

If the institution is public, of course, requirements from the government are expected too and the state of Indiana is not an exception.

5. THE INDIANA STATE HOUSE

Following a national trend, on March 16, 2011, Governor Daniels of Indiana, signed the House Enrolled Act 1220 that limits the number of credit hours for bachelor and associate degrees. The act limits the credit hours required to 120 for a bachelors degree and 60 for an associates degree in effect July 1, 2012, with implementation by 2013

(Indiana, 2011). This restriction put technology programs in a hard possition; the programs compacted some classes to make space for the reduction of 12 credits since the bachelor degree originally had 132 credits.

The State of Indiana through a Senate Enrolled Act 182 of 2012 implemented a common course numbering system and a state-wide general education transfer core. The core was based on core competencies and translates into at least 30 credit hours which apply towards an undergraduate degree. If the student transfers after taking those 30 core credits and/or after having an associate degree, the student is considered to have met at least 30 credit hours of state educational institution's general education requirements to ensure transferability. In 2012, the Essential Learning Outcomes (LEAP) were written by Indiana Commisision of Higher Education (ICHE) (LEAP, 2012) with the collaboration of all universities in Indiana.

Public colleges/universities within the State of Indiana moved further and established a Core Transfer Library (CTL). Each course included in the CTL list should transfer to any public college or university in Indiana if an equivalent course exists and if the student has earned a "C" or above in the course. According to the Transfer Indiana Website (www.TransferIn.net), "all Core Transfer Library courses will meet the general education or free elective requirements of undergraduate degree programs, and a significant majority of CTL courses will also count as one on one equivalent to courses taught at any campus." This measure helps the students in Indiana and helped in their expenses since they not need repeat courses when they transfer.

The 2013 Indiana General Assembly set the standards for financial aid recipients, requiring the students to complete 30 credits per calendar year to stay eligible for the standard financial aid awards. ICHE was in charge of the coordination as will be explained ahead in this document.

6. INDIANA COMMISION OF HIGHER EDUCATION (ICHE)

The Indiana Commission of Higher Education (ICHE) was created in 1971 to define the educational mission in the public education system in Indiana. It consists of fourteen members: nine representing a Congressional District appointed by the Governor, three at-large members, and since 1990 the Indiana legislature added a student and a faculty who are appointed by the Governor. The Commission is a coordinating agency that works with Indiana's public and independent colleges to approve new programs. ICHE is under the umbrella of CHE or the national commission of higher education.

ICHE revised in 2010 the roles of regional campuses. The commission focused on degree completion rates for all students, but also included recommendations such as keeping affordable tuition rates; increasing collaboration with Ivy Tech; other regional campuses and flagship campuses; keeping the needs of local communities and economies in the forefront when planning for growth and focusing scholarly work on local and regional needs (PNC HLC self Study Report, 2010). To increase collaboration and course transferability, agreements between colleges were and are necessary. Agreements come after a serious study of course materials to guarantee students' success. It requires many changes or adjustments in courses. After a series of agreements between colleges, the common effort ended up in the Core Transferability Library explained before. It means that a government initiative ended in a better answer from the Indiana universities and colleges.

Knowing the big gap in Indiana between the number of graduates and non gradates (only one third of Indiana Hoosiers completed education beyond high school), ICHE in 2012, decided to increase the number of Hoosiers with education beyond high school and maximize Indiana's return on investment in higher education, approving to raise the state's maximum student financial aid awards for the first time in six years and promoting student success through state financial aid incentives. The big goal is that Indiana must increase the proportion of Hoosiers with a high quality degree to 60% by the year 2025. The name of this initiative is known as "Reaching Higher, Achieving More."

Some Goals of this initiative are that the State of Indiana invest more in higher education and promote students' success through financial aid incentives that reward college students for their performance and graduating on-time. To achieve this, colleges must control college cost, make smart choices mainly with advising practices and provide students with a clear map to graduate on-time and with minimum debt (ICHE, 2012).

In October 2013, ICHE published a Degree Map Guidance for Indiana Public Colleges and Universities. The degree maps must be provided to each new full-time undergraduate student attending a public institution in the year 2014-2015 (ICHE, 2013).

Alliances between colleges and high schools have being the way to increase students success and a way to increase the students' graduation rates and it impacts the programs too, as will be explain bellow

7. NATIONAL ALLIANCE OF CONCURRENT ENROLLMENT PARTNERSHIPS (NACEP)

The National Alliance of Concurrent Enrollment Partnerships (NACEP) works to ensure that college courses offered by high school teachers are as rigorous as those offered on college campus. As the sole accrediting body for concurrent enrollment partnerships, NACEP helps to ensure high standards so students experience a smooth transition to college. Additionally, teachers benefit from important professional development and at the same time, create an effective academic bridge between high school and college (NACEP, 2014).

Dual credit in the form of concurrent enrollment, began in Indiana over 30 years ago, and historically has been voluntary for high schools, higher education institutions, and high school students. Today, high schools in Indiana could partner with public or private institutions of higher education to offer concurrent enrollment courses in their schools (CEP, 2009). The CEP commission is the one in charge of the accreditation process and NACEP is supervised by the US Department of Education.

NACEP standards for quality programs were adopted for the first time in 2002 after two years of work. Through the years the alliance has been improving the accreditation's criteria. Accreditation is valid for seven years and institutions need to apply one year before expiration (NACEP, 2014). To maintain quality faculty from college oversee high schools dual credit classes.

8. GLOBALIZATION

Since globalization is a broad term that has been studied and incorporated in many of the organizations mentioned in this document, a special section will be dedicated here. Globalization is popular in many debates in the academic settings. ABET emphasize in its general criteria, subpart j: student outcomes must include, but are not limited to, the following learned capabilities… "Knowledge of the impact of engineering technology solutions in a societal and global context" (ETAC-ABET, 2014). For the specific field of construction, globalization means more opportunities and more competition, since it opens the whole world to more jobs and more projects and this competition affects not only the multi-million dollar corporations, but the middle and small size companies who need to be more efficient in order to compete with the global market.

The construction industry is one of the largest contributors to the world economy and one of the most impacted fields of the globalization. To compete or conduct business in the global market, it is fundamental to understand the social and ethical aspects of the intercultural relations of the international market. Communication is another critical aspect, since it is necessary to understand the market and its politics. Misunderstanding can result in delays and over-expenses for a project. Cultural beliefs or cultural differences could be another risk factor since they can end up in disputes that can reduce project's profitability. The educators must understand and determine the curriculum that best fits the needs of the future generation of construction engineers. Educators must understand the global perspective as well as their environment to apply it to the classroom.

Since the industry is going global, some accreditation agencies in the US for engineering and technology programs are moving global too. For example, ABET and the American Council for Construction Education (ACCE) are now accrediting programs outside the US. Additionally, some agencies that provide training, certification and exams for certified project managers and cost estimators are doing it globally. Examples include Project Management Institute (PMI, 2014) that provides Project Management Professional (PMP) credentials and offers the exam in 13 different languages. The PMP credentials have different variations like risk management

and scheduling. The American Society for Engineering Management (ASEM, 2014) is a society that speaks for the profession of engineering management across the world and creates the Engineering Manager Professional Certification (EMPC) after successfully completing the PEM exam. The American Association of Cost Estimators International (AACEI) is another non-profit association serving the total cost management community since 1956 with over 9,000 members world-wide from 87 countries. This organization has been certifying individuals since 1976 and offers the following certifications world-wide: Certified Cost Professional; Certified Cost Technician (CCT); Certified Estimating Professional (CEP); Certified Forensic Claims Consultant (CFCC); Earned Value Professional (EVP); Decision and Risk Management Professional (DRMP); Certified Scheduling Technician (CST); and Planning & Scheduling Professional (PSP). AACE's CCP, CCT, EVP, and PSP certifications are independently accredited by the Council of Engineering and Scientific Specialty Boards. As a faculty, is our responsibility to oversee these organizations and its requirements if we want our students succeed when applying for accreditation. Companies and organizations around the world encourage engineering managers in their countries to take the previous exams and get a certification to validate accquired knowledge.

9. UNIVERSITY REQUIREMENTS

Building a graphic for the University probably will be similar to the one in figure 1. University needs to comply with the Federal government, the state of Indiana, the North Central Association of Colleges and any other organization the university decided to be accredited by. All changes, accomplishments and accreditations are carried out because of the initiative of the university, or programs, or external forces, move us to work independently or in a collective way to get accreditation or fulfill requirements of the state.

The selection of the General Education classes for each program, was something that many faculty from the campus was involved with some years ago. Each program contributed with their own selection and the necessary outcomes. Then everything moved smoothly through a different committees until the faculty senate approved those for each program.

Statewide Transfer General Education Core of at least 30 credit hours was established with a similar procedure as well and were based upon a set of competencies in areas agreed upon by the state educational institutions. It was the base for the Core Transfer Library courses that universities in Indiana established. In a similar way, the Essential Learning Outcomes (LEAP) were written by Indiana Commission of Higher Education (ICHE) in 2012 with the collaboration of all universities in Indiana.

To be ready for fall 2013, a series of discussions took place inside and outside of the programs to get the engineering technology programs aligned with 120 credits that the state of Indiana ordered through the 1220 act in 2011. Adjustments of the program were discussed in different committees until the faculty senate approved those changes.

To make space for a reduction of 12 credits in the program, some topics were added in classes, some classes were eliminated from the program and new requirements in admission were necessary. Here is where for example MA 153 and MA154 became a prerequisite using the opportunity offered by the dual credit. It is a natural law, that a compression over an upper layer (College program) translate in a compression of a lower layer (High school). The dual credit brought new assignments for faculty. Classes accepted for concurrent enrollment are supervised by faculty; and high school teachers who taught those classes need to have the same requirements as the college instructors.

The state of Indiana, ICHE and colleges/universities of Indiana joined into a common effort "Reaching Higher, Achieving More", creating a path for success with "degree maps" and look for ways students can graduate with less debts finding ways to reduce or maintain students tuition flat. Some Indiana universities already decided to maintain college tuition frozen for the junior and senior years. Degree maps is some kind of contract between the student and the university to guarantee each student can take 30 credits per year during four consecutive years to

finish the degree on-time. This program is handled by the professors and advisors. To get the financial aid, students must fulfill the requirements from the degree map.

As a part of the effort of reducing cost too, the university is now merging two regional campuses, and both campuses need to agree about their future and finding ways to work together. It will involve everybody faculty and administrators.

As a part of the globalization, the university have signed many agreements with other universities and governments and opened some offices in other countries to exchange students and bring more students to us and at the same time bring us students to have international experiences in another countries. Budget was ready approved to help students doing this kind of experiences.

10. CONCLUSIONS

Faculty has to deal with assessments, adjustments in the program, advising with degree maps and monthly meetings with students, reports for accreditation or reaccreditation besides the academic load plus the university assignments. Is understandable that this heavy load prevent faculty for doing their job for what was hired: to attend the pillars of the program, the constituents: students and employers.

Due to these external forces driving and shaping the CEMT program the obtained shape is not what the faculty, students and employer's desire, and probably the result is not what the university is looking for. Programs can lose their identity because the resulting shape is more to satisfy the external pressure; of course the university is having the same problems and the bottom line is that the university needs to be accredited too. Now the question is: is it standardization? Or is it micro-management? Where is the place for the local needs? Are we having programs only to satisfy the agencies?

One tendency of the accreditation and regulating agencies is becoming more demanding in rules that unfortunately are mandatory; the result is that faculty is working in collecting data to fulfill the reports to present to them, with detriment of the time faculty need to spend with students. Do we need all those entities to regulate a program? Would be better to have one that groups everything with the advantage that programs have to deal with and becomes clear a sense for cooperation.

The other tendency is associated with the growing of these external agencies. Is it in benefit of the programs? or, is it a competition for power? The ideal would be that a central office would work better avoiding duplication of work and effort of the faculty.

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