Competencies of Construction Management Professionals in MEP Contracting Companies

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Abstract

Construction Management (CM) professionals play an imperative role in achieving projects' objectives in terms of completion within the set budget, planned time and specified quality standards. With the uniqueness of individual construction projects and the challenging environments construction managers work in, they need to possess the necessary competencies that will ensure their as well as their projects' success. Extensive research efforts have been carried to evaluate these competencies and how to gain them for the scope of general contractors. However, the specific competencies required for CM professionals for the Mechanical, Electrical, and Plumbing (MEP) area, being a very critical scope of any construction project, has not been given sufficient attention. This paper presents the framework for the research that the CM program in XYZ University is carrying to explore the required competencies for its graduates as demanded by the electrical and mechanical contractors. The investigation involves screening of the actual job description for specific designations within the construction management spectrum at the entry level aiming at drawing a comparison with the competencies that are currently enhanced by the program curriculum. The outcome of this comparison is a set of recommendations for potential changes to the program with the objective of bridging the gap between the competencies that represent actual market demand by MEP contractors in USA and what the program is currently offering as part of the continuous improvement process adopted by the program. These recommendations entail possibility of several options ranging from adding new courses to enhancing the currently covered subjects with specific materials relevant to the identified gaps.

Key Words: Construction Management – Competencies - Educational Programs – MEP Contractors

Introduction

Construction Management (CM) is an area where several disciplines overlap. These disciplines include, but not limited to, engineering, architecture, technology and management. The scope of this profession is defined in different ways depending on the perspective of the involved discipline; therefore, expectations from construction professionals vary across the market

(Clough, Sears & Sears 2000; Farrell & Gale, 2000). In all cases, the role of the construction management professionals within the industry is vital for the successful completion of projects. For the different types of projects, no matter the size of the project, there are a multitude of different factors that must be considered and planned for before any construction activity begins. The responsibilities for a construction professional are quite vast and he/she could probably be perceived as a symphony conductor who skillfully orchestrates the instruments of numerous individuals to play in perfect harmony (Diamant & Debo, 1988). On this line, Dainty, Cheng & Moore (2004) clarified that, in recent years, there has been a growing emphasis within research and practice on the need to develop and improve the performance of construction project managers in order to meet the increasing demands being placed on the industry by both its clients and governments, which are associated with the expectations from different perspectives. Accordingly, construction professionals strive to meticulously organize and plan each and every stage of construction and ensure that each project participant is completing the required task on schedule, within budget and according to the agreed quality standards. That is true whether they are pursuing new clients through estimating and bidding process, executing field operations, or controlling a project's time and cost (Riley, Holman & Messner, 2008).

One of the very critical trades within the construction industry is the Mechanical, Electrical and Plumbing (MEP) specialty. Although design of the MEP systems for construction projects is carried out by electrical and mechanical engineers, managing the delivery process of these specialty works starting from procurement or bidding process, through project control including scope, cost and time control to handover to clients are commonly managed by CM teams. MEP systems are known in the construction industry to be one of the most sophisticated systems among other building components since they involve technical details related to electrical and mechanical engineering areas. The technologies associated with these MEP details are evolving in a much faster pace than other project elements; therefore, coping up with such continuous technological advancements is a challenge on its own. Also, because most of the scope of building projects are non-MEP, majority of the CM professionals, who take care of the overall management of such construction projects are coming from civil or architectural disciplines. This leads, in many cases, to a situation where the construction project management team deals with high uncertainties or unknown areas, which fall within their control. This is observed in CM tasks related to MEP works including cost estimation, scheduling, and coordination of site activities, to name a few. Due to this, a percentage of the disputes and variation works that happen in construction projects are related to MEP systems and their integration with civil and architectural elements. Facing such a plethora of issues, training graduates in various topics within the construction industry, specifically the MEP specialty, competency performance based education can play a crucial role in preparing construction management graduates with the necessary tools to positively contribute to the industry upon graduation (Pellicer, Yepes & Ortega, 2012).

In order to qualify CM graduates for such challenging environment, understanding the key competencies required in the construction management profession is critical. As with any specialized field similar to MEP, it is extremely advantageous to start gaining the necessary skills and competencies through educational curricula. To achieve this, it is required to analyze and understand the competencies deemed valuable by the MEP contractors who seek eployment

of such graduates. There have been several research attempts to address competencies for construction companies, in general, through a multitude of different data collection techniques. For example, Bhattacharjee, Ghosh, Young-Corbett & Fiori (2013) evaluated the expected skills and knowledge gained by CM graduates from both the perspective of employers and students at the CM program of Ball State University. Also, Pellicer et al. (2012) proposed a method to plan, design, or improve graduate degree programs in the CM area based on selected requirements and market demands. This method involved two indices, the completeness and adequacy index. However, there is yet a need, as will be illustrated more in the literature review section to follow, for assessing special requirements for competencies in the specialized area of MEP works.

Research Background & Objectives

The construction management program in XYZ University, established in 2003, is in continuously striving for improvement. One of the main focal streams of the continuous improvement process in this program is to fully understand the requirements of the construction market and the needs of the companies who look for CM graduates. To assist in achieving this target, the CM faculty members are in ongoing dialogue with the program advisory board, which is comprised of the construction companies that sponsor some of the scholarship and educational programs in the aforementioned program. In 2013, this dialogue has led to the increase of the coursework related to the electrical and mechanical works from one combined course covering MEP systems to two mandatory courses, one for electrical constructions and another for mechanical construction. This change was also supported by the program's movement towards full compliance with the output-driven objectives of accreditation requirements issued by the American Council of Construction Educators (ACCE, 2014).

In light of this directive, as part of the continuous improvement process, the CM program is looking into enhancing the skills of the program graduates in relation to the very critical MEP specialty. Graduates from the CM program in XYZ University are tutored and coached through the 4-year plan to get ready for various CM entry positions, which include cost estimators, planners, schedulers, construction superintendent, contract administrator and Building Information Modeling BIM professionals, among others. General contractors whose management or human resource managers know the CM program in BSU increasingly show interest in engaging students in internships for potential hiring upon graduation. However, the program is also looking into creating more demand on these graduates from the specialty subcontractors with special focus on MEP contractors, being a very important player in any construction project. To achieve this objective, the program is currently seeking collection of more information on specific requirements by the MEP contractors in terms of knowledge and skills that qualify the graduates for mastering the competencies needed for success in these companies. A very relevant research work to this endeavor is the work of Benhart and Shaurtte (2014) who have explained the process used to obtain industry input in establishing undergraduate educational competencies for Purdue University and how these competencies were utilized to restructure the Building Construction Management curriculum. The conclusions for this study process included lessons learned in managing curriculum change that could prove beneficial for other CM programs evaluating their curriculum. However, this study covered

general construction arena, where the presented framework is planned to focus on MEP requirements.

The objective of this paper is to present the framework for the research endeavor aiming to survey the actual MEP market within the construction industry in USA and seek detailed information on the required competencies of CM graduates who will be serving in this critical specialty. This will be done through an extensive survey of the job descriptions of the designations in general contracting companies that are related to CM area and will be dealing with MEP works. These include, but not limited to, cost estimators, proposal engineers and managers, schedulers, contract administrators, cost engineers, project coordinators, project superintendents and project managers. The framework is explained in the following methodology section.

Proposed Methodology

In order to achieve the objectives of this research, several tasks are planned to be carried by the research team in the CM program of XYZ University.

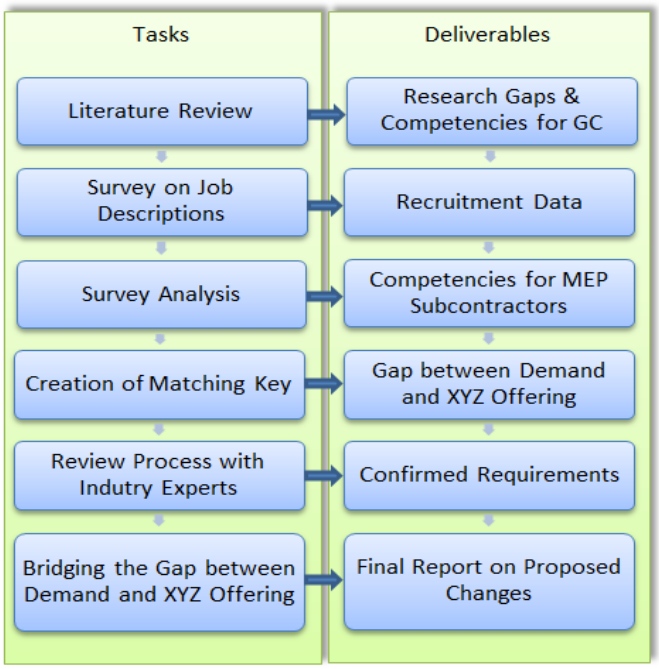

Figure1: Research Tasks and Deliverables

shows the planned tasks along with the deliverable from each task.

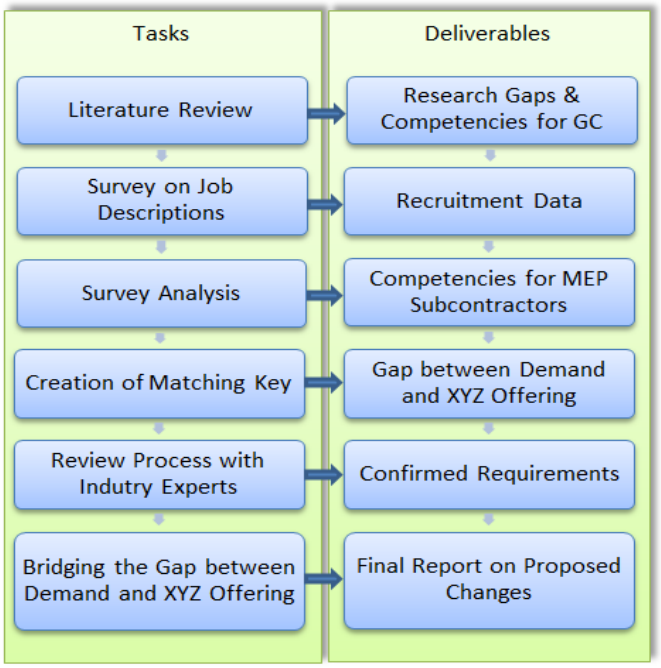

Figure1: Research Tasks and Deliverables

The first task is to conduct a comprehensive literature review of the research work done in this area. Several studies covered analysis of the market demand and competency requirements related to CM graduates in general. As an example, from industry perspective, Dainty et al. (2004) identified 12 core behavioral competencies that support effective construction project management performance. Among those, team-leadership and composure were identified as the most predictive for superior performance. Also, Slattery and Summer (2011) developed a study that provides an assessment of leadership characteristics of construction professionals who are viewed as rising stars within their respective organizations. Another study focused on the competencies required for construction superintendents according to companies' management including presidents, vise-presidents, project managers and the superintendents themselves (Gunderson & Glockner, 2011). One of the comprehensive efforts done in that regard is the study by Ahn, Annie, Kwon (2012) to examine U.S. construction industry perceptions regarding key competencies for construction graduates. The study used a survey of recruiters for over 100 construction companies in the eastern United States. In this study, the researchers obtained rating from recruiters in construction companies for 14 different competencies including problem-solving skills, interpersonal skills, leadership, adaptability, collaborative skills, safety issues, interdisciplinary application, technical skills, computer skills, estimating / scheduling skills, communication, and environmental awareness. However, as indicated in the introduction of this paper, research covering specific demand on competencies for MEP contractors seems to be a gap in literature. In this research, competencies targeted by general contractors are addressed in taken as a stepping stone for more focused research on the requirements for MEP specialty.

The second task planned in this research is to reach out for MEP contractors and survey their actual competencies requirements related to CM graduates at the entry level. For the purpose of this research, entry level here is defined as zero to three years of experience. The reason for this

specifying this range is that companies' expectations change with the years of experience. Also, entry level is the level at which fresh graduates from the construction management program in XYZ University are expected to be at. Some of the students do have one or two years of industry experience that they gain before or during their study at the program, which is a clear advantage. Therefore, the range of zero to three years of experience is reasonable for assessing competencies for the purpose of this research. On this line, Rojas (2013) has analyzed, through focus group discussions and interviews, 12 beneficial characteristics of construction project managers in electrical companies. However, this is very limited to electrical companies and two specific roles within the CM arena. This second task of the planned research work entails collection of the actual job descriptions that electrical and mechanical companies have for selected designations that the CM program qualifies its students for. These designations are:

1. Cost Estimator
2. Planner/Schedule
3. BIM Professional
4. Assistant Project Engineer
5. Construction Superintendent

These designations were selected as a start to explore the area of specific requirements for competencies for MEP specialty. Other possible jobs are planned to be investigated in later phases of the continuous improvement process by CM program. Job descriptions for these designations are planned to be collected from human resource departments within the target MEP companies, where detailed job descriptions can be found. Another viable source is the advertisement to fill vacancies that are circulated in public media or within professional networks. The methodology of data collection entails direct contact with the human resource departments in the MEP companies to request access to the required job description in companies' manuals. Data collection also entails surveys of companies' websites in addition to recruitment websites searching for advertisement to fill vacancies related to the subject designations.

The third task in this research is to analyze the data collected. This includes qualitative analysis to identify the competencies targeted. In this context, a competency is defined as what a person can do well and that meets and even exceeds his or her job requirements (Badger, Bonanno, Sullivan, Wiezel, & Bopp, 2008). More accurately, competencies are referred to as the performance components of an objective (Rothwell & Kazanas, 2011). It is worthwhile noting that preliminary survey of examples of data targeted shows that some job descriptions or recruitment advertisements do not necessarily focus on competencies. They rather focus on tasks to be performed by the prospect new employee or some general expectations related to reporting and target achievements, which eventually translate to competencies. Therefore, the qualitative analysis here aims at extracting the explicit competencies stated in the data collected and also to develop a tool for semantic analysis of the text in the job descriptions that would help in consistent identification of the implicit competencies. This phase of research also includes statistical analysis to explore the repetition of certain competencies for the different designations and therefore highlight the most common ones and whether there are any correlations between specific attributes of the companies in terms of scope, turnover, region or others with the targeted competencies. This type of analysis can assist in exploring the parameters affecting targeting

specific competencies and the significance level of the impact that such parameter may have on selecting specific competencies.

The fourth task in the proposed research methodology is to create a matching key between the competencies identified as most relevant/targeted and what the CM program in XYZ University offers for the students. Each mandatory course will be surveyed to identify the competencies it serves and to what degree. Ranking of 1 to 10 will be assigned to each competency targeted in a course and this ranking will be assigned by the instructor responsible for that course. The output of this task is expected to be in the form of a matrix where the competencies are checked against all courses and the perceived competency level in each course is recorded. The level of competency here is reflecting the judgment of the instructor based on how far the covered materials and practices serve these competencies. From a practical perspective, this level will vary across individual graduates who have different performance and reception of the course content. Therefore, a probable further investigation can lead to endeavors of relating the actual assessment of students' capabilities with the level of competencies instead of relying on the instructor's judgment.

Upon completion of this matching matrix of competencies that highlight levels of competencies as introduced and enhanced by the CM program in relation to the required competencies by the MEP contractors, a review process will be initiated. The relevant members of the advisory board who represent MEP contractors in addition to external industry experts will be invited for a workshop where the results of the previous four research tasks are going to be presented to the industry experts for review purposes. The objective of this task is to scrutinize the findings prior to proposing any changes to the CM program.

The sixth and last step in this proposed research work is to develop recommendations for changes in the CM program as part of the continuous improvement process based on the findings of the results. The recommendation will be basically translation of the identified gaps, between the required competencies of CM graduates going for MEP careers at the entry level and what the CM program in XYZ University offers, into specific actions at two levels. The first level will be the level of courses and the second will be the level of the full program. At the level of individual courses, the corrective actions will basically target increasing the perceived ranking of the targeted competencies while at the program level, corrective actions could possible extend to changing scopes of courses or adding courses whether as mandatory or elective.

Discussion & Conclusion

Results of the first task in the proposed research work, literature review, reveals that there is well-developed research on competencies required for CM graduates in the general contracting field. However, there is an evident gap in addressing evaluation of the specific competencies targeted by MEP contractors at the entry level. The special nature of MEP works makes it a specialty with more challenging demand on relevant skills and knowledge that can assist contractors in achieving their objectives related to success of projects and increasing market shares. Therefore, the proposed research work, in essence, enhances the abilities of the CM program in XYZ to meet such specific demand of these MEP contractors.

The objective of this paper is to present the framework of the proposed research methodology planned for addressing the identified gap and to present highlights of the work done for the first task. The results are expected to be of interest to both the CM program in XYZ along with any equivalent program that would like to make use of the publishable research and also to the MEP contracting companies. For the CM program, results will lead to possible recommendation that would assist in the continuous improvement process. For the MEP contractors, results can be beneficial in improving the job description to encompass the most relevant and targeted competencies. The results will also be a catalyst for continuous dialogue between academia and industry in terms of the expectations of the latter and how academic programs can participate in educating contractors on how to be consistent and focused in the recruitment process. Future work is basically carrying out tasks two through six and eventually disseminating results to both the academic and industry circles.

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