

Employers' Perception of Student Employability in the Construction Management Industry using Resume Analysis and Analytic Hierarchy Process

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Abstract

In recent years, there has been a significant increase in college-level programs offering degrees in Construction Management (CM) and related fields. Most of these programs graduate students who aim to start their careers in management positions that typically require years of previous experience. Many students pursue a bachelor's degree in these programs to acquire knowledge and skills that lead to attractive management-level employment opportunities post-graduation in various construction industry sectors. In most cases, a résumé is submitted as the first step toward gaining employment when students begin their job search in the industry. This study presents the results of a qualitative content analysis of 204 student résumés collected from the Associated Schools of Construction (ASC) Region 1 student competition and identifies seven of the most common categories listed in the résumés. These seven categories were presented to 30 different CM employers using a survey asking them how important each category is as a criterion in their initial candidate screening process. Using Analytic Hierarchy Process (AHP), the compiled weights of all employers surveyed were developed, indicating that employers care most about an applicant's previous industry experience. Students' leadership experience and formal vocational training were also perceived as important, while their grade point average (GPA) and involvement with extra-curricular activities were listed as the least important. Results also show that recruiter demographics can correlate with the perceived importance of specific categories. For example, male recruiters put less importance on the industry experience of college seniors and more on their leadership experience compared to female recruiters who value industry experience significantly more when reviewing the same applicants' résumés. This study is significant as it illustrates that using employers' insights on the information typically included on student résumés, a ranking system can be developed to assist students in strengthening their résumés. Such information will help students and institutions determine the skills and experiences to highlight to increase employability upon graduation. Furthermore, the construction industry can use these types of studies to better understand what they are truly searching for in job candidates and bring more awareness of potential biases in the recruitment process.

Keywords: Employability, Résumé Criteria, Students, Employers, AHP

Introduction

Construction managers are responsible for managing a wide range of aspects of projects, including the budget, schedule, quality, safety, and sustainability, while ensuring that all contractual obligations are satisfied. Most graduating Construction Management (CM) students aim to secure industry positions that typically require years of industry experience. CM higher education programs primarily focus on providing education and training in a number of core skills needed for the CM industry. Although the construction industry has a reputation for being hesitant to change, with the adoption of new technologies, requisite technical and technological skills are expected from students in this field. Some of the other skills required for construction managers include analytical, business management, communication, decision-making, and

leadership [1]. Construction managers also must be adequately trained to respond to evolving owner/client wants and needs. Furthermore, certifications are becoming more popular among those who need additional proof of qualification to manage specific aspects of construction projects effectively.

With all the path and concentration possibilities for students in a 4-year higher education program, the exact requirements for a construction manager are unclear, leaving students wondering about factors that would make them competitive candidates. A résumé is a key tool used in the job search process. A few studies in the construction industry identified what an employer seeks in a job candidate. Still, there are no frameworks to evaluate a student's accomplishments other than the opinions of career centers or their professors. It would be beneficial to involve employers in creating a system that assists students in the job application processes. Employers can provide input on the recommendations for a résumé so that a ranking system can be developed to assist students in strengthening their candidacy for CM roles. Also, there are inadequate studies in current literature investigating the true weights of résumé criteria suggested by industry professionals for CM graduates. Although similar research has been done for business disciplines to identify the weight of importance of résumé characteristics and criteria [2], no such research has been done specifically for the CM discipline.

This research aims to develop weighted scores to assess the impact of a student's performance and involvement in various higher education activities on their post-graduation employment opportunities. The weighted scores will help the typical CM students build their résumés and forecast how employers view them as potential candidates. In addition, this study identifies trends within the construction industry regarding employer demographics relating to different aspects of CM education. This study continues with a review of the literature, followed by the methodology, the findings and discussion, and the conclusion.

Background

Construction management education

Construction involves actions undertaken by construction companies that produce or alter buildings and infrastructure [3]. The profession of CM may have only arrived in the mid-twentieth century [3], but the job outlook still shows a faster than average increase of 11% [1]. Entry into the CM profession typically requires a bachelor's degree in a related field [4]. A CM program is defined by the National Center for Education Statistics (NCES) as, "A program that prepares individuals to manage, coordinate, and supervise the construction process from concept development through project completion on timely and economic bases" [5]. Accreditation is a review process to determine if education programs meet defined standards of quality [6]. It also assures employers that students graduating from these programs are well equipped for a job in the construction industry [7]. Two major bodies that provide accreditation for CM-based education include the Accreditation Board for Engineering and Technology (ABET) and the American Council for Construction Education (ACCE).

Employability

Employability is a conceptualized form of work-specific, active adaptability that enables workers to identify and realize career opportunities [8]. Some argue that employability is not completely self-driven but a composition of individual and external acting forces. Regarding higher education, some speculate that employability is also affected by the institution's brand and reputation in which they have received their education [9] [10]. Other research indicates that it does not necessarily matter where one attended college, but employability is more dependent on performance and activities within the university [11]. In a university, individual attributes that can be changed include participation in extra-curricular activities, performance in the classroom reflected by GPA, software skills, work experience, and other responsibilities outside the curriculum [12]. Pinto & Ramalheira [12] focused on the perceived employability of graduates based on academic performance and extra-curricular activities and found that employers perceived individuals with a high GPA to have better learning skills, although they had lower job suitability than graduates with high extra-curricular involvement but a low GPA [12]. The results also showed that a combination of high GPAs and extra-curricular participation leads to the highest employability mean score representing better job suitability, personal organization, time management skills, and learning skills. Résumés are an essential component in the job application process, as the typical job application process begins with an organization reviewing the applicant's paper credentials before an invitation to interview [13]. Based on résumé reviews, the individual who initially reviews an applicant's résumé acts as the gatekeeper deciding which applicants gain further consideration [14]. Employability can be perceived as an aggregate multidimensional construct (MDC). In other words, employability is caused by a summation of factors that make up an individual, broken down into three dimensions: *career identity*, *personal adaptability*, and *social and human capital* [8].

Career identity provides a coherent representation of a person's career experiences and aspirations [8]. In terms of a résumé, it is a summary of previous jobs and the roles held and experiences in those positions. Career identity may include goals, personality traits (leadership), and interaction styles (communication) [8]. Student involvement in activities like sports and taking up leadership positions in student government has shown a significant increase in perceived communication and leadership skills amongst recent graduates [11]. Therefore, leadership experience, industry experience, non-industry experience, and vocational experience were used in this study as variables assessed on résumés.

Personal adaptability is the ability to change to meet the demands of the situation [8]. The ability to adapt to changing conditions is primarily determined by individual differences [15]. Five individual differences that apply to personal adaptability include optimism, propensity to learn, openness, internal locus of control, and generalized self-efficacy [8]. High GPAs and high participation in extra-curricular activities (ECAs) have been shown to increase job suitability and learning skills, personal organization, and time management. Therefore, GPA and ECAs correlate with personal adaptability affecting employability and are also included as variables in this study.

Social capital is the goodwill created from participating in a social network, while human capital is the compilation of factors that influence a person's career advancement variables like work experience, skills, and education. Some of these factors strongly correlate with career identity,

further reinforcing the principle of employability as an MDC [8]. The aspect of professionalism that Murdoch and Hughes [16] suggest includes social capital and a graduate's ability to express themselves as a CM professional given the right traits. These traits could be acquired through participation in social networks, gaining certifications from professional organizations, and voluntary service to the community. Another view presented by Sears et al. [17] is that construction project managers must have four essential attributes:

- Considerable background of practical construction experience
- Expertise and experience in the application of specialized management techniques
- Capacity to step back from complex details of daily operations and investigate the future
- Personality and insight to work harmoniously with other people

This study encompasses aspects of social and human capital and how they are expected in the CM profession [17]. Scheduling, estimating, and planning are learned in a CM program and are included in the requirements of both the ABET [6] and ACCE [7] accreditation credentials for developing software skills. In recent years, the landscape of software used to manage projects has changed, and the integration of Building Information Modeling (BIM) has offered a new way to help plan and manage projects [18]. The Smart Market Report shows that over 70% of North American contractors have adopted some aspect of BIM for their projects [19]. With social and human capital being a dimension of employability, the variables software skills, BIM skills, certifications (OSHA and others), and community service were also included in this research.

Predictive studies

Extensive work has been done to track recruiters' inferences during résumé screening. Research looking at new graduates' résumés revealed that recruiters generally agree on the extent to which résumé content items (i.e., work experience and ECAs) are present and that the level of academic achievement reported on a résumé leads to a positive perception of the applicants' mental ability and conscientiousness [20]. Research shows that involvement in many ECAs, leadership roles, and participation in relevant ECAs lead to higher overall ratings on résumés [21]. Résumé structure has been used to predict if an individual is invited for an interview. Also, a résumé that is over one page may indicate to recruiters an applicant's inability to eliminate unnecessary information [22]. Employers were surveyed to determine the essential traits for new physical therapy graduates to be hired after attending university. They determined that the most important traits were effective written and verbal communication skills and good time management skills [23]. Little work has been done to create weighted variables that could be used for résumé grading and no work has been done specifically for CM positions.

Effects of recruiter demographics

There is limited research on how a recruiter's personal, professional, and organizational demographics affect their selection of a candidate. Current research mostly looked into the relationship between the interviewer's and the applicants' genders and found that gender biases may occur during organizational recruitment and selection. Furthermore, they identified that men often rated females as having higher extra-curricular involvement while females rated males as having a higher level of work experience than the other gender's assessment of the résumés [24]. Given the current literature on the effects of recruiter demographics in candidate evaluation, this

study also explores the effects of recruiter demographics on their preferences of the résumé criteria.

Methodology

This research aimed to find the importance weights of the common criteria that employers could assess on a recent graduate's résumé. The Analytic Hierarchy Process (AHP) was the primary tool used to generate the weights for the criteria of CM résumés. The following steps were implemented using the AHP method, as explained by [24].

Step 1: Perform an extensive literature review on factors affecting CM graduates' employability.

Step 2: Determine résumé criteria commonly found on CM student résumés and the relevant literature

Step 3: Design and distribute a survey to determine the weights of criteria based on employers' preferences

Step 4: Calculate the weights of each criterion identified in steps 2 and 3 based on employer preferences collected from Step 4 using the AHP methodology.

Step 1: Perform an extensive literature review on factors affecting CM graduates' employability

An extensive literature review was performed to verify common criteria found in résumés that can affect a graduate's employability. The information was collected from peer-reviewed studies. This step required reviewing literature associated with majors that are not just in the construction field but also in business and science. Subsequently, a list was created to check against the résumés collected to explore the criteria represented and any criteria specific to CM.

Step 2: Determine résumé criteria commonly found on CM student résumés and the relevant literature

Since no list of common criteria for CM graduates had been developed, the first step was to identify common elements in a typical recent CM graduate's résumé across multiple institutions. Student résumés were obtained from the 2017 Associated Schools of Construction (ASC) region one undergraduate competition, including 204 student résumés from student teams competing in four different competition categories (heavy-civil, commercial, design-build, and pre-construction). There were eleven participating schools. As a requirement to compete, each participating student was required to submit a résumé to present to the judges and companies at the job fair during the weekend of the competition. Any school in the northeast can compete in the region one competition as long as they have a construction-specific curriculum in a CM or related field.

Following the review of all 204 résumés of participating students, 14 résumé criteria were common amongst most participants. They include OSHA certifications (10 and 30-hour), sports participation, GPA, professional certifications, BIM application skills, leadership experience, project management software skills, community service, vocational experience, extra-curricular activities (ECAs), industry experience, non-industry experience, and multi-lingual ability. These criteria were represented in most of the résumés submitted to the competition.

Step 3: Generate survey to determine weights of criteria based on employers' preferences

To determine the criteria weights, a survey was developed using the AHP methodology. This process weighed each criterion against one another to determine the significance of each criterion as indicated by each subject taking the survey. The survey also included demographic questions related to the subjects' gender, job position, years of experience, company office location, and influence over the hiring process of new graduates. Finally, each criterion was judged against one another in pairwise comparisons with nine options (Figure 1).



Figure 1. Sample pairwise comparison of criteria

If subjects select a bubble on the matrix closer to one criterion rather than the other, it indicates a preference over the other criterion. The center bubble between the two criteria represented no preference. In order to maximize the effectiveness of the AHP process, the number of criteria was narrowed down to only seven by combining BIM application skills and project management software skills into software skills, combining certifications and both 30- and 10-hour OSHA certifications into professional certifications; combining sports involvement and ECAs to only ECAs, and eliminating community service, multi-lingual, and non-industry experience due to lack of literature supporting their significance. The included résumé criteria are GPA, industry experience, vocational experience, leadership experience, professional certifications, ECAS, and software skills. The survey was sent to participants through an anonymous link via email, LinkedIn, and QR codes.

Step 4: Calculate weights of each criterion based on employer preferences

After collecting survey responses, the next step was to calculate the weights for each criterion using the AHP methodology. By gathering the responses of the pairwise comparison and applying the significance of each response (Figure 2), tables (e.g., Table 1) were generated using Microsoft Office Excel (MS Excel). The advantage of MS Excel compared to AHP software is the flexibility, availability, and cost-efficiency. A disadvantage is the requirement to calculate the weights of every single subject individually.

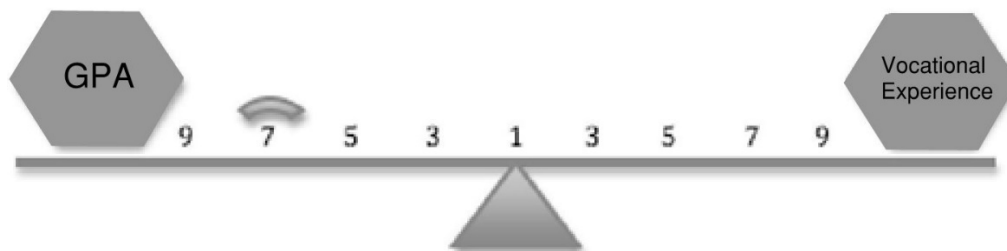


Figure 2: Significance assigned to point selected in pairwise comparison (Adapted from [25])

Once each subject's criteria matrix was set up, the comparison data received was entered into the appropriate column. For example, if the response given in Figure 2 shows the data in Table 1,

when “GPA” receives a score of 7 when compared to “Software skills,” then “Software skills” automatically receives the reciprocal score of 1/7. The total number of comparisons that need to be completed can be calculated as $\frac{1}{2} n(n-1)$, where n represents the number of criteria. After comparing the criteria, the data were normalized and used to develop the final criteria weights presented in the “Findings and Discussion” section.

Table 1. Criteria matrix for participant responses

1	GPA	Software Skills	Vocational Experience	Industry Experience	Professional Certification	Leadership Experience	ECAS
GPA	1.00	7.00	1.00	1.00	5.00	0.20	0.20
Software Skills	0.14	1.00	0.20	0.20	0.20	0.14	0.20
Vocational Experience	1.00	5.00	1.00	0.20	0.14	0.20	0.20
Industry Experience	1.00	5.00	5.00	1.00	0.20	5.00	0.20
Professional Certification	0.20	5.00	7.00	5.00	1.00	0.20	5.00
Leadership Experience	5.00	7.00	5.00	0.20	5.00	1.00	1.00
ECAS	5.00	5.00	5.00	5.00	0.20	1.00	1.00

Findings and discussion

Thirty-six survey responses (n=36) were collected and six were removed because they were incomplete. The survey subjects included 24 males and 6 females. Sixty percent (60%) of them worked in the commercial construction sector, and forty percent (40%) mainly worked in heavy civil construction. Survey subjects held all positions between CEOs with 40+ years of experience and project engineers with only a few years of experience. The median experience of the survey subjects was 11.5 years, with a mean of 17.03 years. Fifteen of the 30 subjects consider themselves highly influential in the hiring process of new candidates, with either 4 (17%) or 5 (33%) on the hiring influence scale (out of 5). Only 10% indicated that they had no influence in the hiring process. Most subjects worked in the northeast, with a few from other states like Virginia and Hawaii.

The final weights for the 30 survey responses were compiled into Table 2. The final weights reveal that industry experience was the most important criterion with a weight of 28.05%. Overall, experience of any kind, including vocational, leadership, and industry, was the most important in a new candidate to the survey subjects.

Table 2. Final weights of résumé criteria

Criteria	Industry experience	Leadership experience	Vocational experience	Software skills	Professional certification	GPA	ECAs
Final weights	28.05%	21.28%	16.06%	11.79%	8.59%	7.13%	7.09%
Rank	1	2	3	4	5	6	7

Using IBM SPSS statistics, the individual weights of responses were compared to demographic data to identify correlations in participants' preferences of the résumé criteria using data developed from the survey responses. Independent samples T-tests were conducted to compare résumé criteria weights based on gender, sector of construction, number of employees at the company, positions held, years of experience, office location, and hiring influence. The independent sample T-tests indicated significant differences in all demographic factors except office location and construction sector. In determining significant differences among the perceptions of the survey participants, the authors used a 90% confidence interval due to a relatively small sample size. There was a significant difference in the weights males recorded for industry experience ($M=26.39$, $SD=10.90$) and weights recorded for females ($M=34.69$, $SD=8.39$); $t(28)=-1.732$, $p = .094$. There was a significant difference in the weights males recorded for leadership experience ($M=23.56$, $SD=12.36$) and weights recorded for females ($M=12.15$, $SD=5.59$); $t(18.661)= 2.182$, $p = .003$. When comparing companies of greater than 1,000 employees to companies with less than 1,000 employees, there was a significant difference in the weights companies with a 1,000+ employees recorded for software skills ($M=9.43$, $SD=5.99$), vocational experience ($M=13.47$, $SD=5.8$), and leadership experience ($M=25.40$, $SD=13.04$) and weights recorded for companies with less than 1,000 employees for software skills ($M=14.49$, $SD=7.43$); $t(28)= -2.064$, $p = .048$, vocational experience ($M=19.01$, $SD=10.53$); $t(19.662)= -1.749$, $p=.096$, and leadership experience ($M=16.57$, $SD=9.46$); $t(28)= 2.095$, $p = .045$.

Two groups were formed to compare résumé criteria weights for construction operations positions and human resources positions based on the positions held. There was a significant difference in the weights construction operations employees recorded for industry experience ($M=26.39$, $SD=10.87$) and leadership experience ($M=22.93$, $SD=12.97$) and weights recorded for human resources employees for industry experience ($M=34.69$, $SD=8.57$); $t(28)= -1.730$, $p=.095$ and leadership experience ($M=14.69$, $SD=4.47$); $t(24.568)= 2.562$, $p=.017$. Years of experience was used when comparing criteria weights by splitting the criteria into two categories of greater than 11 years of experience and less than 11 years of experience, based on the median years of experience amongst survey subjects. There was a significant difference in the weights of subjects with less than 11 years of experience recorded for industry experience ($M=33.42$, $SD=8.38$) and leadership experience ($M=17.39$, $SD=9.09$) and weights recorded for subjects with more than 11 years of experience for industry experience ($M=22.69$, $SD=10.59$); $t(28)= 3.078$, $p=.005$ and leadership experience ($M=25.16$, $SD=13.85$); $t(28)= -1.816$, $p=.080$.

Hiring influence was weighted for subjects on a scale of 0-5, with 5 being the greatest influence. Subjects were broken into two groups, high influence (either a 4 or 5) and low influence (less than 4), and compared for differences in résumé criteria weights. There was a significant

difference in the weights subjects with a high influence recorded for professional certifications ($M=6.55$, $SD=4.47$) and weights recorded for subjects with low influence ($M=10.64$, $SD=7.20$) conditions; $t(23.391)=-1.867$, $p=.075$. A Pearson product-moment correlation coefficient was computed to assess the relationship between the weights of résumé criteria against one another in an individual's recorded survey response. There was a strong, negative correlation between the two criteria software skills and ECAS [$r = -.468$, $n = 30$, $p = .009$] and industry experience and leadership experience [$r = -.585$, $n = 30$, $p = .001$] along with a negative correlation between the two criteria professional certifications and vocational experience [$r = -.434$, $n = 30$, $p = .016$].

Conclusions and recommendations

The results show that in an experience-driven field like CM, less weight is placed on an applicant's academic performance while greater weight is placed on their experience. The weights also reveal the benefit of students having some vocational experience to support their career advancement. Some functional knowledge of the workers' tasks on-site may prove valuable to enhance their ability to become effective construction managers. Regarding gender, it is shown that males tend to care less about the industry experience of an applicant and more about leadership experience than females reviewing the same applicant. Larger companies with over 1,000 employees put greater weight on leadership experience and care less about an applicant's software skills and vocational experience when compared to a smaller company with less than 1,000 employees. Individuals holding a construction operations position put a lower weight on industry experience and a higher weight on leadership experience than human resources employees reviewing the same applicant.

This study recommends that further research utilizing criteria weights identified in this study are used to rate and rank real-world résumés. Such ratings can be used to develop research to test the validity of the weights by comparing industry professionals' résumé ratings to the résumé ratings developed strictly using the criteria weights. It is still possible that when faced with a résumé with an impressive amount of academic accomplishments, they may overlook how much they value the industry experience they claim to be the driving factor in the hiring process. It may prove valuable to put employers to the test and see if they hold true to their positions on experience being the driving force behind a new graduate's employability. Further research can also investigate the qualitative differences in industry experience. It is possible that if a student possesses industry experience from a particular firm or larger company, their experience may be more valuable to employers than another student with experience from a small firm. Along with industry experience being the most valuable, there may be a critical point where a GPA is so low for an applicant that even with an impressive amount of industry and leadership experience, they will not be selected for an interview by the company. Lastly, it would be beneficial to conduct research that identifies the mitigating factors for students who do not have leadership or industry experience but are seeking post-graduation employment.

This study is significant as it illustrates that using employers' insights on the information typically included on student résumés, a ranking system can be developed to assist students in strengthening their résumés. Such information will help students and institutions determine which skills and experiences to highlight to increase employability upon graduation. Furthermore, the construction industry can use studies like this to better understand what they are

truly searching for in job candidates and bring more awareness of potential biases in their recruitment process. With respect to the demographics, students can tailor their résumé to the recruiter or company reviewing it. Universities may use this study to better advise students on opportunities to increase their post-graduate employability. Finally, the construction industry can better understand what they are truly searching for in job candidates and be more aware of the possible biases in the recruitment process.

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