

Construction Management Students using Technology in the Field

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This research paper examines the affect technology has had on the desire for college graduates to pursue a career in the field. The idea of college graduates entering directly into a field leadership position was contemplated and discussed. Historically, soft skills such as leadership and communication have been the predominate attributes of any worker expected to run construction in the field. While the importance of these skills hasn't changed, the importance of technological skills has increased to be considered alongside soft skills. Through an anonymous survey of industry professionals with 10+ years of experience as well as interviews of two lifelong builders, it was determined that rapidly evolving construction software continues to play an increasingly vital role in the construction process. Knowing how to use these programs to create schedules, manage people and materials, predict costs, and create models has become a mandatory part of a resume in construction. This dynamic balance between the people skills and technological skills required for effective management in the field demonstrates the complexity of the construction industry. A majority of respondents agreed that the need for technological skills will continue to increase as jobsites transition to progressively include the latest technology.

Key Words: Management, Communication, Leadership, Software, Productivity

Introduction

Most field personnel work their way up to their position, while college graduates usually take a role in the office as management. Soft skills are a common topic when discussing or prioritizing traits of an effective construction superintendent or field engineer, along with experience and leadership. Even so, with the increasing prevalence of construction software on site, as well as that software's increasing complexity and abilities, college graduates are mastering more technological skills that are becoming required of field personnel. Paperwork is a large part of any construction project from submittals to RFI's, schedules, and even formal emails. A multitude of software programs such as Procore, PlanGrid, and even Microsoft Excel have been designed to decrease paperwork and increase efficiency, as well as reduce costs and improve safety. With hundreds of different construction management software programs available and many more constantly being created or improved, this paper aims to examine the effect that this technology has had on the desire for college educated field

personnel over the last 20 years. Through a survey and interviews with industry professionals, the idea of college graduates entering directly into a field leadership position was examined.

Literature Review

There have been several studies focused on which skills are the most vital to being beneficial and worthwhile in the field on a construction project. Due to the nature of field positions in the construction industry, soft skills such as leadership, teamwork, and time management are commonly considered some of the important qualities of an effective superintendent or field engineer. A national study conducted by a professor at Washington State found that “11 out of the top 20 ranked competencies and attributes can be considered people skills.” (Gunderson and Gloeckner, 2011, p.8). There is no doubt that these soft skills are still imperative to effective management. Another more recent survey conducted by a Cal Poly student concluded that the four skills students need to work on to become effective superintendents are trade processes, value engineering, leadership, and quality assurance (Armando, 2021). While value engineering and quality assurance have loose connections to technology such as centralized software being utilized to share daily pictures and waste being reused on various jobsites, understanding the trades and leadership are both soft skills more than technical knowledge. However, in an era of rapidly changing digital technologies, soft skills may not be an adequate skill set on their own. As pointed out in an article about emerging technology in construction, “Technology has simplified the construction process, but this technology has not yet achieved the productivity gains possible because of the lack of integration between applications.” (Holt, Benham, and Bigelow, 2015). In other words, the technology is there, construction professionals just need to learn how to better utilize these new digital tools.

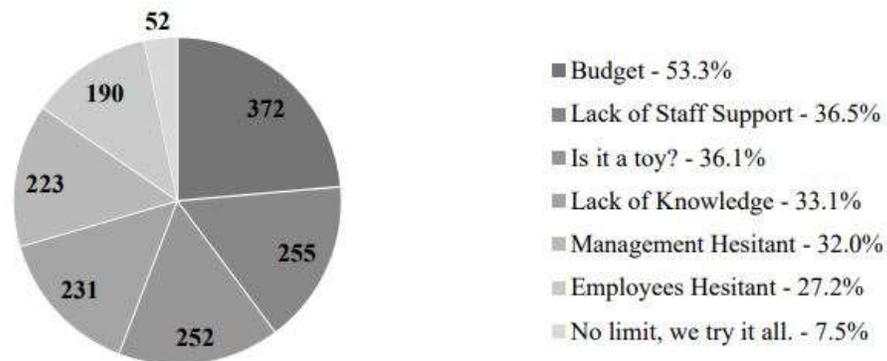


Figure 1: Software Adoption Limiting Factors (Holt, E. A., & Benham, J. M., & Bigelow, B. F. (2015, June))

A civil engineering paper points out that while BIM has had a significant impact on the design process, it is rarely effectively applied during the construction phase (Zhenbao, 2019). The author explains that part of the reason for this may be that many field personnel, while possessing great people skills, lack the necessary knowledge in technology to successfully implement it on a job site. This Civil Engineering paper also discusses the variety of implementation options such as smarter human resource management, machinery and resource allocation, supervision of materials, site access, quality control, safety and other important information (Zhenbao 2019). Not to mention, the decision-making can be remote yet still based on live updates which can improve both productivity and efficiency. On the subject of live updates, centralized communication software programs such as

Procore has the ability to fix another less discussed problem with field management and construction in general: lack of trust. Too often in this industry it's about what people can prove as opposed to what is just. "As an industry, construction has suffered a lack of trust from the public for decades. In a survey by the Construction Management Association of America (Doran, 2004), 63% of respondents answered affirmatively when asked if the construction industry is tainted by prevalent acts that are considered unethical." (Broughton, et. Al., 2016, p.1). Using programs that keep all parties involved and honest is one way technological skills have a chance to change this negative connotation around the industry. Overall, while soft skills have always been and most likely will always be an important part of a successful superintendent or field engineer, the rapid progression and implementation of technology such as construction management software on and around the job site calls for a new set of technological skills to be required for effective field personnel and more successful jobs.

Methodology

The methodology used for this paper was basic research using an anonymous survey sent out to industry personnel with 10+ years of experience in this field as well as two non-structured interviews. The survey contained seven short answer questions. The short answer/text boxes were used to reduce any limitations in the respondents' answers. The survey audience of 10+ years in the industry is ideal due to the astonishingly quick progression of technology over that time. The data received from the survey was a mix of quantitative that was used to describe the respondent's company as well as qualitative to gather general knowledge about the subject of technology and college graduates in the field. The non-structured interviews were also used to gather more qualitative data. The interviews were conducted face to face on two job sites. The interviews worked much better without structure, seemingly because the respondents were much more relaxed and open with their opinions.

Survey Questions

- 1) What type of construction does your company perform?
- 2) How large is your company? (estimated # employees)
- 3) What field positions does your company currently include for management?
- 4) What construction software does your company use?
- 5) Does your company hire college graduates for field positions? Why/why not?
- 6) Do you predict skills such as construction software experience will become a more vital part of a resume in construction?
- 7) In what specific area(s) can college students improve their technological skills for use in the workplace? (Name and/or style of software)

Interview Questions

What do you think about a college graduate going into a superintendent role?

Do you think technology has or will have an effect on that?

Results

The results were varied slightly from one respondent to the next. In total there were twelve responses to the survey and two interviews were conducted. The survey respondents included the following type of construction companies:

Heavy Civil (2/12), Commercial (6/12), Structural and Architectural Concrete (1/12), Pharmaceutical (1/12), and Residential (2/12).

The two interviewees were in their mid 50's and have been in the industry their entire careers. Jack is a retired commercial and residential superintendent while Jim is a carpenter/head framer with a custom home builder.

Head Framer – “The right people can be superintendents whether they go to school or not. I’m just an Indian not a chief”. “Technology may change the way people get the job but most of the skills needed every day on the jobsite will stay the same. Experience and an ability to overcome language barriers will always be vital.”

Retired construction management – “With the right amount of motivation and experience college graduates make impressive supers. At the end of the day anyone can gain valuable experience and practice technical skills but they have to be able to motivate people to work, a constant hype man”.

When asked about hiring college graduates for field positions such as superintendent or field engineer, eleven of the twelve respondents answered yes. The one no response explained that they are a union company so the graduate would need to join the union and work their way up. Half of the respondents who hire college graduates included that where graduates work is largely dependent on the individual and their interests as well as skills.

When asked about construction technology experience, all twelve respondents agreed that skills such as construction software experience will become a more vital part of a resume in construction. Two of the respondents included a caveat with their answer. Giving more than a simple “yes” like the others, one respondent stated “...understanding and using software will remain important, but only to the degree that it supports and is a tool for professionals who have the experience dealing with the different disciplines, who understand the building processes, and who are capable of dealing with the different people and personalities involved in the construction industry.” The other simply added that construction software can be easily learned.

When asked about areas where college students could improve their technological skills, six respondents gave names of the following specific skills:

Revit, Excel, and sending formal emails, plan reading, scheduling, 3D modeling, BIM360, Bluebeam, PlanGrid, Navisworks, oral communication.

The other six respondents agreed that software programs were not the area to improve but rather translating those programs directly to the site as well as field experience would be the most beneficial for students looking to head into a career in the field.

Discussion

The results of this research varied greatly between the respondents. These results build on existing evidence that technology will continue to become a more vital part of a resume in construction, including field personnel. It is apparent that soft skills are still a top priority for qualities of effective field managers. Most of the twelve responses included attributes that are considered people skills in their responses. The undeniable need for people with the ability just stay motivated themselves, but can also motivate others to constantly drive the work and the project forward is not going away. Leadership and communication are naturally bound to managing people, though these results also make it clear that social skills have some increasing competition – technology. With every respondent agreeing that technology is becoming a greater part of the construction process, it may be time to start considering technological skills side by side with social skills. The growing number of programs is obvious even just in the variety of different construction software listed as survey answers. The ability to learn new technological skills and applications is equally as important as the ability to use this technology on site to increase productivity.

Future Research

There are many opportunities for future research on this topic. One option is to examine the soft skills of Cal Poly Construction Management graduates. Many industry workers believe that soft skills are the most vital part of a successful leader on a construction site. Leadership is not an easy subject to teach or even explain, though by researching what kind of skills graduates have and what skills they lack, a better understanding could be had about what people skills to teach students that would help them in their careers.

Another idea for future research is current field personnel ability to learn new software. With technology progressing and changing so quickly, it is imperative that anyone expected to manage a jobsite is able to adapt to and learn new programs from job to job and owner to owner. A possible comparison to college graduates' ability to learn new construction programs would be a solid addition to this research.

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