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CONSTRUCTION INDUSTRY PROFESSIONALS' PERSPECTIVE TOWARDS COMMUNICATION TECHNOLOGY AND EDUCATION

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Abstract

The advancement of Communications Technology (CT) has benefitted many industries. Since the construction industry has used CT to increase efficiency and performance, this paper focuses on determining the level of usage, proficiency, and perception towards incorporating CT in the construction industry in Missouri and Kansas states. A survey was conducted among 36 construction-related firms. This study found a positive acceleration in the use of CT in the construction industry. Results show that communications were less preferred via social media or text to exchange information related to their business. Nonetheless, the respondents believe that social media could be used for public relation and advertisement. The results show that industry professionals want university students to enroll more than three credit hours of construction-related courses such as estimating and designing. This study also investigated how industry professionals see their new hires in their companies in terms of fresh graduates' CT skills. The results found out that about fifty percent responded they were semi-skilled. Based on these findings, the authors of this paper recommend that students need to learn more CT skills and enroll more CT-related courses. The study recommends students considering classes that enable them to collaborate more and interact.

1. INTRODUCTION

The use of Information and Communications Technology (CT) in the construction industry all over the world has accelerated in recent years. It is often said that technological advancement has a lot to offer, but the construction industry is slow in using and taking full advantage of recent developments in technology. This lack of utilizing the full benefits of technology brings to attention why studies about the use of CT in the construction industry have become more relevant and essential. In the past, various studies have been conducted to determine the purpose, benefits, and costs of CT in the construction industry (Feng, 2006; Rivard, 2000; Shrestha et al., 2011; Zhang & Yuan, 2007). Few studies have compared how different sectors of the construction industry use CT and have also identified their perceptions about CT education (Shrestha et al., 2011).

According to the Kansas City Chamber of Commerce (2016), the construction industry is expected to experience an average annual growth rate of 7.5% for the combined categories of residential, non-residential buildings, and nonbuilding structures from 2015 to 2019. The study described in this paper was conducted to understand better how the construction companies in Saint Joseph and Kansas City areas were using CT to pace up with the challenges and expectations. Also, this study was conducted to identify

what expectations of industry professionals were from fresh graduates and how much expectations were being met by the graduates.

This paper focuses on determining the level of usage, proficiency, and perception towards incorporating CT in the construction industries. This paper also investigates the skills and type of software used by architects, engineers, and contractors in Missouri and Kansas. Moreover, industry professionals' expectations of CT-related course hour requirement in Construction Management (CM) curriculum, as well as their perceptions of new hires in terms of CT skills, are evaluated and analyzed in this paper.

2. LITERATURE REVIEW

A study was conducted in Southern Nevada that compared the use of CT by the professional in the construction industry. The study showed all the contractors, architects, and engineers had used computers at their workplace and about 90% of them were using their laptop (Shrestha et al., 2011). The study also found that the majority of contractors were involved in training their CT skills through several different ways such as on-the-job training, self-learning, school, professional training, and outsource training. The study concluded that CT helps to improve work productivity and suggested students should take more scheduling and estimating software courses. Another study was also conducted in Southern Nevada to see what factors influence career and technical academy students' decisions towards pursuing construction baccalaureate (Kisi et al., 2011). Kisi et al. (2011) found that some of the influencing factors to pursue construction career were school courses, television, internet media, and professional presentations.

Doherty (1997) researched the use of CT in the New Zealand construction industry concentrating on software packages used for project management. The reports suggested 32% of construction companies in New Zealand used project management software. Almost 39% commonly used Microsoft Project, but many users used Microsoft Excel for project management rather than customized project management packages.

Ogunmakinde et al., (2014) conducted similar research on the impact of CT on architectural practices in Nigeria. The results of the study indicated a high level of awareness and usage of CT by the architects. The study showed a gender imbalance in the profession as the majority of the respondents were male. The study believed that the adoption of CT was a changing trend in the construction industry. The study also found that the level of using specialized software (AutoCAD, Revit Architecture, etc.) for architectural designs were relatively high among young architects.

In Finland, a similar study was conducted by Lautanala et al., (2002) on potential benefits of CT in construction. The estimation was based on a methodology which analyzed a company's current CT capability. The study identified four mechanisms that contributed to cost savings in using CT technology: (1) the automation of information work, (2) the facilitation of learning processes and the reduction of waste, (3) the interoperability and transparency of information, and (4) synergy impacts.

Liberatore et al., (2001) conducted a study to determine the use of scheduling software in the construction industry. The study analyzed data from 42 firms in the construction industry and observed that industry professionals were using Primavera (51.4%) more often than Microsoft Project (24.3%). The use of construction scheduling software in a construction project is affected by the complexity, the size, and the duration of the project as well as the interest of clients. Mui et al. (2002) collected and analyzed data from 70 firms in Malaysia to study if the use of the internet increases work efficiency. They identified that internet usage was high, but a little bit limited to email and information searches uses.

The IT-Barometer 2007 survey (Samuelson, 2008) was performed in the spring of 2007 in Sweden and Finland, as a follow-up to the IT-Barometer 1998 and 2000 surveys. The study presented the most significant results from the Swedish research with comparisons with the earlier ones. All these studies in different time frame revealed a clear trend of increase in access to computer and networking. The rapid growth of using CT could be observed in information sharing and standardization of work over time. The

common disadvantages shown in IT-Barometer survey were the minimum use of CT by contractors on the job site and the construction industry taking small steps in IT development.

The IT-Barometer 2003 was conducted in Singapore by Hua (2005). Several industry projects were implemented to help architecture, engineering and contracting firms adopt CT. The survey results of Singapore were compared with those of the other countries, notably Denmark, Sweden, and Finland, under the IT-Barometer project. The key findings on CT usage in Singapore were similar to the findings of the previous research. The study provided positive feedback for the construction industry to overcome limitations to adopt CT on a large scale, which includes developing standards, integrated databases, supporting investments in information systems, and mainly focusing on people.

3. METHODOLOGY

3.1 Questionnaire Design

The survey questionnaire was developed based on literature review and inputs from the three researchers at three different universities. The questionnaire was sub-categorized for detail study, and each category has its structure and purpose in the inquiry. The survey questionnaire design consists four sections: (1) general information, (2) computer training facility, (3) CT usage, and (4) perception of industry professionals towards fresh graduates' CT skills.

3.2 Questionnaire Sampling

This research used email as the medium of distributing a questionnaire to the participants. This method was chosen because of multiple benefits such as cost-effectiveness and secure medium to correspond. The survey was designed using Microsoft Word tool. Instructions were provided for the respondents to complete the survey. A total of fifty-five questionnaires were distributed to contractors, engineering firms, and architects whose primary offices were in Missouri and Kansas areas. The number of projects per year, number of employees, and sector of work were some criteria for selecting those companies and consulting firms.

3.3 Questionnaire Sampling Response

It took almost two months to finalize the questionnaire and four months to collect the data. All the data was collected through email. The received data was entered into an Excel spreadsheet for statistical analysis. The overall response rate was 65.5%. Table 1 shows the breakdown and percentage of the respondents.

Table 1: Survey response rate

Category	Questionnaire Sent	Responses	Response Percentage
Architects	10	5	50
Engineers	20	11	55
Contractors	25	20	80
Total	55	36	65.5

4. RESULTS AND DISCUSSION

Contractors constituted 56% of the total respondents of the questionnaire survey, followed by engineers at 30% and architects at 14% respectively. Also, 86% of the respondents were male and 14% female. The majority of the respondents belonged to the age group of above 40 years (47%) followed by the 36 to 40 years range (28%). All of these respondents were at the management level. Among them, the majority

have 15 to 20 years (42%) of computer literacy followed by more than 20 years (22%), 10 to 15 years (17%), and rest had less than 10 years.

Architects responded that they all learned their computer skills through on-the-job training, whereas engineers learned them through multiple categories: 45% through on-the-job training, 36% through self-learning, and 18% through a professional training course. On the contrary, the results were different for contractors; 31% of contractors answered that they learned their computer skills from self-learning, 28% via on-the-job training, 19% through school, 13% through professional training, and rest through outsource training by an employer. Overall, the majority of the respondents learned their CT skills through on-the-job training.

This study investigated the use of electronic devices and training facilities available for architects, engineers, and contractors in the construction industry. Figure 1 shows that using desktop and laptop computers is preferred by most of the respondents. Noticeably that architects prefer to use tablet PCs rather than laptop computers.

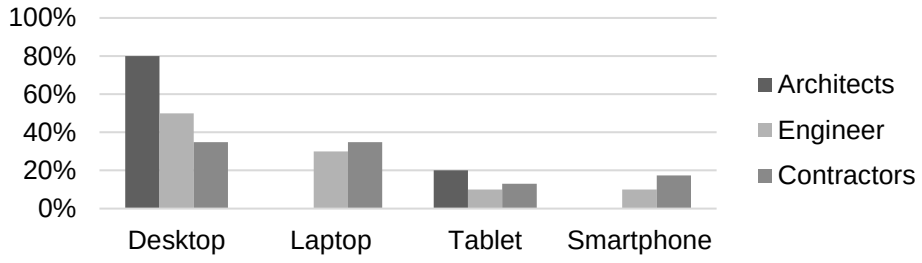

Figure 1: Types and usage of electronic devices

Figure 2 shows the average screen time spent by architects, engineers, and contractors per office day. The average time spent per day was close to either 4-6 hours or 6-8 hours. Architects were found spending more time; 80% spend 6-8 hours daily, which is not surprising since they architects involve with design work technology.

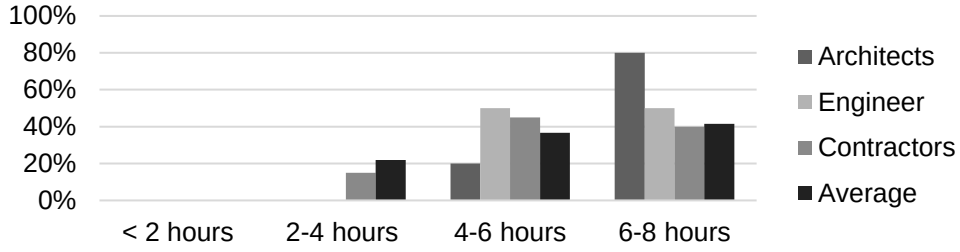

Figure 2: Time spent on electronic devices

The study analyzed which type of media was commonly used to communicate related to projects within the organization. More than 50% of the respondents used email as their primary correspondence medium as shown in Figure 3. The result shows (refer to Figure 3) phone calls, texts, and social media were not commonly used to exchange information related to the project works.

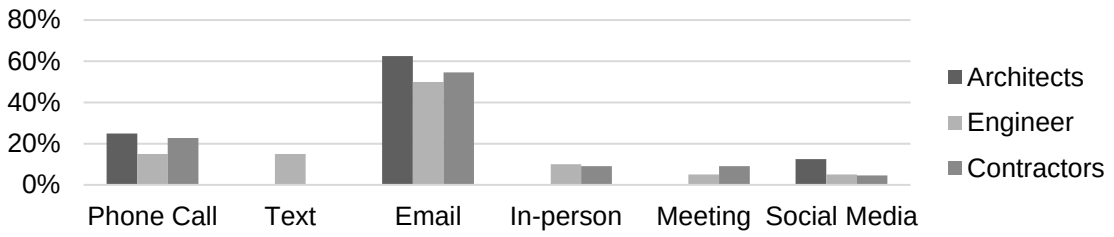

Figure 3: Communication media

Although social media was less used as an internal communication medium about the projects, it was highly recommended to use as a platform to increase public relations and advertisements. Figure 4 shows that 60 percent of the architects thought that social media could be better used for growing public relations and 40 percent said that it could be better used in an advertisement. Engineers and contractors had a similar thought; however, engineers inclined their opinion to use social media towards notifying about the events of the organization. Social media was less preferred, less than 10 percent, to use it as a medium of career opportunities notification.

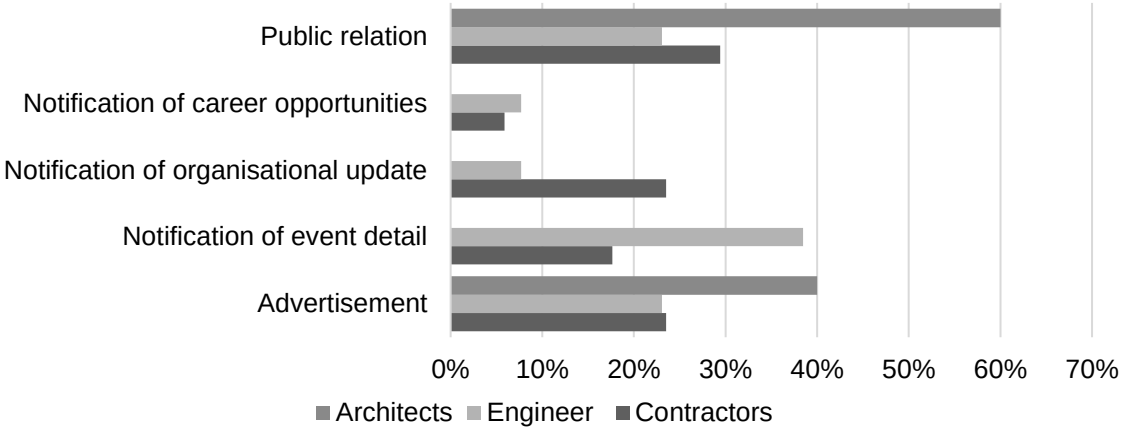

Figure 4: Professionals opinion on the use of social media

CT is used in various forms and for many purposes. The study found that on average 23 percent of the respondents used CT for their technical works, and remaining percent for emailing, accounting, managing resources, and updating records. Contractors were found using CT for their technology works. Table 2 shows the CT usage in different areas by architects, engineers, and contractors.

Table 2: Communication technology usage by professionals

Category	Email (%)	Record Updating (%)	Technical Works (%)	Accounting (%)	Resource Management (%)	Others (%)
Architects	19	19	19	15	19	11
Engineer	20	20	22	16	12	8
Contractors	15	10	25	19	19	13
Average	17	15	23	17	17	11

The critical values of construction education are context-laden and have relied on contextualized teaching to bring an industrial experience of the construction sector into the classroom (Tenant and colleagues 2015). However, it has been a challenge for institutions to meet all the expectations of the industry professionals. This study investigated how industry professionals see their new hires in their companies in terms of fresh graduates' communication skills. Figure 5 shows most of the respondents see fresh graduates are semiskilled. Also, comparatively architects have fewer interactions with field crew members, and construction management works, 60 percent of architects see new graduates as highly skilled in communication. MacLaren and his colleague state that society driven by industry requires students to have problems solving skills that include strong collaborative and communication skills (MacLaren et al. 2017). The result from Figure 5 shows the challenge of barely meeting the skill sets of industry expectations.

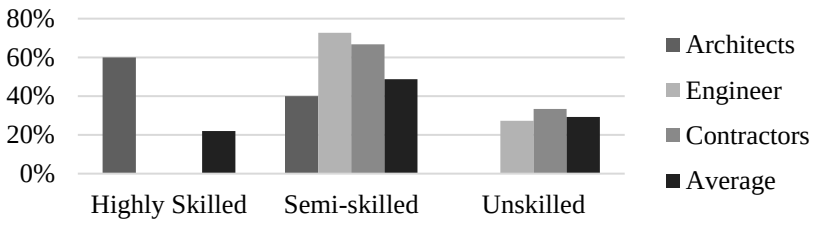

Figure 5: Perception of industry professionals towards new graduates' communication skills

The respondents were then asked about the required number of credit hours student may need to take in various areas of construction education. All architects responded that students should take more than three credit hours of estimating and designing courses whereas they suggested that students may take three credit hours or fewer hours of scheduling, report writing, and public speaking classes. Table 3 shows the result of the data analysis. The engineers and contractors had a similar opinion about estimating course where students were encouraged to take more than three credit hours of estimating course. The engineers responded that students should take more than three credit hours of report writing and public speaking courses; however, the contractors and the architects responded that three credit hours would be sufficient for those courses. On average, students were suggested to enroll more than three credit hours of construction-related courses such as estimating, designing, and report writing. Industry people prefer those candidates who met this preferred requirement.

Table 3: College credit hours requirement based on professional expectations

Software Category	Architects		Engineers		Contractors		Average	
	≤ 3 CR (%)	> 3 CR (%)	≤ 3 CR (%)	> 3 CR (%)	≤ 3 CR (%)	> 3 CR (%)	≤ 3 CR (%)	> 3 CR (%)
Estimating	0	100	45	55	46	54	39	61
Scheduling	100	0	73	27	50	50	66	34
Designing	0	100	0	100	47	53	28	72
Report Writing	100	0	0	100	53	47	45	55
Public Speaking	100	0	30	70	59	41	56	44

5. CONCLUSION

This study determined the level of usage, proficiency, and perception towards incorporating CT in the construction industries located nearby Saint Joseph and Kansas City areas in Missouri and Kansas by conducting a questionnaire survey. This limits the generalization of the results. The survey conducted in this study shows a positive acceleration in terms of CT usage in the construction industry. The study found that 80 percent of the architects spend 6-8 hours daily and 60 percent of the architects see fresh graduates as highly skilled. However, the result shows the challenge of barely meeting the skill sets of industry

expectations for other trades. Based on the outcome, students were suggested to enroll more than three credit hours of construction-related courses such as estimating, designing, and report writing where the students can leverage CT tools including software training and work practices for learning management and develop skill sets to meet industry needs. The architects responded that students should take more than three credit hours of estimating and designing classes, which helps them earn their skill more in-depth.

The study found out that communications via social media or text were less preferred. One of the reason could be because a significant percentage (47%) of the respondents were the age of 40 or above and social media was not as prevalent as it is today. This study has limitations to validate this argument statistically. However, the study found that social media could facilitate public relations and advertisements.

This study found out that industry professionals want students to enroll more than three credit hours of construction-related courses such as estimating, designing, and report writing. The results provide insights into curriculum development and incorporating communication technologies for the construction industry. The study also investigated how industry professionals see their new hires in their companies in terms of CT skills. The results of this study identified that students should learn more CT skills while taking more construction-related courses. The study recommends students considering classes that enable them to collaborate more and interact.

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