

Mobile Applications to Aid Office to Field Communication

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The advancements in new age communication technology are changing and shaping the construction industry more than ever, and this technology can be utilized to solve the many issues faced in the realm of office to field communication. Currently, many companies in the construction industry struggle to effectively manage office to field communication. In an industry where details surrounding RFI's, change orders, and submittals are constantly changing, it is imperative that information is communicated effectively and in a timely manner to the necessary people. If communication is not flowing in an accurate and succinct manner, very costly mistakes can be made and projects can suffer serious consequences. Construction software apps for the iPad or iPhone have made this challenge of office to field communication easier but companies are still reluctant to adopt this technology. During my internship at Webcor, I noticed that a mobile app that allows easier communication from office to field was needed. Applications using a connected network can reduce the communication mistakes that can lead to cost, schedule, and safety challenges. As more and more companies are moving toward integrating new age communication technology, the question arises as to how to best implement this technology. This paper will not only seek to demonstrate the best practice for implementing this new technology, but also exhibit how companies can improve productivity, safety, costs, and the scheduling process by adopting this type of technology.

Keywords: Information Management, Shop Drawings, Cloud, Mobile Application

Introduction

The purpose of this research is to analyze the potential benefits that new age communication technology can have in the construction industry in terms of office to field communication. In construction, the office and field are geographically separated and new technologies could help bridge the issues that arise due to this location gap. As businesses are using technology more and more to improve their operational efficiency, the construction industry needs to keep pace. The construction industry can benefit from this new technology because it will deliver the following: straightforward transitions for students into the field, fast tracked communication to improve productivity, safety, cost, scheduling, and real time tracking of productivity.

The research has minimal limitations, as its main objective is to observe current practices and offer solutions to improve these practices. This research was conducted during my internship at Webcor Builders. It involved interviewing, as well as posting surveys to decide if problems existed, followed by extensive research to figure out the best method to remedy the problems found. One limitation of this research is the sample size.

The construction industry is very information based. Unfortunately, the construction industry remains behind other industries and it is still relatively in the early stage of adopting modern Internet technology (Klinc et al., 2010, Shen et al., 2010). If the information flow is not a two way street, any construction project will suffer. With projects getting larger and larger the need for an effective way of all around communication must be found. Field to office communication has always been a focus of mine because of how important the act of communicating is to the construction industry. The construction industry is known to be labor-intensive and generates large amounts of information. This information ranges from drawings, which are produced in the design stage, to different project reports, which are prepared during the construction stage. Information is obtained from all stages until the end of the project. Thus, the fusion and management of construction information are crucial due to the diversity and intensity of the information (Chen and Kamara, 2008a, Soibelman et al., 2008). The research described in this paper is carried out with the aim to find if mobile applications can be effective in improving information management in construction projects. The purpose of this paper is to show Construction companies how they can benefit by adopting web based mobile applications.

Literature Review

The construction industry is always information hungry. The ability to manage both office and on site information is critical to any successful project. While there is no one-way to manage this information and communicate it effectively, technology has had a huge impact in the way construction companies manage their work. Construction information can be classified into 10 main groups, which are requests for information, material management, equipment management, cost management, schedule means and methods, jobsite record keeping, submittals, safety, quality control (QC), quality assurance (QA), and future trends (De La Garza and Howitt, 1998). With this many categories of information it can become overwhelming to make sure the information is transferred both to the right people and in a timely manner. On-site information management is critically important because it is the fundamental element of successful project management (Tsai, 2009). This fundamental need for proper information management is a driving factor in why the construction industry needs to start adopting mobile technologies that can bridge the gap between the field and the office.

Developed Mobile Application Systems for Managing On-site Information Flow

Mobile technology has made incredible strides in everyday life, however it still seems to lag behind for construction application. Based on Chen and Kamara (2008b), there are three types of mobile applications that have been used in the construction industry. The first is Mobile CAD Applications for interacting with drawings in construction sites. The second is Data Capture Applications for managing on-site information. This type of application can be subdivided into three categories, namely capturing data, the bar code system, and wireless sensor system. The final type is Project Management Applications for dealing with project schedule in construction sites. Until recently construction mobile applications have been focused on one task whether it be in the field or in the office.

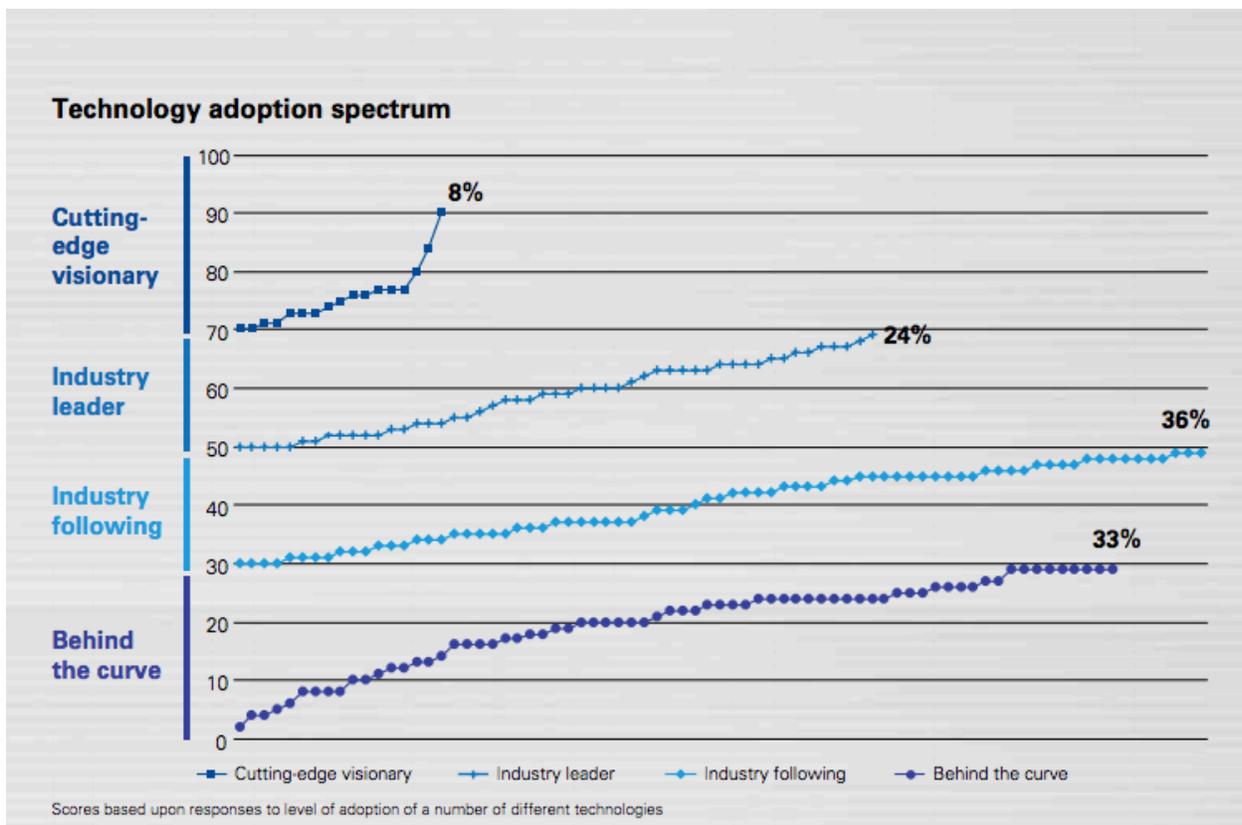


Figure 1: Industry Statistics for the level of adoption of Mobile Technologies

In a survey conducted by Sage Software with over 600 construction professionals from small and mid-sized firms, it was found that 33% feel the need to improve communication and collaboration, 32% want to streamline processes and over 80% think that mobile technology is a high or moderate priority (Sage Software, 2015). Three key factors are driving the demand for mobile technology in the workplace: executive demand, an increasingly mobile workforce, and the growing need for real-time information, as found in a study by IDG Research Services. With demand so high there is no question a need for mobile applications that control and distribute information.

Information control in construction

The most sophisticated method currently in use is to use document management systems, where the documents are stored centrally on a server and users interact with this central repository through interfaces implemented using standard web browsers (Bjork, 2003). The needs for time sensitive communication and documentation control systems have the potential to remove many errors for the communication process. Electronic document management systems focus on facilitating the management of documents pertinent to particular enterprises, projects and work groups in computer networks (Bjork, 2003). Using mobile apps as a liaison between the field and offices information and combining this with an effective electronic document management system can lead the industry in the right direction to improving communication errors.

Methodology

The objectives of this study are as follows:

- To report whether the need for construction based mobile applications are needed.
- To highlight the challenges and transitional difficulties to implementing this technology
- To highlight the benefits of using this technology in comparison to not.
- To highlight the lessons learned
- To provide a recommendation to future companies regarding the use of mobile applications on projects.

The methodology I have primarily chosen in this study is an analysis of quantitative data taken by broad postal survey questionnaires and detailed interviews along with on-site research. The survey will be posted company wide as to capture multiple opinions for different types of projects. The questions were designed to get a better feel of where the industry stands on mobile construction based applications. The researcher will identify and highlight the main similarities and differences from the results. This information will be relevant to any company that wants to understand and possibly implement new construction technologies.

Results

During my time at Webcor, I noticed that information, such as RFIs or changes in the plans, did not reach everyone's ears and mistakes often arose due to the fact that the majority of the team were not on the same page. Time delays due to rework were the main cause of issues during my internship and most of these delays were caused by poor communication. The introduction of new construction software will mitigate most of the problems caused by poor communication. I surveyed a total of 20 interns to see if they were having problems with office to field communication. I found that out of 20 interns 9 said they had a problem with jobsite communication, which is almost 50 percent. Secondly, I found that a total of 12 interns rated their communication at a 3 or below out of 5. This shows that improvements can be made. I then asked what areas the most issues were occurring in. The main areas where issues were identified included daily logs, RFI/Submittals, errors in shop drawings, upper office management not talking to the boots on the ground, and relaying information in a timely fashion so changes can be made. After this information was provided I called multiple construction software companies such as Procure, B2W, CrewTracks, PlanGrid, and eSUB. I requested full product demos of their software. I decided that the software eSUB would be a good example of a mobile application that works in the field.

Does your jobsite have a problem with field to office communication?

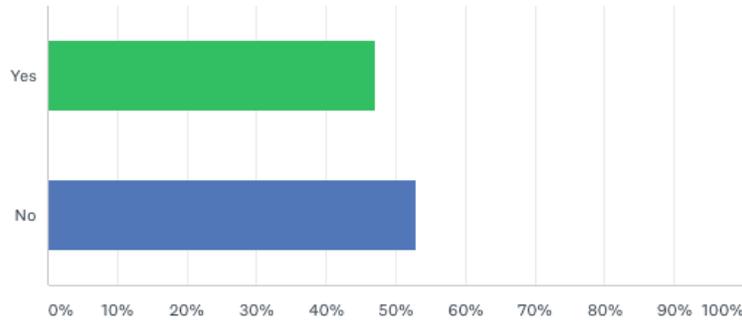


Figure 2: Survey Response from Webcor Interns

eSUB Software

eSUB is a mobile application and cloud-based project management solution that helps commercial subcontractors across various trades to manage day-to-day operations. eSUB offers tools to connect field workers with office managers and assists them with initiating and managing project documentations.

eSUB creates paperless projects with one central storage for information, photos, drawings, PDFs and any other documents that all team members access in real time. Logging in through a secure Internet portal, eSUB's project management module allows subcontractors to create, log, and track important documents like requests for information (RFIs), change orders, and more. eSUB's timecard module tracks subcontractors' labor hours and costs, which can be sent from the field to accounting software. All information can be accessed at any time from any location on any mobile device making it an incredibly useful tool.

Implementation of eSUB

The need for a cloud based application that has the ability to relay information to everyone efficiently and in a proper format was apparent after my internship at Webcor. Implementing project management and document-control software seems like a monumental task however it doesn't have to be. This is why I suggest that companies use a type of intergraded start program. This method allows the current programs offices are using such as CMIC management software to be linked via an Internet storage cloud to the mobile app. This means that current office systems can stay in place while allowing the new mobile software to be integrated smoothly.

Beginning with one project makes implementing eSUB easy for a company, and accelerates seeing the value from the technology. Starting on a smaller project with a small team is the best practice to ensure that the software can work company wide. Employees at Webcor are given access to company iPhones and iPads, which will allow for a smooth transition when introducing the software.

Table 1: Implementation Schedule for eSUB

- **Mid-September:** Request a free eSUB demo with upper management present
- **Early-October:** Purchase app for use on test project
- **Mid-October:** Train employees via webinar on how to use eSUB software properly
- **Mid-December:** Conduct interviews with software users to see how the software improved their project's efficiency
- **Early-January:** If cost benefit analysis is positive, purchase it for other jobsites

Economics

I had eSUB create a proposed cost for a small team of about 20 users. The average cost per person is around \$45 per month or \$544 per year. This is miniscule compared to the amount of savings improved communication could bring to Webcor's jobsites. In March 2009 the Journal of Engineering and Management stated that, poor communication usually contributed directly to rework and this adds an estimated 5% to the cost of an average construction project (CII, 2005). If we look at our trial project of 100 million dollars we can see that eSUB could potentially eliminate 3% of these costs. This would add up to savings of \$3 million dollars, which compared to the yearly cost of \$15,100, is tremendous.

Mobile Applications Lessons Learned

Mobile applications can have a positive impact on the construction industry and deserves a place on the construction site. Mobile applications can help organize and control the diverse information of the construction industry. These applications allow the user to efficiently process and distribute critical construction information to all parties that require the information. The main effect of this is the time and rework savings.

Mobile applications such as Plangrid, eSUB, and others have the potential to mitigate rework and save time and money. These applications allow information to constantly be updated meaning that the field always has the most current drawings, RFI information, and other critical information to the jobsite. This constant stream of current information always the field to avoid rework mistakes which can lead to both time and money loss. As well as the potential to reduce rework these applications can be used for daily reports. Daily reports can include the questions and comments of foreman and superintendents on the jobsite and can be directly pushed to the office for processing. This allows questions between the office and field to be answered quickly and efficiently and without the need for a face-to-face meeting. This eliminates forgotten conversations and leads to more comprehension and far less frustration. These reports can also include comments towards safety, which can be collected and turned into a best practice. Having this information documented is critical in the construction industry as it allows all parties to understand what has been said and agreed upon to date.

Mobile applications and how to operate them can be easily taught to anyone both in the field and in the office. Due to mobile applications being user friendly the ability to implement them on a jobsite to parties that have never used them is both easy and affordable. For many applications a simple 2-4 hour lecture and demo on how to use the application is sufficient for almost anyone.

Conclusion & Further Research

Due to the large amount of people involved on any given construction project, there are many communication points in which communication can fail. Failed communication can lead to rework because one party will think that a job is being done a certain way while it is actually being done another. Mobile technology can improve communication and lead to more collaborative decision-making, which will lead to more accuracy in implementing a project and a higher chance of catching a problem in its early stages before it has a chance to affect other parts of a project. It is imperative that the construction industry starts to adopt these impressive new technologies into their day-to-day business practices. This will ensure that the construction industry does not lag behind other industries and operates at its peak efficiency. This research study examined the role of mobile technologies in improving transfer of information and how mobile technologies can support the construction industry. In order to increase communication efficiency it's important that the industry start to implement these transformative technologies. From the findings above, it is clear that even a simple app such as eSUB can have a critical role in the construction process.

As technology advances the construction industry needs to stay up to date on current innovations. As new products come out case studies should be conducted to measure the beneficial effect these communication applications have on the construction process. These findings would be a great indicator for other companies who are on the fence about adopting these new technologies into their company's structure. This information could also benefit which sectors of the industry need which type of applications.

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