

Integration of BIM Management Tools into Custom Residential Construction

Cruz Calderhead

California Polytechnic State University
San Luis Obispo, California

The custom residential sector of construction currently lacks the usage of BIM management tools. This paper looks to research the current usage, advantages, and disadvantages of using BIM management software's within custom residential construction. There will be a comparative case study held between two custom residential contractors, one with minor BIM usage and one who has fully integrated BIM software into their management procedure. The goal is to find out if BIM management is cost-effective and scalable to the custom residential industry. This information will be beneficial to the custom residential industry because it will provide custom residential general contractors with information and data about BIM, that can be directly applied to their business.

Key Words: Residential, BIM, Management, Process, Construction

Introduction

The idea of this topic came from two internships in custom residential construction that took place over six summers. While being involved with the Cal Poly Construction Management program, the growing importance of BIM technology in the industry was evident. While working with a thirty-year old residential construction company, there was very little BIM involved during construction. During a second internship with a 10-year old residential construction company, BIM was used for all management and communication needs. The second internship was made up of employees who had experience in commercial construction which is where they had become comfortable with using BIM management programs. Interviews were conducted to see what information is needed to make a small general contractor feel comfortable with implementing BIM management tools into their company.

Purpose

The goal is to construct a paper that custom residential contractors could access that would easily breakdown the cost-effectiveness of implementing BIM management tools into their company. Custom residential contractors with BIM implemented into their management, are used to show if they are satisfied with the services that BIM has provided. This paper shows the cost impact of buying licenses from the top two used BIM management software companies. Cost-saving benefits are provided to show the effectiveness of these management tools. The goal is to provide custom residential contractors with enough information to allow them to decide if investing in BIM management tools would be beneficial to their company.

This senior project will benefit the custom residential construction industry because it will encourage the use of BIM within the industry. The goal is to have more contractors using this technology, which will help advance the industry as a whole. BIM is more effective when more parties are actively using it, communication between contractors and other trades will become faster and more efficient. Custom residential contractors who decide to implement BIM will be able to save money and time while running their company more efficiently.

Methodology

Qualitative information will be used to conduct this research. Qualitative research suits this topic best because it will allow in-depth reasoning of why a company would want to implement BIM. A comparative case study is held between two construction companies to see different views. One company being interviewed has minimal BIM usage in their company, while the other company has already implemented BIM management fully into their practices. By holding case studies, more in-depth responses will be obtained. These interviews are held to find why a company would be reluctant from implementing BIM management into its company. While also seeing how effective BIM has been to a company that has already fully integrated BIM. Since there will be a comparative case study held, the best option for data collection would be through a personal interview. The personal interviews are semi-structured so that the company can openly respond and be able to give an in-depth analysis of their view of BIM.

Case Study

Overview

Semi- structured interviews are held to find out what the custom residential industry views of BIM management are. Interviews are held with a residential contractor who uses minimal BIM

management tools, a contractor who has BIM fully integrated into their project management, and a BIM management software company. These interviews are used to find what the current views of BIM management tools are and see what amount of BIM is being used to manage their company. These interviews also capture how these companies benefit from using BIM management in their company. Also, seeing the tools and services that cannot be applied to their companies due to their structure and size. A BIM management company was interviewed to see how they are marketing towards potential clients. The interview also looks to see what tools and services are important for BIM management companies to provide their customers.

Blair Construction

Blair Construction is a small/medium-sized general contractor in Santa Monica that specializes in custom residential projects. Blair Construction has been performing construction since 1988. Blair Construction still uses many traditional management methods but is currently working towards implementing BIM into their management process. Builder Trend is the management software that Blair Construction has lightly used over the last few years. Blair Construction has taken advantage of select tools that Builder Trends offers, like their easy and accurate estimating tools. Blair Construction has also seen the document control abilities to be a great tool in keeping their important documents sorted and organized. Builder Trend provides its clients with convenient, easy to fill, templates for documents like RFI's and PCO's. Blair construction uses these templates to create organized and professional documents for communication with architects and engineers.

There have been difficulties with implementing Builder Trend due to the structure of Blair Construction. Blair Construction currently has one senior project manager who oversees all operations, while having designated employees who report back from each project. Without having the typical business structure of having field engineers reporting back to the project manager, there is a lack of up to date information that is logged onto Builder Trend. Another problem facing the optimum use of BIM management tools is from the participation of subcontractors, engineers, and architects. These trades in residential construction do not use Builder Trend; this creates a lack of communication between all parties. This problem creates a one-way feed of communication for the contractor since the other parties are not able to respond via Builder Trend. Blair Construction usually receives emails in response to requests that are sent via Builder Trend, which is then uploaded by Blair Construction to Builder Trend.

Blair Construction does see the value in the \$329 a month they pay for Builder Trend's services. There is value seen in the time saved by creating estimates and takeoffs through the software. Document control and the provided templates have benefited Blair Construction because it has made a more organized filing system than what they had before.

Lyons Development

Lyons Development is a general contractor that specializes in high-end, custom residential construction. Lyons has been in business since 2003 constructing homes in the Los Angeles area. Lyons decided to introduce BIM management tools into their company 5 years ago (Lyons). Through extensive research on pricing and software capabilities, they decided that Pro Core was the best fit for

the company. Pro Core is valuable because of the tools and capabilities that it offers with very helpful customer service. Lyons uses Pro Core for document control, communication, project finances, and communication. Pro Core typically works with commercial contractors, so Lyons had to show their revenue stream for Pro Core to qualify as a client. Lyons is made up of a team that has commercial construction backgrounds, so most of the employees had experience using Pro Core's tools and interface. With their previous knowledge of how to use Pro Core, the employees welcomed the software because it was familiar and straight forward to use.

Some of the problems that come along with using BIM management is having all participating parties use the same platform. Lyons has run into a problem with using BIM management to communicate because some of their architects and engineers do not use Procore. This creates one-way feedback and then they are usually replied to via email. This problem also occurs with subcontractors and sending approvals for change orders or things of that matter. There are times that subcontractors cannot access a link or attachment within an email sent via Pro Core which causes confusion between the two parties.

Overall Lyons does see great value in being able to use Pro Core for their management operations. Pro Core costs a significant amount more than other BIM management software like Builder trend. Lyons accepts that they pay a much higher price than most residential contractors for the services that they are provided. Even though there is a higher price, they see it worth it because it allows the company to run efficiently and allows a growing room instead of picking software that struggles to keep up with their management needs.

Builder Trend

Builder Trend is a BIM management software that was created in 2006. This software was created with the thought of residential contractors in mind. Builder trend saw that there was a large market of residential contractors that could use BIM management because software like Pro Core was too expensive and geared towards commercial projects. Builder trend sells its services on a monthly basis; pricing is dependent on the revenue of their client.

Builder Trend takes pride in its easy to use interface and great customer service. Their sales strategy includes showing their client how user-friendly their app is to use. Builder Trend's user-friendly app makes it easier for crew members to report back to management regarding design flaws or the progress of the project. Builder Trend explained how they were a huge company that has many resources that residential contractors can use to have their questions and concerns answered.

Results and Discussion

Cost-Effectiveness

These interviews showed that both contractors are willing to pay their current price, but feel as if they are paying too much for the services they are provided. Blair Construction feels that Builder Trend has priced its services at a fair price but Blair Construction is limited to what tools they can use. The difficulties that Blair Construction faces are due to the residential construction industry not using BIM management software. Lyons finds that they are paying too much for Pro Core's services due to being a smaller company. Pro Core's capabilities are necessary for Lyons's complex projects. This necessity for premium software demands Lyons to pay a significant amount.

Both contractors explained the advantages of having these systems like being able to save time and money while performing estimates. Money could be saved by not having to hire another employee who specializes in doing price or material estimates. The estimating tools also allow the contractor to do takeoffs that are much faster than measuring the plan set by hand and performing calculations. Lyons uses Procore to its full capabilities and has seen increasing benefits from the more they use it. With all their design and costs included in Procore, it has centralized all their information regarding current projects.

Contractors are seeing a loss in money when they are not capable of using these programs to their full abilities among other parties like architects, engineers, and subcontractors. Time is lost when contractors must log info into BIM management software due to the architect and subcontractors not being able to log it in themselves. Architects, engineers, and subcontractors do not have an incentive to log this updated information into Procore because that means they would have to buy a license and perform more work. Being responsible for logging in information creates more work for a subcontractor for no real gain or incentive.

Time Savings

The contractors that were interviewed expressed that they saved a lot of time from the tools that this software's provided. Blair Construction explained that they saw time saved during estimating for current or potential new jobs. The time savings were found during the taking off and compiling of lengths from plans and shop drawings. Blair Construction also saves time by using the provided templates in Builder Trend.

Lyons said that time savings are the biggest reason that they use Pro Core. They see time savings in being able to distribute information through their contact list. They can send updated plan sets and other information through contacts that are grouped by project, company, or name. Time is also saved from having their finances in the same location as their PCO's and PCCO's. This creates an easy way for finances to simultaneously update in multiple areas so that the budget is always up to date. Their field engineers save time by being able to add pictures and callouts to the punch list through their phones. This creates a transmission of information to the plan set so that no information is forgotten.

Customer Experience

Both BIM software companies pride themselves on their customer service. Procore advertises on their home page that they have, "From implementation to ongoing service, our world-class support comes standard- no hidden fees or fine print" (Pro Core). Pro Core seeks to show their clients that the transition into a new BIM management software can be easy due to their customer support. During the interview, Builder Trend talked about how customer service was one of their top priorities. Builder Trend uses customer service to build a customer's trust, resulting in the client using their product more frequently knowing they have security and support.

Blair Construction and Lyons saw the ability to be able to use the mobile apps provided as a beneficial feature. They both said they do not use the app as their primary source of logging information but have used it for convenience. Builder Trend advertises their app capabilities as "It's time for everyone on your team to stay informed, no matter where they are." (Builder Trend). Builder Trend seeks to advertise to smaller contractors through the ability to keep their crew informed on current building statuses.

Conclusions and Future Implementation

BIM has been making its impact on the custom residential construction industry over the past few years. Some construction companies have had great success with fully implementing all of the tools while others are still adjusting. Teams have been able to use these tools to keep their businesses organized, cost-efficient and time-efficient. While BIM has helped many companies, it has left some wondering if they are paying too much for the services that they are receiving. Teams have been restricted due to the fast learning and implementation that is being performed by the construction companies but not with architects, engineers, and sub-contractors. In the future, BIM management companies need to create easy access to their service for these trades. The more trades that are using BIM, the more efficient it works as a whole. Contractors can also incentivize or make it part of the contract that these other trades work on this software and contribute to the information uploaded.

Right now, every custom residential contractor could use some, if not most, tools that BIM management provides. But general contractors have to self-evaluate and see if they are willing to spend a premium price for this service. Contractors need to be willing to self-educate and make an effort to have their team implement BIM. If owners of these companies make a true effort and are willing to change their common practices, BIM can be very effective on any scale of a project.

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