

Utilization of a Co-location Office in conjunction with Integrated Project Delivery

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Integrated Project Delivery (IPD), an emerging project delivery system, calls for integrating all of the participants and stakeholders in a project by encouraging collaboration between those different entities starting very early in the project. Co-location is a concept that can be utilized to facilitate that high degree of collaboration as required by IPD. Co-location promotes physical office sharing by the project participants such as the general contractor, architect, engineer, subcontractors, suppliers, owner representatives and end users such as tenants and facility managers during the course of the project. The issues relevant to co-location such as its structure, its differences from a typical home office, its advantages, and its disadvantages have not been studied significantly. The purpose of this research is to provide a case study evaluation of the co-location office utilized for the Cathedral Hill Hospital project (which is delivered using IPD) to develop a better understanding of this phenomenon and to identify its potential for projects using IPD. Within this context, this paper: (i) presents a description of the co-location office used in the Cathedral Hill Hospital project and (ii) presents the opinions and experiences of the key professionals working in that project with respect to its co-location office.

Key Words: Integrated Project Delivery, co-location, project delivery systems, collaboration

Introduction

Integrated Project Delivery (IPD) is emerging as a new project delivery system at a time when the construction industry is searching for ways to eliminate waste, cut cost(s), improve productivity, and create overall building success. This approach to project delivery integrates all of the participants and stakeholders in a project such as the owner, architect, engineer, general contractor, subcontractors, suppliers, and even the review agencies to encourage collaboration between these entities starting very early in the project. The potential effects of integration and early collaboration on the project are less waste, shorter construction time, and more value to the customer. The reader is referred to AIA (2007) and Thomsen, Darrington, Dunne, and Lichtig (2009) for a detailed discussion on IPD.

Co-location is a concept that can be utilized to facilitate the high degree of collaboration and thus effective communication as required by IPD (Ashcraft, 2011; The REAlignment Group, 2011). In spite of the existing technology which provides the ability for different entities to communicate via videoconferencing as well as interactive online meetings, co-location essentially promotes physical office sharing by those entities to maximize the collaborative effort, which is essential to an IPD project. Co-location provides a setting designed to resolve project issues in real time (Howard S. Wright Company, 2011).

Problem Statement

Since IPD is a relatively new project delivery system, only utilized in a small number of projects, the issues relevant to co-location such as its structure, its differences from a typical home office, its advantages, and its disadvantages have not been studied significantly. The perceived complexity of developing a co-location office may deter companies from attempting co-location in IPD projects unless its benefits can be justified. Research in the form of case studies is needed for construction professionals to better evaluate co-location and ultimately determine its feasibility for their projects.

Purpose

The purpose of this research is to provide a case study evaluation of the co-location office utilized for the Cathedral Hill Hospital project to develop a better understanding of this phenomenon and to identify its potential for projects using IPD. As such, this is an exploratory study. The Cathedral Hill Hospital project, which is being delivered using IPD, is located in San Francisco, California. It is planned to be completed in 2015 and is targeting the Leadership in Energy and Environmental Design (LEED) Gold rating (Yoders, 2010). The Cathedral Hill Hospital project is one of a few projects that are using co-location in conjunction with IPD; therefore, it is a unique and current case study that can provide insights into the co-location phenomenon. The findings with respect to the co-location office used in this project can be valuable for professionals (representing different entities such as the owner, designer, general contractor, etc.) planning future IPD projects. Within this context, this paper: (i) presents a description of the co-location office used in the Cathedral Hill Hospital project and (ii) presents the opinions and experiences of the key professionals working in that project with respect to its co-location office.

Literature Review

As mentioned earlier, there is a very limited amount of literature on co-location for IPD projects. Literature suggests that, in addition to the primary entities (i.e., the architect, engineer, and general contractor), the co-location office may include major subcontractors, suppliers, owner representatives and end users such as tenants and facility managers (NASFA, COAA, APPA, The Association of Higher Education Facilities Officers, AGC, and AIA, 2010; The REALignment Group, 2011). Not all employees from the entities will co-locate, just the representatives from each entity assigned to the project. While co-location is most useful if it is implemented for the whole duration (design and construction) of a project, co-locating entities for 3-5 days at regular intervals can be done for smaller projects (Mossman, Ballard, & Pasquire, 2010). Co-location is believed to be critical for the success of an IPD team because it increases communication to a degree rarely practiced in the industry (Wember, 2011). However, while co-location is a valuable concept for larger projects, there may be an issue with the logistics (e.g. location, technology, equipment, and attendees) for smaller projects (Wember, 2011).

Research Methodology and Limitation

To reach the purpose of this case study, a qualitative research approach was adopted as there was a central phenomenon (i.e., co-location office used in conjunction with IPD) for which a better understanding was sought given the limited amount of literature on the topic (Creswell, 2008). Creswell (2009) suggests that in qualitative research, several different data collection procedures can be used. This research utilized two of those procedures, observations and interviews, as described below (Creswell, 2009).

The first part of this case study involved a site visit to the co-location office used for the Cathedral Hill Hospital project to be able to generate a description of the office through the observations of the researcher. The office description includes basic information about the office's location, physical characteristics, and how the team members are organized within the office.

For the second part of this case study, four professionals working in the co-location office for the Cathedral Hill Hospital project were interviewed. These professionals represent different entities and have different responsibilities for the project. One of the interviewees was the lean production leader for the project. His job is to facilitate lean production in the co-location office. The other interviewee was the general superintendent. This person is responsible for representing the general contractor in regards to construction and on-site operations. The third professional was the structural project manager and also the structural cluster facilitator (the concept of clusters is discussed in the next section). His job is to manage the structural components for the project and facilitate the structural cluster in the co-location office. The last interviewee was the project manager in charge of the exterior skin of the building. His job is to coordinate and manage the design and construction of the vertical facades including the curtain wall, metal panels, and stone, in addition to the horizontal roofing areas, which include a living roof system.

A semi-structured interview method was chosen; because even though it does not restrict the interviewees to a strict protocol, it helps minimizing the variation between the interviews (Bell, 2005). This interview method facilitated detailed explanations by the interviewees and allowed for additional questioning, either for clarification or to expand on an answer if necessary. This resulted in the rich gathering of information.

As suggested by Creswell (2009), qualitative research calls for purposefully selecting the interviewees who will best help the researcher address the research question. Furthermore, Creswell (2009) suggests that qualitative research does not necessarily require the selection of a large number of interviewees as typically is the case for quantitative research for data points. Consequently, the previously mentioned four interviewees were selected because they were believed to be best suited to provide the most useful information to reach the purpose of this case study due to the following two reasons: (i) these four individuals assume significant responsibilities in the Cathedral Hill Hospital project and thus have the most amount of day-to-day interactions with other project participants located both in the co-location office and their respective home offices and (ii) these four individuals belong to the core team which is very likely to stay in the co-location office all throughout the project and thus have the most amount of exposure to the co-location phenomenon as opposed to “rotators” who come and go as project demands change (as discussed later in this paper).

Having stated the reasons for selecting the four interviewees, it is also acknowledged that interviewing more project participants could have potentially provided more insight into the co-location phenomenon. However, due to time limitations of participants and the researcher and scheduling conflicts, more interviews could not be performed. Although this is acknowledged as a possible limitation of this study, it is important to note that this study is an initial attempt to collect and present information on the co-location phenomenon as is currently being utilized in an IPD project. Given that there are no other case studies in the literature that provide insight into the utilization of co-location offices in conjunction with IPD, this case study and preliminary findings presented herein are aimed at starting the discussion and motivating possible future research on the topic as outlined in the “Conclusions and Future Research” section of this paper.

Findings from the Site Visit and Description of the Co-Location Office

The information provided in this section with respect to the co-location office is based on a site visit made at a time when the project was in the preconstruction stage with design, project cost estimation, and schedule development still ongoing.

General Office Description

The co-location office is located several blocks away from the Cathedral Hill Hospital project in downtown San Francisco. The office is shared by all primary team members of the project such as the representatives of the owner, general contractor, architects, engineers, and the various subcontractors, referred to as trade partners. There are several parking garages within blocks of the office; and the building is located in close proximity to different means of public transportation. The entire floor is enclosed by large windows which provide ample light and views of the city from all areas of the office. There is a shared kitchen space with tables and chairs for on-site dining.

Each project team member typically has a cubicle separated by movable partitions. The typical cubicle contains a desktop computer, file cabinets, chairs, and display boards. The cubicles are located at the outer edges of the rectangular-shaped office in front of the windows, allowing plenty of natural light. Noise generated by the shared space is minimal and did not appear distracting. If team members need to have a private conversation, there are conference rooms and private meeting rooms available for their use.

Since Cathedral Hill Hospital is targeting LEED-Gold rating, there is a large focus on sustainability and green buildings in the co-location office. There are display boards dedicated to sustainable product information and other sustainability-related information with respect to the project. The office also has a LEED library area where team members can educate themselves about LEED and generate ideas to be used on the project.

One very interesting display board that the authors would like to highlight relates to how team members get to work. The display board exhibits a series of different colored pushpins that represent the location of where each member of the office commutes from on one large map of the San Francisco Greater Bay Area. The different colored pushpins represent distinctive means of transportation. For example, a red pushpin might indicate that one office member commutes from Oakland to the office by means of an automobile, or a blue pushpin would indicate that person utilizes public transportation. This board seems to be a great way to add sustainability to the office by promoting carpooling by office members who might live close to one another. It also offers great insight into how far people have come to participate in this unique project and their personal carbon footprint as it relates to commuting.

Cluster Descriptions

Team members from all participating entities are organized in the office by what is referred to as a cluster. There are four main clusters in the office related to the project: (i) Structural, (ii) Mechanical, Electrical, and Plumbing (MEP), (iii) Building Interior, and (iv) Building Exterior. Each cluster has general contractor, architect, engineer, and trade partner representatives relevant to that cluster.

The clusters evolve during the project as new tasks commence and the project progresses. Some of the changes to the clusters during the evolution of the project have been (i) the addition of new members from the participating entities to help with the new tasks, (ii) relocation of cluster members to other clusters to facilitate the integration of different clusters, and (iii) relocation of members within the cluster to encourage knowledge sharing and communication within the cluster.

Since this project uses IPD, shared knowledge and a common understanding of where the design and preconstruction processes are at any one time is important to the whole team's success. Each cluster helps facilitate that understanding by providing visual displays of current schedules, pertinent cost information, 3D drawings, and graphs for other clusters in the office to observe. The most recent schedule generated by each cluster is displayed; this enables others in the office to quickly identify where each cluster is with respect to the schedule. Display boards also show the clashes generated from the building information models which provide information to other clusters about areas that need attention as it relates to design. Some of the display boards have material samples and product submittals displayed for the office's review. Items such as paint brush-outs, cloth swatches, glazing samples, wall connectors, and flooring samples are all displayed for project team members to view. Each cluster appoints a person to manage the visual displays and serve as the facilitator of that cluster. The cluster facilitator is in charge of updating the display boards and organizing the information in an effective manner to be shared with the project team. There are weekly meetings in addition to the displays to share the current progress of the individual clusters. Any updates to the display boards are also presented in these weekly meetings.

Findings from the Interviews

This section presents the findings from the interviews with respect to different issues relevant to the co-location office used in the Cathedral Hill Hospital project under their respective headings. It is important to note that for the purposes of this study, it was important to document what opinions were provided as opposed to who provided those opinions. For this reason and for confidentiality purposes, the specific individual who commented on a specific issue is not explicitly identified but rather named as a "respondent" or "interviewee."

General Comparison of the Co-location Office with the Typical Project Office

The intent of this discussion was to identify the fundamental differences between the interviewees' normal project offices and the one they share for this project. The interviewees made this comparison with respect to the privacy and communication speed.

One of the interviewees stated that the open cubicle design of the co-location office was new and took some getting used to. This person is used to having a private office with his own plan table and more privacy. He stated some difficulties in having tough conversations at his cubicle and talked about his use of the private conference rooms as his primary place to conduct those types of conversations. The lack of privacy was actually highlighted by all

respondents; but also noted was that the lack of privacy did not hinder their ability to perform their responsibilities effectively.

Another interviewee discussed his ability to overhear other team members' conversations because of the open cubicle design and highlighted this as a positive thing. This respondent felt that overhearing so many other conversations gave him a strong sense for where others were in regards to project tasks and helped maintain his productivity.

Interviewees also talked about the faster communication that the co-location office offers. Quicker problem resolution and resulting increase in project productivity were talked about as positive attributes of the co-location office when compared to a typical office.

Comparison of the Co-location Office with the Typical Project Office with respect to Meetings

All interviewees stated that there were more meetings in the co-location office than in a typical project office during a typical workweek. Nonetheless, they also agreed that the meetings were more efficient.

One interviewee stated that the meetings were more like working sessions than typical project meetings. This respondent went on to explain that the meetings seemed to more efficiently generate solutions. The co-location office helps reduce the effort involved in scheduling the meetings and gives the ability to quickly schedule meetings with the attendance of individuals representing different entities all located in the same office.

Another interviewee stated that the social interactions that result from the co-location office have helped the meetings because team members become very comfortable with one another. According to this respondent, co-location office members, even though representing different entities, develop a higher comfort level with each other because they are accustomed to seeing and interacting with each other; and as a result meetings generate more useful information at a faster pace.

Communications in the Co-location Office

All interviewees agreed that most of their interoffice communication is done face-to-face. The co-location office encourages members to utilize face-to-face communication. Furthermore, one interviewee stated that e-mailing team members present in the office is even looked down upon, unless that person is unavailable to meet face-to-face. Another interviewee suggested that e-mail is used as a means of communication only if people who are not located in the co-location office need to be copied on the communication.

The Significance of the Clusters in the Co-location Office

All interviewees agreed that there was significant thought involved in the layout of the clusters. One theme shared by all respondents was the clusters that require the most interaction are located close to one another. For example, the MEP Cluster and the Building Interior Cluster share tasks at this point in the project; therefore the two are next to one another.

One interviewee went into detail about the science behind establishing the clusters. This respondent emphasized the importance of placing people together with individuals who they don't already know and aren't used to working with for this project. He talked about the significance of organizing the inter-cluster office area with individuals from design and contractors related to that cluster's focus. Each cluster has general contractor, architect, engineer, and trade partner representatives involved in that specific facet of the project; and putting these people together facilitates the breakdown of barriers and maintains the productivity. Furthermore, the people are moved within the cluster every couple of months or as new tasks begin to help maintain the focus of eliminating barriers and promoting the collaborative effort required by this IPD project. According to this respondent, the first couple of moves were very challenging for cluster members because of the mental blocks associated with moving; but after a year of the same routine, the people in the office embraced the concept and accepted the moves as part of the overall goal of the project. The clusters will continue to evolve throughout the project as new team members arrive and the tasks change.

Another interviewee agreed that reshuffling helps the overall collaborative process. This respondent also provided specific information about the Structural Cluster and its unique situation in the project. The Structural Cluster has the least amount of companies involved in the project who have co-located to the office. Because of the technology and software requirements for the structural component of the project, it was not cost effective to relocate structural engineers from their corporate office. As a result, the Structural Cluster is involved in a substantial amount of virtual online meetings.

Evolution of the Co-location Office

All interviewees agreed that the core team has stayed the same from the beginning, but the composition of the co-location office evolves as the project demands change. One example given was the amount of detailers located in the office, and how the number fluctuates according to the project tasks.

It was suggested that a follow up study of the co-location office would be helpful during the construction phase of the project. There would be an estimated 800 trade people present on-site during construction; and the resulting evolution of the co-location office was not known at the time of the interviews.

The Success of the Co-location Office in Integrating Different Entities

All interviewees agreed that the co-location office has absolutely helped integrate the different entities for this project. IPD philosophy of openness and sharing has really been effectively implemented by the use of the co-location office. One interviewee stated that the increased face-to-face communication helped the team integrate better. This respondent also stated that in the co-location office, they feel free to ask anyone anything related to the project, which is not always the case in the projects that do not use co-location offices.

One struggle to the integration that was not thoroughly investigated during the co-location planning was the information technology (IT) infrastructure. IT issues with respect to compatibility of systems and file sharing were underestimated during the early stages of the project. Since those early stages, the IT managers have worked through those issues and the overall IT infrastructure is now working fluidly. A significant amount of planning should be done to ensure that the IT infrastructure in the co-location office integrates smoothly from the beginning.

Advantages and Disadvantages of Using a Co-location Office for IPD Projects

According to the interviewees, the advantages of using a co-location office for IPD projects are (i) the faster pace of the project, (ii) quicker identification of problems and solutions, (iii) the increased collaboration among team members, (iv) the positive social interaction, (v) the face-to-face communication, (vi) the breakdown of barriers present in construction, (vii) more productive meetings, (viii) knowledge sharing, (ix) shared office expenses, (x) the use of clusters to organize the office and to encourage integration of members, and (xi) the visual display boards for each cluster. Furthermore, two interviewees asserted that an IPD project would be very difficult to move forward without a co-location office.

With respect to the disadvantages, one interviewee pointed out that the co-location office puts pressure on managers to become facilitators of discussions on top of their normal managerial responsibilities. This would include keeping their team members focused on the topic at hand, facilitating group work and problem resolutions, and managing meetings and work sessions. He also stated that co-location requires better personal time management because of the fast pace of the office. He stated that if a team member's tasks are not completed on time, then it holds up everyone involved.

Possible Improvements on the Existing Co-location System for Future Projects

Overall, the interviewees were pleased with the existing co-location system in place. Two respondents stated that table sharing instead of separated cubicles would be an even more effective way of structuring the office. One of them took that topic further by stating that he would rather have everyone using laptop computers as opposed to desktop computers and not assigning seating so as to further streamline the interaction between team members. The

other respondent explained his past experience with this sort of system; and stated that it took getting use to but was very effective for team collaboration.

It was stated that prior to the establishment of a co-location office, all team members should get training to be equally prepared for the co-location phenomenon and collaborative construction projects. One respondent felt that for this project, different entities were prepared at different levels. As a result, the first few months required lots of training and problem solving to get everyone up to speed. He suggested that early team building exercises can help facilitate this process.

One respondent stated that changes to the office layout could be made to improve the co-location office. One of his suggestions was utilizing a space that did not have a central corridor and was completely open. The existing co-location office is in a tall office building with an elevator in the center, which separates the clusters.

Another interviewee stated that in IPD projects, contracts should make co-location a requirement for all participating entities. He believes that the trade partners who are not using the co-location office hinder the fast pace of the project.

Conclusions and Future Research

The purpose of this study was to provide a case study evaluation of the co-location office utilized for the Cathedral Hill Hospital project to develop a better understanding of this phenomenon and to identify its potential for projects using IPD. To reach the purpose of this case study, a qualitative research approach was adopted which included a site visit to generate a description of the co-location office followed by interviews of four key professionals with significant responsibilities in this project.

The co-location office for the Cathedral Hill Hospital project has many components which help make the project successful in its implementation of IPD. The shared space for the project team is the foundation for the co-location office. Project team members utilize the relatively open office layout by sharing cubicles with other team members and using face-to-face communication. Team members in the co-location office share their office with individuals who they would not normally work with side by side. As explained by one of the interviewees, shared office space has helped him feel more comfortable with the other project team members, and he feels comfortable enough to ask anyone in the office a question regardless of their role in the project. He went on to explain that because he shares an office and sees the entire project team on a daily basis, his personal comfort level with the project team is much higher on this project. The visual displays throughout the office further facilitate the integration and collaboration for this IPD project.

On the display boards are current schedules, cost information, design ideas, product information, design clashes from the building information models, and sustainable building information. These display boards are produced and maintained by representatives from all of the participating entities. These display boards help break down the professional barriers between the team and enables effective implementation of IPD by making the project-related information available to all team members. The openness expressed in the display boards shows firsthand the collaborative process of the co-location office.

The clusters offer a great way to organize the IPD effort within the co-location office by breaking the project down into smaller groups; this helps integrate team members' efforts towards their project responsibilities. There are four clusters in the office: Structural, MEP, Building Interior, and Building Exterior. Location of team members in these clusters is highly organized and much planning is done to ensure clusters are optimizing the work performed in the co-location office. When organizing the cluster team members' individual locations, attention is given to place people next to others they do not know or normally work with side by side. To maximize the collaborative effort needed in an IPD project, team members should feel comfortable with all people involved in the project. To facilitate this, the individual office locations get periodically reshuffled to encourage office members to continually meet and interact with new project team members. The clusters also evolve based on the project demands with new project members joining the co-location office as the project progresses. People come and go based on the project demands, but the core group or primary team has remained steady so far during the project. The weekly cluster meetings ensure that all team members are moving forward collectively.

Based on the fundamental principle of IPD, every member of an IPD project is responsible for the overall success of the project. Since each company involved shares the risks and rewards, the whole project team collaboration is necessary (AIA, 2007). It appears from the interviews that the project team collaboration starts with breaking down the barriers between individual team members so they are inclined to share their information and truly integrate their role in the project. The daily face-to-face communication as facilitated by the co-location office seems to expedite the process of breaking down the barriers and support this crucial aspect of IPD. Face-to-face communication is the primary means of communication in the co-location office.

Utilization of a co-location office seems to increase the number of meetings. However, these meetings are more like working sessions. It is also important to highlight the simplicity involved in conducting a meeting at the co-location office. Since the project team composed of different entities is located in the same location, meetings do not require as much effort of planning and commuting.

While a co-location office has many benefits that help streamline the IPD process, items to be aware of in the planning for a co-location office are: (i) IT compatibility issues, (ii) the learning curve for the team members and thus the need for team member training, and (iii) the need for better personal time management. Of these issues, the particularly important one is the IT compatibility issues. Compatibility of the IT systems is crucial to support this collaborative effort and could potentially make the co-location office a success or a failure. If the IT infrastructure does not perform, then the co-location office will not run efficiently; and the fast pace could be hindered.

Given that there are no other case studies in the literature that provide insight into the utilization of co-location offices in conjunction with IPD, this case study and preliminary findings presented herein are aimed at starting the discussion and motivating possible future research. An important future research on this topic would be a follow up case study of the Cathedral Hill Hospital project after construction is complete. Such research should investigate the overall lessons learned with respect to the co-location, the overall opinions of the team members related to the co-location office after construction, and how the co-location office evolved during construction. Similar studies can be done for other projects that utilize co-location offices to identify similarities, differences, and best practices. Furthermore, a study investigating the potential of including provisions related to the co-location offices in the multi-party IPD contracts would be beneficial for the construction industry.

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