

CBA AS A DIFFERENTIATOR TO WIN PROJECTS IN PURSUIT: A CASE STUDY

Paz Arroyo¹, Annett Schöttle², Randi Christensen³ and Chad Arthur⁴

ABSTRACT

This paper presents a case study where a Design and Construction project team, general contractor and architect were asked to use Choosing By Advantages (CBA) during the pursuit phase of the project. The paper describes how the design and construction project team implemented CBA throughout the project pursuit, including details surrounding the team's preparation and decisions developed during confidential conversations with the Owner. Ultimately the team implemented CBA when selecting the structural system, external facade, and the project programming. The researchers integrated the Owner's perspective to understand the motive(s) to utilize the CBA decision making method, why they chose the winning team, and the ways CBA methodologies were implemented beyond the project pursuit phase. This paper presents unique viewpoints, from both the project team and Owner's, on the benefits of using CBA during project pursuit and beyond. The aim of sharing this case study is to inspire more owners to request the use of the CBA method at the start of the project. Choosing By Advantages simplifies the internal decision-making process, which many team find as a challenge. CBA allows for project teams to approach owners with a decision-making process that allows for optimal owner feedback leading to productivity and clarity within the phases of the project.

KEYWORDS

Choosing by advantages, pursuit, collaboration, decision-making

INTRODUCTION

Owners appreciate a Design and Construction team that assists them with decision making. Traditionally teams struggle to make decisions together and projects are often delayed due to the lack of clarity on how to move forward (Arroyo & Long, 2018). This paper describes the UC Davis Project pursuit process that set a new standard, in terms of, how to choose a project team based on their capacity to lead collaborative decision-making efforts. The research is written from the perspective of the winning teams, DPR Construction and Smith Group and how they succeeded in demonstrating their ability to identify and drive decisions by implementing the Choosing By Advantages (CBA) method starting early on in pursuit. This research focuses on answering two questions from the design and construction team's perspective: How can CBA be implemented during the pursuit phase? What benefits and challenges did this approach present for the pursuing team?

¹ Quality Leader DPR Construction, San Francisco, CA. paza@dpr.com

² Partner & Head of refine cell Munich, Refine Project AG, annett.schoettle@refine.team

³ Sustainability Director, COWI, rmch@cowi.com

⁴ Design Manager, DPR Construction, Sacramento, CA. chadar@dpr.com

The Owner's perspective is also included in the research to compliment the findings and to provide clarity surrounding the Owner's motives for requesting CBA during pursuit. The research's primary focus here is to answer the question: What is the value (from the owner's perspective) of requesting the use of CBA during pursuit?

Few owners have publicly embraced the use of CBA and even fewer have published a case study or academic paper about the use of this decision-making method. UCSF has published the potential use of CBA for tender procedure (Schöttle and Arroyo, 2016; and Schöttle et al.2017). Schöttle et al. (2018) and Arroyo et al. (2019) also presented an example of the use of CBA by Highway England Projects, as another example of owners implementing CBA as part of their internal process. This paper contributes to the existing literature by providing a case study on how CBA was successfully implemented during pursuit by the winning team, what lessons were learned, the owner's viewpoint on the benefits of CBA and how the use of CBA aided in their selection of the winning team.

CBA TABULAR METHOD

CBA is a multi-criterion decision-making method developed by Jim Suhr (1999). CBA allow teams to differentiate between alternatives based on the importance of the advantages among the alternatives evaluated. The CBA decision-making method provides a structured and transparent way to make decisions. CBA uses a defined vocabulary so that a group can formulate and discuss based on a share understanding (Schöttle & Arroyo, 2017; Schöttle, Christensen, & Arroyo, 2019). The common method is the CBA Tabular Method. According to Arroyo (2014), CBA is the best multi-criteria decision-making method compared to traditional Weighting Rating Calculating (WRC), AHP, and linear optimization methods, when it comes to 1) providing transparency by creating a shared rationale for the decision and differentiating ‘value’ from cost 2) building consensus, with focus on optimizing the whole and not just the pieces and avoiding unnecessary conflicts. 3) continuous learning, this method helps document decisions in a way that is transparent and can guide future iterations as more information is gathered.

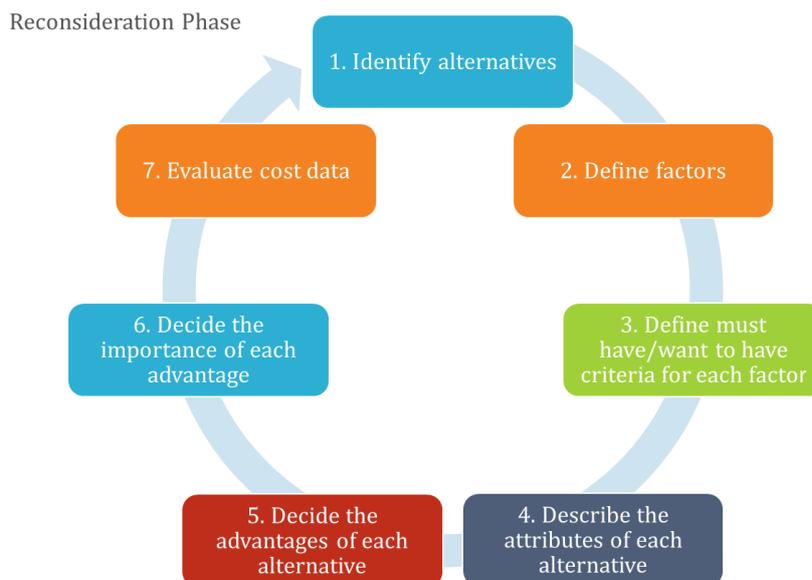


Figure 1: CBA Tabular method (Arroyo, 2014)

RESEARCH QUESTIONS AND METHODS

The research questions from the proposing team's perspective are:

1. How can CBA be implemented during pursuit?
2. What benefits and challenges did the pursuing team face when implementing the CBA approach?

From the Owner's perspective the research question is:

3. What is the value of requesting the use of CBA during pursuit?

To answer question (#1) "How" this paper uses a case study methodology (Yin 2019) to describe the process of winning a pursuit proposal based on a specific owner request (UC Davis) and is centred on showing how the team guides decision making with CBA. In addition, this study utilizes action research (Dikens and Watkins 1999). The first author taught the pursuing team CBA basics and provided feedback. The last author was of the pursuit team. The two additional authors were not directly involved in the project, but helped mitigate potential biases by the two authors involved in the case. The research describes the initial owner request and the process of developing the presentations that allied the team (DPR Construction and Smith Group) to win the project.

To answer question (#2) "What" from the proposing team's perspective, the researchers did a focus group with project participants and directly asked about benefits and challenges. The paper describes lessons learned and insights from the winning project team members. To answer question (#3) "What" from the Owner's perspective the authors reached out to the Owner via e-mail. Researchers asked about the owner's motivations to request CBA in the proposal, why they selected the winning team and how they plan to keep applying CBA to the project. Two owners responded to our questions via email. Finally, researchers talked to the project team to validate the accuracy of the project's story.

CASE STUDY

This section presents the project background, the design and construction team's approach to implement CBA, the design alternatives that were presented in the pursuit meetings with the owner, and the Owner's perspectives

THE OWNER'S REQUEST FOR PROPOSAL

The request for proposal was developed by the University of California Davis Health (UCDH) team and encompassed the design and construction of the Sacramento Ambulatory Surgery Center project. Part of the proposal's development was overcoming the challenge of identifying the scope and program of the building. The team was given little background information, including site location and size, to use in the development of the proposal's foundation.

In this case the owner decided to split the interview process into 2 confidential meetings and a final presentation. Confidential Meeting #1 (90 min) - Prepare a draft CBA presentation where your team outlines 3 key drivers that impact the SASC (Sacramento Ambulatory Surgery Center) project. Identify alternatives, define factors, describe attributes, and decide advantages and importance for each of the 3 drivers, along with the impact on schedule and cost. In addition, they requested a presentation of the team structure for the project and team dynamics to collaborate in the process. Confidential meeting #2 (60 min) - Present your final CBA presentation, be prepared to discuss your collaborative approach to the project with program validation and limited

user engagement. Final Presentation (60 min)- Wow the selection committee. Show us what differentiates your progressive design-build team from others.

TEAM PREPARATION

The team consisted of Design and Construction experts. The challenge was to consolidate the huge amount of information and many of the questions the team had to get answered to develop a design and construction proposal.

The team had different levels of expertise and experience with CBA (some had previous training), so the team leadership decided to have an inclusive introduction to CBA for the Designers and Construction team together. After the team became familiar with CBA key words, definitions and process, main drivers for decision making emerged. The word “drivers” was confusing for the team because is not part of the standard CBA vocabulary. The team then decided to focus on 3 decisions (Figure 2):

- CBA #1 - What is the optimal Structural System?
- CBA #2 - What is the optimal primary Exterior Façade system?
- CBA #3 - What is the optimal program deployment?

The team decided to create a visual representation of CBA to present to the owners.

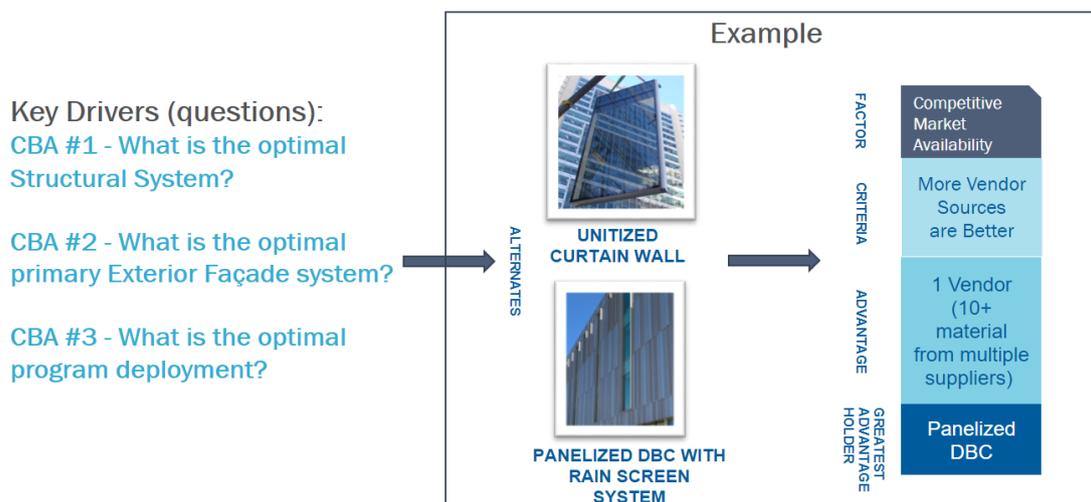


Figure 2: Decisions and example of CBA visualization.

The Owner’s challenge making decisions forced the team to define these 3-pointed questions, requiring answers, to start the design process. Experts were assigned to collaboratively answer, develop initial factors, criteria, attributes and advantages to all 3 questions, which resulted in decisions being made. The team decided not to attempt to decide the Importance of Advantages (IofAs) since that would have required owner and user inputs. In addition to the team providing clarity on the decisions made and visual presentation, they also consistently practiced y how to communicate clearly, by defining the transitions between speakers for the owner meetings. This process also helped refine the decision, collect questions, and request for feedback from the owner’s perspective. At the end the team wanted to develop a design attuned to the current owner’s needs. The team also decided to present the decisions from simplest to hardest, mainly to avoid running out of time if discussions concerning more complex decisions extended over the allocated time.

STRUCTURAL SYSTEM DECISION

At the top of Figure 3 it shows the structural system alternatives and the main factors the team measured. Upon closer consideration, most of the factors did not differentiate the alternatives (i.e., no alternative had a big advantage), therefore the team was able to simplify the decision to only consider 4 differentiating factors and thus, focus on the relevant facts. The team knew that all structural systems being evaluated could achieve the desired building height, provide enough architectural flexibility and structural resiliency. They also have similar durability, requirements for on-site labor, permit risks, etc. The four factors that the team knew would really differentiate the structural alternatives were: 1. How the structure limits the initial plan layout. How much early the decision needs to be made. Availability of materials. 4. Future flexibility. Differentiating factors are shown with more contrast in Figure 3.

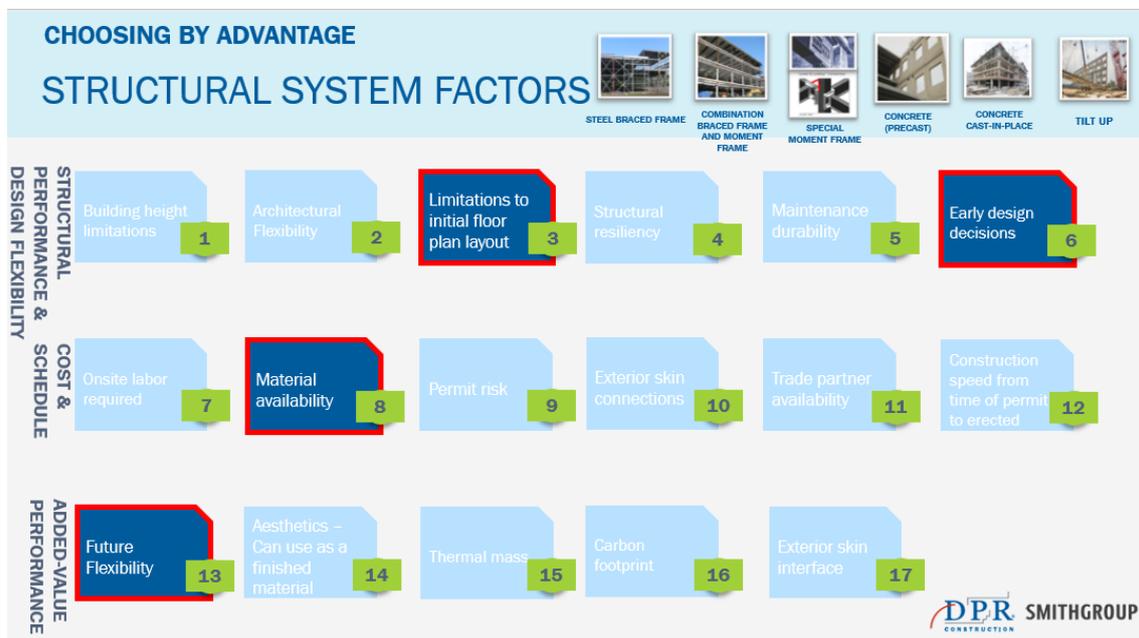


Figure 3: Structural Systems Factors.

Figure 4 shows how 2 of the 4 differentiating factors created a much greater advantage for the Special Moment Frame alternative. The team did not weigh the advantages since they were unaware of owner's preference at that point in time. Therefore they presented an initial visual assessment of the advantages.

This preliminary information was presented to the owner and the team requested further feedback:

- Is there an additional factor we should include in this decision that was not considered?
- Are there other structural system alternatives that the owner wishes to explore?
- Do our recommendations make sense?
- In addition to the advantages of a Special Moment Frame, the team also highlighted less installation time and the fact that this is probably the cheapest alternative.

As a result, it seemed that this could be an easy decision to make.



Figure 4: Special Moment Frame advantages.

EXTERIOR FAÇADE SYSTEM

The team followed the same structure for the exterior façade system decision. Figure 5 shows the final factors considered and a preliminary discussion on a recommended alternative.

Again, the team asked for feedback from the owner in efforts to understand what was important to them. During the interview the team learned that the advantage on campus continuity was very important for the owners. This helped the team identify an important advantage for the Pre-Cast C-CAP alternative, which is more consistent with the rest of the campus buildings. This alternative is the only alternative that allows for sharp angles that are valued by the owner. Therefore, the project team leaned towards this alternative even though it was more expensive than the other two alternatives.

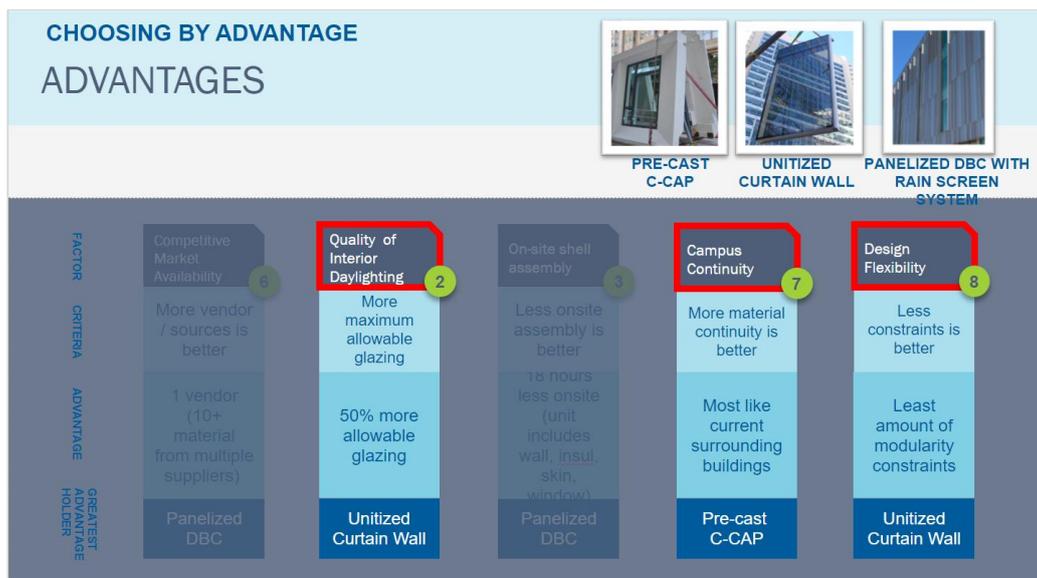


Figure 5: Exterior Façade systems advantages.

PROGRAM DEVELOPMENT ALTERNATIVES

Deciding on the program development alternatives was the most difficult decision to prepare, because there was much more uncertainty surrounding needs and preferences of owners and users. However, the team developed four high level design concepts that revealed important differences. This allowed the team to ask the owner for specific trade-offs that they needed to make. In this case, the design team decided to present factors and criteria first and then started asking for feedback (Figure 6). Finally, the designers developed 4 major concepts for the building footprint (Figure 7).



Figure 6: Program development factors.

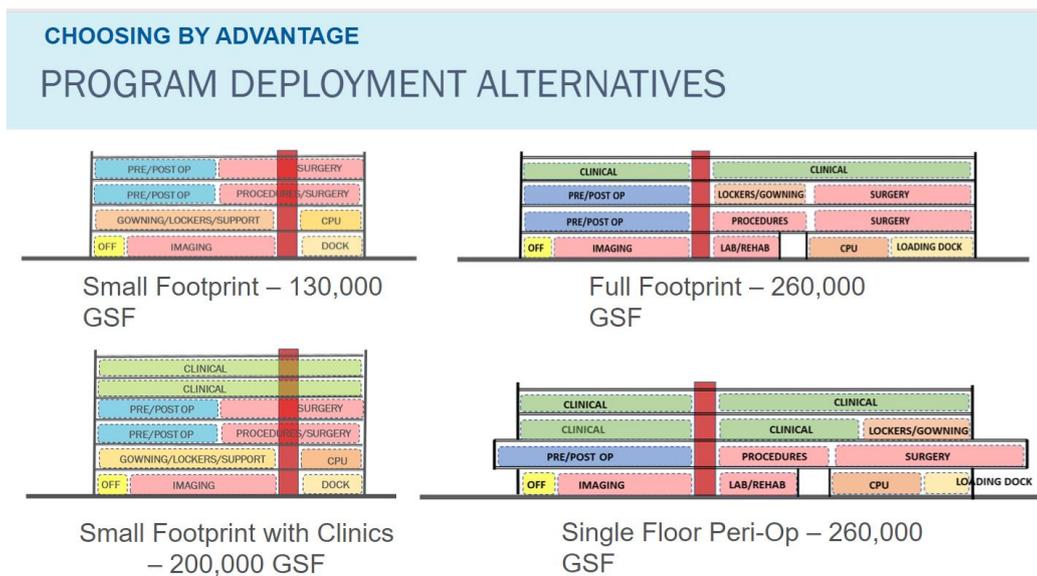


Figure 7: Program development alternatives.

Even though these designs were conceptual in nature they showed the know-how of the healthcare system since. All designs proposed to maximize separation of clinical space to increase clinical efficiency. The two designs on the left used smaller footprints and proposed the construction of a tower 4 to 6 floors depending on the owner's desire to provide clinical space. On the other hand, the two designs on the right used the full footprint available and achieved a higher GSF (260,000 SF / 24,155 m²). However, the proposed distribution and building shape differed because the one shown on the bottom included more clinical space. After very quickly identifying the preliminary factors and creating 4 design alternatives the proposing team was able to have a rich conversation in both confidential meetings with the owner. This demonstrated the team's capacity to design, think innovatively, and be curious and relentless in testing assumptions.

OWNER'S PERSPECTIVE

The researchers posed 3 questions to the owners and received answers from two people - the Owner's Project Manager (UCDH Facilities Design and Construction) and the owner's representative (UCDH, California Tower Team). Their answers are presented in the text below:

- Why did you ask the teams to use the CBA method during the confidential meetings/interviews?

“On any complex project like the SASC, there are always many difficult decisions that need to be made in the course of planning and design to successfully optimize the project. CBA is a LEAN tool that not only assists with the decision-making process but also documents the process that leads to a particular decision. UCDH has had many successes in delivering projects with our design-build partners using LEAN methodologies including the use of CBAs. Because CBAs are so integral to the process, getting a glimpse into how each of the shortlisted teams for this project develop a CBA was deemed to be an important aspect in evaluating the prospective teams.” - Owner's PM

“Since the SASC is a complex, fast paced project that is being driven by tight logistics and a speed to market timeframe, the team wanted to challenge the proposers to use a tool that could assist in making smart decisions quickly. We wanted our failures to be fast and small! By asking the team to consider a CBA tool within the decision-making toolkit, we were looking to see how firms handled challenging questions and their thought process in (a) asking the right level of questions and (b) learning how the shortlisted firms came to the decision which appeared to have the greatest “advantage”. - Owner's Rep.

- How did the other teams use the CBA method and did DPR – Smith Group's usage of these methods help them to be selected for the project?

“While many organizations use CBAs to help make and document decisions, methodologies can take on a range of flavors. The DPR/Smith Group team excelled at tailoring the level of detail to correspond with the planned time to discuss and to the audience. The DPR/Smith Group team prepared the work in advance, was able to synthesize and share that detailed work in a digestible way and was able to solicit feedback on the team assumptions without getting bogged down in all of the details. Other teams either struggled by either slogging through the details, not doing enough pre-work, or conversely, not demonstrating enough rigor in their approach.” - Owner's PM

“Agree with (Owner's PM) on the summary regarding the other team approaches. As far as the DPR/SG methodology, it was very apparent that DPR/SG team prepared the work in advance, especially in their use of the Miro board. The ability of the team to highlight information needed from the client and use the client's assessment of the advantages along with their expertise is what set this team apart from the other participants.” - Owner's Rep.

- How do you see the use of CBA influencing decision making within the UCDH organization?

“Perhaps the greatest value organizationally is assisting with various leadership teams with decisions that take into account priorities from a diverse group of stakeholders and competing interests, in prompting those conversations to take place, and to create transparency in the process.” - Owner's PM

“Use of facts, outside of opinions, to formulate a decision. CBAs don't just highlight the decision that is less costly, lesser impact and quicker on the schedule. They are a tool that

can be utilized to look at all the options and to help the client make an informed decision.”
- Owner’s Rep.

DISCUSSION

The Request for Proposal requiring the team to explicitly use CBA was a first time for DPR Construction and Smith Group. This ask was both a challenge and a blessing. The owner requirement stating the need for CBA was something that the winning team celebrated and acknowledged as a great opportunity to work collaboratively with the owner and build a foundation of trust. According to the owner’s responses, the DPR and Smith Group team was able to demonstrate the use of CBA in a visually appealing manner, presented relevant information and requested relevant feedback, which resulted in them winning the project. Per the Owners' responses, they were familiar with CBA before requesting the method. The DPR team was also familiar with CBA, as they have utilized CBA for a previous proposal with UCDH.

The project team is currently using CBA for design decisions. The information captured during the interview process helped them make decisions on the massing of the project. This has allowed them to move faster with the design, which is important due to the schedule constraints of the project. For the current decisions, the team has learned to reduce the number of factors typically from 15 to 3-4 factors by curating them, to make the decision making process more efficient. The team is learning to be more selective of the factors to be used depending on the type of alternatives and selecting the most applicable ones from a larger list of factors collected during project meetings with diverse stakeholders. In addition, keeping the project under cost is very important for the owner and that is considered when making decisions with CBA. However, the team doesn’t always choose the cheapest alternative, as mentioned in the façade decision.

In addition, the team has learned to stop the process if a decision is obvious to maximize time. The CBA process has inspired the conversation with multiple stakeholders. The team has learned how to simplify the decisions, and the client’s interest in the process has made applying CBA much easier. The team is also using a system for CBA and documenting the decision data with software. However, the software’s generated A3 is not as comprehensive as the whole report. To maximize the visual effectiveness, the team needs to generate a clean overview in an A3 report, clearly depicting all advantages.

From the owners’ responses we can state that they value the use of CBA based on their previous experiences dealing with complex decision making, as well as the current CBA use in this specific project. We can argue that the owners value a "smart and quick" decision process, the ability to separate cost and schedule from importance of advantages, and a transparent and inclusive decision-making process, which can be achieved using CBA. The owner also valued the proposing team’s ability to ask questions requesting the right level of detail, at the right time. Owners wanted to see the thinking process of the team and their ability to synthesize complex ideas and show progress in an easily digestible way. Owners valued the proposing team asking for feedback and then used their expertise to facilitate the decision-making process.

CONCLUSION

This case demonstrates the value of having a clear expectation on how decisions will be made in the design and construction phases of a project. The winning team became more

prepared to tackle the project after winning by having gathered feedback to allow them to make decisions. The project team has been able to make decisions transparently and collaboratively while maintaining the schedule and budget. The overall benefits of implementing the CBA approach will be clear by the end of the project. However, in early design the team has already learned how to implement CBA in a transparent way and made decisions together, beginning in the pursuit phase. The owner valued the decision-making process achieved with CBA, which allows them to make faster decisions, in a transparent manner, using the expertise of the whole team to understand the importance of advantages, and at the same time manage cost and schedule. Implementing CBA helped the owner and proposing team build a shared understanding beginning at pursuit.

ACKNOWLEDGMENTS

The authors want to thank all of the Design and Construction participants in the preparation of the pursuit documents and in the revision of this article including George Hurley and Greg Mantz from DPR Construction, and Tyler Krehlik from Smith Group architects. In addition, special thanks to UCDH owners, Creed Kampa and Jana Aubert, who provided us with the owner's perspective and kindly shared their insight with the researchers and the international Lean Construction community. Finally, we would like to thank Emilee Hinsley of DPR Construction for editing this paper.

REFERENCES

- Arroyo, P. (2014). Exploring decision-making methods for sustainable design in commercial buildings [Doctoral dissertation, University of California, Berkeley].
- Arroyo, P., Ballard, G., & Tommelein, I. D. (2014). Choosing by advantages and rhetoric in building design: Relationship and potential synergies. *Proceedings of the 22nd Annual Conference of the International Group for Lean Construction*, 391-408..
- Arroyo, P., & Long, D. (2018). Collaborative design decisions. *Proceedings of the 26th Annual Conference of the International Group for Lean Construction*, Chennai, India, 18-20 Jul 2018. pp 463-472.
- Arroyo, P., Christensen, R., Schöttle, A. & Long, D. (2019). "Lessons Learned on Teaching Choosing by Advantages" *Proceedings of the 27th Annual Conference of the International Group for Lean Construction*, 405-416. <https://doi.org/10.24928/2019/0249>
- Dickens, L., and Watkins, K., (1999). Action Research: Rethinking Lewin. *Management Learning*, 30(2), 127-140.
- Schöttle, A., & Arroyo, P. (2016). The impact of the decision-making method in the tendering procedure to select the project team. *Proceedings of the 2th Annual Conference of the International Group for Lean Construction*, 23-32.
- Schöttle, A., Arroyo, P., & Haas Georgiev, C. (2017,). Applying choosing by advantages in the public tendering procedure. *Proceedings of the 25th Annual Conference of the International Group for Lean Construction*, 9-12.
- Schöttle, A., Christensen, R., & Arroyo, P. (2019). Does Choosing by Advantages Promote Inclusiveness in Group Decision-Making? *Proceedings of the 27th Annual Conference of the International Group for Lean Construction*, 797-808. <https://doi.org/10.24928/2019/0209>
- Suhr, J. (1999). *The Choosing by Advantages Decisionmaking System*. Quorum, Westport, CT..
- Yin, RK. (2009). *Case study research: Design and methods*. Thousand Oaks, CA: Sage.