WHAT CAN WE DO BETTER?

Convening the best minds to re-imagine capital construction at UW and WSU

CAPITAL PLANNING AND DEVELOPMENT

University of Washington & Washington State University

CENTER FOR EDUCATION AND RESEARCH IN
Department of Construction Management

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Summary

On October 24, 2016, Washington State University (WSU) and University of Washington (UW) invited the building industry's best minds to discuss what they can do to add value and innovation around how and what to build. The objectives of the day's events were to identify approaches, tools, methods, processes and more to improve:

1) Design and construction solicitation and procurement.

2) Project definition and set-up.

3) Programming and design process.

4) Project governance and decision-making.

5) Team creation and best work encouragement.

Out of this event, participants developed twenty-five key ideas for improving value and innovation for ongoing and future university building projects.

In the days that followed, UW and WSU Capital Projects synthesized the key lessons from the conference with work carried out during roundtable discussions in 2016 to develop the final white paper, "What Can We Do Better?" This document consists of key lessons for re-inventing the capital project delivery process, concluding that the process requires creating truly effective collaborations between university owners and their project teams.

The Center for Education and Research in Construction (CERC) supported UW and WSU Capital Projects through participating in the conversations of the conference and organizing several graduate and undergraduate students from the UW's College of Built Environments to capture conference conversations. CERC also developed a literature review as an appendix to the white paper. This literature review demonstrates the importance of strong collaboration between owners and project teams and that owners can integrate many IPD collaborative practices into their own projects regardless of the delivery method.

Introduction

Why do university buildings cost so much? Most capital project groups have a series of pat answers to this question, but at the UW and WSU we think it is time to give this question the full exploration it deserves. We owe it to the taxpayers, government officials, donors, faculty, and students. So in the best academic tradition, we pulled together the brightest minds in the industry to help us find ways to deliver more value with our capital projects. By questioning both what we build and how we build, we hope to uncover ways that we as owners can create an environment that leads to significantly higher value projects. As a result of this effort, we anticipate improving:

1) the way we solicit and procure design and construction services,

2) the way we define and set up projects,

3) the way we think about the programming and design process,

4) the establishment of project governance and decision making,

5) how teams are created and encouraged to do their best work.

Background

Universities operate in profoundly different ways than other sectors, so the buildings and open spaces they construct are naturally different. The American campus is often held up as a model of an idealized collaborative environment. However, there is no question that this environment comes at a price – increased capital cost, operating costs, maintenance costs, etc. With so much focus on the affordability of higher education, we must re-examine these costs and find ways to reduce them. The challenge is to enhance the qualities that make our campuses special, but spend less doing it. To make this even more difficult, productivity in the design and construction industry has been on a steady decline – down 20% over the last five decades - while nearly every other industry has shown triple digit increases. This suggests that a fundamental shift is necessary in the way buildings are conceived, planned, and executed. Higher education capital project delivery can—and must—become a leader in efficient and value-added planning, design, construction, and operations and maintenance.

To help seed this effort, the State of Washington's two research universities have been collaborating to find more effective ways to maximize the value of their buildings. With state funding for capital projects and NIH funding in decline, it is absolutely critical that the value of our construction projects be maximized.   In a series of roundtables with local industry leaders in the first half of 2016, best practices were identified and a model for more effective project delivery began to take shape.

While total capital costs are typically separated into hard construction costs and soft costs, the group chose to divide the recommendations into two questions, *what we build* and *how we build*. Drawing on both experience from actual projects and a number of research studies, conversations focused on the choices that are made during the process and how they can affect the overall value of the project.

What we build is the most significant determinant of the capital cost. It is widely recognized that different types of buildings vary in cost, and most studies carefully segregate building types. However, there

are many nuances within each of these building types. Issues such as building standards, floor to floor height, the level of customization, redundancy, environmental sustainability, and design details, can have significant impacts on the cost of the same type of building. To make it even more complicated, some of these factors add to the long-term value of the project while others simply do not. The question is how are these choices made? The decision-making structure within the University, the relationships between the University, designer and builder, the project governance structure, the alignment of goals, and key performance indicators all need to be carefully established at the outset of the project.

How we build is the other determinant of cost. Many people point out that the design and construction process has not seen fundamental change in the last 100 years. While there are examples of more efficient methods leading to better quality for less cost, higher education has been relatively slow to embrace these methods. Finding the most appropriate methods to maximize the value of each project is the key, and this is almost exclusively the owner's role. Beginning with the solicitation for services, the owner sets the course for how the project is delivered and at what cost.

In order to significantly affect the value of the projects universities undertake, a very careful examination of both *what we build* and *how we build* is necessary. Many decades of experience, policies, and public works procurement requirements often push us to do things the same way as we have always done them—this seemingly reduces our individual risks—but we must challenge these assumptions and rethink the way we do business if we are to make a significant impact on the outcomes.

Conference in October 2016

To expand on these ideas, UW and WSU hosted a conference in October 2016 with local industry leaders, including architects, engineers, contractors, subcontractors, developers, construction attorneys, other public owners, and private sector owners. The day started with a series of break-out sessions to brainstorm around three themes: 1) what we build – approaches to programming, planning & design, 2) how we build – approaches to teaming, 3) how we build – fostering innovation. From these sessions twenty-eight actionable ideas were identified and reviewed (see Appendix A). Five were then chosen for further discussion:

1)   Project Business Plans

2)   Standardized Building Components

3)   Assembling the Project Team Early

4)   Improve Decision Making / Leadership

5)   Shared Risk Reward / Incentives

Key Lessons

Based on the work done at the conference combined with the earlier work carried out during the round-tables conducted earlier in 2016, the following lessons can be summarized as we look to re-invent the

capital project delivery process:

What we build

Decisions about what we build are the most important decisions in the life of the project. Roughly 50-60% of the total project cost is labor and materials, and it drives the other 40-50%. While different types of buildings inherently cost different amounts, projects need to be set up in advance to make choices that focus on the value the building brings to the institution. The most critical stage of the project is the initial formation of the project. If done well, it aligns the interests of all of the parties involved and focuses the efforts on the overall objective. If done poorly, it can lay the seeds for dysfunction that will continue until the end of the project and sometimes for the life of the structure. Unfortunately, many of the most important aspects of the project setup are often overlooked, as owners and designers rush to move forward with the things they know best. Detailed programming and analysis, site selection, conceptual design, etc. are often required by funding authorities, but they can take the focus away from the critical issues that will drive the project. This often results in wasted effort when the true project drivers are discovered along the way. Instead, the early focus should be on the following:

- Defining the Institutional Objectives / Business Strategy – It is commonly believed that Albert Einstein once said, "If I had only one hour to solve a difficult problem, I would spend 55 minutes defining the problem." Unfortunately, this simple step is often completely overlooked by university project teams. A clear statement of the institutional objectives and how the project relates to the overall University goals, along with a clear understanding of the funding sources and ongoing costs, should drive all of the major decisions about the project. Ensuring that everyone on the project team has a clear idea about why the project is being done will help focus the thousands of decisions that are made during the course of a project. While this may seem simple, it merits an entire phase of work—writing the objectives, identifying key performance indicators, testing them against potential fund sources (capital and operating) to make sure they are in alignment, vetting them with the entire team to be sure they are well understood, and preparing the team to be guided by them throughout the project. The time spent doing this well will pay dividends later. During this "problem definition" phase, it is critical not to focus on floor plans, detailed programs, cost estimates, life cycle costs, etc. because without a full understanding of the problem that is being solved, these more detailed examinations can create distractions that block the "line of sight" connecting every aspect of the project to the objective. This will naturally focus the team to look broadly at alternatives and search for fully integrated solutions.

- Budgeting – While people in the industry are fond of saying each project is unique, thorough benchmarking of both private and institutional buildings can help the team create a common understanding about the project and key trade-offs. These lessons can be built into the business plan. This requires more than a simple list of similar projects and their cost. It should be a careful analysis so information can be mixed and matched to align with the problem at hand. The project budget should then be established based on a final business plan that factors in sources of funds, potential income streams, and the total cost of ownership—rather than an estimate of an early design solution.

- Separating the Shell & Fit-out – The character of most college and university campuses are de-

fined by their heritage buildings: historic buildings that have stood the test of time and maintained their architectural beauty. However, few if any of these buildings are still being used for the activities they were designed for. Although it is unlikely these buildings were conceived of as shells with changing fit-outs, they were nevertheless built in the same manner—strong and wonderfully designed exterior envelopes with interiors that inevitably change over time. Our current buildings should be designed this way: exteriors with high design integrity, generous floor to floor heights, standard column spacing, and flexible layouts suitable for the changing pedagogies and research needs. Focusing on the second and third generation costs as much as the initial costs can add clarity to the long-term decisions about the shell of the building, while interior decisions can be made in a more short-term manner. Separating these issues, and the groups who have influence over them, allows many more activities to proceed in parallel, saving time and money.

- Optimizing Standardization – The manufacturing industry has demonstrated the huge gains that are possible through the use of standardized components, yet our industry continues to believe that each project is unique, that every situation is different, and that each occupant is special. This leads to having hundreds of different light fixtures, locksets, mechanical units, and finishes in one building, making construction, maintenance, and space management exponentially difficult. With more standardized parts and layouts, more flexibility can be built into the project and more componentization and off-site construction can be done. This lowers the capital cost and operating costs, while making the building more flexible for future uses.

- Applying Building Standards Appropriately – While there are many good reasons to apply building standards to institutional buildings—taking advantage of buying power, standardizing replacement parts, capitalizing on specific maintenance skills, etc.—most tend to be a litany of "lessons learned" that inappropriately focus on the end products rather than the process that led to their installation. This adds significant cost but no value. In a recent study, the University of Washington found that its building standards were adding roughly 7% to the project cost. With the constantly changing technologies and innovative thinking in our industry, static building standards do not create the best value. Instead, we should think of the standards as a checklist for discussions we need to have with the project team to ensure that we really are adding value.

How we build

With the project direction firmly established, it is now important to decide how to execute the project. There is no question that university buildings are becoming more and more complex. The same heritage building mentioned earlier likely had a very simple heating and plumbing system and none of the electrical, data, security, audio visual, or controls systems that are standard in today's buildings. In addition, today's regulations require a carefully balanced approach to a variety of considerations including energy use, accessibility, historic preservation, stormwater runoff, and material selection. This added complexity requires more and more expertise and therefore larger teams. We simply cannot rely on one or two parties to possess all of the knowledge and come up with the best solutions. Therefore, larger and more collaborative multidisciplinary teams must be created and nurtured to maximize the value of any project. A great deal of attention needs to be paid to the dynamics of the project team and

the way it communicates. In fact, a growing body of research suggests this is one of the most important indicators of project success (see literature review). While other industries have embraced this notion, the construction industry has been slow to adopt this methodology, sticking with standard contracts and communication mechanisms. To make this fundamental shift, critical consideration of the following is required:

- Establishing Project Governance - The function of a good project governance structure is to make solid and timely decisions that allow the institution to achieve its objective while ensuring that the project takes full advantage of the resources around it. In a complicated organization like a university, this usually requires more than one perspective, but it needs to be nimble enough the keep up with the project requirements. A relatively small group with a variety of perspectives, including the primary proponent of the project, a broader institutional perspective often provided by the Provost's office, a "portfolio view" of a broad set of projects, and a longer range view of the financial investment is typically the best mix. It is too common for university projects to be driven only by the primary proponent of the project, leading to highly customized buildings that may be quickly outdated. An appropriate governance structure should balance the enthusiasm of the proponent with the long-term goals and realities of the institution. The governance structure should be developed at the very beginning of the project and remain in place throughout the project, as important decisions are made through construction and the transition to operations.

- Assembling the Team – An effective team begins with having the right people at the table. Very careful attention needs to be paid to the individuals who will be executing the work (not just the companies). Effective team members must have the right combination of knowledge, skills, and abilities, as well as the desire to truly collaborate. It can be extremely difficult to select the best people in a low bid procurement method, but in a qualifications-based method the owner can focus the appropriate amount of attention on having highly qualified people involved. In fact, in most cases it is possible to build your team successively with input from the other team members all the way down through the subcontractors, ensuring that skills can effectively complement each other. Sometimes it may be necessary to add team members from outside the industry to help with certain aspects of the project. It is important to keep an open mind while assessing the team's needs.

- Fostering the Team – After the assembling the team, the university must focus on creating an atmosphere in which that team can thrive. It is often beneficial to conduct partnering sessions and/or enlist the help of consultants to help lay the groundwork for effective collaboration. Identifying a "Team Coach" or "Implementation Manager" emphasizes the need to pay attention to the team's dynamics as one of the most important determinants of success. The University's primary role throughout the life of the project is to make sure the team is motivated and focused on achieving the project objectives and goals. It is easy for even the best team to lose motivation and/or shift their focus to budget or other design aspects that begin to emerge. It is also important to keep the team together. Appropriate financial incentives need to be in place to help the teams stay intact.

- Resilience – In the dynamic environment of a research institution, no project goes completely as planned. Research needs, pedagogies, and personnel change at a rate much faster than construction. The most successful teams work together to come up with even better solutions to overcome these challenges. However, a foundation needs to be built. Team members by nature have com-

peting loyalties: to themselves, to their company, and to the project team. The goal of the owner is for the loyalty to the project team to be primary. This requires a team culture based on a level of trust and respect not often seen on a typical jobsite. Activities typically established as check and balances (e.g., shop drawing review, schedule analysis, invoice auditing, punchlisting, field tests) are important, but they should be treated as trust and verify exercises emphasizing transparency and openness, rather than a search for mistakes. This needs to be true from top to bottom of the project team and their organizations.

- Sharing Risk & Reward – Typical procurement strategies are intended to shift nearly all of the risk away from the owner and onto the architect or contractor. The architect and contractor then shift much of this risk to the consultants and subcontractors, resulting in a situation where much of the project risk is carried by team members who don't actually have much control over the project. Consequently, they tend to price their work to cover the risk and behave defensively with a lack of transparency that erodes the team culture described above. Alternatively, it is possible to shift the risk/reward to the team as a whole rather than to the individual parties through shared contingencies, shared savings, and sliding fees tied to overall performance. These techniques should be analyzed carefully with an eye toward encouraging an innovative and collaborative team culture. It is also important to recognize that the university itself is one of the biggest risks to the project due to changing processes, directions, scope, or priorities. These risks should be appropriately borne and managed by the university rather than the project team.

- Streamlining the Process - Traditionally, designers produce one set of drawings used to set the price and then subcontractors produce a second set (e.g., shop drawings, fabrication drawings.) that is used to build from. Each set is passed back and forth numerous times and in numerous formats in an effort to reconcile the design intent and the price that was set. Alternatively, an integrated team can "draw it once" as the development of drawings flows seamlessly from design to fabrication. This can significantly reduce the level of effort producing and checking drawings, and it can increase productivity in the field.

- Choosing the Contract Arrangement – The overall goal of all of these recommendations is to create and nurture a collaborative team. Contract arrangements such as Integrated Project Delivery (IPD) and Progressive Design Build are clearly more conducive to the development of fully integrated teams. They are not only a means to select an integrated team, but they create a variety of incentives that encourage the development of a productive team environment.

Conclusion

In order to have a significant impact on the cost of building projects and the value they provide to the university, a paradigm shift is required. In an industry largely built on the idea of carefully customized solutions implemented through a series checks and balances (distrust), it is becoming more and more difficult to effectively deal with the complexity of today's projects and the large team of experts that is required to complete them. The paradigm shift that is needed is to create truly effective collaborations built on mutual respect. This will enable the university to focus on its primary goals and objectives for

the project, rather than a detailed accounting of square footage, and enable project teams to take a multidisciplinary approach to coming up with truly creative solutions. This is a cultural shift that will require continuous leadership from the universities and deeper involvement in every aspect of the project. If successful, we believe it will result in significant value added to every project

Appendix A: Twenty Five Key Ideas

What we build

1) Build Less - Utilize Existing Space More

2) Create Project Business Plans

3) Align Capex and Opex

4) Meet User Needs, Not Expectations

5) More Generic Less, Specialized Space

6) Design to Adaptability

7) TI and Shell Paradigm

8) Standardize Building Components

9) Challenge/Scrap Standard Specifications

10) Design Buildings to Shorter Life as appropriate

How we build

11) Assemble Full Team Early

12) Expand Thinking of Project Teams by Integrating Out of Industry Expertise

13) Qualifications based, Not Fee Based Selection

14) Reduce Stakeholders to improve decision-making

15) Establish Team Coach / Implementation Manager

16) Raise Expectations of and Support of Owner Project Managers as Team Leaders

17) Build Moments of Innovation Into Projects

18) More Research /Lessons Learned from Other Projects

19) Commit to VDC In Big Room Format

20) Align Goals at Start For Entire Team, and More Robust Onboarding

21) BHAG (big hairy audacious goal) for Projects and Incentives

22) Use of Progressive Design-Build

23) Share Risk/Reward – Cost savings incentives

24) Employ More Manufacturing Models

25) Change Funding Cycle

Appendix B: Literature Review

Building teams of architects, engineers, contractors, and owners (AECO) are simultaneously competitive and cooperative (Peña-Mora and Tamaki 2001). Inherently interdisciplinary and inter-organizational, building teams have members that bring to a project their own areas of expertise, work practices, and organizational—as well as personal—needs and goals. Team members have to negotiate and work through these potentially conflicting obligations (Dossick and Neff 2009; 2008) in order to cooperate and innovate on a building project.

Research on collaborative forms of project delivery, such as partnering, Integrated Project Delivery (IPD) and Design/Build (DB), demonstrates that strong owner leadership and the early integration and continuing support of collaborative work practices and structures enhances leads to high performing teams, achieving project goals, and producing innovative building outcomes. For example, IPD fosters collaboration through adhering to a set of contractual and behavioral principles focused on aligned goals, early team integration, shared project risks and rewards, collaborative decision-making, trust, and a "willingness" to openly collaborate and communicate (Kent and Becerik-Gerber 2010; AIA 2012). Asmar, Hanna, and Loh's (2013) study on IPD outcomes demonstrated that collaborative forms of project delivery produce higher quality facilities, fewer and less time-consuming RFIs, and less construction material waste. Likewise, Cheng's (2015) case study research on DB and custom CMC+6 project delivery using integrated collaborative work structures, contracts, and communication strategies also produce highly integrated collaborative teams where owner and team come together to produce innovative high performing designs.

Despite the project delivery contract method, there are many lessons we can learn from research on collaboration-focused project delivery strategies. Furthermore, studies show that clients can play an important role in a project's success (Chan, Scott, and Lam 2002; Slaughter and Cate 2008; Molenaar et al. 2014; Leicht et al. 2016; Baiden, Price, and Dainty 2006; Chan, Ho, and Tam 2001). In the following, we describe some of these successful collaborative strategies that owners can implement when determining what to build and how to build.

What we Build: Setting the Stage for Collaboration

When owners are determining what to build, a key strategy is to develop superordinate goals (Slaughter and Cate 2008) or a project vision. Superordinate goals are higher level project goals that define the owner's key objectives. These goals often focus on high performance, innovative building design goals such as LEED, marketing objectives, or the owner's institutional values (Slaughter and Cate 2008). Superordinate goals should be broad enough to be able to ensure that team members can align their own institutional, organizational, or personal goals with the project's superordinate goals (Slaughter and Cate 2008). This helps to ensure buy-in for a central project vision across all stakeholders (Slaughter and Cate 2008).

When determining what to build, the owner should also assemble the right owner team that can make project decisions and interface with other project stakeholders during the design and construction process. On DB projects, client competency is a primary success factor leading to successful project

outcomes (Chan, Ho, and Tam 2001). One of the key ways to show client competency is an owner team that has members with expertise in architecture, engineering, construction, and facilities and operations (Slaughter and Cate 2008). In any form of project delivery, having owner team members with expertise in varying AEC fields means they can act as technical and cultural boundary spanners (Dossick et al. 2016). These boundary spanners enrich team collaboration due to their knowledge about the needs, goals, and expertise of one or more AEC domains: they know what owner information designers and/or constructers need for decision-making and they can translate complex technical design and construction information in a way that is meaningful and actionable for the owner (Dossick et al. 2016).

How we Build: Making Collaboration Work

Owners can play a key role in developing and maintaining collaborative work relationships using a mix of formal (e.g. contracts, documents) and informal (e.g. work norms, project values, establishment of expected behaviors) tools (Bygballe, Jahre, and Swärd 2010). These tools help enhance trust through fostering team integration, developing a shared team culture, ensuring goal alignment across the team, and developing strategies for managing risk and reward.

To enhance team integration, key project team members should be brought on early in the project (Leicht et al. 2016). Team integration requires that multiple, potentially conflicting stakeholder processes and cultures align (Ochieng and Price, 2009). To align conflicting team cultures, Manley, Shaw and Manley (2007) suggest establishing a boundary culture that uses formal and informal tools to establish expected behaviors and align team member goals. Esmaeli et al. (2013) note that frequent, quality, effective communication and the transfer of stakeholder knowledge are key factors that lead to successful team integration. In particular, an owner's superordinate goals, established prior to team integration, can be an aligning force between team members and demonstrate ongoing client commitment (Slaughter and Cate 2008). Clients can link these goals to specific project objectives and should emphasize the goals throughout the project to continue to align across the needs and goals of different team members (Slaughter and Cate 2008).

Contract arrangements are a key formal tool for establishing collaborative team frameworks, cultivating trust between team partners, and setting expectations about team relationships (Bygballe, Jahre, and Swärd 2010; Shek-Pui Wong and Cheung 2004). Contracts should define the roles and responsibilities of team members and establish how conflict will be negotiated around key stakeholders (Peña-Mora and Tamaki 2001). While there are differences in project delivery contract types, partners using IPD contracts have found a positive impact on fostering a sense of trust and respect across AEC teams through the contracts' focus on shared risks and rewards, liability waivers, and fiscal transparency (AIA 2012).

A key part of a successful collaborative team is enhancing trust. In the construction industry, low trust can lead to higher costs (Bohnstedt, Haugbølle, and Bejder 2013). In a survey of different building project stakeholder types, Bohnstedt, Haugbølle, and Bejder (2013) found that the most important factors to enhancing trust were control mechanisms related to cost transparency, mutual respect, and communication. Likewise, Leicht et al's (2016) research suggested that increased cost transparency enhances trust and leads to more cohesive teams. Cost transparency, through using an open-book approach, can help to make risks transparent and manageable and are a key strategy for managing risk and rewards

(Leicht et al. 2016)

Lessons Learned from the Literature

While new forms of project delivery, such as IPD, are showing to have great success due to their focus on aligned goals, early team integration, and collaborative decision-making and communication, owners can integrate many IPD collaborative practices into their own projects regardless of the delivery method. Based on the literature, key owner strategies for determining what to build and how to build are:

- Developing superordinate goals
- Selecting owner team members with expertise in an array of AEC fields to demonstrate client competency
- Using formal and informal tools, such as contracts and setting expectations about collaborative values and norms, to enhance team integration
- Demonstrating client commitment through aligning team goals with superordinate goals
- Encouraging open communication
- Using risk and reward strategies, such as cost transparency, to enhance trust

These strategies can help to establish a strong, knowledgeable, and committed owner and foster high performing, collaborative teams.

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