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RETHINKING PROJECT DELIVERY TO FOCUS ON VALUE AND INNOVATION IN THE PUBLIC SECTOR

Patricia A. Tillmann[1], Stuart Eckblad[2], Fred Whitney[3], and Niall Koefoed[4]

ABSTRACT

With the intent to move towards value generation, public organizations have been increasingly searching for alternative procurement and project delivery routes. Countries like the U.S., Finland, U.K., Norway, and Australia are pioneers in adopting alternative means to project delivery in the public sector. Past studies have documented the benefits of more collaborative arrangements in that sector. However, their impact on project performance and their ability to generate value still lack evidence and documentation. In addition, little is known about project management practices that helped organizations focus on value and achieve better project performance within this context. Thus, this paper aims to provide evidence about the impact of alternative delivery methods on generating better project outcomes in the public sector, highlighting fundamental mechanisms and lean management practices that have contributed to these results. This research follows a multi-case study approach, reporting the journey taken by The University of California San Francisco (UCSF) Health to rethink its project delivery methods in the public sector. A close collaboration between the University of California Berkeley (UC Berkeley) and UCSF allowed data to be collected throughout the years. This paper results from a reflection of collected data and new insights gained through focused group discussions.

KEYWORDS

Lean in the Public Sector, Value generation, Integrated Project Delivery.

INTRODUCTION

The challenge of changing the focus to value generation in the construction industry has been widely discussed. Past research points out the historically fragmented and sequential approach to construction, impacting the industry's ability to generate value (Forgues and Koskela, 2009; Tillmann, 2012). The industry's incapacity to move from a sequential to an integrated approach resides in inefficiencies associated with traditional methods of procuring and delivering construction projects in the public sector, e.g., the price component taken as the most important (if not single) component of contractor selection, and the adversarial business context created by transactional contracting methods.

[1] Senior Manager for Lean Project Development, The Boldt Company, San Francisco, USA. Patricia.tillmann@boldt.com, https://orcid.org/0000-0003-3420-3132
[2] Vice President, Health Major Capital Projects, UCSF Real Estate, San Francisco, USA. Stuart.Eckblad@ucsf.edu
[3] Director Project Delivery, UCSF Real Estate, San Francisco, USA. Fred.Whitney@ucsf.edu
[4] Senior Project Manager, Cambridge CM, San Francisco, USA. N.Koefoed@ccm.to

Maximizing value at the project level is difficult when the selection process is based on price and increased value, quality, and speed are only considered for a premium. In addition to that, the type of contract generally inhibits coordination, stifles cooperation and innovation, and rewards individual contractors for reserving good ideas and optimizing their performance at the expense of others (Matthews and Howell, 2005).

Collaborative construction project arrangements have been the subject of many development efforts in response to the frustration toward the opportunism inherent in traditional contracting (Lahdenperä, 2012, Hietajarvi, 2017). Lahdenperä (2012) describes three multi-party contractual arrangements that are currently predominant in the industry: (a) project partnering, emerging in the US in the late 1980s and then used in the UK and Australia; (b) project alliancing, emerging in the UK in the mid-1990s and disseminated to Australia; and (c) Integrated Project Delivery (IPD), emerging around 2005 and most popular in the US. These alternative arrangements use mechanisms to incentivize companies to work as one team, e.g., balancing risk allocation, rewards tied to collective performance, integrated governance structure and team organization, and an agreed-upon operating system. Within this context, the lean philosophy has been a fundamental element of success on IPD. Project teams not only pursue a lean mindset but also adopt techniques and tools to establish an operating system that incentivizes companies to develop and achieve common goals.

Some of the benefits of alternative project delivery models to focusing on generating value in the public sector have been reported in the literature. Chen and Manley (2014) observe that the choice of procurement model has a significant impact on project outcomes due to the governance mechanisms chosen to organize work, shape the scope for goal achievement and determine innovation potential. In collaborative arrangements, owners are more directly involved with project delivery (Love et al., 2010) and seem to have a more active role in championing innovation and influencing improved outcomes (Namand and Tatum, 1997; Loosemore and Richard, 2015).

Within this context, around 2007, the University of Berkeley started holding the 'Lean in the Public Sector' annual conference, bringing practitioners from all over the world to discuss and share advancements in their countries around the topic. Throughout the years, some of the reported advances included (LIPS History, 2016): (a) Introduction of lean philosophy and methods to Australia's project alliancing; (b) Pioneering work of Finland's government organizations applying lean and IPD to over 35 projects; (c) Integrated Project Delivery (IPD) was legalized under EU construction procurement regulations; (d) UCSF led the development and testing of alternative contract structures and methods of aligning commercial interests, leading to the approval of its first IPD project in the public sector in 2022 and inspiring other University systems to apply lean methods and follow a similar path (i.e., California State University and community colleges and the University of Washington and Michigan State U).

While the benefits of more collaborative arrangements have been documented in the public sector, including the use of lean practices to focus on value generation, the impact of these practices on project outcomes still lacks evidence and documentation (Lahdenperä, 2012; Vilasini et al., 2014). In addition, although there is anecdotal evidence that lean practices have been used in the sector, there is little understanding about how they support focus on value and improved project performance.

A few studies have provided evidence on how Target Value Design contributes to an increased focus on value generation in the public sector. Among these studies is a paper published by Melo et al. (2015), which documented the first UCSF case study under a

collaborative contractual arrangement. More than seven years later, this paper builds on that study and provides additional evidence about the impact of alternative delivery methods and lean management practices on improving project outcomes in the public sector, even when multi-party contracts are not permitted. The paper highlights fundamental mechanisms and lean management practices and discusses their impact on project outcomes.

The contributions of this paper are two-fold. The paper hopes to inspire other practitioners in the public sector to embark on a journey towards alternative delivery methods to support a better focus on value generation in the public sector. This discussion also hopes to reveal new insights into the underlying theory of project management and how concepts from different knowledge areas may play a key role in advancing construction project management as a discipline.

The research method adopted in this study was a multiple case study approach and encompassed the analysis of three projects. Data from the first project started to be collected from 2013 to 2014 through a collaboration between UC Berkeley, UCSF, and the general contractor. Data gathering techniques included analysis of documents and semi-structured interviews with selected project personnel from different companies, including UCSF, the project manager representative, general contractor, architectural firm, and structural engineering firm. Data collection continued from 2016 to 2019, when one of the researchers joined the UCSF Real Estate team. The focus was on Case 2 and sources of evidence were field observations, additional interviews with the owner and owner representative, as well as analysis of documents on UCSF policies shaping project delivery methods, the contract, documented lessons learned and project documentation. In 2021, with the eminence of UCSF's first IPD project, the co-authors of this paper regrouped again for a series of focused discussions with the intent to reflect on the current state, past achievements, and expectations for the future. This paper summarizes the main lessons learned resulting from this reflection.

UCSF HEALTH'S JOURNEY TO IPD

UCSF is dedicated exclusively to health science. It focuses on research, education, and patient care, employing 3,400 faculty and 22,800 staff. UCSF generates nearly 43,000 jobs and has an $8.9 billion economic impact in the Bay Area, California, U.S.

UCSF Health is a department of UCSF focused on the delivery of care. It administers the University's hospitals and clinics: (a) UCSF Medical Center at Parnassus, Mount Zion, and Mission Bay; (b) UCSF Benioff Children's Hospitals in San Francisco and Oakland; and (c) Primary care and specialty clinics throughout Northern California. The department receives comprehensive project management services from UCSF Real Estate's Health Design & Construction unit, including programming and design, budget development, construction administration, inspection, and move-in assistance.

Since 2006, this department has undertaken a long journey to reshape project delivery practices within the University, introducing mechanisms to design, build and operate cutting-edge care facilities successfully. Every step of this journey involved myriad negotiations with the University of California Office of the President (UCOP). It ultimately resulted in the entire university system accepting new delivery methods and changing California's public contracting code. Once restrictive of alternative procurement methods, the California Public Code now allows organizations in the public sector to choose Integrated Project Delivery (IPD) to deliver major capital projects. This

section will review UCSF's value proposition and then summarize the steps of this journey towards a more significant impact on value creation and innovation.

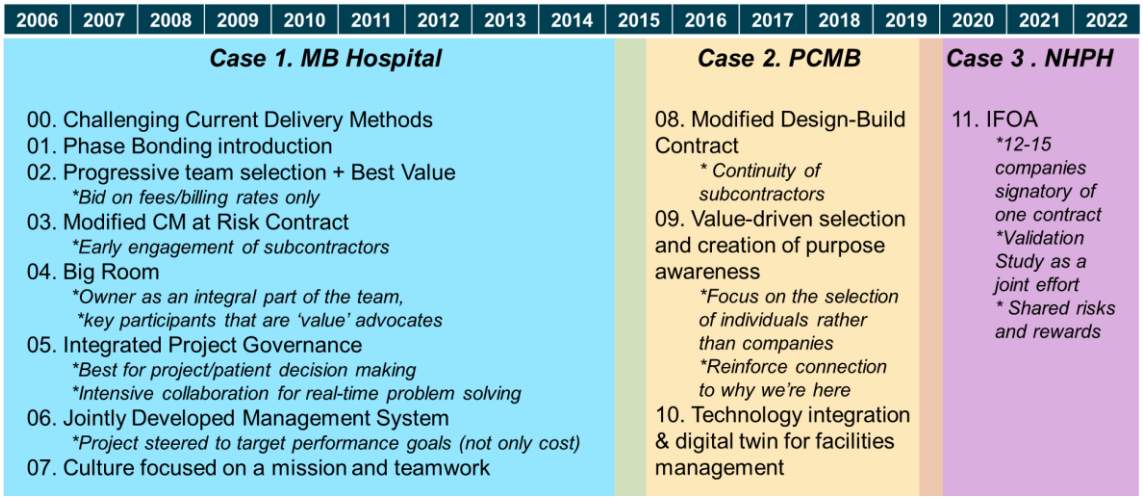
The pursuit of increased value

Project management organizations face a few challenges in supporting healthcare delivery. Firstly, models of care are rapidly changing with new understandings from science and technology. Secondly, an increased focus on operations design in care delivery poses several implications for the design of healthcare facilities – increasingly, designers are challenged to consider how the design of the built facility impacts the delivery of care – i.e., patient safety, care delivery routes, co-location of services, etc. Thirdly the rapid advancement of information technology and automation in providing care is generating new requirements to be considered when designing healthcare facilities.

By the time facilities are designed and built, medical equipment and technological requirements have often changed, causing rework on facilities that are already halfway through construction—not mentioning opportunities related to business revenue that often need to be incorporated late in the project delivery process.

In addition to these changing demands, it's often challenging to accommodate so many requirements from multiple stakeholder groups, which sometimes are conflicting. Requirements from various stakeholders need to be met, i.e., users, community, the city, the city's workforce development program, seismic requirements, facilities management, the university's sustainability policies goals, while also (and most of the time) attending to donors needs and the university's aspirations to contribute with iconic landmarks of health care in San Francisco.

These complexities and need for adaptation and a high level of customization make it very ineffective to use a traditional delivery method, such as DBB, which the University was using. Several problems are associated with using DBB in such a context: poor ability to manage risk, make changes, limited contractor participation on bids when projects are too large (bonding capacity[5]), and a litigious environment. UCSF health's journey started with a critical analysis of the current state and a desire to change into a delivery method that better fits the university's needs. The picture below provides a summary of this journey (Figure 1). The journey will be described under three main case studies.



[5] Construction bonds are a type of surety bond that protects against disruptions or financial loss due to a contractor's failure to complete a project or failure to meet contract specifications.

Figure 1: Removing barriers to focus on value and innovation

Case 1: The Mission Bay Hospital

The Medical Center at Mission Bay was *awarded ENR Best National & California Health Care Award*. The Center is UCSF's newest state-of-the-art hospital complex that has been designed to ensure top-notch patient care. The new hospital was built focusing on the patient's experience and is seen as *"An iconic landmark of health care, built from the ground up with care and compassion in mind."* The Center offers treatment with the latest technology, including telemedicine, robotics, intra-operative imaging, and space to accommodate future innovations.

The $1.5-billion integrated hospital complex includes a 183-bed children's hospital, women's specialty hospital, cancer hospital, and medical office building. Designers met the challenge of integrating three separate hospitals within the 878,000-sq-ft structure by incorporating shared support services and diagnostic treatment spaces arranged along a common spine to boost efficiency.

Nearly 18 months after construction began, UCSF drastically changed the project by adding cancer-treatment services, which required re-scoping 175,000 sq ft of the building to accommodate the new cancer center. When finished in 2014, the project claimed a $200-million reduction in budget from the initial estimate; even with the increased scope - $55 million in changes were made without impacting the opening date. The facility uses 50% less power than the average U.S. hospital. Work included an "unprecedented" analysis of materials to screen out from patient rooms those that were toxic or unsustainably manufactured. The outstanding outcomes of Mission Bay set the precedence for other projects to use collaborative contractual arrangements within the UC system. The main mechanisms that supported these outcomes are described below[6]:

00. Challenging current delivery methods

Influenced by the engagement with the American Institute of Architects (AIA) project delivery initiative, the first step taken on this journey was an honest conversation about the inefficiencies of the current University's practices and a proposal to move toward more collaborative project delivery methods. The proposal was to adopt Design-Build with a cost-plus fee and Guaranteed Maximum Price (GMP) type of contract, allowing early engagement of contractor and subcontractors. However, for different reasons, it took more than 18 months for the University to approve the request to use a more collaborative structure, and a modified Construction Manager at Risk contract was selected.

01. Phase Bonding introduction

Another aspect that was hampering the participation of a larger pool of contractors was the bonding requirements. The scale of projects was prohibitive for many contractors to participate in the selection process for projects, due to bonding capabilities. Phase bonding allowed the participation of a larger number of contractors.

02. Progressive team selection + Best Value (bid on fees/billing rates)

Progressive team selection refers to the gradual selection of team members based on consensus. The project teams get involved in the Request for Proposals (RFQ) and interview process of prospective parties, increasing the chances to build a well-

[6] Melo et a. (2015) presents a preliminary analysis of this case when the project was still ongoing. The focus was on describing the Target Value Design process and some of the supporting mechanisms. This paper focuses on additional elements and new insights that adds on and complements the reflections on that previous paper.

functioning team. Throughout the selection process, people get to know each other, and partners are selected on their ability to contribute to the team and the likelihood of working well together.

The use of Best Value (BV) contractor selection has been a key mechanism used by UCSF since 2007. This practice allows the university to consider the additional value a contractor may offer in concert with their bid price, thus determining the bid that delivers the best value. There is however a problem with this process: the cost of work is still considered as a key element in the contractor's selection, not mitigating the challenge of potential unrealistic bids upfront. A modification of this process allowed the team to establish the cost of scopes of work as a common denominator among bidders, allowing companies to set their overhead and profit amounts only. This modification excludes the cost of work as a factor in the selection process – and is a key element to eliminate competition based on the lowest price. Once this foundation was set, the team worked on altering the contracts and setting a different environment for project delivery. These changes will be described below.

03. Modified CM at Risk Contract

The contract used on the project was rewritten to enable design-assist major subs to engage earlier in the project. This type of contract, however, has a downside: the trades that are chosen for the pre-construction/early design phases are not guaranteed to continue during the construction phase, resulting in an undesired fragmentation.

Unlike an IPD project, the team was not able to implement a shared risk and rewards structure, to work together on validating the business case or limit liability for companies that are signatories of the agreement. A feasibility study is carried out by the University's construction management team. The team analyses historical data about other similar University projects and carries out a market benchmark analysis to validate this business case. As a result, the allowable and target costs were set and shared with the project team, but not developed collaboratively.

As an alternative to support the achievement of common goals, an incentive program was set. The incentive included 11 criteria to be met, i.e. schedule milestones achievement, change order mitigation, community workforce development, and quality. If criteria were met, the project team (contractors and subcontractors) would get an additional 2% of the project's construction budget. As already reported in Melo et al. (2015), the project team was little incentivized by the program. The importance of continuing the project during an economic downturn and the purpose and mission of the building were greater motivators to improved performance.

04. Key Participants in the Big Room

For the Mission Bay Hospital, the owner, owner's rep, general contractor, architect, engineers and subcontractors created a "big room" set up onsite and worked collaboratively during the design and construction phases of the project. Other participants of the Big Room who made a difference in achieving improved project outcomes included: (a) Inspectors from the Office of Statewide Health Planning and Development (OSHPD) - responsible for the reviewing and inspecting all healthcare construction in California [7]; (b) Two full-time UCSF employees from facilities management were full-time in the project for 7 to 8 years: their participation allowed for

[7] The participation of OSHPD inspectors in the big room allowed the project team to achieve a 99.92 % success rate on a total of 9047 inspections. The project had on average 16 full-time inspectors who oversaw approximately 45 inspections per day.

a comprehensive analysis of the BIM model development and easy hand-off to operations. They verified every submittal in the project and made sure all equipment received their approval. This project was the first one at UCSF to generate a BIM model for operation; and (c) A full-time liaison with clinical experience: an ex-nurse from UCSF was a liaison between the users and the project team and an important asset to the project team

The participation of these "value advocates" in the Big Room, allowed for the project team (including builders) to be exposed to their multiple and sometimes conflicting requirements from an early stage. The multi-disciplinary team worked to incorporate those requirements while considering constructability and cost/schedule constraints.

05. Integrated Project Governance

The owner, architect, general contractor, and key subcontractors were part of the Project Solutions Group (PSG). One cardinal rule that this group established was to make decisions on what was best for the project and for the patients first, without talking about money. This allowed a focus on realizing value without being constrained by budget and schedule concerns too early. Later, during construction, the PSG became a key problem-solving hub. Meeting on a daily basis, the group provided close support for field personnel to solve any emerging problem. It was an effective forum to solve conflicts between construction, design, and inspectors, minimizing delays, rework, and re-inspections.

In order to escalate issues that the PSG couldn't solve, a meeting called DAM (Dispute Alignment Meeting) was set up. In this meeting, principals from the participating companies would meet to resolve any remaining items the project team could not find a solution for, i.e., resolve contingency use, risk allocation, and budget impasses.

Owner participation was not limited to these upper levels of decision-making. There was also owner representation (with decision-making authority) in the cluster and other day-to-day meetings. In addition, the owner team was fully collocated in the Big-room. This allowed intensive owner participation, reducing the latency of decisions and also increased influence on decisions, especially on important ones with potential impact to project outcomes. The team feels this was the most important mechanism to be able to advocate for value and champion innovation in the project.

06. Jointly developed management system

In the Mission Bay Hospital project, the team developed common goals, management protocols, and a mission statement through a series of workshops. It took six months of team building and organizational integration in order for the team to agree on methods and techniques to use. One of the agreed methods was the use of Target Value Design with the Project Modification and Innovation (PMI) process, already described in Melo et al. (2015). What is important to note, which was not captured in the previous study is that along with target costs for each cluster, the team also established value criteria to assess the impact of innovations, namely, improvements to maintainability, sustainability, operability, and aesthetics. Schedule impacts were also considered.

One aspect that hasn't been mentioned in the previous study is the power of co-developing these processes and procedures together and the positive impact that it has on a team's performance. Every process was co-designed and agreed upon by the different parties. This was a major lesson learned when the University team started a new project and tried to use some of the best practices with a different team. Other design processes include the agreement to use the last planner system and the establishment of agreed KPIs.

07. Culture focused on mission, teamwork, and collaboration

Intentionally building a culture focused on collaboration and innovation was also an important element introduced alongside co-developing the project's processes and procedures. In a week-long exercise facilitated by Stanford University, the team worked together on developing the project's mission, goals and processes, as well as discussing what it means to work collaboratively. This, and other team-building exercises played an important role in developing a cohesive team. The successes achieved in Mission Bay led the team to adopt the same model on their next project. In the next session, we will focus on describing only the differences between the cases.

Case 2: The Precision Cancer Medicine Building

The PCMB was awarded the *ENR California Health Care Award of Merit*. The building consolidates UCSF's solid tumor practices to a single location on the Mission Bay Campus. In addition to clinic space for most cancers, PCMB has 47 infusion bays, 120 exam rooms, radiology, pathology, radiation oncology, blood draw, a patient resource center, and support services. There are 19 imaging modalities dedicated to cancer diagnosis, staring, and treatment. Bringing these practices together at Mission Bay, further integrates research and clinical care, encouraging collaboration between researchers and medical teams. PCMB has the space and equipment to offer the newest treatments, such as infusion with genetically engineered viruses that target specific cancer cells, and cutting-edge tests, including genetic sequencing of tumors and germline testing to look for gene mutations associated with cancer risk.

The project's budget was 275M project budget with $163M for construction. When the project was complete in 2019, $19M savings were recognized.

08. Modified Design-Build Contract

To mitigate the potential fragmentation of subcontractor participation in the design and construction phase, the team chose a Progressive DB contract for this project. This model also has its downsides. Collaboration and opportunities for innovation are susceptible to the general contractor's culture and managing style. It's a model that does not support full transparency and collaborative problem-solving culture. As a result, issues may remain unsurfaced, increasing the probability of disputes.

This contract also had an incentive program. During the course of the project, the team opted to use these resources toward meeting the target cost and the program was extinguished.

09. Value-driven Team Selection and Creation of Purpose Awareness

The PCMB project selected its team members based on their affinity to the higher purpose of the project. The team developed focused questions in the RFQs and selected individuals who demonstrated a genuine commitment to improving healthcare and patient-centric outcomes. The traditional RFQ responses given by contractor's marketing departments were discouraged and interviews were carried out with individuals that would be the day-to-day contributors on projects, not executives that are typically involved only 5%-10% of their time in the project. From the beginning, the RFP literally spelled out: *"we want to work with individuals who want to cure cancer."*

Another initiative to bring awareness of the project's mission to each individual on the team was multiple presentations done by UCSF medical staff. On a monthly basis, different staff members that will work in the hospital came to the big room and presented on topics that helped the team reflect on the whole purpose of why we're here. The same ideas were conveyed during the onboarding process. Each team member onboarding the

process would get exposed to the project's mission and its desired collaborative culture focused on value and innovation.

The idea behind this was to create greater awareness of the project's mission and touch individuals on a personal level to be advocates for health and healing and invested in making decisions that better consider patients and caregiver perspectives. Knowing the project's aspirations regarding its culture and goals also sets the right expectations for new team members. This focus on value becomes the team's unifying element.

10. Technology integration and digital twin for facilities management

Increasingly, the University prioritized the need to consider technological requirements in the design of new hospitals. At PCMB, the team was able to have full-time staff from the UCSF's IT department. Besides rethinking the delivery of care from a technology standpoint, the use of a digital twin to support a hospital's operations gained more attention and the team developed a robust plan for its adoption at UCSF.

Case 3: Expectations for the Hellen Diller Medical Center

The new hospital (estimated at $4bi) will strengthen UCSF's world-renowned clinical, research and training mission. The hospital will be designed to integrate with the natural setting of the surrounding Mount Sutro Open Space Reserve, focusing on the total patient experience to promote healing, wellness, and recovery. Expected to open in 2030, the plans for the hospital call for designing an architecturally outstanding, energy-efficient, and environmentally sustainable facility that will accommodate the advanced technologies UCSF uses in clinical and surgical settings, including robotics and intra-operative imaging, as well as the space needed for a modern Emergency Department.

11. The shift to Integrated Form of Agreement (IFOA)

A multi-party contract allows the mitigation of limitations observed on previous projects, i.e., fragmentation and discontinuity of subcontractor participation in projects, and lack of direct access to all team members to incentivize a value-driven mentality and champion innovation. A multi-party contract is expected to provide an open forum for innovation and implementation of value-driven ideas, allow for increased communication, and support a more proactive approach to issue identification and resolution.

The IFOA will bring 12-15 companies together, with shared responsibilities, goals, risks, and rewards. Different from other projects where the team had to work within the boundaries of best value selection, this time companies were chosen based on their qualifications only, taking the cost component completely out of the selection process.

Another major shift is that now, the team is working together to validate the business case (as opposed to a validation made by the university's construction management team). The team will finalize its validation study in May 2022 and has been working together on a virtual big room for more than a year to accommodate the complex program of a state-of-the-art facility in what will be a truly iconic landmark for the city of San Francisco. All of this is within stringent time and budget constraints.

DISCUSSION

Previous studies observed that the direct involvement of owners and their investment in the project shape the scope for goal achievement and determine innovation potential, influencing improved outcomes in alliancing projects. The cases presented here are evidence that such engagement and its benefits can happen even in non-alliancing projects.

Building on the findings of Melo et al. (2015), this paper also evidences the contribution of lean management practices to achieve better outcomes in the public setting, arguing that along with Target Value Design, the co-creation of common objectives, KPIs, processes, and procedures help teams to be more aligned improved performance.

This paper demonstrates that there are valuable insights from contract theory and production theory to the management of construction projects. It also brings to light underlying contributions of social science to the discipline of construction management that need further investigation.

CONCLUSIONS AND FUTURE RESEARCH

The aim of this paper was to provide evidence about the impact of alternative delivery methods on generating better project outcomes, highlighting fundamental mechanisms that had contributed to these results. The journey taken by UCSF Health to rethink its project delivery methods in the public sector was used as a case study. Ten different mechanisms were described, and their contribution to value generation. For hospitals with such complexity, facing a dynamic environment susceptible to change and consideration of additional requirements, an integrated form of agreement is expected to be the most supportive project delivery method. The next steps of this research will be to monitor and document the achievements of this new case study.

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