Glenn Ballard, Blake Dilsworth, Doanh Do, Wayne Low, James Mobley, Philip Phillips, Dean Reed, Zach Sargent, Patricia Tillmann, Nathan Wood (2015) How to Make Shared Risk and Reward Sustainable. *Lean Construction Journal* 2015 pp 25-33 www.leanconstructionjournal.org

How to Make Shared Risk and Reward Sustainable

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Abstract

Question: How to make shared risk and reward sustainable?

Purpose: To bring to the attention of the construction community the risk that shared risk and reward approaches to project delivery are themselves at risk, and to promote practices that assure its sustainability.

Research Method: Case study of a 'failed' shared risk and reward project by academics and industry practitioners, some of whom were participants on the project.

Findings: The countermeasures to failure of shared risk and reward projects are predominantly principles of Lean/IPD project delivery previously formulated but not universally followed.

Limitations: The proposed countermeasures need to be tested against more shared risk and reward projects.

Implications: Despite its evident value, shared risk and reward can die unless both clients and service providers follow principles of Lean/IPD project delivery.

Value for authors: The authors are strong advocates for shared risk and reward and hope to awake the industry to the possibility that it may disappear.

Keywords: Countermeasures, integrated project delivery, shared risk and reward, sustainability, target value design

Paper Type: Full paper

Introduction

In May of 2010, the Project Production Systems Laboratory (P2SL) at the

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University of California, Berkeley launched a Target Value Design (TVD) Research Group with the financial support and participation of twelve member companies. These companies included a general contractor, an architectural firm, various engineering firms (structural, mechanical, electrical, controls), and various specialty

A poll of this paper's authors found that the failure rate on completed IPD projects on which their companies worked was approximately 15%, with 4 of 26 projects failing to meet cost targets, and the risk pool companies failing to make any profits. On these same projects, clients reported no loss in value delivered as regards functionality, capacity, or quality, and paid less than 8% more than the target cost for the project. There have been many more IPD projects than those in our sample, but if the actual probability of failure is close to or greater than the 15% we found, shared risk and reward is itself at risk. Clients may continue offering such multiparty agreements, but will likely fail to attract the most capable and experienced firms.

More comprehensive reports on the TVD Research Group's work will be forthcoming. This paper is a report of the Group's study of that failed project and countermeasures proposed to prevent reoccurrence of such failures. We believe that shared risk and reward can be sustainable, delivering value for all parties, if TVD and IPD principles and methods are understood and put into practice. In accordance with lean principles, that belief and these countermeasures need to be tested—a task for future research.

Following this introduction, there is a section briefly explaining TVD and IPD, then a description of the failed project and the team's analysis, followed by proposed countermeasures, a conclusion, acknowledgments, and references.

TVD and IPD

TVD is a managerial practice that has its origins in the Target Costing method, a strategic approach for managing product profitability that emerged in the manufacturing industry in the 1980s (Cooper and Kaplan, 1999). A fundamental characteristic of this method is viewing cost as an input to the product development process instead of an output.

In the U.S., anecdotal evidence suggests that, to date, over 100 TVD projects have been completed. Its implementation has led to significant improvement in project performance. Sutter Health reported in August 2012 that their first 22 lean projects (involving at least Last Planner and TVD) all completed within time and budget, averaging 3.4% under budget (Conwell, 2012). Roughly half the 22 were done under Sutter Health's Integrated Form of Agreement, a multiparty contract with shared risk and reward. UHS reported that of 46 IPD projects that followed some of the principles of TVD, only two had exceeded the budget, with the largest 7.25% over budget (Seed, 2013).

TVD can be used in a variety of different contractual environments, one of which is IPD (Integrated Project Delivery). IPD designates contracts signed by multiple parties, including the client, and involves shared risk and reward for the key members of the project team, those in the risk pool, whose costs of work are reimbursed. The client risks paying costs in excess of project budgets (target cost) and risk pool companies risk doing the work for reduced or zero profit.

Description of Analysed Project

This section provides a brief project description and a timeline of key events. The factors that contributed to the project completing over time and over budget are described. The method used to conduct this analysis was the case study, which has distinct advantages over other research methods when a "why" question is being asked about a contemporary set of events over which the investigator has little or no control (Yin, 1994). Using both qualitative and quantitative data, case studies allow an investigation to retain meaningful characteristics of real-life events, providing an in-depth understanding of phenomena and allowing the investigation of causal relationships.

To assure internal validity of this single case study, data collection procedures included different sources of evidence: (a) an extensive evaluation of project documents, including the project's risk and opportunity log, contract, validation study, floor plans, Owner Architect Contractor (OAC) presentations, and cost estimating documents; (b) multiple interviews with over 30 different project participants; and (c) a series of workshops with project team members to discuss research findings and develop countermeasures.

The project was a 250,000 square foot patient care pavilion. It was an addition to an operating hospital and was connected on three sides to existing buildings. The 13- storey pavilion included 238 medical/surgical and acute rehabilitation beds with 11 floors above grade and 2 floors below grade. The EMP (estimated maximum price; Darrington and Lichtig, 2010) for the risk pool member companies was $251 million. The project was completed 6.4% over budget, with no profits for the twelve risk pool member companies that signed the Integrated Form of Agreement (IFOA, Lichtig, 2006).

Design Phase

In December 2007, the scope of the project was increased by owner decision, resulting in an increase in the total target cost from $219 million to $276 million, which included owner costs for which the risk pool member companies were not responsible. In target value design, a target scope and cost are set by mutual agreement of client and risk pool member companies, then design is steered to those targets. Steering is informed by tracking expected cost against target cost. At first glance, Figure 1 appears to have served that purpose, but closer examination revealed that the target scope for the project was not fixed until the commitment to an Estimated Maximum Price (EMP) in July 2010.

Although no further changes in the target cost were made during design, there were numerous substantive changes in project scope. The owner was exploring alternative ways to deliver its Master Facility Plan, of which the Patient Care Pavilion was one part. The project team was continuously challenged to provide design and pricing for different options. With no certainty what portion of those budgeted costs would or would not be the responsibility of the team to capture in the EMP. The big jump at Dec 08 and decline at May 09 is an example of that effect from the $50M 1000-car parking garage being included/then excluded from reports and estimates.

There was a sharp decrease in the estimated cost between Nov '09 and Dec '09. This may coincide with efforts to reduce the gap between expected and target cost to a more "manageable" number just prior to signing the IFOA. (At the signing of the IFOA in Jan '10, the gap between target and expected cost was ~$21 million or ~8% above the target cost.) One instance of reduction in expected cost: $10 million was removed from the expected cost, allegedly in expectation of improved productivity as a result of detailed modelling. There does not appear to have been any analysis linking cause to desired effect, and in fact field productivity did not improve. It may be that risk pool companies were trying to avoid cancellation of the project and/or to assure their eligibility for future projects with this client—what Axelrod (1984) referred to as 'the shadow of the future', arguing that current cooperation requires expectation of a shared future. However, in this case, exacting such concessions violates both the spirit and the letter of the contract. If this practice was followed on all projects, companies invited to join a project risk pool could expect to risk not only their profits but some share of cost overruns. Another instance of the same kind occurred when expected cost dropped again between June '10 and Jul '10. The IFOA team decided to set the future escalation of the project at $0 given the extent of committed costs and the economic climate at the time. This decision removed $15.5 million from the expected cost of the project.

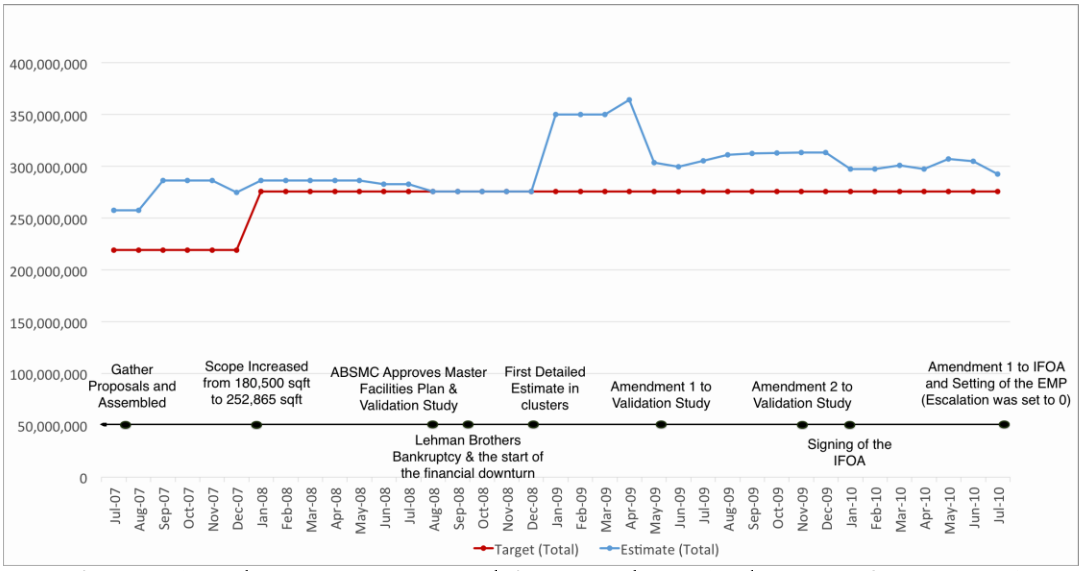

Figure 1: Comparison between Expected Costs and nominal Target Cost in Design Phase

Construction Phase

In Figure 2, the original EMP of $243 million, not total project target cost, is compared with expected costs during the construction phase. (Note that subsequent owner changes increased the contractual EMP to $251 million.) Although there were considerable savings from value engineering innovations (e.g., spending $200K to redesign the pile system to get over $1 million in savings), overall the cost increases exceeded the cost savings.

The major changes in expected cost relative to the EMP and their respective explanations were:

1. A: The decrease was mainly due to the removal of escalation from the project and the adjustment in expectation of improved productivity.
2. B: After the completion of steel erection, the project seemed to be on track to finish within the EMP. However, problems with the exterior skin surfaced in July

'12 and persisted until Nov '13. The original schedule anticipated that the exterior skin be finished in ~6 months but the actual schedule showed that they were on-site for over 1 year.

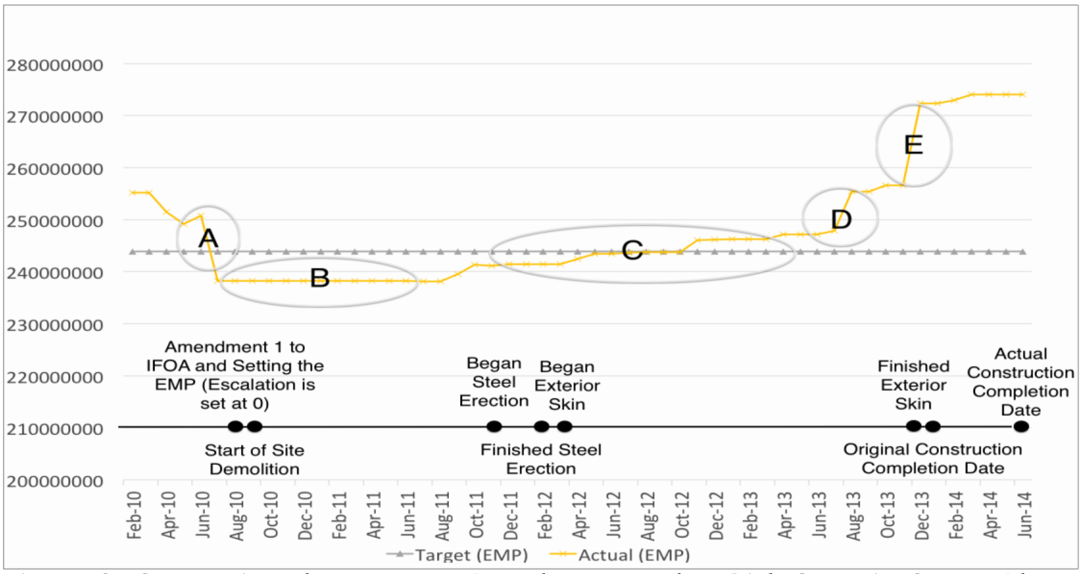

Figure 2: Comparison between EMP and Expected at Risk Costs in Const. Phase

3. C: The drywall trade had increased costs from working overtime to make up the schedule, jumping around due to missed details or not being able to do them in the field, and impacts from the exterior panels not being signed off in time. As a result, much of their work was out of sequence.
4. D: The electrical and mechanical trade partners also had overtime work that contributed to the cost increases. The structural and architectural group had a greater amount of construction administrative cost than they had previously anticipated.
5. E: Construction completion, scheduled for Dec '13, was anticipated to be 4 to 6 months late. The team had not factored the increase in general conditions into their cost projections. After including the cost of the additional general conditions, the project cost increased dramatically.

There was a sharp increase in costs toward the end of construction. The problems that happened during that period were analyzed and their root causes investigated by the team. While some causes seemed to be out of the team's control, others perhaps could have been avoided and represent important lessons learned about the application of TVD on IPD projects.

One cause of the cost overrun: the approved design for the building envelope was not complete or constructible at the point when fabrication was needed.

Responsibility for the building envelope, including seismic joints, belonged to a company not signatory to the IFOA, bringing extra challenges to problem solving, including conflicting incentives and delayed communication. For over a year (from early 2012 to mid 2013), the architect, structural engineer, contractor, subcontractor, and subcontractor's sub tier detailer struggled to coordinate the design of the 100+ unique seismic joints. Many critical issues were identified where the conditions of satisfaction for seismic requirements and fire rating could not be met given the existing conditions at the time (structural steel and concrete decks were already poured). The more the design was investigated, the more issues were found. The seismic joint manufacturer struggled to provide an acceptable solution and finally brought in a specialty designer one full year after permit. This had a drastic impact on site operations, delaying execution of several activities.

Other problems occurred because installers were not involved in early design stages, which caused constructability and inspection problems that also contributed to delays, rework and increased project cost. What's more, the project contingency was set at the same level as for a standalone hospital constructed in the same area and time frame, despite the differences in complexity. Beyond the challenge of connecting the patient care pavilion to three existing buildings, there were numerous constraints that might reasonably have required a larger contingency, including differences in the hospital ownership structure and behavior, which impacted owner speed of decision-making.

Finally, the lack of shared governance during the construction period concealed productivity problems faced by some contractors, and hindered the constant analysis of changes in expected costs through time. The project team also failed to implement accurate and transparent productivity measuring systems which would have allowed the team to identify areas of the project that were underperforming. Scrutiny is much more common when projected costs are above the expected but rarely done when projected costs are below the target. This tendency may well have contributed to late realization of the magnitude of the cost overrun.

Countermeasures

To reduce the risk of project failure, the following principles and practices are proposed. Following these is recommended for all IPD/TVD projects, and are not intended exclusively for the case study project:

1. Commit the entire project team, owner included, to delivering what the owner needs within their constraints with a fair profit to the risk pool members. Customers must commit to the economic success of their suppliers, and suppliers must commit to delivery of customer value. Only projects that achieve both objectives are truly successful. Sustainability of the delivery method must not be sacrificed to the pursuit of excessively risky targets. Don't be Greedy…. Don't be Foolish
   - OWNERS – Don't be Greedy:
     - Pursue continuous improvement from project to project, respectful of the risk pool companies' need for profits.
   - RISK POOL – Don't be Foolish:
     - What is the probability that the cost gap can be closed without reducing value delivered to the client?
2. Follow P2SL's recommended process for determining if projects are financially viable.

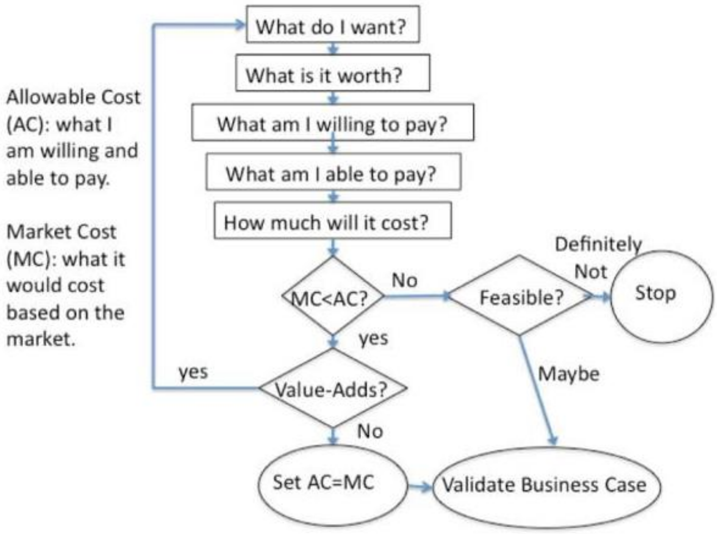

Figure 3: Determining Project Viability (Ballard and Morris, 2010)

- Anchor target cost in allowable cost (what the owner is willing and able to pay), assess gap between allowable and market, decide if to do a validation study only if you (the owner) think the gap might be closed, validate the owner's business case only if you (the risk pool members) are prepared to accept the risk of working for free.
- Treat validation as the first and primary assumption of risk by both owner and risk pool members, not as a mere cost estimating exercise.
- Should Allowable Cost be Calculated & Shared?
- If an owner does not know the allowable cost for a project, they can't determine when the project is financially viable. And if they want the advantages of a shared risk and reward project, they can't judge viability by themselves because they're asking the risk pool members to accept the risk of working for free. An owner can pose a target cost without revealing its relationship with allowable, but doing so may conceal the extent of risk. Suppose the target cost is 10% below the market benchmark, and the allowable cost is 5% below the expected cost (Figure 4). If the target cost becomes budget, shared savings starts at 10% below market. If the allowable cost were to become the budget, shared savings would start at 5% below market. The best advice is for the owner to share their allowable cost, so the team can see what's needed to make the project viable and what options exist for managing risk.

Figure 4: Relationship Between Market, Allowable, and Target Cost

- Keep close track of the scope of work. When scope is unclear, cost estimates are inaccurate. Revalidate when scope is changed.

3. Having the people who will actually design and construct the project help clients work through alternatives to get to a firm scope is one of the advantages of IPD. However, the act of validation is an assessment of risk and assumes the scope of the project is relatively firm so risk can be assessed relative to targets. Consequently, it is advisable to revalidate when scope is changed.
4. Involve the right people at the 'earliest responsible moment' to maximize the impact on design and constructability.
    a. Engage the craft workers and supervisors who will actually build the project. Otherwise, if only estimators and schedulers are involved, you will discover too late that the design is not 'right'.
    b. Assign owner representatives with decision-making authority. This can be a problem when the owner/users do not actively participate in the management of the project, in which case the owner representatives who do participate are compelled to defer some decisions in order to involve the users.
5. Have owner and risk pool members decide what companies and individuals to add/remove to/from the project team.
    - This is standard practice for some, but should be standard practice for all in order to match shared governance with shared risk and reward. Timing is critical—not too soon and not too late.
6. Exclude from the risk pool only companies whose work can be decoupled from the rest of project delivery or where risk is small.
7. Move money and scope across traditional trade and contractual boundaries to achieve better project outcomes. Even though IPD contracts make this possible, sometimes it still does not happen, or happen at the right time; e.g., releasing excess funds from one TVD cluster to another that needs the money.
8. Require the same level of evidence for cost reductions as for cost increases.
9. Maintain shared governance throughout project execution. Shared risk and reward calls for shared governance, a role many design and construction professionals find challenging. Experience has taught the necessity of radically changing their role, especially as regards oversight of the performance of fellow professionals. There is also a tendency for projects to revert to traditional practice during the construction phase, after commitment to an EMP or GMP, when the GC again takes on their traditional role.
10. Use transparent productivity measuring systems to allow the team to identify areas of the project that are underperforming.
11. Faced with cost pressure, too often the reaction is to stop spending, disregarding opportunities to reduce future cost by spending wisely now. For example, decisions may be made to reduce the scope or level of detail in modelling in order to reduce cost, and thus run past the opportunity to reduce future fabrication or installation costs.

Conclusions and Future Research

For shared risk and reward to remain a viable project delivery option, it must be sustainable. That means that owners get value for money and at-risk service providers make an acceptable profit. There will inevitably be exceptions, but the industry can learn from its own experience how to reduce such exceptions. This paper has presented a case study of one shared risk and reward project that clearly failed to deliver acceptable profits to risk pool member companies, cost the client more than budgeted, and was delivered late. Countermeasures have been proposed, based on the study of both successful and failed projects. The countermeasures are IPD and TVD principles and best practices, many of which have been previously identified, but are not consistently observed in practice.

All countermeasures are elements in Plan-Do-Check-Act cycles. A countermeasure (PLAN) such as those proposed in this paper must be tested in practice (DO) and its effectiveness evaluated (CHECK). If not fully successful, revisions are made in the countermeasures and they are tested again, until a version is found to be effective, in which case, that is deployed as a standard practice (ACT). Another area for future research is analysis of shared risk and reward contracts for their consistency with current theories of the conditions underlying cooperation and competition, of which one of the principal authors is Robert Axelrod, cited previously.

Acknowledgments

The research informing this paper would not have been possible without the financial support and dedicated involvement of the companies in the TVD Research Group and the individuals that represented them. In addition to the authors' companies, the TVD Research Group consisted of ACCO Engineered Systems, Berg Electric, Boulder Associates, Capitol Engineering, Forell-Elsesser Engineers, Herrick Steel, Johnson Controls, J.W. McClenahan, Rosendin Electric, Rutherford & Chekene, and The Engineering Enterprise.

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[Republished from Proc. 23rd Ann. Conf. of the Int'l Group for Lean Construction. Perth, Australia, July 29-31, pp. 257-266, available at www.iglc.net]