Risk/Reward Compensation Model for Civil Engineering Infrastructure Alliance Projects

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Abstract: A risk/reward model is described as that which aligns project participants' behaviors toward the achievement of a project's performance objectives through the use of incentives. A risk/reward model typically includes the following mechanisms: risk/reward shared percentages among nonowner participants, project cost risk/reward, noncost risk/reward, risk cap, and achievability of performance targets. This paper examines the influence of a risk/reward model on the behavior of project participants. Twenty-nine industry practitioners from eight civil infrastructure project alliances were interviewed. The interviews revealed that individual features of a risk/reward model identified had merits, but the achievability of performance targets model appeared to be the most appropriate for promoting positive behaviors within the project team. Additionally, it was found that all incentive aspects of the model examined led to positive and constructive behaviors occurring due to their perceived fairness and equity of payment structure. Participants indicated that having a commercial interest in an alliance's performance outcomes ensured collaboration and engagement throughout the project's life cycle. It is concluded that risk/reward sharing is pivotal to obtaining a successful project outcome for the procurement of civil engineering infrastructure projects when using an alliance.

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Introduction

Infrastructure projects are prone to cost and time overruns and often fail to meet stakeholder expectations (Flyvbjerg et al. 2002; Flyvbjerg 2007; Flyvbjerg et al. 2009; Love et al. 2010c). Evidence of this can be seen in several high profile infrastructure projects that were subjected to considerable cost and schedule growth in Australia. These include: the Perth to Mandurah Rail Link (Western Australia); Southern Cross Railway Station in Melbourne (Victoria); and Cross City Tunnel in Sydney (New South Wales). Australia needs to increase capital expenditure on infrastructure to meet the growing demand for economic and social development. In 2008, it was estimated that a budget of A$700 billion was required over the forthcoming decade (Citigroup Economic and Market Analysis 2008). In an effort to reduce pressure upon the taxpayer and simultaneously relieve the public sector from financing and delivering infrastructural needs, public private partnerships (PPPs) have been extensively used in Australia (Jefferies and McGeorge 2009). PPPs have performed significantly better in terms of time and cost than traditional methods (Allen Consulting Group 2007). However, although PPPs are an improvement, they remain subject to cost and schedule blow outs (i.e., a process where additional funds are injected into the project to correct, errors, missions, or mistakes). Underestimated costs, overestimated revenues, undervalued environmental effects, and overvalued economic development contribute to ever increasing cost overruns, delays, loss of revenues, disputes, debt, and negative environmental and social impacts (Kwak 2002; Li et al. 2000a; Zhang 2005; Rowlinson et al. 2006; Ferguson 2007; Flyvbjerg et al. 2009; Kwak et al. 2009; Love et al. 2010b).

Since the subprime crisis and collapse of the capital markets, the viability of PPPs has increasingly come into question. According to Regan et al. (2010), the funding methods previously used were no longer (as of May 2009) applicable in the current economic climate and as a result, alternative procurement and finance arrangements for procuring infrastructure projects (including alliances) should be considered. Alliances have proven to be effective in delivering infrastructure projects in Australia (e.g., Jefferies et al. 2000; Love et al. 2010a), because it engenders collaboration and integration between client/owner organizations (e.g., state or authority) and nonowner participants (NOPs) (e.g., design consultant, construction contractor, and supplier) (Love et al. 2002). Essentially, the alliance procurement arrangement aims to share both risk and reward among the project team via the use of a risk/reward model. To address issues related to performance and achieving specified deliverables, a risk/reward model is often used to drive project performance (Department of Treasury and Finance and Ross 2006). Limited research has been published

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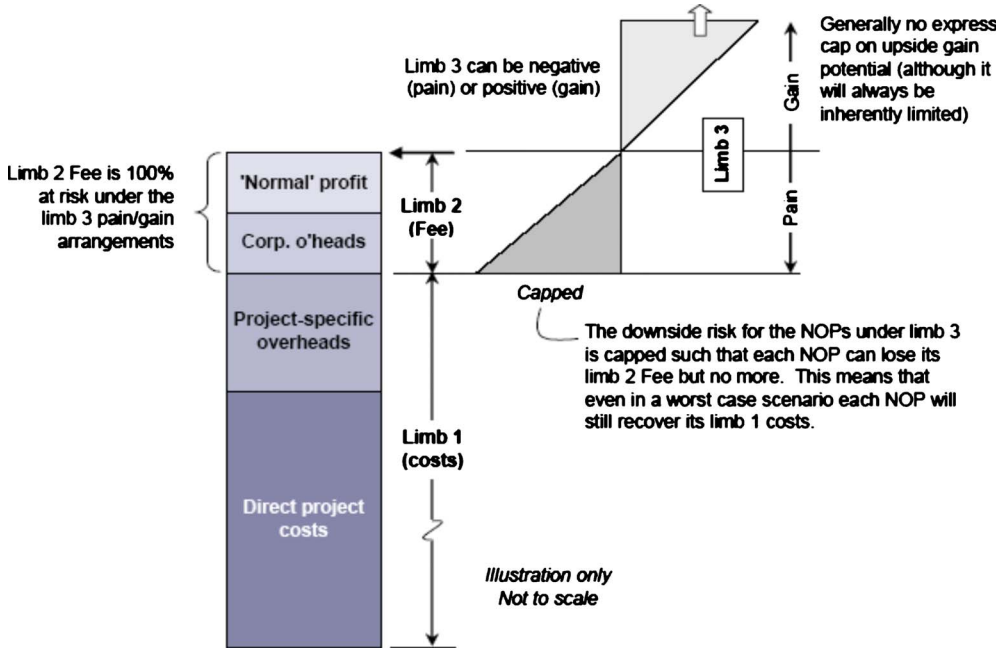

Fig. 1. Generic three-limbed project alliance compensation model for NOPs (Department of Treasury and Finance and Ross 2006, with permission from Jim Ross, PCI Alliance Services Pty Ltd)

about how a risk/reward model can influence project outcomes. This paper examines a sample of eight Australian case study projects that used a risk/reward model and reports upon the behavior of project participants who aspired to achieve predetermined project deliverables. A detailed review of the nature of alliances can be found in Holt et al. (2000), Das and Bing-Sheng (2002), Love et al. (2002), Li et al. (2004), Rowlinson et al. (2006), and Love et al. (2010b). An overview of an alliance compensation model and its constituent components that are typically used for procuring civil engineering infrastructure in Australia is initially presented and discussed so as to provide a contextual backdrop for the research undertaken. A glossary of key terms used within the paper can also be found in an appendix.

Alliance Compensation Model

The underlying purpose of an alliance compensation model is to provide a fair and equitable performance-related payment mechanism to project partners who strive to achieve predetermined performance criteria. The model is aligned to the project objectives and behaviors of NOPs and the client/owner and provides the sole commercial mechanism of payment which seeks to achieve a win/win financial position for all parties involved (Department of Treasury and Finance and Ross 2006). Factors previously identified as contributing to project disputes include low fees scales for consultants and low margins for contractors (Love et al. 2010a). In a move to improve project outcomes, a compensation model has been used within alliances to incentivise NOPs to work together as a coherent team. A typical compensation model comprises of three components, which are often referred to as "Limbs"

- "Limb-1" (L_1) —*Reimbursement of NOPs' direct project costs:* all NOPs are reimbursed 100% of costs and expenses that they incur directly, including any project-specific preliminaries and overheads. L_1 reimbursements are usually in relation to their direct costs (e.g., labor, plant and equipment, materials, engaged subcontractors, specific risk contingencies, and mobilization and demobilization expenses). Any mutually agreed costs or expenses incurred directly can be reimbursed to them as L_1 payments.
- "Limb-2" (L_2) —*NOPs' corporate overhead and profit fees*: a contribution fee is paid to each NOP by the client/owner toward nonproject specific corporate overheads. In addition, a fair profit margin based on a "neutral performance" outcome is paid. The L_2 payment is calculated by applying an agreed fee percentage to direct project costs. Direct costs can either be estimated at the beginning of a project, or based on costs that a NOP incurs.
- "Limb-3" (L_3) —*Risk/reward performance incentive payment*: NOPs receive a bonus payment or penalty based on actual performance measured against noncost targets known as key result areas (KRAs). KRAs may include critical success aspects of the project such as timely completion, environment, and safety. Often termed risk/reward (but also known as "pain/gain" or "pain share/gain share"), these risk/reward payments are shared among NOPs through predetermined percentages.

Under a "three-limbed" compensation model identified in Fig. 1, NOPs are entitled to full reimbursement of their direct costs, regardless of performance outcome(s). L_3 risk is capped for NOPs at the maximum loss of their entire L_2 payments. One further aspect of an alliance's compensation model requiring explanation is the target outturn cost (TOC) or sometimes simply referred to as the *target cost*. The TOC is a jointly determined estimate of the total capital expenditure required to deliver the project. A TOC includes the estimated direct cost of each NOP for their respective portions of work within an alliance, as well as the estimated direct costs of the client/owner. A TOC also includes estimates of L_2 corporate overhead and profit fees payable to NOPs. When combined with L_2 corporate overhead and profit fees, the actual outturn cost (AOC) is generated (Department of Treasury and Finance and Ross 2006).

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This form of compensation model encourages NOPs to efficiently attain best practice (as opposed to mere conformance to minimum standards) and maximize their potential for acquiring financial rewards. Firms are selected by the client based upon their ability and experience while performance is monitored throughout the project using the TOC as a base estimate. The TOC is a jointly determined estimate of the total capital expenditure required to deliver the project but because it is often not genuinely competitive, an alliance can be perceived to have performed well even when the converse is true (Davis and Cowan 2008). In addressing this concern, *price competitive alliances* have been espoused as an alternative to the use of *pure alliances* (Love et al. 2010b).

There are differences in the two alternatives, but generally two independent interim teams are first selected on the basis of experience, capability and attitude, not price. Each team works with the client to develop a design, execution strategy, and TOC. The client selects the winning team based upon a comparison of the TOC juxtaposed with nonfinancial criteria. Alliances eliminate any misalignment of commercial interests with the risk/reward model by using an open book accounting approach where risks are identified and shared equitably (Yeung et al. 2007). Under the risk/reward model, the project cost or the TOC is established *only* after the partners have been selected. The TOC is developed jointly by the alliance partners with a commercial model designed around reward incentives for cost savings and penalties for cost overruns (Walker et al. 2002). If the TOC is too high, then the relationship may breakdown and the project may not proceed. If the TOC is too low, then significant pressure to cut corners and compromise quality may arise (Alchimie 2004).

Risk/Reward Model

According to Hutchinson and Carter (2004), the L_3 risk/reward model was the key component of the alliance compensation model. Two ways that an alliance creates a "risk" or "reward" payment for participants are (Hutchinson and Carter 2004; Department of Treasury and Finance and Ross 2006)

1. Participants receive a share of project profits and losses generated during the alliance so that no single party is deemed responsible for financial performance. Profits and losses are determined by calculating the difference between the AOC and the TOC. So, NOPs share a performance-based payment, whether it is a bonus or penalty, from the client/owner. This payment relates to performance outcomes achieved in noncost
2. The risk/reward model provides incentive for participants to deliver outstanding outcomes in KRAs and ensure that all participants receive an equitable share of the risk or reward. Of the three limbs that form an alliance's overall compensation model (Fig. 1), the risk/reward model element appears to exert the most influence on team behaviors.

There are several principles that underpin a L_3 risk/reward model (Hutchinson and Carter 2004, p. 23)

- Profit and loss is linked to "real" risk and benefits that impact the value of the project to the client/owner;
- Outcomes are either win/win or lose/lose, there should be no opportunity for win/lose;
- Potential losses are capped at a preagreed percentage of normal profit, corporate overhead, and gain share for each participant;
- Each participant has meaningful financial incentives;
- The client/owner is committed to NOPs earning 100% of their possible gain share entitlement;
- Links between separate elements of the profit share system provide no incentive to sacrifice performance in one objective to secure reward in another; and
- Complete transparency in all arrangements.

These principles govern the structure and function of the risk/reward payment model. Adherence to such principles link the commercial interests of participants to the best interests of the project outcomes. This is subsequently promoted as ensuring and encouraging participants behave "as an integrated team to identify, eliminate and/or mitigate all risks regardless of the source, including in some cases risks that no single party could manage effectively on its own" (Ross 2003, p. 7). These principles, alongside the compensation model presented earlier, play a pivotal role in defining and influencing project behavior. The common features of an alliance's risk/reward model are presented below.

Sharing of Risk/Reward among NOPs

Determining how payments can be shared in an equitable way is an important decision to be made when developing an alliance's risk/reward model. Risk/reward payments include sharing profit/loss, and/or payments relating to noncost KRA performance. Perceptions of equity and fairness in the distribution of risk/reward may be assumed to play a role in behaviors (Bresnen and Marshall 2000; Davis and Walker 2003). Accordingly, Hutchinson and Carter (2004, p. 23) stated a risk/reward model should provide "meaningful financial incentives" for each participant. Participants often perceive equity in absolute terms, for example, the "appropriateness" of their reward received is balanced against perceptions of individual performance (Bresnen and Marshall 2000). If the reward is judged inappropriate, then behavioral performance may be reduced (Bresnen and Marshall 2000).

One method for calculating shared percentages of risk/reward payments is based on the relative proportions of the direct project costs or estimated L_1 costs (Ross 1999). This seems to be the most logical method for calculating shared percentages because it is directly linked to the individual's respective estimated capital expenditures within an alliance. Under such arrangements, the contractor will receive the majority of risk/reward due to their high expenditure.

Design consultants allocated risk/reward percentages through L_1 proportions may not be viewed as being equitable both in (1) *relative* terms (i.e., compared to the contactor's risk/reward percentage) and (2) their own *absolute* internal standard (i.e., the reward they believe they should receive given their performance). Equity theory implies that behavioral problems from design consultants could potentially arise, if L_1 proportions are used to split risk/reward among NOPs. To overcome this and maintain positive behaviors from all NOPs, design consultants should receive more allocated risk/reward by using respective L_2 determined shared proportions (Ross 1999).

Ross (2003, p. 7) recommends that as a "starting point," risk/reward shared percentages should be based on their relative L_2 fee proportions. Yet, the Department of Treasury and Finance and Ross (2006) suggested that such a method for calculating shared percentages may still be disproportionately low for design consultants given their potential influence in the project's final outcome(s). Thus, further increases to design consultants' shared percentages (at the expense of a contractor's percentages) could be considered. However, due to design consultants' risk adverse

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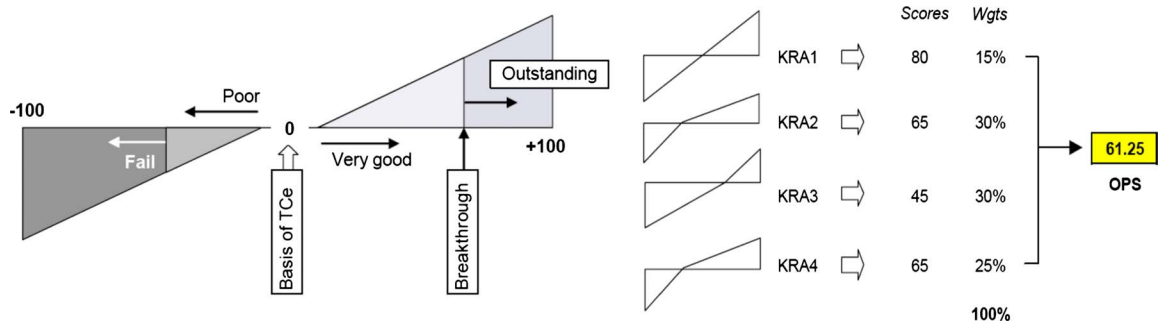

(A)

Source: Department of Treasury and Finance and Ross (2006)

(B)

Source: Ross (2003:p.8)

Fig. 2. (a) Typical noncost KRA performance scale (Department of Treasury and Finance and Ross 2006, with permission from Jim Ross, PCI Alliance Services Pty Ltd); (b) determining the OPS in noncost KRAs (Ross 2003, with permission from Jim Ross, PCI Alliance Services Pty Ltd)

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nature, they might refuse an increased share of risk/reward, if it means accepting a larger share of risk (Ross 2003).

Project Cost Risk/Reward Model

For most alliances, sharing profits/loss between a client/owner and NOPs on a preagreed percentage ratio forms the commercial driver of the risk/reward payment model. A shared ratio of 50:50 is often used (Hutchinson and Carter 2004; Department of Treasury and Finance and Ross 2006) because it underpins and symbolizes the equality of the alliance relationship.

Noncost Risk/Reward Model

One of the main attractions of alliancing is the ability of the commercial model to focus project participants via incentives onto other noncost KRAs that represent value and/or importance (Ross 2003; Hutchinson and Carter 2004). Noncost KRAs are limited only by the imagination of a client/owner in deciding what incentives to employ (Hutchinson and Gallagher 2003). Any noncost KRA can be included provided an economical method can be implemented to measure performance in these KRAs to preagreed performance targets (Hutchinson and Gallagher 2003). Some broad noncost KRAs in civil infrastructure project alliances include: timely completion; safety, quality, environmental, or community outcomes; and traffic management.

For each individual noncost KRA a number of *key performance indicators* (KPIs) exist that measure specific and defined aspects of performance. KPI scores are rated on a scale between −100 and +100, with zero designated as the "neutral performance;" the extremities of +100 and −100 represent "outstanding" and "poor" performance, respectively (Ross 2003). The performance score for a noncost KRA is then calculated as the summed weighted average associated with KPIs (Department of Treasury and Finance and Ross 2006). The neutral performance score for each noncost KRA is used to determine the TOC (Fig. 2 uses target cost estimate). A typical performance scale for a noncost KRA is denoted in Fig. 2(a).

While any noncost KRA can be considered within a single risk/reward model, the usual practice is to first measure performance across all individual noncost KRAs being incentivized. Second, individually weighted performance scores for each individual KRA are then combined into one *overall performance score* (Ross 2003; Hutchinson and Carter 2004; Department of Treasury and Finance and Ross 2006). This procedure is illustrated on the right hand side of Fig. 2.

The total monetary value of a noncost risk/reward is kept in a funding pool (known as the risk/reward pool) and is determined by a client/owner who distributes these funds depending on noncost performance scores achieved. If noncost outcomes have overall been better than targeted neutral performance benchmarks, the overall performance score (applied as a percentage to a noncost risk/reward pool) determines the amount of reward payable to NOPs. If overall noncost performance has been worse than targeted neutral performance, a monetary amount is subtracted from NOPs' other L_3 reward, and/or L_2 corporate overhead and profit fees. NOPs, therefore, incur risk, or a penalty payment for poor noncost performance.

The overall performance score for noncost KRAs can be also linked to a shared model between client/owner and NOPs (Ross 2003). The Department of Treasury and Finance and Ross (2006, p. 116) suggested this noncost model provides an additional incentive to ensure that noncost KRAs are "not compromised in pursuit of cost savings." In this case, there is a preagreed maximum percentage swing value that can be applied. The initial shared ratio of profit/loss between a client/owner and NOPs is set at 50:50.

The share of profit/loss can be increased or decreased at the expense of a client/owner's 50% share. If an alliance has achieved good noncost outcomes, NOPs can alter their percentage share of profit/loss to their benefit. In such a model, noncost outcomes are clearly linked to the cost outcome, ensuring "that performance in noncost areas is not compromised in pursuit of continuing cost savings" (Ross 2003, p. 8). Establishing a link between separate elements of a L_3 risk/reward model is one of the key principles given when developing a risk/reward model.

Risk/Reward Cap(s)

The capping of financial risk that can be incurred is a key feature in a risk/reward model. In some cases, a risk cap may be set slightly lower than the loss of a NOP's entire L_2 fees, so that a small return margin is guaranteed. A number of reasons for risk capping are (Ross 2003)

- An alliance is delivered for the benefit of a client/owner, and NOPs have little, if any, interest or equity in a project following its completion. It appears illogical or inequitable to assume "unlimited" risk for "limited" potential reward.

- A capped maximum financial risk may encourage acceptance of unwarranted risk.
- Uncapped risk may lead to NOPs increasing their L_2 corporate overhead and profit fees, as well as increasing their (risk) contingencies within their direct project cost estimates (i.e., L_1 costs).

The subject of capping maximum reward in an alliance is rarely discussed within the normative literature. The maximum potential reward available is always limited because several fixed lump-sum reward pools exist for noncost KRAs (Ross 1999). The Department of Treasury and Finance and Ross (2006) recommended that there is no cap on upside rewards available in a risk/reward payment model. This means that there always exists a tangible commercial incentive for NOPs to strive for better outcomes. However, client/owners new to alliancing may envisage that they are generating "safeguards" against overinflated TOC by capping potential upside reward in a risk/reward model.

Achievability of Performance Targets

When developing and structuring a risk/reward model, performance objectives and targets that are clear, concise, and easy to understand must be estimated. Neutral performance for example should be equal to or better than current best practice. A neutral performance score for noncost KRAs can be defined as being "better than has been consistently achieved by the individual participants working in a nonalliance environment" (Department of Treasury and Finance and Ross 2006, p. 112). The neutral performance benchmarks and performance targets for an alliance's various KRAs should be both set at a very high performance standard but should also be achievable (Love et al. 2000; Li et al. 2004; Li et al. 2000b; Holt et al. 2000). High performance targets should drive project behaviors toward the attainment and achievement of established targets (Holt et al. 2000).

Research Approach

The influence of the *five* compensation elements of a risk/reward model on the attitudes and behavior of participants was examined using an interpretative research approach (Miles and Huberman 1994; Silverman 2001). The specific aim was to determine how components of an alliance risk/reward model influenced NOPs' behaviors. Interviews were chosen as the primary data collection mechanism because they provide an effective tool for learning about matters that cannot be readily observed. According to Taylor and Bogdan (1984, p. 79), no other method "can provide the detailed understanding that comes from directly observing people and listening to what they have to say at the scene." The interviews were conducted at the offices of participants and via telephone.

Interviews were digitally recorded and transcribed verbatim to allow for finer nuances in the interviews to be recorded. Participant details were coded for anonymity, although all interviewees were made aware that it might be possible to identify them from the textural content. The format was based upon themes associated with disputes that emerged from the literature. This data collection instrument allowed for avenues of interest to be pursued as they arose without introducing bias in the response. Interview notes were taken to support the digital recording and maintain validity. Each interview varied in length from 30 min to 2 h. Interviews were open to stimulate conversation and breakdown any personal or professional barriers that may have existed between the interviewer and participant.

Twenty-nine in-depth interviews were conducted over a 2-month period with senior project managers with significant experience selected from available client, design, and contracting organizations (Goodman 1961). Of these 29 interviewees, seven were from client/owner organizations, 11 were from contractor organizations, and 11 were from design consultancy organizations. Moreover, 16 of the 29 were engaged within the "Alliance Leadership Team" (ALT) (i.e., senior-level management), and the remaining 13 were engaged at "Alliance Management Team" (AMT) levels. The ALT and AMT level representatives were chosen because these individuals would have the greatest understanding of a project alliance's risk/reward payment model, and its influence on project behaviors. The sample of participants was derived from eight civil engineering infrastructure projects where risk/reward models had been implemented in projects in Australia ($n=7$) and New Zealand ($n=1$). Due to commercial and political sensitivity issues, only limited information can be provided about each project. However, the project values varied from A$45 to A$130 million.

Data Analysis

The text derived from the interviews was analyzed using QSR N5, (which is a version of NUD*IST and combines the efficient management of nonnumerical unstructured data with powerful processes of indexing and theorizing) and enabled the explanation of emergent themes identified. One advantage of QSR N5 is that it enables additional data sources and journal notes to be incorporated into the analysis. The development and reassessment of themes as the analysis progressed accords with calls for avoiding confining data to predetermined sets of categories (Silverman 2001). Kvale (1996) suggested that ad hoc methods for generating meaning enable the researcher to access "a variety of common sense approaches to interview text using an interplay of techniques such as noting patterns, seeing plausibility, making comparisons, etc." (p. 204).

QSR N5 enabled the development of an organic approach to coding because it enabled triggers or categories of interest within the text to be coded and used to keep track of emerging and developing ideas (Kvale 1996). These codings can be modified, integrated, or migrated as the analysis progresses and the generation of periodic reports, facilitates the recognition of conflicts and contradictions.

Findings and Discussion

Each of the eight project alliances that were studied used a variety of risk/reward payments. The actual shared percentages for each project alliance studied could not be disclosed for commercial reasons. However, Table 1 provides a description of the means whereby shared percentages were calculated, focusing primarily on the allocation of risk/reward for design consultants.

Case A was the only project alliance where *both* risk and reward shared percentages for all risk/reward payments were calculated from relative proportions of L_2 fees (Fig. 1). In all the other cases, design consultants were allocated increased shared proportions of reward in at least one of the risk/reward payments. The increased reward shared percentages for design consultants varied from minor increases applied to L_2 determined proportions, to

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Table 1. Calculation of Design Consultants' Risk/Reward Sharing Percentages

Case	Cost underrun/overrun			Noncost pool(s)			TOC formulation phase		
	Based on relative limb-2 proportions (or thereabouts)	Based on limb-2 proportions with minor uplifts to the design consultant(s) proportion	Independent sharing proportions with significant proportions for the design consultant(s)	Based on relative limb-2 proportions (or thereabouts)	Based on limb-2 proportions with minor uplifts to the design consultant(s) proportion	Independent sharing proportions with significant proportions for the design consultant(s)	Based on relative limb-2 proportions (or thereabouts)	Based on limb-2 proportions with minor uplifts to the design consultant(s) proportion	Independent sharing proportions with significant proportions for the design consultant(s)
A	Risk and reward			Risk and reward					
B			Risk and reward			Risk and reward			
C	Risk		Reward	Risk		Reward			
D		Risk	Reward		Risk	Reward			
E	Risk and reward					Risk and reward			
F			Risk and reward			Risk and reward			Risk and reward
G		Risk and reward			Risk and reward				
H		Risk and reward			Risk and reward				

significantly increased proportions of reward with no correlation with L_1 direct project costs, or L_2 corporate overhead and profit payments. Five of the eight project alliances studied also featured enhanced risk shared percentages for design consultants, increased from their L_2 determined proportions.

Sharing of Risk/Reward among NOPs

Participants provided several consistent reasons why design consultants were allocated increased shared proportions of risk/reward. These shared percentages were revealed to have increased from a design consultant's estimated L_1 proportions. Seventy-five percent (22) of participants stated that increasing design consultants' percentages provided a fair reflection and recognition of their level of influence on project outcomes, particularly in relation to the level of documentation they produced. Respondents from contracting organizations stated that rewarding design consultants, based on their ability to influence overall project outcomes was intended to drive designers' behaviors toward ongoing commitment and engagement throughout the project.

Financially incentivizing design consultants was repeatedly identified by contractors and clients as intending to drive their behaviors toward producing high quality and "innovative" project designs. Several contractor respondents $(n=8)$ indicated that giving design consultants a greater percentage of reward at the expense of their own percentage did not drastically reduce their own reward relative to other NOPs. The increased percentage share for the design consultant increased their perception of their potential reward. A design manager stated

> I think that it meant that there was a lot more transparency between the consultant(s) and the contractor(s). There was that willingness to investigate alternate design options that little bit further, and there was a lot more effort put into modifying the design to suit the contractor(s). So I think that by having that [increased stake], by having that extra incentive to do everything that you could and knowing that you're going to get an appropriate reward out of what you do, that really drove the consultant(s) behavior.

Five cases were found to have design consultants receiving an increased share of risk among NOPs. Participants $(n=9)$ believed that increased risk percentages for design consultants were intended to provide an extra incentive for them during the delivery of an alliance. This was reported as attempting to ensure that designers continued to strive for the "best" project outcomes throughout the alliance life cycle.

Client/owners stated that if contractors felt designers were to receive extra potential reward at their expense, it was only appropriate and fair that designers also accept a greater percentage share of risk. Raising design consultants' risk shared percentages in line with reward percentages was felt to maintain perceptions of equity (particularly for contractors). It was reported that this was intended to promote unified project behaviors as well as ensure that perceptions of fundamental alliance principles: that is, reward and risk are bedfellows and shared equitably. Noteworthy, several design consultants $(n=7)$ indicated that if more rewards were sought, then more risk should be adopted. Though, one design consultant stated that raising their risk/reward percentages merely provided recognition of their potential input in to a project.

One particular contractor proffered that altering a design consultant's risk/reward shared percentages would have little impact upon behaviors demonstrated. Design participants were largely

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influenced by other behavioral drivers, such as innovative corporate cultures and maintaining organizational reputations for future work. Several respondents also remarked that once risk/reward shared percentages were agreed upon, the contract and any influence that it may have on behaviors, were then "put away into a drawer." Thus, it was considered that risk/reward sharing did not influence behaviors. However, as all cases delivered "neutral or better" overall project outcomes, the opportunity may not have existed for shared percentages to have become an issue and drive different behavioral outcomes. In particular, one contractor stated

> The shared percentages amongst NOPs probably set up the framework for getting all NOPs working well together, but the actual shared percentages probably played a lesser role in driving behaviors, especially at the project level. The percentages provided the underlying framework to develop other drivers of behavior, such as the alliance culture, but those other drivers were driving behavior during the alliance.

Project Cost Risk/Reward Model

In all case projects, there was a shared percentage starting at an initial 50:50, for a project profit and loss between the client/owner and NOPs. In several cases there were noncost risk/reward models that had the ability to alter the NOPs' 50% share of profit and loss depending on the noncost outcomes achieved. It was revealed by all participants that the provision of a share in the profit/loss was a driving factor for collaborative behavior and achieving cost efficiencies. In particular, one design consultant stated

> I think that once we got into it, the alliance team drove very hard to reduce costs and to look for opportunities to save money. This was in areas such as construction methodology, design changes, how things were processed on site and how quickly issues were responded to and "turned around." I think that it was a very powerful tool on everyone's behaviors in that everyone had a clear idea of what was up for grabs… Every time you saved a dollar, you knew that 50 cents was yours.

It was suggested that equal cost sharing "kept everyone interested" and committed to project cost decisions and outcomes. Some ALT level respondents indicated that the "best resources" were provided to identify cost innovations and to ensure the project was adequately resourced. The working relationship between a client/owner participant and NOPs was also commented as being "positively enhanced." Traditional adversarial boundaries and behaviors between client/owner organizations and NOPs were reported to disappear due to the incentives in place. Several respondents noted that the client/owner participant quickly reacted to issues and made decisions and thus assisted the project's progress.

A number of respondents ($n=10$) believed that sharing cost equally had a positive influence upon the working relationship (particularly the formation and maintenance of the alliance culture) and the approach to dealing with problems. When forming an alliance's culture, equality in sharing cost risk/reward was commonly described as establishing good behavioral principles at the outset which subsequently guided participants' behaviors. Such principles included equal ownership and commitment, ensuring that all participants "won together or lost together," driving equal and collaborative relationships with open and honest communication, thus avoiding disputes.

Several respondents ($n=13$) believed that while cost considerations had some influence on behaviors, behaviors were described as being primarily focused on achieving general project objectives. Respondents reported that considerable finance was spent ensuring outstanding outcomes were achieved in all of a project's performance areas particularly for incentivized noncost KRAs in a noncost risk/reward model. Maximizing cost efficiencies was relegated to being a "background driver" of behaviors within an alliance. Behaviors were reported as being focused on "the bigger picture" and achieving outstanding performance outcomes of an alliance's KRAs.

Noncost Risk/Reward Model

All cases had noncost risk/reward models as part of their payment model. For two cases, the "schedule/timely completion" KRA featured its own designated risk/reward pool, and was separated from other noncost and nontime KRAs. The monetary value of noncost pools (where all noncost pools are combined) when compared to an alliance's initial TOC were found to vary from 0.55 to 3.6%, with the mean being 1.65%. Three cases had noncost models with the ability to alter NOPs' percentage share of profit/loss. This was in addition to their noncost risk/reward pools. These cases featured cost share "percentage swings" ranging from ± 10 to ± 15%. Such a feature provided NOPs with a variable percentage share of the profit/loss depending on noncost outcomes achieved.

Participants acknowledged that the client decided upon the overall structure of noncost risk/reward models and which noncost KRAs were included in the project. Decisions on a noncost model's structure typically included how noncost outcomes would be rewarded/penalized (e.g., pool and/or percentage swing approach), and the monetary amounts used to incentivise behaviors. Participants reported that determining KPIs for noncost KRAs was a process of joint negotiation and development by all participants. Therefore, the overarching structure of noncost risk/reward models was largely determined by client/owner participants with the finer detail (e.g., KPI development) being jointly developed by all participants.

Participants ($n=16$) suggested that the monetary value of risk/reward pools was not a primary driver of behaviors in achieving good outcomes in noncost areas. One contractor stated

> The fact that there was a noncost pool was significant. But the value of the pool, if you looked at by itself, it wouldn't be enough to actually change behaviors just to get the money. You had to have other monetary payments to drive behaviors overall. So having the noncost pool assisted in driving the team's behaviors, but not from a financial perspective. It was just from the fact that it was there and people knew that there was some risk/reward associated with the outcomes achieved in noncost KRAs.

The actual monetary value of noncost pools was not considered to be a driver of behaviors toward achieving good outcomes in noncost areas. Several respondents ($n=7$) suggested this could change in future alliances they were involved with. In the eight cases, a significant nonfinancial driver identified was the influence that "ownership" of noncost performance targets had on alliance teams. This ownership of performance targets was reported as having a positive impact on behaviors demonstrated in noncost areas. A construction manager stated

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> Because we had gone through the whole exercise of jointly developing the KPIs for the various noncost areas, I think that this created a lot of ownership of the noncost model, at least by the ALT and the AMT. So during the alliance, there was a real emphasis on trying to beat noncost performance targets, mainly because you were partly responsible for setting them. It was the whole process of first of all developing the model jointly, and then trying to prove a point by beating the noncost performance hurdles you had set for yourself!

The intrinsic motivation gained by "beating" jointly developed performance targets significantly influenced behaviors in noncost areas at a project management level within an alliance.

Regular measurement of noncost performance against targets was deemed to be a behavioral driver in noncost areas. The process of regularly measuring actual performance against targets and providing ongoing feedback in a working environment encouraged excellent outcomes in noncost areas. It was perceived that project teams strove to deliver outstanding noncost outcomes in all noncost areas, regardless of whether some noncost KRAs were weighted more than others. There was general consensus among participants that the behavioral focus to achieve good outcomes in noncost areas was to maximize the noncost KRAs' overall performance score.

Accountability, credibility, pride, and reputation were identified as driving behaviors toward achieving good noncost outcomes and delivering a project that would reflect well upon all parties involved (as part of a "legacy"). Participants ($n=9$) from four different case projects revealed that cost savings were reinvested back into the alliance in noncost areas to further improve project outcomes. While financial considerations were not reported as being primary drivers of behaviors in noncost areas, they were reported as being evaluated at the project's most senior-level management. It was stated by 25 (86%) participants that the percentage swing noncost model has a significantly greater impact on NOPs' financial outcomes than the noncost pool. This was due to noncost pools being perceived as relatively low in monetary value, compared to the alliance's TOC.

Risk/Reward Cap(s)

Of the 24 organizations from the eight case projects, 23 organizations had their maximum risk capped at the loss of their entire L_2 fee. For actual delivery stages, risk caps were not reported by any respondents as ever being used in limiting financial loss. It was stated by 18 (62%) participants that risk caps enabled, participants were able to focus on positive outcomes and have a constructive mindset during an alliance. This was described as being due to NOPs knowing that if a project performed poorly their potential to incur financial losses did not exist. Several participants ($n=9$) indicated that capping maximum risk enabled them to "look at the bigger picture" when assessing and accepting risks. A contractor stated

> If there was no risk cap, it would have reduced the propensity to try a new innovative way of doing something that because it hadn't been done before, naturally had more risk associated with it. You'd be hesitant to try it, because the potential consequences could have been very high! So by having the risk cap there, it allowed you to 'think outside the square' and try new innovative ideas, because when you looked at the bigger picture, at the end of the day there was a cap on your risk.

Participants ($n=12$) also believed that capping risk enabled designers and contractors to focus on developing innovative solutions. One participant referred to this process as "the unshackling of overconservatism." Capping maximum risk and promoting innovation was deemed to be one reason why the projects delivered satisfactory outcomes.

Several respondents ($n=10$) thought that risk caps had no major influence on relationships and behavior within an alliance as it was just "part of the risk/reward model." Some interviewees ($n=4$) believed that risk caps helped promote perceptions of fairness and agreement among alliance participants. These perceptions were commonly identified as driving positive behaviors toward collaborative culture.

Interviewees ($n=8$) drawn from three cases stated that each of the alliances that they had worked on had been delivered considerably under budget. Five respondents thought that the maximum reward received from a profit could have been capped. The capping of a profit was identified as a possible solution in preventing the issue of a TOC being perceived by a client/owner as "overinflated." Several interviewees ($n=5$) stated that senior management were dissatisfied because of the cap and the reduced cost savings that they would receive as a reward due to a profitable project.

Achievability of Performance Targets

Respondents indicated 24 (82%) that high performance targets set had a positive impact on project team behaviors and the dynamics within. Respondents reported that for the majority of an alliance's lifecycle, high performance targets acted as motivational drivers as they aimed to "beat the established targets" and achieve outstanding project outcomes. Early stages of an alliance were identified as being a critical time for formulating perceptions on achievability of performance targets, and as a result, workshopping and coaching of the project team was required. The purpose of these activities was to "buy into" acceptance of high performance targets. On agreement to the targets, it was revealed that commitment and confidence were acquired and in particular, a client\owner stated

> If we hadn't got members to buy in to our targets, we pretty much could have kissed the targets goodbye and that would have been the end of the project! We needed an innovative solution and an alliance was the best option for us.

Despite project teams initially regarding high performance targets with apprehension, once the process of performing and monitoring had started and become established, perceptions of what had previously been regarded as unachievable gradually changed. A senior project manager stated

> I suppose the reality was that once you started the ball rolling you got more and more ideas, you got better momentum, you achieved one, two, three things, and all of a sudden the 'achievability' actually seemed a lot more real than when you set them up. Once you could actually see the achievability, the team's behaviors were a lot more driven towards trying to beat the targets…

For some respondents ($n=7$), just being part of an alliance environment and a member of a high performance team aided their confidence to strive toward established targets. For other respondents ($n=9$), the process of the team jointly developing and establishing performance targets in the formative stages of the

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project inspired ownership. Leadership of project managers was also deemed an important function in establishing targets and getting the team to mutually abide to them.

Conclusions

Alliances are contractual frameworks that are being extensively used to deliver civil engineering infrastructure by state and local government in Australia. They are being used to ensure that projects are delivered on budget and time and now should be considered the principal means to deliver infrastructure as a result of the collapse of capital markets. The current stimulus package that has been set aside by the Federal Government infrastructure in various states can provide the means for ensuring that realistic estimates of project costs can be made as the TOC is established by the alliance. This results in the alliance having ownership of the project and in so doing provides an incentive to achieve the desired project outcomes. A major component of the alliance framework is the use of a risk/reward model to encourage project team members (i.e., nonparticipants owners) to work together in a cooperative and integrated way so that rewards match performance. Risks/rewards are typically determined using a tiered compensation structure. To understand how this compensation structure is applied in practice (particularly its five structural elements) and its effectiveness in ensuring project outcomes, an interpretative research approach was adopted.

Twenty-nine industry practitioners who had been involved in eight alliance projects were interviewed to determine their experiences with the risk/reward compensation model. Fundamentally, it was revealed that collaborative and cooperative behavior between team members were espoused by

- The perceived fairness and equity in payment structure;
- A mutual commercial interest in an alliance's performance outcomes;
- Incentive payments; and
- High performance culture through the joint establishment of achievable performance targets.

Accountability, credibility, pride, and reputation were revealed to be the underlying driving forces of behaviors that contributed to good noncost outcomes. There was a desire for NOPs to attain best practice and be part of a team that had delivered a legacy project. It was generally perceived that financial incentives and the capping of risks acted as determinants for design consultants and contractors to work toward producing innovative design solutions. Risk/reward sharing is pivotal to obtaining a successful project outcome for the procurement of civil engineering infrastructure projects when using an alliance. This research has provided valuable empirical research regarding the relationship that exists between the structure of a project alliance's risk/reward model and behaviors that are exhibited within them.

Glossary of Key Terms

- *Actual Outturn Cost (AOC)* equals the sum of actual direct project costs and overhead and profit fees.
- *Initial targeted cost (TOC)* or business case cost estimate; is the agreed target cost set at the start of the project. In the project the AOC is compared with the TOC to determine cost underrun or overrun. An AOC close to the TOC demonstrates value for money.
- *Owner and Nonowner Participant (NOP)* is the direct project stakeholders who represent the commercial/legal framework of the project organization. Generally, the owner is a government backed enterprise and the NOP comprises one or more private sector service providers delivering the capital works project.
- *Key Result Area (KRA)* is a performance-related bonus or penalty payment based on actual performance outcomes achieved by the NPO, compared to preagreed performance targets in a project alliance's KRAs. For cost and noncost KRA (e.g., timely completion, safety, quality, environmental outcomes, community outcomes, and traffic management), there exists a number of KPIs which measure specific and defined aspects of performance.
- *Key Performance Indicators (KPI)* are jointly developed and agreed, KPI performance scores are measured on a scale between −100 and +100, with zero designated as the neutral performance score, and +100 representing an outstanding performance outcome NOP. Refer to Ross (2007) for further details.

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