Building trust in cross-sector R&D collaborations: exploring the role of credible commitments

Author
Couchman, Paul, Fulop, Liz

Published
2006

Conference Title
European Group for Organizational Studies (EGOS) 22nd Colloquium Trust Within and Across Boundaries

Copyright Statement
Copyright remains with the author's 2006 Griffith University. This is the author-manuscript version of this paper. It is posted here with permission of the copyright owners for your personal use only. No further distribution permitted. For information about this conference please refer to the publisher's website or contact the author's.

Downloaded from
http://hdl.handle.net/10072/15583

Link to published version
Building Trust in Cross-sector R&D Collaborations: Exploring The Role of Credible Commitments

A paper submitted for Sub-theme 11 “Trust within and across boundaries: conceptual challenges and empirical insights” of the 22nd EGOS Colloquium (Bergen, Norway, 6 – 8 July 2006)

by

Paul K. Couchman
Griffith Business School
Gold Coast Campus Griffith University
PMB 50 Gold Coast Mail Centre
Queensland 9726, Australia
Telephone: +61-7-5552-8003
Fax: +61-5552-9206
Email: paul.couchman@griffith.edu.au

Liz Fulop
Griffith Business School
Gold Coast Campus Griffith University
PMB 50 Gold Coast Mail Centre
Queensland 9726, Australia
Telephone: +61-7-5552-8544
Fax: +61-5552-8469
Email: l.fulop@griffith.edu.au

Abstract

This paper reports selected findings from a study of one form of cross-boundary relationship: cross-sector R&D collaboration under the Australian Cooperative Research Centre (CRC) Programme. The study sought to explain project partners’ collaboration experience using a theoretical model which was empirically tested with a survey of CRC project leaders. It was hypothesised (H₁) that the higher the level of relational trust (measured, following Sako, in terms of contractual, competence, and goodwill trust) amongst the partners in a collaborative project team, the more positive would be the partners’ experience of the project. The construct of credible commitments (the making of pledges, or the economic equivalent of the taking of hostages, which bind partners to a relationship) was posed in the model as an antecedent of relational trust. Accordingly it was hypothesised (H₂) that the more that credible commitments are made by the project partners, the higher would be the level of relational trust between them. Data from the achieved sample (n = 156, 51% response rate) were analysed using PLS Graph. The results of the analysis provided support for hypothesis 1 but not for hypothesis 2. It was concluded that this latter finding could be due to the specific context of the study (cross-sector R&D collaborations under the CRC Programme differ markedly from inter-firm strategic alliances), or it could be due to the complex nature of credible commitments which was not adequately captured by our measure of this construct. Further research is required in this area to clarify the nature credible commitments, and the circumstances under which they contribute to a spiral of rising trust, in different cross-boundary contexts.

The authors of this paper would like to gratefully acknowledge the expert assistance provided to us for the PLS Graph analysis of our survey data by Leonie Miller and Peter Caputi of the Department of Psychology at the University of Wollongong. We would also like to acknowledge that the research on which the paper was based was funded by an Australian Research Council (ARC) Discovery Grant.
Building Trust in Cross-sector R&D Collaborations: Exploring The Role of Credible Commitments

Introduction

An increasingly important form of interorganizational collaboration is that which crosses public and private sectors to conduct R&D, especially in the areas of biotechnology, pharmaceuticals and information technology. While this form of collaboration offers significant advantages for the collaborators, it can be problematic in that it brings together partners with quite different interests, objectives, modes of operation, capabilities, resources and commitments thereby potentially creating arenas of tension, conflict and power struggles. This paper presents key findings from a two-phased study of the Australian Cooperative Research Centre (CRC) Program, an example of such cross-boundary collaboration, which involves consortia of universities, public sector research agencies and companies jointly pursuing R&D projects under the auspices of government-sponsored intermediary agencies in six broad sectors of application (e.g. manufacturing, medicine, and information and communications technology). The CRC Program, launched by the Australian Government in 1990, specifically to strengthen the link between public sector research and its application in industry (Slatyer, 1993), is a manifestation of an international trend whereby there have been major changes within national economies in the institutional arrangements among universities, companies and government agencies to create a “new knowledge infrastructure” (Etzkowitz and Leydesdorff, 2000). As a result of this trend, there is now considerably more cross-boundary interchange among organizations in the two sectors (for example, as Turpin 1997 p. 255, has observed “… for industry, universities are no longer simply a resource for carrying out basic research and producing well-trained graduates; they are now often partners in research and development activities and ongoing training programs for technical and administrative staff”), often intermediated by “hybrid” government-sponsored agencies such as the CRCs, and this raises many issues of interest for the field of organizational studies. But while the CRC Program has been evaluated a number of times during its relatively brief existence, there remain relatively few empirical studies of its operation and management, especially at the project level where collaborative R&D is conducted. Our study aimed to address this knowledge gap, and in so doing sought to contribute to the theory of interorganizational collaboration.

Our study has focused on the risks posed to the participants in the new organizational settings of the CRC Program as part of an investigation into the development of sustainable cross-sector linkages and their associated management processes. This focus on risk (conceptualised as “downside risk”, i.e. the possibility of some adverse consequence to a participant resulting from their involvement in a CRC) and its management as the central problematic for organizations engaged in collaborative R&D, represents a new theoretical direction in this field of study (see also Das and Teng, 1999; 2001). One aspect of this study, and on which this paper is based, was concerned with the management of risk in commercially-focused collaborative R&D projects. What is particularly interesting in these projects is that, although they are not established on the basis of market transactions (in contrast to a firm contracting out research work to a supplier) and they involve public sector organizations which are not generally motivated by market considerations, they are set up to develop marketable products or other commercialisable outputs. Furthermore, they are often seen as particularly risky for the partners, in that much is at stake (i.e. both in terms of investments and returns) and there is considerable uncertainty about the achievement of a successful and profitable outcome. This concern with the risk in these collaborations lead us
to an engagement with the construct of trust. It is now generally agreed that trust is an essential prerequisite for IOC, especially for those collaborations which involve high levels of uncertainty about outcomes (e.g. Ring and Van de Ven, 1992, 1994; Ring, 1997; Hausler et al., 1995). Most importantly, trust - as a positive expectation about a collaboration partner (Moorman et al., 1992; Sako and Helper, 1998) – not only attenuates perceptions of partner-related risk thereby mitigating the need for excessive project controls and reducing transaction costs, it also encourages risk-taking as well as the sharing of proprietary information (both of which are necessary in the largely unpredictable and uncertain area of R&D). Another construct, “credible commitments”, formulated originally in an analysis of bargaining tactics (Schelling, 1956), also appeared to be of value in understanding how the risks of partner opportunism could be addressed in the formation of a collaboration, especially when the partners had had no prior experience of working together. This construct had not previously been linked to trust, either theoretically or empirically, until de Laat’s work on R&D alliances (1997a), wherein he made it clear that, through the use of credible commitments, partners provide tangible, waterproof guarantees committing them to faithfully execute an agreement (1997a, p. 160). Hence, following de Laat (1997a, 1997b), credible commitments can be described as undertakings that bind partners to a collaborative agreement by ensuring that any gains achieved from meeting the agreement exceed the gains derived from defecting, and so can act as proxies of trust. In this way they act as safeguards against partner opportunism and signal that a partner will remain trustworthy within a partnership.

On the basis of a literature review and preliminary qualitative research, we formulated a theoretical model to explain the collaborative experience of the partners, as shown in Figure 1 (Couchman and Fulop, 2004a). We have now empirically tested this model through a sample survey of CRC project leaders, and report selected findings in this paper. In considering these findings, it should be emphasised that the study has a number of unique features. Firstly, while a number of other researchers have formulated models which identify the factors that contribute to effective cross-sector R&D collaboration (e.g. Santoro and Chakrabati, 1999; Mora-Valentin et al., 2004; Barnes et al., 2002), none to date have appropriately formulated and empirically tested such a model in a systematic quantitative study. Secondly, the study focuses on cross-sector collaborations involving three types of organization (i.e. universities, public sector research agencies and companies) as well as a “third party” brokering agency (the CRC), and this focus differs from the more usual study of university/industry or company/research agency partnerships. Thirdly, we focus on the project rather than the organizational level of collaboration (because this is where the collaborative activity occurs and risks are faced) but we recognise such projects are embedded within specific institutional and organizational contexts, which both shape and constrain project management. Fourthly, as indicated above, the projects we have studied involve multiple partners rather than dyadic relations and differentiates our study from most others in the field of interorganizational relations. Fifthly, we have defined and measured two new constructs (cross-sector management capability and project management capability) and we have attempted to measure the application of the construct of credible commitments.
Figure 1: Proposed Model Explaining the Collaboration Experience of the Partners in Cross-Sector Collaborative R&D Projects Under the Australian CRC Programme

<table>
<thead>
<tr>
<th>Antecedent Variables</th>
<th>Independent Variables</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credible Commitments</td>
<td>Relational Trust</td>
<td>Collaboration Experience</td>
</tr>
<tr>
<td>Previous Collaboration Experience</td>
<td>Contractual Trust, Competence Trust, Goodwill Trust</td>
<td></td>
</tr>
<tr>
<td>Communication Intensity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In this paper, we focus on only one path in our theoretical model, i.e. credible commitments $\rightarrow$ relational trust $\rightarrow$ collaboration experience, which encompasses two hypothesised relationships (a positive relationship between credible commitments and relational trust, and a positive relationship between relational trust and collaboration experience). We develop the paper in the following way. We first discuss our theorising, focusing on the conceptualisation and operationalisation of the three constructs collaboration experience, relational trust, and credible commitments. We then outline the survey methods used to test the model and present key findings from the analysis of the survey data. We conclude with a discussion of the implications of our findings for trust in cross-boundary relationships and identify areas for further research.

Theoretical Framework

We decided not to formulate a developmental or formation process model of IOC, as this has already been addressed by other researchers (e.g. Ring and Van de Ven, 1994; Barnes et al., 2002; Daellenbach and Davenport, 2004). Instead, we focused on projects that are at, or beyond, the stage where the partners have decided to collaborate (Boersma et al., 2002), and have already had to make commitments to a project. Moreover, while we initially sought to explain project outcomes (e.g. in terms of performance measures), we subsequently decided to focus on the partners’ collaboration experience, i.e. a subjective measure of the participants’ attitudes towards the collaboration (Genefke, 2001; Jap, 2001). Studying tangible project outcomes is difficult due to time lags, whereby commercialisation is achieved over a long period and often outside of the timeframe set by the immediate project objectives. Our theoretical model (as depicted in Figure 1) proposed that a cross-sector R&D project, which has both a strong relationship focus (in terms of three forms of relational trust - contractual, goodwill and competence - among those engaged in the project), and a strong task focus (in terms of project management competence of the project team), is likely to be seen in more positive terms by the project partners. The model also proposed four antecedents to the
independent variables, and one of these was credible commitments, which we postulated are
decisive in R&D projects because they provide tangible proof of escalating forms of relational
dependable commitments. The following section discusses the three constructs that form the focus of this
and the associated hypotheses derived from the model.

**Collaboration Experience**

Most studies of cross-sector collaboration have so far focused on outcomes in terms of the
success of the partnership overall, and often use performance measures that are difficult to
apply to commercially-focused R&D projects such as those we studied (Bonaccorsi and Piccaluga, 1994; Geisler, 1995; Brockhoff and Teichert, 1995; Santoro and Chakrabarti, 1999; Barnes et al., 2002; Mora-Valentin et al., 2004). Measuring the effectiveness of collaborations is a complex problem and an underdeveloped field of empirical research in R&D alliances, let alone at the project level in cross-sector R&D collaborations (Hoang and Rothaermel, 2005). As we noted above, we sought to explain the partners’ attitude towards the collaboration which we postulated is positively associated with more tangible project outcomes (such as those proposed by Bonaccorsi and Piccaluga, 1994; Brockhoff and Teichert, 1995; Barnes et al., 2002; and Santoro and Betts, 2002), and we did indeed test for this association using a range of tangible outcome measures.

Our approach to this subjective assessment of a collaborative project was based on that taken
by Jap (2001) who used the attitudinal construct of “relationship quality” to refer not only to a
relationship evaluation by the participants (i.e. perceived satisfaction and outcome fairness) but also to future expectations of the relationship. Thus, in the proposed model the construct to be explained, “collaboration experience”, was based on perceived relationship quality and was defined as the extent to which the partners perceived the collaboration as a positive experience in terms of three attitudinal dimensions: (a) the extent to which the participants were satisfied with the collaboration, (b) the extent to which the participants perceived the collaboration outcomes to be fair, and (c) the extent to which the working relationship among the participants was seen to be sufficiently rewarding that further collaboration would be seen as desirable if the opportunity arose. We used a slightly abbreviated and modified version of Jap’s (2001) scale to measure collaboration experience (see Appendix 1).

**Relational Trust**

Trust is widely considered to be a critical factor in the success of collaborative R&D projects
(Barnes et al., 2002), and it has been theorised in a number of ways in this context (e.g.
Liebeskind and Oliver, 1998; Davenport et al., 1999). In this study we have drawn on Sako’s
definition of trust (Sako, 1992, 1997), which is based on an expectation that partners will behave in predictable and mutually acceptable ways. According to Sako, trust is a multifaceted construct with three components. This three-dimensional view of trust is consistent with a broad literature on the topic (see Ryan et al., 2004). Predictability is associated with stability and consistency of behaviour, and the confidence that a partner will act in the future to produce mutually beneficial outcomes (also Gulati, 1995; Davenport et al., 1999).

One of the three forms of relational trust is contractual trust, and refers to the belief that partners will adhere to agreements and keep promises. The second form, competence trust, develops in relation to the dependability associated with the expertise, know-how, ability, and the actual performance of partners in meeting targets and obligations as distinct from an
intention to perform (Sako, 1997; Das and Teng, 2001). While competence-based trust focuses on immediate risk reduction, it contributes to the building of relational trust over time as confidence in a partner’s loyalty, integrity and honesty builds (Davenport et al., 1999). Expectations of positive outcomes in longer-term partnerships can only arise from the trust associated with the partners proving themselves to be equitable, fair in their dealings, having high integrity and standards of conduct, reciprocating favours, and acting in ways that go beyond the formal agreement to benefit the partnership. This is goodwill trust, the third form identified by Sako. This form can only develop over time and through repeated successful encounters and, if sufficiently strong, can lead to “hand-shake” agreements (de Laat, 1997a). For collaborations to continue over time, trust relations have to develop their own dynamics, transcending individual relationships, to become ingrained in the routines and practices of the collaborating entity and the partners within it (Dodgson, 1993).

We used the construct “relational trust” (which we defined, drawing on Sako and Helper, 1998, as an expectation of an organizational actor that collaboration partners will behave in mutually acceptable and supportive ways during a collaboration) to encompass these three forms of trust, where a high level of relational trust is associated with “respect for a partner’s abilities, commitment based on belief in mutual benefit, and open and honesty in objectives” (Dodgson, 1993, p. 92), and this both reduces the perceived risks of collaboration and enhances the perceived quality of the relationship. It is commonly accepted that in R&D partnerships which involve the commercialisation of knowledge, trust not only encourages risk-taking and the sharing of proprietary information, it also mitigates the need for excessive controls and encourages looser contractual practices in what is largely an unpredictable and uncertain area (de Laat, 1997a; Ryan et al. 2004). Trust reduces the transaction costs associated with contracting and other legal means aimed at reducing the risks of opportunism in partnerships, though trust in a partner can be misplaced and betrayal is always a possibility (Nooteboom, 1999). There is thus an extensive literature indicating that trust is important for interorganizational relationships to succeed. We therefore hypothesized (H1) that: the higher the level of relational trust (i.e. in terms of contractual, competence and goodwill trust) amongst the partners in the project team, the more positive will be the partners’ experience of the project.

To operationalise the construct of relational trust, we drew on Ryan et al. (2004) who had developed their measure from Sako’s work (although we did not follow them in measuring perceptions of partner opportunism). We used seven of the items in their non-validated scale, and added an additional six from Cummings and Bromiley’s (1996) validated Organizational Trust Inventory to create our three trust scales. We have four items for contractual trust (the first three from Ryan et al. and the fourth from Cummings and Bromiley), four for competence trust (the first two from Ryan et al. and the others from Cummings and Bromiley), and five for goodwill trust (the first two from Ryan et al. and the rest from Cummings and Bromiley), as shown Appendix 1. In some cases these scale items were modified slightly to make them more suitable for our study context, and for one-half of them we negatively phrased the item (requiring that we subsequently reverse-coded the responses). This operationalisation enabled us to measure project leaders’ perceptions of the trusting behaviours of their project partners.

Credible Commitments

Finally, we proposed that credible commitments were antecedent to trust in collaborations. These forms of commitment, which vary in scope and intensity, provide tangible proof of
trusting in a partnership. Credible commitments involve making pledges (e.g. the commitment of funds and in-kind contributions) or making the economic equivalent of ‘taking hostages’, e.g. by building penalties into agreements (Williamson, 1983; Gulati, 1995; de Laat, 1997a), and are to be distinguished from commitment to a relationship (as Anderson and Weitz, 1992 have pointed out the former is a management act and the latter is a state of affairs). De Laat (1997a, pp. 154 - 155) distinguished between credible commitments that are “self-directed”, in which a partner ties his/her own hands and binds him/her to the relationship (i.e. by making pledges), and those that are “other directed” which tie other partners to the relationship (see also Weesie and Raub, 1996). De Laat (1997a) based his approach to trust and credible commitments by considering a situation of mutual vulnerability “where opportunistic abuse cannot be excluded” (p 162). To overcome the problems of a lack of trust associated with this opportunistic potential in R&D alliances, partners can use the instruments of “classical contracting” in an attempt to gain direct control over the other partners and/or they can create credible commitments. Such commitments provide safeguards that help lead to a resilient, as opposed to a fragile, form of trust (Ring, 1996) where the former signals a desire for continuity of the partnership:

“Partners voluntarily provide tangible investments which contribute to the prosperity of the co-operation. Such steps signal that they want it to become a success. This approach, therefore, clearly expresses high trust in the other(s). The consequences are straightforward: such strategic moves tend to create a spiral of rising trust. While communicating openly about and accepting each others’ views on the matter in hand, partners loyally discharge their obligations, and are inclined to invest increasingly in the co-operative effort if required. Thus, the commitment approach not only effectively eliminates opportunistic dangers, its effects are much broader: it also tends to foster high quality co-operation. A real team spirit emerges. Such alliances will be optimally equipped to cope with external uncertainty and to adapt to changing circumstances over time.” (de Laat, 1997a, p. 164)

In using this construct, we were seeking empirical support for the proposition that credible commitments help project partners to manage relational risks and hence contribute to a positive collaboration experience. As we discuss below, relational risks are of several kinds and can only be managed if relational trust is established in a collaboration. The importance of commitments to projects, and collaborations in general, has been widely cited in the literature (Davenport et al., 1999; Barnes et al., 2002; Mora-Valentin et al., 2004; Daellenbach and Davenport, 2004). The concept of credible commitments is especially applicable to situations where there is a high level of risk, the possibility of partner opportunism, and uncertainty of outcomes – all of which apply to commercially-oriented cross-sector R&D projects. Credible commitments are an important prerequisite for developing the trust that is critical to managing the relational risks of opportunism, such as partners appropriating proprietary knowledge, out-learning other partners or leaking information to competitors and thus, creating “boomerang hazards” that are common in many R&D collaborations (de Laat, 1997b).

In collaborative research projects relational risks can be seen as “vulnerability costs” that organizations need to prepare for as “…a premium for the risk involved in joining the collaboration” (Genefke, 2001, p. 26). In cross-sector collaborations vulnerability costs derive from two main sources: (a) structural dependence, and (b) information asymmetry, and these costs can be incurred whether the partners are competitors or not. Structural dependence
Information asymmetry occurs most often in cross-sector projects when one partner has less opportunity to use or access intellectual property (IP) created from the collaboration and faces the possibility of losing competitive advantage and being exploited by others. Controlling and sharing IP is a major issue for all partners in such collaborations and industry and universities have differing goals and missions in relation to IP and hence, perceive the risks and opportunities of exploiting it quite differently. Balancing information dissemination with the need to withhold commercially or intellectually valuable information is a major challenge in cross-sector collaborations that requires innovative and inventive forms of agreements and commitments to make them work (Santoro and Betts, 2002). In R&D projects, information asymmetry is hard to manage in ways that are beneficial to all partners, and much harder if structural dependence favours one partner over the others. “Information dominance” creates an unbalanced relationship of dependence leading to the possibility that the more vulnerable partner becomes a victim of opportunistic behaviour. Large companies often see their relationship with public sector partners in terms of “information gifts”, whereby the latter must offer something interesting in order to attract commercial commitments. This has been described as a “commercial courtship ritual” necessary to get industry involved in research projects (Zechhauser, 1996). However, de Laat (1997a, p. 165) suggests that sharing know-how and investing in common facilities establish a minimum level of trust that is generally needed in almost all forms of transaction. Only more extended commitments, such as making financial commitments in advance, adopting a systemic approach, charging entry fees and instituting cross-shareholdings (in the sectors he studied) can lead to the spiral of rising trust. It is unclear though whether or not these proxies of trust can be easily translated into cross-sector collaborations and this concern has been noted by Noorderhaven in his work on trust (1992, p. 240).

De Laat (1997a) has argued that credible commitments can be used either on their own or in conjunction with contracts to facilitate the building of relational trust through developing norms of reciprocity that help overcome relational risks and encourage the sharing of IP. We argue that they might also help manage the structural and information asymmetries peculiar to cross-sector R&D collaborations. As a form of safeguard, such commitments are more than simple declarations or signals of commitment but, rather, they entail tangible actions binding
a member to a potentially long-term relationship (Anderson and Weitz, 1992; Nooteboom, 1999). De Laat (1997a) described such commitments in terms of their relative costs to partners. A low cost non-equity form, for example, is that of establishing protocols for sharing valuable or commercially-sensitive information relating to IP, which constitutes a form of pledging. Other lower level credible commitments include, for example, the development of systematic approaches to the organization of projects and an undertaking to make phased financial or resource commitments to a project, these being forms of economic hostage taking. Higher or extended levels of commitment identified by de Laat (1997a) are those involving more costly and idiosyncratic safeguards that are harder to undo, and such undertakings include: joint equity in projects, the sharing of royalties, advanced investments from larger partners made before a project commences, the larger partner contributing a higher proportion of funds, and specific upfront contributions (of equity or resources) that bind partners to a project and help offset problems with reciprocation and dependency.

Credible commitments provide safeguards that can lead to a spiralling trust based on “self-amplifying reciprocity” (Browning et al., 1995), which arises as partners build a track record of successfully executing their commitments. They therefore help build relational trust, especially that based on what we have described as “goodwill trust” (which seems to be very close to de Laat’s notion of “resilient trust” that had been drawn from Ring, 1997). More importantly, credible commitments also act as a form of “enforceable trust” by setting the norms of compliance as well as the sanctions for breaches of agreed commitments, and hence involve the reputation considerations of project participants (Anderson and Weitz, 1992; Gulati, 1995; de Laat, 1997a). This perspective on credible commitments was reinforced by our preliminary case study research. In a case study of a highly successful cross-sector R&D collaboration involving a medical CRC (Couchman and Fulop, 2004b) we found that a key feature of the project’s success was the way in which bi-lateral dependency was managed among the partners. The collaboration was not between competitors, as in de Laat’s strategic alliances which involved inter-firm relationships, but rather between complementary organizations that still had to deal with the problems of structural and information asymmetries. The major stakeholder in the project was a large multinational pharmaceutical company, while the partnering organizations were much smaller public sector entities (although the CRC had an international reputation in its specialised field). Research team leaders identified the initial commitments as being critical to the success of the collaboration, most notably including resource pledging that reflected the relative size and stake of each entity in the project with the MNC making the largest upfront financial contribution. The joint assignation of IP, the free sharing of project information with an explicit agreement to have no secrets or hidden agendas (delivered through an extensive information system and a management emphasis on inter and intra team communication), as well as the establishment of parallel track sub-projects to achieve critical project tasks helped create bi-lateral dependency ensuring that the extended commitments made by all of the partners formed a core element of how the project was conceived and executed.

Thus, on the basis of our reading of the literature and our case study findings we hypothesized (H2) that: the more that credible commitments are made by the project partners, the higher will be the level of relational trust between them.

One form of credible commitments have previously been measured in an empirical study of business-to-business relationships by Anderson and Weitz (1992). They treated these as “idiosyncratic investments”, a type of pledging which - along with specific contractual terms – seeks to bind partners to a relationship (see also Nooteboom, 1999, pp. 95 - 96). As they
have noted, “Idiosyncratic investments are investments specific to a channel relationship. They are difficult or impossible to redeploy to another channel relationship; therefore, they lose substantial value unless the relationship continues” (p. 20). Through this form of pledging a collaboration partner “ties their own hands” by constraining their own room for manoeuvre (it will cost them to withdraw or otherwise act opportunistically to the detriment of the collaboration) and in doing so strengthens the relationship by sending a strong signal of commitment. Anderson and Weitz (1992) operationalised this construct in terms of two sets of multi-item scales (for self-reported idiosyncratic investments and partner perceptions of the idiosyncratic investments) which measured the “… level of investment in the relationship by [the parties] and the degree to which those investments are not redeployable to other relationships” (p. 23). The idiosyncratic investments identified in their scale items included investments in dedicated personnel, customer training in the use of the manufacturer’s product, and investment in dedicated facilities. The context and focus of this approach were quite different from those of our study. Anderson and Weitz (1992) were concerned with dyadic relationships within a distribution channel (i.e. between a manufacturer and distributor), a quite different form of relationship than that among three or more organizations engaged in an R&D collaboration.

In our study we defined credible commitments more broadly as undertakings made by the partners in a collaborative relationship, in the form of contractual obligations and/or other agreements, “tying the hands” of themselves and/or the other partners, either through pledges which incur non-recoverable or partly-recoverable costs or through the economic equivalent of taking hostages such as incorporating penalties into an agreement, thereby ensuring that any gains achieved from keeping to the agreement would exceed those from defecting and binding the partners as well as signalling their commitment to the relationship. We were interested in the extent to which such credible commitments were made by the partners to a CRC R&D project, as indicated by the sum of possible commitments actually made by one or more partners. In this approach, each type of credible commitment could either have been made or not as the case may be (it did not make sense to us to measure the extent to which it had been made either by using a frequency scale or an agreement/disagreement scale in response to a scale item describing a credible commitment) and each was seen as an independent and equally-weighted act. To create the measure we listed seven items that included both high and low levels of the credible commitments as described by de Laat (1997a) and as identified in our case study (examples of pledging included the commitment to share proprietary or commercially-sensitive information and an agreement to share in any intellectual property created by the project, while more extended forms of commitment included an undertaking to invest in further development of project outcomes and an agreement to take equity in any joint venture arising from the project). We then used the binary responses to the items on this list to create a single numerical scale of 0 - 7 commitments made by the collaboration partners in a project; at one end of this scale the partners had made none of the credible commitments and at the other end the partners had made all of them. In formulating this single-item measurement scale we were mindful of the limitations of such an approach (as indicated by, among others, Carmines and Zeller, 1979; including their limited capacity to fully capture complex constructs, their lack of precision, and above all the difficulties in statistically assessing their psychometric properties), but considered that this was most appropriate for our study in which the construct was employed in an essentially exploratory way.
Methods

Development of the Survey Instrument

A questionnaire was designed to test the theoretical model that had been developed to explain the collaboration experience of cross-sector collaborative R&D project participants (Couchman and Fulop, 2004a). There were 7 constructs in the model, and a first step in the questionnaire development was to operationalise these constructs. This was achieved by, wherever possible, using and/or modifying existing scales (e.g. that for collaboration experience), but for a number of the constructs no such scales existed (e.g. for credible commitments and project management capability) and so these were developed specifically for the survey. After the addition of questions to collect supplementary data (e.g. on the background of the respondents), an initial draft was pilot tested with 6 experienced CRC project managers. This resulted in modifications to some of the questions and to the instructions, and the final questionnaire consisted of 19 questions, nearly all of which were closed and most of which were multi-item Likert-type scales (where respondents were required to reply in terms of a 6-point agreement scale). In completing the questionnaire, respondents were asked to focus on the CRC project that they had most recently completed (or were about to complete) as project leader in the last two years.

Sampling Strategy

In order to achieve greater sample precision, it was decided to adopt a more focused sampling strategy rather than the more common “shotgun” mail-out approach. The sampling strategy was designed to access a target population which was defined to be: CRC project leaders who had completed (or were soon about to complete) a CRC project that had been established with the intention of leading to some financial benefit (e.g. in the form of income or cost savings) for the CRC and/or at least one of its partners. Our interest here was in commercially-focused projects (as distinct from projects with a more academic or ‘public good’ knowledge focus) which we originally defined in the pilot test questionnaire as “R&D projects that have a concern with the creation of ‘commercialisable’ outputs (e.g. in the form of new materials, products, technologies or processes). We are defining this broadly to mean that a project has been established with the intention of receiving some financial return on the investment made.” However, the pilot test of the draft questionnaire revealed that this definition was problematic, the issue of the commercialization of CRC outputs being somewhat contentious at the time, so we modified the wording to encompass what we believed to be the broadest possible perspective on commercially-focused projects and which distinguished them from those which had been set up solely to produce new knowledge with no expectation of a financial return on the investment made in the research (Couchman and Fulop, 2005).

The initial sampling frame of 456 potential respondents in selected CRCs (i.e. those most likely to be engaged in commercially-focused R&D and covering 5 of the 6 CRC sectors) was derived from publicly-available sources (e.g. CRC annual reports and websites, reports in the mass media, etc.). In some cases, the list of project leaders for a CRC was confirmed and supplemented by that CRC’s CEO. Originally the CEOs of all 73 CRCs in existence at the end of 2004 had been contacted to access the names of eligible project leaders, but a poor response to that request rendered this approach impracticable. The survey questionnaires were mailed out in April 2005 and a first reminder letter was sent 2 weeks after the mail-out. Two more reminders were sent, and in August 2005 a supplement to the initial sampling frame – a recently published “expert list” of senior CRC researchers with expertise in specific
areas of R&D – was identified and from this a further 85 potential new respondents meeting the survey eligibility criteria were contacted as part of the sampling strategy. Thus, the total number of potential respondents contacted by the close of the survey period (6 September 2005) was 541, and this covered all of the 6 CRC sectors. Also in August 2005 a website with the survey questionnaire was established in an attempt to improve the sample response rate (it was believed that many members of this population, with their research backgrounds and familiarity with new technologies, would find the web-based questionnaire more accessible and convenient), and respondents were then given the option of either returning a completed paper questionnaire or responding to the web survey.

Survey Data Analysis

Data were entered or transferred into an SPSS database, and the resulting file was cleaned up to remove anomalies and data entry errors. Initial descriptive analysis of the sample data was conducted using SPSS for Windows version 12.0.1, and to test the hypotheses structural equation modelling was conducted using PLS Graph version 3.0. The partial least squares method of latent structural modelling was chosen in preference to the more widely-used factor-based covariance approaches such as LISREL and AMOS because of the minimal demands PLS makes on measurement scales, sample size and distributional assumptions (Barclay et al., 1995; Chin, 1998a, 1998b; Yi and Davis, 2003). This approach was indicated because our achieved sample size was relatively small (the rule of thumb generally accepted is that the minimum sample size should be 10 times the largest number of structural paths directed at a particular construct in the structural model), and we knew from our initial descriptive analysis that the distribution of at least one of our measures, that for credible commitments, was very skewed and deviated markedly from a normal distribution. Further advantages of using the PLS method are that it can be used in an exploratory mode to suggest possible relationships in a model, thereby indicating propositions for later testing, and that it is better suited for analysis “in situations of high complexity but low theoretical information” (Jöreskog and Wold 1982, p. 270). Using PLS Graph we first assessed the measurement model, by examining the hypothesised links between the observed indicators and the latent constructs (all of the indicators were treated as reflective rather than formative because it was posited that the indicators or observed variables are manifestations of a construct and any change in the construct will cause a change in the indicators), and then examined the structural model by estimating the hypothesised paths between the exogenous and endogenous latent constructs.

Results

The Achieved Sample (n = 156)

At the end of the survey period, a total of 165 completed or partly-completed questionnaires had been returned by eligible respondents. Of these, 145 were paper questionnaires and 20 were responses to the web-based questionnaire captured in an Excel spreadsheet. Of the 541 questionnaires that had been mailed out to potential respondents over the survey period, 215 were returned as incorrectly-addressed or ineligible (i.e. because the addressee did not meet the survey criteria). The survey response rate was therefore 165/326, or 51% of eligible respondents in the mail-out, which we considered to be very satisfactory compared to other management surveys (where response rates are generally in the range of 10 – 35%) and given the difficulties of sampling the population of interest. Of the 165 returned questionnaires, 9
had too much missing data and so were discarded as insufficiently complete leaving a usable sample of n = 156.

Determining whether there was any non-response bias in the achieved sample was difficult given that the population parameters are not known. The approach proposed by Armstrong and Overton (1977) of estimating non-response bias in mail-out surveys using a time trend extrapolation method was therefore applied. This approach is based on the assumption that those who respond later or less readily to the survey are more likely to be similar to the non-respondents, and this can be used to estimate the nature and direction of any bias. The analysis of early versus late respondents was conducted by comparing the responses of the first 50 respondents with those of the last 50 on 3 key descriptive variables: number of years as a CRC project leader, number of CRC projects completed as a project leader, and main employing organization. The analyses revealed no significant differences between the two groups on each of the three variables: (a) mean number of years as project leader was 5.9 versus 5.1, t = 1.13 with 96 degrees of freedom and a two-tailed significance p = 0.26 (equal variances assumed; Levene’s test F = 0.071, p = 0.79), (b) mean number of projects as a project leader was 3.0 versus 2.2, t = 1.79 with 91 degrees of freedom and a two-tailed significance p = 0.076 (equal variances not assumed; Levene’s test F = 4.84, p = 0.03), and (c) cross-tabulation of current employer by response group, chi-square = 0.214 with 3 degrees of freedom, two-tailed significance p = 0.975. It was concluded that non-response bias was not a serious concern in the achieved sample, and that the sample can reasonably be treated as representative of the population of interest.

The respondents were a diverse cross-sector of CRC project leaders. Nearly one-half (49.7%) were employed in a university, 19% were from CSIRO, 7.2% were employed directly by a CRC, only 6.5% were from industry, and 17.6% were from other (primarily research) organizations. On the basis of anecdotal accounts, it appears that this distribution of the sample project leaders closely approximates that for the population of CRC projects generally. Their experience as project leaders ranged from 1 to 20 years, with a median of 4 years (mean = 5.16 and standard deviation 3.37 years), and the number of projects they had completed as a project leader ranged from 0 to 25 with a median of 2 (mean = 2.72 and standard deviation = 2.79). Overall, these were reasonably experienced project leaders, with 81% having 3 or more years leadership experience and 58.2% having led 2 or more CRC projects to completion. We would thus conclude that these were sufficiently experienced project leaders to be considered as reliable informants on the nature and experience of their reported projects.

### Table 1: Expected Outcomes From CRC Projects

<table>
<thead>
<tr>
<th>Project Outcome</th>
<th>% Cases (n = 156)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New technology or technologies</td>
<td>63</td>
</tr>
<tr>
<td>New or improved product(s)</td>
<td>40</td>
</tr>
<tr>
<td>New process(es) of commercial value</td>
<td>40</td>
</tr>
<tr>
<td>Income through IP licensing</td>
<td>29</td>
</tr>
<tr>
<td>Spin-off venture to commercialize IP</td>
<td>18</td>
</tr>
<tr>
<td>New or improved material(s)</td>
<td>14</td>
</tr>
</tbody>
</table>

The sampled commercially-focused projects were also diverse, with 38% contributing to the Agriculture and Rural Manufacturing sector, 23% to Information and Communications Technology, 21% to Manufacturing Technology, 11% to Medical Science and Technology,
7% to Mining and Energy, and 5% to the Environment. The distribution of sampled projects across the six CRC sectors more or less reflects the relative propensity of CRCs in each sector to be engaged in commercially-focussed R&D projects. The expected outcomes for the projects were as shown in Table 1, with an average of 2 outcomes listed per project. Of particular note, given that these were commercially-focused projects, only 29% expected to achieve income through the licensing of any intellectual property (IP) created and only 18% expected to create a spin-off venture to commercialise IP.

In terms of the organizational mix, 81% of the projects had at least 1 university partner (mean number of university partners was 1.8), 76% had industry partners (mean number was 2.4), 45% one or more CSIRO divisions (mean 1.1), and 35% another research organization (e.g. a non-profit research institute or foundation, a research firm, a State government research agency, etc.). The sample projects had between 1 and 19 collaborating organizations (median number was 4) with the distribution skewed towards a smaller number of organizations: three-quarters of the projects had 5 or less partners. The size of the project teams varied from 1 to 65 people (median = 6), made up of 1 – 13 full-time personnel (median = 3) and 1 – 65 part-time personnel (median = 4). 83% of the projects consisted of 10 or less personnel. Project budgets were relatively modest, with 41% having an initial duration of up to 2 years, 44% 3 – 4 years, and 15% 5 or more years. Previous collaboration experience revealed three distinct groups. In 42% of the projects the partners had never worked together in other CRC projects, 32% had worked together only once or a few times before, and 27% had collaborated quite often or frequently on CRC projects. The withdrawal of one or more partners before project completion was not so common, having occurred in only 16% of the sample projects. Perceptions of project risk at commencement (i.e. risk in terms of achieving some financial benefit) were of some interest: 13% of the projects were considered to be of negligible or very low risk and 32% of low risk compared to 55% which were seen to be of high or very high risk. This finding contrasted with our expectation, based on the assumption that commercially-focused R&D projects are particularly risky for the partners, that the great majority would be seen to be of high risk by the partners.

Table 2: Credible Commitments Made by the Project Partners

<table>
<thead>
<tr>
<th>Credible Commitment</th>
<th>% Cases (n = 156)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreement to share proprietary or commercially sensitive information during the project</td>
<td>63</td>
</tr>
<tr>
<td>Agreement to jointly assign or equally share project IP</td>
<td>56</td>
</tr>
<tr>
<td>Undertaking to invest in further development of project outcomes</td>
<td>36</td>
</tr>
<tr>
<td>Agreement to take equity in any joint venture arising from project</td>
<td>23</td>
</tr>
<tr>
<td>Exclusive partnership formed among partners for future projects</td>
<td>9</td>
</tr>
<tr>
<td>Industry partners agreed to license back IP to project partners</td>
<td>9</td>
</tr>
<tr>
<td>Industry partners guaranteed to purchase project outputs</td>
<td>7</td>
</tr>
</tbody>
</table>

In 89% of the projects the partners had made at least one of the listed credible commitments. On average, 2 credible commitments had been made per project and the distribution of commitments was positively skewed (such that in 81% of the projects 1 – 3 credible commitments had been made). The credible commitments made in the sampled projects were as shown in Table 2. The three most widely employed credible commitments were an agreement to share proprietary or commercially-sensitive information during the project
(63%), an agreement to jointly assign or equally share any project IP (56%), and an undertaking to invest in further development of project outcomes (36%).

In sum, a “typical” project in the sample contributed to one of four CRC sectors, expected to produce new technology, new products and/or new processes, had around 4 collaborating organizations (with at least 1 university and 1 industry partner), employed a total of 6 personnel, had a budget of less than A$1 million and a scheduled life of up to 2 years, had partners with little or no experience of working together but who made 2 credible commitments to the venture and remained in the partnership for the duration of the project, and was seen to be of some risk in terms of achieving the goal of a financial return on the investment in the research.

Structural Equation Modelling

1. The Measurement Model

The first step in the analysis was to assess the proposed measurement model which was conducted, following conventional PLS practice (e.g. Fornell and Larcker, 1981; Barclay et al., 1995; Chin, 1998b), by examining (a) individual item reliability for the construct measures, (b) the internal consistency of the measures, and (c) the discriminant and convergent validity of the construct measures. This process ensured that we had reliable and valid measures of the constructs before we proceeded to investigate the relationships among the constructs. We could not, of course, assess the properties of our measure of credible commitments as this was a single item scale. The initially-submitted measurement model was modified by the removal of 6 items (1 for project control capability, 1 for communication intensity, 2 for contractual trust, 1 for competence trust and 1 for goodwill trust) either due to low item loadings on a construct or because of high cross-loadings with other constructs. The results for the revised measurement model which was accepted as suitable for further analysis are shown in Table 3.

Individual item reliability was assessed by examining the loadings of each of the measurement items with their respective constructs in a matrix of item loadings by constructs (the result of a principal components analysis, see Appendix II). The accepted rule of thumb here is to accept items with loadings of 0.707 or higher which indicate that there is more shared variance between the construct and its measures than error variance. In the revised measurement model all but 4 items met this criterion (the loadings ranged from 0.67 to 0.92), but we accepted these items as sufficiently reliable because they were very close to the rule of thumb (their values were 0.69, 0.67, 0.67 and 0.68) and did not cross-load with other constructs. Thus we did not consider that these items were too laden with random error so as to be unreliable and kept them in the model.

The indicator of internal consistency proposed by Fornell and Larcker (1981), i.e. the sum of the loadings all squared divided by the sum of the loadings all squared plus the sum of the error terms, was used to assess the composite reliability of the measures in the model. This measure is similar to Cronbach’s alpha, but is seen to be superior in that it uses the loadings estimated within the causal model (in contrast Cronbach’s alpha assumes that each item in a measure contributes equally so the loadings are set to 1) and is not influenced by the number of items in the scale. The measure is interpreted in the same way as Cronbach’s alpha, and a value of 0.70 is generally seen to indicate an adequate level of reliability (Nunally, 1978). As shown in Table 3, all measures of the constructs in the revised model met this criterion (using
both Cronbach’s alpha and Fornell’s composite reliability measure), and so were deemed to possess an acceptable level of internal consistency.

In a PLS analysis, discriminant and convergent validity (together indicating how well the measurement items relate to their constructs; convergent validity is shown when each measurement item strongly correlates with its own construct, and discriminant validity when measurement items correlate weakly with the other constructs; Gefen and Straub, 2005) is assessed in two ways. Firstly, the Average Variance Extracted (AVE, which is the average variance shared between a construct and its measures) was used. This AVE for a construct should be greater than the variance shared between the construct and other constructs in the model, and is indicated in the correlation matrix of constructs when the square root of each construct’s AVE is greater than the correlations of the construct to the other latent variables. As shown in Table 3, the diagonal elements in the correlation matrix (= \sqrt{\text{AVE}}) range from 0.72 to 0.91 and all indicators load more highly on their own construct than on other constructs (i.e. the diagonal elements are greater than the off-diagonal elements in the matrix). Secondly, each indicator’s factor loadings in the component structure matrix are examined and the criterion for discriminant validity is that no item should load more highly on another construct than it does on the construct it intends to measure. An examination of the component structure matrix revealed that all items passed this second test (Appendix II), and so we concluded that the measured constructs demonstrated an adequate level of discriminant and convergent validity.

Having ascertained that we had a satisfactory measurement model, with acceptably reliable and valid measures of the constructs, we then proceeded to assess the structural model.

2. The Structural Model and Hypothesis Testing

In a PLS structural model, the loadings of the measures of each construct are interpreted as loadings in a principal components factor analysis. The path coefficients are interpreted as standardized beta weights in a regression analysis. To assess the statistical significance of the path coefficients, a bootstrapping procedure (i.e. through random resampling with replacement from the original sample, 100 resamples were obtained with each consisting of the same number of cases as in the original sample) was used to obtain estimates of the standard error of the coefficients and enable the application of t tests (Chin, 1998b). As a measure of the predictive power of the model, an \( R^2 \) value is calculated for the endogenous constructs and this indicates the amount of variance in the construct that is explained by the preceding constructs. Both relational trust and project management capability are second-order constructs reflected by first-order constructs in the model (i.e. relational trust is reflected by contractual trust, competence trust and goodwill trust; project management capability is reflected by project planning capability and project control capability). Because PLS Graph does not directly support the representation of second-order latent constructs, each first order construct was first tested in a sub-model and the computed first-order factor scores were then treated as manifest indicators of the second-order construct in the full model. The results for the path of interest to this paper are shown in Figure 2.
Table 3. Means, Standard Deviations, Internal Consistencies, and Correlations of Constructs (Hypothesised Model)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.81</td>
<td>1.23</td>
<td>-</td>
<td>1</td>
<td></td>
<td>1</td>
<td>-75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.49</td>
<td>1.46</td>
<td>-</td>
<td>1</td>
<td>-.07</td>
<td>1</td>
<td>-75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>10.60</td>
<td>3.55</td>
<td>.75</td>
<td>.84</td>
<td>-.17</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>13.36</td>
<td>5.02</td>
<td>.89</td>
<td>.92</td>
<td>-.16</td>
<td>-.13</td>
<td>.65</td>
<td>.80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.53</td>
<td>1.75</td>
<td>.80</td>
<td>.91</td>
<td>-.12</td>
<td>-.09</td>
<td>.55</td>
<td>.50</td>
<td>.91</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>7.86</td>
<td>2.81</td>
<td>.74</td>
<td>.85</td>
<td>-.18</td>
<td>-.01</td>
<td>.42</td>
<td>.41</td>
<td>.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9.60</td>
<td>3.01</td>
<td>.70</td>
<td>.81</td>
<td>-.17</td>
<td>-.03</td>
<td>.53</td>
<td>.47</td>
<td>.60</td>
<td>.43</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>12.04</td>
<td>3.94</td>
<td>.85</td>
<td>.89</td>
<td>-.24</td>
<td>-.08</td>
<td>.63</td>
<td>.64</td>
<td>.54</td>
<td>.44</td>
<td>.44</td>
<td>.79</td>
</tr>
<tr>
<td>4</td>
<td>8.07</td>
<td>3.21</td>
<td>.83</td>
<td>.89</td>
<td>-.22</td>
<td>-.09</td>
<td>.46</td>
<td>.64</td>
<td>.39</td>
<td>.25</td>
<td>.30</td>
<td>.65</td>
</tr>
<tr>
<td>5</td>
<td>12.41</td>
<td>4.39</td>
<td>.87</td>
<td>.91</td>
<td>-.24</td>
<td>-.08</td>
<td>.59</td>
<td>.65</td>
<td>.45</td>
<td>.36</td>
<td>.42</td>
<td>.52</td>
</tr>
</tbody>
</table>
| Composite reliabilities are calculated using factor loadings and residual variances: Consistency = \((\sum \lambda^2)/((\sum \lambda^2) + \sum \text{Var}(\varepsilon))\), Var(\varepsilon) = 1 – \lambda^2 \text{Var}(\varepsilon)

Diagonal elements are the square root of Average Variance Extracted (AVE).

AVE = \((\sum \lambda^2)/((\sum \lambda^2) + \sum \text{Var}(\varepsilon))\), Var(\varepsilon) = 1 – \lambda^2 \text{Var}(\varepsilon)
As shown in the resulting path model, the four exogenous constructs explained 44% of the variance in relational trust, and relational trust in conjunction with project management capability explained 36% of the variance in collaboration experience. Given the relatively parsimonious nature of the model, and the potentially large number of factors in the study context that could contribute to these endogenous constructs, the variances explained are fairly substantial. The model therefore appears to have some utility in predicting the perceived experiences of partners in cross-sector R&D collaborations.

With a positive and highly significant path coefficient (coefficient = 0.302, t = 3.44, p < 0.001), the model provides support our first hypothesis (H₁) that the higher the level of relational trust amongst the partners in a cross-sector R&D collaboration project, the more positive will be the partners’ experience of the project.

However, and contrary to our expectations, the model provides no support for our second hypothesis (H₂: the more that credible commitments are made by the project partners, the higher will be the level of relational trust between them) because no significant positive path coefficient was found (coefficient = -0.070, t = 1.42, p = 0.16).

3. Further Exploration

Given that our initial hypothesis with respect to credible commitments was not supported by the structural equation modelling, we moved from a confirmatory to exploratory mode of analysis. We reformulated our conceptualisation of trust into two constructs: partner trustworthiness (equivalent to Sako’s goodwill trust) and partner reliability (Sako’s contractual trust and competence trust combined). Initial indications from this exploratory modelling are that there is a significant negative relationship between credible commitments and partner trustworthiness (in one model the path coefficient was -0.17, t = 2.37, p = 0.02,
with credible commitments explaining 3% of the variance in partner trustworthiness), i.e. the more that credible commitments are made, the less the partners are seen as trustworthy. Furthermore, this effect appears to become more pronounced with greater previous collaboration experience among the partners: the association between credible commitments and trustworthiness is stronger (coefficient = -0.33, t = 2.65, p = 0.01, with credible commitments explaining 11% of the variance in trustworthiness) among those in the sample who had had the most experience of working together (i.e. had indicated that they worked together on other CRC projects “quite often” or “frequently”). This finding suggests that there could be a developmental effect here, whereby credible commitments become increasingly counter-productive as the partners gain experience in working together on collaborative R&D projects. However, this finding should be treated with some caution given that it was obtained from a small sub-group of 41 respondents within the sample.

Discussion and Conclusions

The main effect that we hypothesised, of a positive association between relational trust and collaboration experience was supported by the findings of this study; i.e. the more that there is relational trust between the partners in an R&D collaboration (where trust is measured in terms of three dimensions: contractual, competence and goodwill) then the more positive will be the experience of the partners. This result is consonant with a wide range of previous studies that have argued trust is not only necessary for effective partnerships it also contributes to partnership or collaborative venture performance (e.g. Mohr and Spekman, 1994; Rousseau, et al., 1998; Dyer and Chu, 2003; Bstieler, 2006). Trust reduces uncertainty among partners and the fear of opportunism, it enhances cooperative behaviour so contributing to higher partner satisfaction and partnership efficacy, it minimises the effort required for contract monitoring, and through such mechanisms reduces transaction costs (Nooteboom 1999). We also found that collaborative experience was significantly and positively associated with more tangible measures of project success (Table 4).

Table 4: Correlations Between Collaboration Experience and Project Outcomes

<table>
<thead>
<tr>
<th>Project Outcomes</th>
<th>Mean</th>
<th>Correl. Coeff. (r)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmosphere of trust created among partners</td>
<td>2.48</td>
<td>0.675*</td>
<td>150</td>
</tr>
<tr>
<td>Partners agreed project was successful</td>
<td>2.05</td>
<td>0.637*</td>
<td>151</td>
</tr>
<tr>
<td>Partners learned to collaborate for subsequent projects</td>
<td>2.63</td>
<td>0.563*</td>
<td>149</td>
</tr>
<tr>
<td>Knowledge of value &amp; use to partners created</td>
<td>1.89</td>
<td>0.554*</td>
<td>149</td>
</tr>
<tr>
<td>Project objectives were fully met</td>
<td>2.29</td>
<td>0.486*</td>
<td>151</td>
</tr>
<tr>
<td>Project delivered within budget</td>
<td>1.97</td>
<td>0.428*</td>
<td>150</td>
</tr>
</tbody>
</table>

* Pearson Product Moment Correlation Coefficient (r) significant at 0.01 level

From this latter analysis we conclude that the more a project is seen as a positive experience by the partners, the higher is the likelihood that it will be successful in terms of delivering on its objectives. Given the uncertainties of R&D, it cannot be predicted with any certainty whether or not a project will succeed in terms of meeting its objectives within a specified timeframe and budget. For R&D projects which are focused on producing commercialisable outcomes, there are also often extended time lags involved between completion of the research and the commercialisation of the resulting knowledge. So, collaborative experience may not necessarily be reflected in project outcomes in that a positively experienced project may fail to deliver despite the best efforts of the collaborators, and this is reflected in the correlation coefficients which are only moderate or moderately high.
The survey analysis provided no support for our proposed relationship between credible commitments and relational trust. Our structural equation model showed that there was no significant positive association between credible commitments and relational trust. Indeed there was even a suggestion from our subsequent exploratory analysis that credible commitments, as we conceived and measured this construct, were negatively associated with goodwill trust (i.e. the more that credible commitments are made by the partners, the less goodwill trust there is among the partners). There are three possible ways of interpreting this finding: (a) this was a spurious finding due to some flaw in our research methods, (b) the finding was valid but specific to the context of the study (i.e. cross-sector R&D collaborations within the Australian CRC Program) and not generalisable to other situations, or (c) the findings are valid and generalisable to other forms of collaborative R&D venture in other countries. Let us examine each of these possibilities.

Firstly, it could be possible that there was some flaw in our research methods and this resulted in the unexpected finding, which may or may not be valid. Re-examining the sampling strategy we can find no evidence that this lead to unacceptable levels of bias in the achieved sample. We maintain, on the basis of the limited evidence available to us, that the sample we obtained was reasonably representative of the population from which it was drawn and thus was unlikely to be a significant source of systematic error in the survey data (e.g. due to under-representation of particular groups from the population of interest). In terms of the respondents themselves, this was a single informant study in which a project leader was asked to make judgements about the project experience and outcomes on behalf of the project team. While there has been considerable discussion on the problems of single informant bias in organizational surveys (e.g. Ernst and Teichert, 1998; Ketokivi and Schroeder, 2004), and in this study no attempt was made to control for such an effect, we would argue that the respondents were generally experienced project leaders and that the judgements they made about their projects could be treated as trustworthy and reasonably reflective of those of the project team as a whole. Any biases in the assessment of the projects (e.g. arising from the fact that a very small proportion of the respondents were from industry while most were from universities or public sector research agencies) are unlikely to account for such a large proportion of item variance in the data as to make the measures invalid and so affect the substantive conclusions drawn.

The final element in the research methods employed was the data collection instrument, and notably the measures it included for credible commitments and relational trust. The measures for the dimensions of relational trust were derived from existing instruments (i.e. Sako, 1992; Sako and Helper, 1998; Cummings and Bromiley, 1996; Ryan et al., 2004) and their psychometric properties were found in the PLS analysis to be adequately reliable and valid. We are confident that we have measured some aspects of relational trust among the project teams that is more or less consistent with our definition of this construct. Furthermore, our operationalisation addresses the argument of Gillespie (2003) that measures of trust should incorporate the notion of “a willingness to be vulnerable” and thereby capture “the interdependence and risk that is central to trusting behaviour”. Our measure of relational trust does so in that each of the five measurement items for goodwill trust implies interdependence among the partners as well as the risk arising from this (see Appendix I). On the other hand, our measure of credible commitments was entirely new and, given that we employed a single-item scale, it was not possible to assess the psychometric properties of it. The construct of credible commitments, as we have defined it, is complex and encompassing of a wide range of possible acts that can be taken when entering into an interorganizational relationship. Our measure of this construct is relatively simplistic and does not entirely capture its complexities.
(e.g. we covered only a limited sub-set of possible commitments, and we did not seek to
determine the extent to which partner commitments were reciprocated by the other partners).
In interpreting the results of the study, the limited nature of our measure of credible
commitments should be taken into consideration, and it is clear (as we discuss below) that
further theoretical elaboration of this construct is required before we can develop more
satisfactory measures of it.

Secondly, the finding that there is no relationship between credible commitments and
relational trust could be specific to cross-sector R&D projects conducted within the Australian
CRC Programme. This involves public sector organizations, which as we have previously
argued are much less likely to act opportunistically than private sector partners (Couchman
and Fulop, 2002), and the cross-sector relationships are mediated by a third party quasi-
government agency, the CRC, which can play the role of an “honest broker” in these. The
situation differs markedly from that of the inter-firm collaborations referred to by de Laat
(1997a), wherein the partners may often be actual or potential competitors. In this latter
situation, the potential for opportunism is much greater as is the risk that this poses for the
partners, so the role of credible commitments is clearly indicated. In the context we have
studied, by contrast, credible commitments may not be as important, there may be different
interpretations of what constitutes a credible commitment or even different valuations of the
various types of credible commitment, and other factors – such as partner reputation – may be
more decisive. Further, following Burchell and Wilkinson (1997) we would argue that the
institutional context of the CRCs plays an important role in the building of collaborative
relations among the partners. CRC projects are initiated only after intensive negotiations
which culminate in a formal project agreement among the partners. This agreement has the
force of a legal arrangement, in that it is binding on the partners across a wide range of project
areas (e.g. the disposition of any intellectual property created, the allocation of tasks and
resources, the project’s governance mechanisms, etc.), and as such may “…. lend special
assurance to particular expectations and make them sanctionable… [and] lessen the risk of
conferring trust” (Luhmann, 1979, p. 34). This creates what Lane and Bachmann (1995)
have termed a “systems trust”, which is grounded in stable institutions, and so plays a part in
building and maintaining other more resilient forms of trust. Taking the argument further:
perhaps in the CRC context the partners start with higher levels of trust than in inter-firm
relations, with lower expectations of opportunism or of partners otherwise defaulting on their
contractual obligations and competence-related commitments, and here certain types of
credible commitments made by one or more of the partners may be counterproductive (as
suggested by the findings of the exploratory modelling) in that they are interpreted as signals
distrust by the other partners.

Thirdly, in R&D collaborations generally, the making of the sorts of credible commitments
that we identified by some or all of the partners may not be sufficient on their own to create
resilient trust among the partners. At best they may only create a conditional form of trust as
discussed by Daellenbach and Davenport (2004) which contributes to initial assessments of
partner trustworthiness. More resilient forms of trust may either only develop with repeated
transactions and mutual adjustment, or their formation requires specific types of credible
commitments that are reciprocated and balanced among the partners. However, it should be
recalled that our operationalisation of the construct is limited, and we may not have captured
the full nuance of the act of making credible commitments as discussed by Transaction Cost
Economics theorists such as Williamson (1983) and more recently by de Laat (1997a). Are
some credible commitments more effective in building the virtuous circle of rising trust, and
what is the role of reciprocity in this? This brings us back to the theorisation of the construct and the limitations of the study.

We have extended the application of the construct of credible commitments in three ways. We have applied it to multi-lateral relationships, whereas to date it has almost exclusively been applied to dyadic relationships (e.g. between two firms or between a buyer and a supplier). We have applied the construct at the project level, but credible commitments are generally considered at the interorganizational level (wherein the projects are embedded). We have also used the construct in a consideration of cross-sector relationships, in contrast to the more usual application in inter-firm relations. In the context of our study, what was a seemingly simple construct with general application in cooperative relationships was actually quite complex in both its method of application and its efficacy. Fundamentally, the issue is that of identifying what constitutes acts of commitment (either self or other directed) that are regarded as credible by the partners collectively, so which bind them to a collaboration and create the conditions for the building of trust. Two considerations, arising from de Laat’s theorisation of credible commitments, would seem to be decisive here. The first is that of managing asymmetries (e.g. of financial power and knowledge) in relationships and creating mutual dependence among collaborators. According to de Laat (1997a, p. 166) for credible commitments to be effective they need to be mutually balanced: “….to promote enduring cooperation, credible commitments by partners should balance each other.” This raises a wide range of issues, not least of which is what a “balance” actually means in different contexts, but we did not investigate this in our study. We simply asked whether commitments had been made by any of the partners during the project, with no attempt to gauge reciprocity or whether there was a balancing of commitments (as indeed there was in our preliminary case study referred to earlier). This aspect of credible commitments could well be a major factor determining their efficacy in creating “a spiral of rising trust” and so therefore needs to be incorporated in their measurement. The second consideration is that of “more extended commitments”, those which involve substantial investments or undertakings that are seen to be of considerable value, for “….it is only when more extended commitments are made …. that the spiral of rising trust is set in motion” (de Laat, 1997a, p. 165). These types of credible commitment act as effective safeguards that initiate the process of rising trust, in contrast to other commitments that only appear to indicate the establishment of a minimum level of trust. It should be noted that in our study, most of the commitments actually made were either those of a lesser kind (e.g. an agreement to share proprietary or commercially-sensitive information during the project – 63%, an undertaking to invest in further development of project outcomes – 36%) or were those that had been mandated under the project agreement (i.e. an agreement to jointly assign or equally share project intellectual property – 56%). The more extended credible commitments (e.g. an exclusive partnership was formed among the partners for future projects – 9%, and the industry partners guaranteed to purchase project outputs – 9%) were not so common, and this may have contributed to the findings with respect to the relationship with trust. Clearly this dimension of depth of commitment also needs to be incorporated in a measure of the construct.

To conclude. In seeking to respond to the exhortation of de Laat (1997a, p. 170) that “more empirical evidence should urgently be amassed” about the role of credible commitments, we have merely opened up a research agenda with this study of one particular form of cross-boundary relationship. The building of trust in this type of relationship is of some interest because it involves the crossing of three main boundaries – sectoral (public/private), organizational (research/industry), and disciplinary (researcher/manager) – thereby
introducing a considerable degree of complexity into the relationships involved; relationships which may or may not persist and which are embedded within higher-order entities. The findings of our study, and its limitations, indicate that much more research is required in this area not only to address the questions posed at the inauguration of this conference theme (and notably: “if boundaries reduce social complexity and vulnerability, and constrain opportunistic behaviour, then do they increase trust, or simply reduce the need for trust?”) but also to understand the relationship between credible commitments and trust. We identify four main areas where further research is required. Firstly, a more detailed understanding of the nature of credible commitments, especially the role that the balancing of commitments and reciprocation by partners play in determining the efficacy of such acts, is needed as a basis for the effective measurement of this construct. Secondly, more research is required on the role of opportunism and the associated partner perceptions of risk in cross-sector collaborations. Thirdly, there is the issue of project leadership, which can have a significant impact on team member relationships (e.g. Santoro and Betts, 2002; Barnes et al., 2002), but which we did not address in this study. An effective project leader, for example, could do much to effect credible commitments and build trust among the project partners through intensive communication, the open sharing of information, and acting to ensure the team keeps to agreements. Finally, the study should be broadened to encompass other forms of university-industry research partnerships (another and more common type of cross-sector relationship, but without the mediating role of a third party such as a CRC), and to inter-firm R&D collaboration more generally in order to establish whether our findings are specific to the form of collaboration we studied.
References


Lane, C. and Bachmann, B. “The social construction of trust: supplier relations in Britain and Germany”, *Organization Studies*, 17: 365 - 395.


Turpin, T. “CRCs and transdisciplinary research: what are the implications for science?”, *Prometheus*, 15, (2): 253- 265.


Appendix I: Measurement Scales for the Constructs

Credible Commitments (“yes” responses recorded for each item)

- Guarantees were made by the industry partner(s) to purchase project outputs.
- The partners agreed to share proprietary or commercially-sensitive information as the project progressed.
- Undertakings were made by all or some of the partner(s) to invest in further development of project outcomes before the project was completed.
- An exclusive partnership was formed so that the partners would work with each other on future projects.
- The partners agreed to jointly assign or equally share any intellectual property produced by the project.
- The industry partner(s) licensed back intellectual property to the other partners for future projects.
- An agreement was made by all or some of the partners to take equity in any joint venture arising from the project.

Relational Trust (6-point agree/disagree response scale for each item)

1. **Contractual Trust**

<table>
<thead>
<tr>
<th>Item</th>
<th>Variable name</th>
<th>Initial (Final) Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>We preferred to have everything spelt out in detail in the project agreement*</td>
<td>Partdet</td>
<td>-0.35</td>
</tr>
<tr>
<td>We felt we could rely on the partners to fulfil their commitments to the project</td>
<td>Partcom</td>
<td>0.88 (0.92)</td>
</tr>
<tr>
<td>We felt that the partners would keep to the spirit of the project agreement</td>
<td>Partspir</td>
<td>0.88 (0.91)</td>
</tr>
<tr>
<td>We felt we could not rely on the partners to stick to the project schedule*</td>
<td>Partsche</td>
<td>0.35</td>
</tr>
</tbody>
</table>

2. **Competence Trust**

<table>
<thead>
<tr>
<th>Item</th>
<th>Variable name</th>
<th>Initial (Final) Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>We were confident that the partners were capable of doing what they said they could do*</td>
<td>Partcapa</td>
<td>0.71</td>
</tr>
<tr>
<td>We felt we had to monitor the partners’ work closely to make sure it was of the quality required</td>
<td>Partmon</td>
<td>0.82 (0.84)</td>
</tr>
<tr>
<td>We felt that the partners were very knowledgeable and skilled in their areas of expertise</td>
<td>Partskil</td>
<td>0.73 (0.72)</td>
</tr>
<tr>
<td>We felt we had to question the partners’ statements about their capabilities during the project</td>
<td>Partques</td>
<td>0.82 (0.87)</td>
</tr>
</tbody>
</table>
3. **Goodwill Trust**

<table>
<thead>
<tr>
<th>Item</th>
<th>Variable name</th>
<th>Initial (Final) Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>We felt we could rely on the partners to help the project in ways not required by the project agreement</td>
<td>Parthelp</td>
<td>0.65 (0.67)</td>
</tr>
<tr>
<td>We felt we could not rely on the partners to treat each other fairly throughout the project*</td>
<td>Partfair</td>
<td>0.37</td>
</tr>
<tr>
<td>We felt that the partners would not mislead each other throughout the project</td>
<td>Partmisl</td>
<td>0.65 (0.67)</td>
</tr>
<tr>
<td>We felt we could share information openly during the project because we knew none of the partners would take advantage of the others</td>
<td>Parshar</td>
<td>0.80 (0.81)</td>
</tr>
<tr>
<td>We felt we had to monitor each of the partners closely so that they could not take advantage of the others during the project</td>
<td>Partadva</td>
<td>0.75 (0.74)</td>
</tr>
</tbody>
</table>

**Partners’ Collaboration Experience** (6-point agree/disagree response scale for each item)

<table>
<thead>
<tr>
<th>Item</th>
<th>Variable name</th>
<th>Final Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>The partners’ outcomes from the collaboration have been equitable</td>
<td>Benefits</td>
<td>0.83</td>
</tr>
<tr>
<td>The benefits of the collaboration have been fair to the partners</td>
<td>Outcomes</td>
<td>0.74</td>
</tr>
<tr>
<td>The collaboration has more than fulfilled the partners’ expectations</td>
<td>Expects</td>
<td>0.83</td>
</tr>
<tr>
<td>The partners are satisfied with the outcomes from this collaboration</td>
<td>Satisfac</td>
<td>0.86</td>
</tr>
<tr>
<td>The partners would be willing to collaborate again, should the opportunity arise</td>
<td>Willing</td>
<td>0.80</td>
</tr>
</tbody>
</table>
## Appendix II: PLS Graph Analysis Factor Loadings Matrix (Final Measurement Model)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMMIT</strong></td>
<td>1.00</td>
<td>-0.07</td>
<td>-0.14</td>
<td>-0.15</td>
<td>-0.12</td>
<td>-0.18</td>
<td>-0.17</td>
<td>-0.21</td>
<td>-0.22</td>
<td>-0.24</td>
</tr>
<tr>
<td><strong>TOGETHER</strong></td>
<td>-0.07</td>
<td>1.00</td>
<td>-0.13</td>
<td>-0.09</td>
<td>-0.01</td>
<td>-0.03</td>
<td>-0.11</td>
<td>-0.09</td>
<td>-0.09</td>
<td>-0.08</td>
</tr>
<tr>
<td><strong>SYNCHR</strong></td>
<td>-0.24</td>
<td>0.00</td>
<td>0.71</td>
<td>0.60</td>
<td>0.47</td>
<td>0.35</td>
<td>0.40</td>
<td>0.62</td>
<td>0.51</td>
<td>0.49</td>
</tr>
<tr>
<td><strong>KNOWL</strong></td>
<td>0.02</td>
<td>-0.04</td>
<td>0.72</td>
<td>0.27</td>
<td>0.35</td>
<td>0.20</td>
<td>0.37</td>
<td>0.33</td>
<td>0.21</td>
<td>0.33</td>
</tr>
<tr>
<td><strong>BALANCE</strong></td>
<td>-0.05</td>
<td>-0.01</td>
<td>0.76</td>
<td>0.32</td>
<td>0.35</td>
<td>0.28</td>
<td>0.29</td>
<td>0.30</td>
<td>0.25</td>
<td>0.32</td>
</tr>
<tr>
<td><strong>CULTURE</strong></td>
<td>-0.16</td>
<td>0.04</td>
<td>0.84</td>
<td>0.63</td>
<td>0.48</td>
<td>0.42</td>
<td>0.48</td>
<td>0.55</td>
<td>0.35</td>
<td>0.56</td>
</tr>
<tr>
<td><strong>COMDIAL</strong></td>
<td>-0.16</td>
<td>-0.04</td>
<td>0.36</td>
<td>0.75</td>
<td>0.30</td>
<td>0.30</td>
<td>0.36</td>
<td>0.43</td>
<td>0.47</td>
<td>0.47</td>
</tr>
<tr>
<td><strong>COMUNDER</strong></td>
<td>-0.12</td>
<td>-0.03</td>
<td>0.57</td>
<td>0.86</td>
<td>0.49</td>
<td>0.41</td>
<td>0.44</td>
<td>0.60</td>
<td>0.50</td>
<td>0.59</td>
</tr>
<tr>
<td><strong>COMTIME</strong></td>
<td>-0.20</td>
<td>-0.20</td>
<td>0.47</td>
<td>0.84</td>
<td>0.42</td>
<td>0.38</td>
<td>0.41</td>
<td>0.61</td>
<td>0.57</td>
<td>0.58</td>
</tr>
<tr>
<td><strong>COMOPEN</strong></td>
<td>-0.06</td>
<td>-0.21</td>
<td>0.53</td>
<td>0.82</td>
<td>0.38</td>
<td>0.38</td>
<td>0.42</td>
<td>0.51</td>
<td>0.48</td>
<td>0.57</td>
</tr>
<tr>
<td><strong>COMRELEV</strong></td>
<td>-0.08</td>
<td>-0.12</td>
<td>0.56</td>
<td>0.86</td>
<td>0.46</td>
<td>0.29</td>
<td>0.36</td>
<td>0.57</td>
<td>0.55</td>
<td>0.49</td>
</tr>
<tr>
<td><strong>COMMEDIA</strong></td>
<td>-0.12</td>
<td>-0.02</td>
<td>0.41</td>
<td>0.69</td>
<td>0.34</td>
<td>0.23</td>
<td>0.27</td>
<td>0.43</td>
<td>0.54</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>PARTCOMM</strong></td>
<td>-0.09</td>
<td>-0.13</td>
<td>0.49</td>
<td>0.41</td>
<td>0.92</td>
<td>0.36</td>
<td>0.49</td>
<td>0.49</td>
<td>0.31</td>
<td>0.36</td>
</tr>
<tr>
<td><strong>PARTSPIR</strong></td>
<td>-0.13</td>
<td>-0.04</td>
<td>0.50</td>
<td>0.50</td>
<td>0.91</td>
<td>0.38</td>
<td>0.62</td>
<td>0.53</td>
<td>0.41</td>
<td>0.47</td>
</tr>
<tr>
<td><strong>PARTMON</strong></td>
<td>-0.18</td>
<td>0.05</td>
<td>0.28</td>
<td>0.32</td>
<td>0.32</td>
<td>0.84</td>
<td>0.36</td>
<td>0.35</td>
<td>0.13</td>
<td>0.23</td>
</tr>
<tr>
<td><strong>PARTSKIL</strong></td>
<td>-0.17</td>
<td>-0.02</td>
<td>0.46</td>
<td>0.41</td>
<td>0.40</td>
<td>0.72</td>
<td>0.41</td>
<td>0.49</td>
<td>0.34</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>PARTQUES</strong></td>
<td>-0.09</td>
<td>-0.05</td>
<td>0.28</td>
<td>0.32</td>
<td>0.29</td>
<td>0.87</td>
<td>0.29</td>
<td>0.29</td>
<td>0.17</td>
<td>0.24</td>
</tr>
<tr>
<td><strong>PARTHELP</strong></td>
<td>-0.27</td>
<td>0.01</td>
<td>0.29</td>
<td>0.35</td>
<td>0.54</td>
<td>0.35</td>
<td>0.67</td>
<td>0.35</td>
<td>0.27</td>
<td>0.28</td>
</tr>
<tr>
<td><strong>PARTMISL</strong></td>
<td>-0.12</td>
<td>-0.11</td>
<td>0.44</td>
<td>0.36</td>
<td>0.43</td>
<td>0.18</td>
<td>0.67</td>
<td>0.34</td>
<td>0.24</td>
<td>0.34</td>
</tr>
<tr>
<td><strong>PARTSHAR</strong></td>
<td>-0.03</td>
<td>0.02</td>
<td>0.40</td>
<td>0.34</td>
<td>0.44</td>
<td>0.19</td>
<td>0.81</td>
<td>0.36</td>
<td>0.23</td>
<td>0.30</td>
</tr>
<tr>
<td><strong>PARTADV</strong></td>
<td>-0.08</td>
<td>-0.03</td>
<td>0.35</td>
<td>0.33</td>
<td>0.35</td>
<td>0.52</td>
<td>0.74</td>
<td>0.27</td>
<td>0.14</td>
<td>0.32</td>
</tr>
<tr>
<td><strong>OBJECTS</strong></td>
<td>-0.22</td>
<td>-0.14</td>
<td>0.45</td>
<td>0.55</td>
<td>0.43</td>
<td>0.34</td>
<td>0.35</td>
<td>0.78</td>
<td>0.58</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>TEARESPS</strong></td>
<td>-0.19</td>
<td>-0.04</td>
<td>0.43</td>
<td>0.48</td>
<td>0.36</td>
<td>0.33</td>
<td>0.29</td>
<td>0.80</td>
<td>0.55</td>
<td>0.35</td>
</tr>
<tr>
<td><strong>PROPLAN</strong></td>
<td>-0.24</td>
<td>-0.04</td>
<td>0.45</td>
<td>0.48</td>
<td>0.37</td>
<td>0.29</td>
<td>0.24</td>
<td>0.81</td>
<td>0.59</td>
<td>0.48</td>
</tr>
<tr>
<td><strong>AIMS</strong></td>
<td>-0.16</td>
<td>-0.11</td>
<td>0.44</td>
<td>0.49</td>
<td>0.47</td>
<td>0.35</td>
<td>0.43</td>
<td>0.82</td>
<td>0.49</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>RESPLAN</strong></td>
<td>0.00</td>
<td>-0.19</td>
<td>0.44</td>
<td>0.49</td>
<td>0.44</td>
<td>0.32</td>
<td>0.31</td>
<td>0.68</td>
<td>0.48</td>
<td>0.33</td>
</tr>
<tr>
<td><strong>SKILLS</strong></td>
<td>-0.13</td>
<td>0.01</td>
<td>0.48</td>
<td>0.54</td>
<td>0.52</td>
<td>0.46</td>
<td>0.47</td>
<td>0.70</td>
<td>0.31</td>
<td>0.39</td>
</tr>
<tr>
<td><strong>MILES</strong></td>
<td>-0.19</td>
<td>-0.14</td>
<td>0.35</td>
<td>0.47</td>
<td>0.28</td>
<td>0.23</td>
<td>0.22</td>
<td>0.63</td>
<td>0.77</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>MONITOR</strong></td>
<td>-0.22</td>
<td>-0.08</td>
<td>0.31</td>
<td>0.52</td>
<td>0.24</td>
<td>0.18</td>
<td>0.24</td>
<td>0.49</td>
<td>0.87</td>
<td>0.34</td>
</tr>
<tr>
<td><strong>REPORT</strong></td>
<td>-0.19</td>
<td>-0.05</td>
<td>0.35</td>
<td>0.53</td>
<td>0.39</td>
<td>0.21</td>
<td>0.24</td>
<td>0.52</td>
<td>0.86</td>
<td>0.39</td>
</tr>
<tr>
<td><strong>MEETING</strong></td>
<td>-0.10</td>
<td>-0.03</td>
<td>0.40</td>
<td>0.59</td>
<td>0.38</td>
<td>0.20</td>
<td>0.28</td>
<td>0.53</td>
<td>0.78</td>
<td>0.40</td>
</tr>
<tr>
<td><strong>BENEFITS</strong></td>
<td>-0.14</td>
<td>-0.05</td>
<td>0.47</td>
<td>0.50</td>
<td>0.33</td>
<td>0.23</td>
<td>0.34</td>
<td>0.39</td>
<td>0.34</td>
<td>0.83</td>
</tr>
<tr>
<td><strong>OUTCOMES</strong></td>
<td>-0.14</td>
<td>-0.03</td>
<td>0.40</td>
<td>0.43</td>
<td>0.28</td>
<td>0.29</td>
<td>0.28</td>
<td>0.37</td>
<td>0.28</td>
<td>0.74</td>
</tr>
<tr>
<td><strong>EXPECTS</strong></td>
<td>-0.21</td>
<td>-0.08</td>
<td>0.47</td>
<td>0.62</td>
<td>0.38</td>
<td>0.29</td>
<td>0.38</td>
<td>0.47</td>
<td>0.46</td>
<td>0.83</td>
</tr>
<tr>
<td><strong>SATISFAC</strong></td>
<td>-0.25</td>
<td>-0.09</td>
<td>0.48</td>
<td>0.56</td>
<td>0.43</td>
<td>0.30</td>
<td>0.31</td>
<td>0.44</td>
<td>0.42</td>
<td>0.86</td>
</tr>
<tr>
<td><strong>WILLING</strong></td>
<td>-0.24</td>
<td>-0.08</td>
<td>0.43</td>
<td>0.53</td>
<td>0.43</td>
<td>0.36</td>
<td>0.39</td>
<td>0.43</td>
<td>0.39</td>
<td>0.80</td>
</tr>
</tbody>
</table>