# A Dyadic Research Program:
# The Interaction Possibility Space Model

by

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**Abstract**

Different forms of interaction between firms are at the heart of a relationship and network perspective of business-to-business markets. This paper presents a dyadic research program based upon an Interaction Possibility Space, defined by the interactions between firms using potentially different coordination modes.

That firms may have different perspectives of their preferred coordination mode opens two areas of research. First, how does interaction proceed when both parties have similar views of coordination modes? Second, how does interaction proceed when parties have dissimilar views of their coordination modes? Such research necessarily requires dyadic studies and furthermore, for quantitative research, requires the development of clusterwise regression methodologies capable of examining dyadic data.

Keywords: Business Dyads, Levels, Interaction, Clusterwise Regression

# Executive Summary

This paper brings together theory and methodology to quantitatively analyse inter-firm interaction from a dyadic perspective; while avoiding the issues associated with compositional rules to generate relationship level constructs.

The relationship and network model of the Industrial Marketing and Purchasing Group of academics is applied to the problem of quantitatively revealing and examining classes of business relationships. In addition, the paper presents a model of Interaction Possibility Space, which allows visualisation of the richness of business relationships that might occur given the three ideal inter-firm coordination modes of market exchange, hierarchy and relationships.

The first section of the paper applies the relationship and network framework, to explain why business relationships are naturally composed of different intentions as well as common interest. These sources of difference and commonality, inherent in all inter-firm interaction, suggest that each firm necessarily brings their own preferred coordination mode to a relationship. Furthermore, as inter-firm interaction continues, these coordination modes change and shift in a continual relationship dynamic.

When two firms interact on the basis of differences and commonality, and with variation in the way they follow the three coordination modes, a wide range of inter-firm interaction classes can be envisaged. The Interaction Possibility Space model, presented in the paper, indicates this variety visually.

However, past research has shown that firms also vary on their balance of self and collective interest and the inherent differences between firms suggests that each will have different models of how to proceed with cooperative behaviour. Thus, modelling inter-firm interaction requires multiple models. Further, the dependent variable for these models must reflect the coordination context of the firm. Taken together, this means quantitative modelling of relationship classes cannot proceed unless techniques can be found to disaggregate analysis according to the dominant coordination modes informing interaction, while at the same time allowing analyse of multiple models of firm behaviour.

In conclusion, it is suggested that post-hoc classification of dyad data, based on models presented in the paper, be conducted using segmentation methodology to reveal relationship classes. Importantly, this approach bypasses problems associated with composition rules to generate dyad level constructs.

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## *INTRODUCTION*

The centrality of business relationships in a network perspective of business-to-business markets suggests that continuing research of relationships is important. Business firms working together have been described as dyads (Bonoma, et al., 1978). A dyad is defined as a "group of two" (Wilkes and Krebs, 1985) and thus represents two levels of organization: firms and relationship. Interaction, defined here as coordination between two or more firms who understand their intentions and abilities, shapes dyad organization. However, a dynamic view of dyads naturally encompasses a number of phases, not necessarily in order, depending on the definition of group organization and modes of interaction. Accordingly, Ford and Rosson (1982) identified different relationship categories: 'new', 'growing', 'static', 'inert' and 'troubled'.

To-date quantitative research of relationships has not accounted for these different types of group organization. This is so for at least three reasons. First, it is not possible to define correctly the nature of group organization without dyadic data, for one party cannot necessarily identify the other firm's perspective. Second, there has been a lack of conceptual models able to explain dyad level organization. Finally, and related to the need for dyadic theories, methods for data analysis (eg compositional rules) have foundered on realizing ways to deal with data from different levels of organization and differing perspectives (cf Chan, 1998, Glick, 1985, Rousseau, 1985). The problems of theory and measurement have been the major obstacles, for quantitative dyadic data has been collected and incompletely

reported on more than one occasion (cf Gundlach, et al., 1995, Heide and John, 1992, John and Reve, 1982, Kim, 2000).

This paper presents a conceptual model of 'interaction possibility space' (IPS), which leads to methods for quantitative examination of different forms of dyadic organization. Within the IPS model the concept of actor bonds, as elaborated by the Industrial Marketing and Purchasing (IMP) Group (Ford, 1990, Håkansson, 1982, Håkansson and Snehota, 1995), is used to separate organizational modes. In the IMP framework actor bonds, composed of trust and commitment, exist as personal constructs that explain inter-firm interaction within a relationship (Håkansson and Snehota, 1995). For example, when a firm makes a commitment to another party, resources and activities are applied to a joint activity with an element of risk, which is supported by trust within the minds of the firm's decision makers. In the case of episodic exchange, limited trust reduces willingness to commit resources beyond the time required to effect exchange. In either case the resource and activity decision rests ultimately upon personal judgements of trust and commitment by key decision-makers within the firm. Thus, firm and relationship level constructs rest wholly upon psychological constructs, with the IMP framework standing-in as the process model (cf Chan 1998) explaining inter-firm interaction and relationship performance at different analytical levels.

The decision to focus on actor bonds as the means to categorise relationship types rests upon Medlin and Quester's (1999) argument that the interaction between actor intentions and actor bonds is pre-eminent in structuring relationships. Briefly, actor bonds, actor intentions and their reciprocal 'conditioning' shape a firm's understanding of environmental events or of any change arising from the firms in the relationship. Furthermore, this interpretation of events informs the optimal strategy and tactics available to the firm and the relationship in response to any change. In this vein, Alajoutsijärvi et al. (1999) described three possible

coordination contexts for actor bonds: (i) markets, (ii) dominant/submissive relations, and (iii) cooperation. These mechanisms for structuring interaction are well recognised in the Social Science literature (Bonoma, 1976, Bradach and Eccles, 1989, Luhmann, 1979).

The remainder of this paper is organised in the following manner. First, interaction between firms is discussed within the IMP framework. This discussion indicates that it is some commonality of goals and inherent differences between each firm's perspectives that leads to the formation of different types of inter-firm interactions. In addition, the importance of difference makes it clear that quantitative treatment of dyadic data must overcome variance in perspective. Second, a model of 'interaction possibility space' is presented to show the richness of potential relationship types. Third, the IPS model is used to highlight methodological implications for modelling interaction between firms in different contexts and segmentation solutions are considered as an appropriate methodology. Finally, the implications of the IPS model for future conceptual development and methodology are considered.

## *INTERACTION TO FORM ACTOR BONDS*

Within the IMP framework, interaction is envisaged to comprise at least three aspects. First, interaction between firms is two sided, with both parties "dancing" (Wilkinson and Young, 1994). This is so, even for episodic exchange. In this light, a single exchange in a market involves formation of a very limited relationship, for episodic interaction requires some 'agreement' on the coordination process between the two parties to complete exchange. Thus, the time scale is dramatically compressed and although the future is limited to only the completion of the transaction, the success of the exchange depends upon the past and the future of the interaction. With continuing relationships the time scale is extended and the mode of coordination emerges from past actor bonds, the two firms' intentions and each

6

parties' considerations of future orientations of these aspects of relationships (Medlin and Quester, 1999).

Second, interaction between firms is undertaken with intention to achieve an economic goal, with strategic objectives being implemented to obtain final economic rewards. Further, economic goals involve some overlapping of self and collective interests (Bengtsson and Kock, 1999, Skinner, et al., 1992, Young and Wilkinson, 1997). In addition, it is likely there is some disparity between interacting firms on their combinations of expected self and collective interests, however; equally, it is apparent that too great a difference will be dysfunctional. Even episodic interaction requires a minimal level of collective interest, simply to effect exchange in the pursuit of self-interest. Thus, it is argued that both private and collective interest economic goals must be examined to understand almost all inter-firm interaction. A distinction with longer-term exchanges is that the relationship 'atmosphere' (Ford, 1990, Håkansson, 1982) also influences the nature of the interaction.

Third, interaction occurs between firms, relationships and networks so that events and change are transmitted by networks and relationships to firms and conversely from firms to relationships and networks (Håkansson and Snehota, 1995). Thus, relationships mediate change away from and towards the firm. This connectedness of firms has an important implication, as the process of 'interaction' and its 'context' take-on a greater significance in explaining the way firms pursue their individual and joint economic goals.

While these three aspects of interaction suggest a firm will follow a strategy for each relationship (ie intention and preferred mode of interaction to achieve a blend of self and collective interest goals), they also explain how similarities and differences between firms create a relationship dynamic.

*Relationship Dynamic*

A relationship, as an entity between firms and networks, exists as a different contrivance for each party. This is a result of variation in network embeddedness for each firm (Anderson, et al., 1994). The remainder of this section examines the sources of difference and commonality in a relationship, so providing the perspective for development of a model of that combines "interaction possibilities" with the "space between firms".

Interaction between firms is worthwhile, if matching differences of capability occur between firms that exist in different initial networks. That is, the first appraisal of economic interaction occurs at the juxtaposition of two networks (see figure 1), where there are complementary differences in network identity. Next, the formation of a focal relationship leads to the creation of a wider network and the interaction between the firms moves from a dynamic created by the two separate network histories and capabilities to a new dynamic whose 'logic' follows the broader network. Immediately, therefore, interaction is dependent upon two sets of embeddedness: the initial networks and the new broader network. However, the embeddedness is of two different types, for the first is historical and specific to one firm and the second is future oriented and specific to both firms. Thus, difference is absolute and commonality of purpose is created on the basis of difference.

However, before commonality can fully arise, many factors intervene and influence the connection so that a relationship remains forever dynamic. First, embeddness in the initial network means each party will have slightly different intentions in creating the relationship. Not only will intentions vary from a firm perspective, for each firm is seeking access to a complementary resource or activity (Håkansson and Snehota, 1995), but firm strategies will also vary so that while the firms may seek to complement each others strategy their

embeddness in the initial network will require maintenance of some present relationships and create pressure for change and difference between those parties.

FIGURE 1. Focal Relationship Joining Two Networks
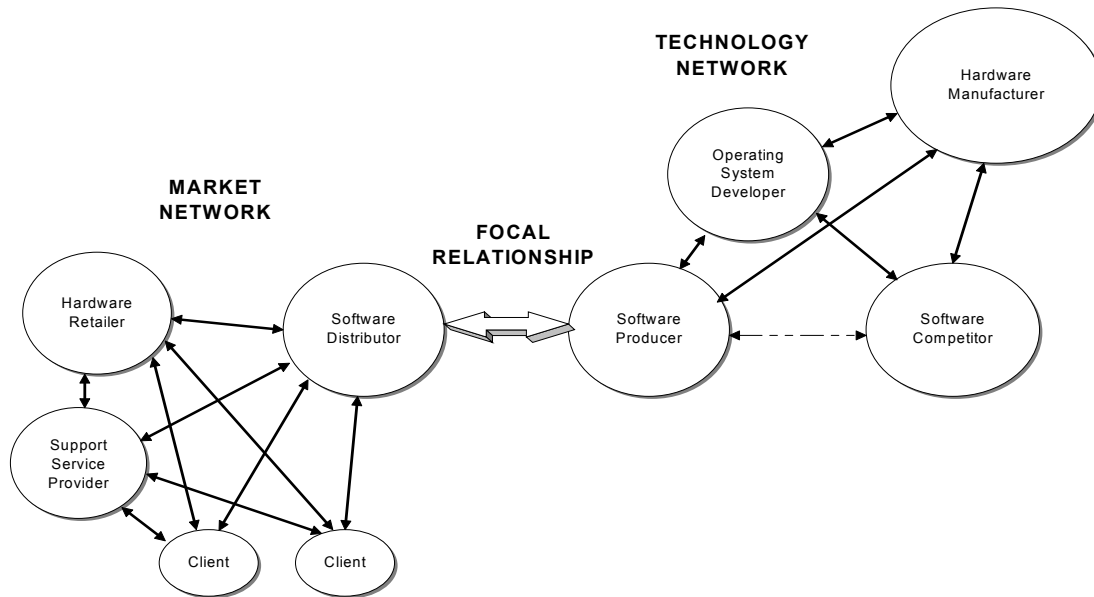


Second, the parties must deal with differences in expected goals. As goals vary in the degree of self and collective interest, the interaction to achieve reasonable outcomes necessarily results in give and take over time, with shifts in the use of coordination methods as each firm's strategy and network also change.

While complementarity of networks is the logic that creates a focus relationship, the initial networks remain the source of difference between each firm's intentions and variation in balance of self and collective interest. Thus, each firm's preferred interaction mode for a specific interaction will arise from previous network identity and firm history, as well as the need to coordinate the present exchange. In fact, even a long-term relationship continues to face these variations as change occurs in the firms and their other relationships (Håkansson and Snehota, 1995).

An example may clarify these sources of difference. In the software industry, when a producer and distributor see the complementarity of their resources, activities and network connections and settle on an exclusive distribution agreement, they work jointly (ie coordination process) to maximise sales (ie a combination of self and collective economic interest). The producer continues to research and develop the software to meet new hardware configurations and customer needs, while the distributor builds market share in a geographic area by employing sales staff and setting up promotional events and activities. Both firms, however, work towards profit from sales to final customers (ie new network provides interaction logic). Thus, common economic purpose at the new network level, where the dyad is a unit supplying to final customers, causes each firm to balance their differences against their common interests.

Finally, and apart from the differences resulting from the above structural factors, there are logically two scenarios with regard to perceptual difference that will also influence interaction between firms. First, when parties are not close, differences in perceptions of the other party will exist and both parties will necessarily incorrectly perceive actor bonds. Incorrect perceptions of this kind are likely to be acted upon, until some event makes the error apparent. Such a scenario would occur in the early stages of a relationship and in the mature phase where the partners have been moving apart. These situations may equate to Ford and Rosson's (1982) "new", "static" and "inert" relationships. They may also apply to "troubled" relationships, but these clearly can have other causes such as environmental change.

The second scenario is where both parties perceive actor bonds correctly and therefore have clear perceptions of the other party. In this case, different levels of closeness would be

apparent as actor bonds move from market to relational coordination. Ford and Rosson (1982) would consider such relationships to be "growing".

Each of these scenarios highlights the importance of relationship closeness in explaining differences in perception. The distinctions of structural and perceptual difference have not been made previously within the actor bond construct. Yet, these differences would seem to explain the different forms of relationship identified qualitatively by Ford and Rosson (1982). To account for these differences one may define an *actor bond structure* as the combinations of views by dyad parties of their coordination mode. This definition is noteworthy for it implies that actor bond structure is composed of both commonality and difference of preferred interaction modes between the parties, as well as continuing change of interaction mode between the parties.

Actor bond structure avoids the weakness of past conceptualizations of dyad level constructs (cf Kumar, et al., 1993), which have used simple aggregates and averages of firm level indicators (cf Gundlach, et al., 1995, Gundlach and Cadotte, 1994, Kim, 2000) as the composition rules (cf Glick, 1985, Chan 1998) for dyad constructs. For example, Gundlach et al.'s (1995) 'dyad commitment' was theorized to be a commonly held construct by two firms and the composition rule was an un-weighted addition of each party's commitment to a relationship. Thus, dyads with medium levels of commitment can be composed of firms with high and low commitment to the relationship and there is the presumption that interaction dynamics proceed from a medium level of commitment; when in fact, interaction is closer to either commitment and opportunism or acquiescence and exploitation. This example makes it clear that composition of dyad constructs by addition, or averaging, of firm indicators ignores the duality of dyads. This comment also extends to other means of aggregating dyad data: for example, structural equation modelling (cf Anderson, 1985).

11

The inherent differences and duality of interaction in the IMP framework suggests two implications. First, that whole new classes of interaction may exist between the ideals posited by Alajoutsijärvi, et al. (1999) and second, that more sophisticated analytical techniques will be required for measurement of interaction. The next section presents a dyadic model of potential actor bond structures, which allows for differences in preferred coordination methods as firms interact and so posits a greater number of interaction classes. The methodological implications of the IPS model are in a following section.

### *INTERACTION POSSIBILITY SPACE MODEL*

The model of 'Interaction Possibility Space' (IPS) presented here (see figure 2) is an elaboration of Alajoutsijärvi et al.'s (1999) coordination contexts based on three ideal actor

FIGURE 2. Interaction Possibility Space Model
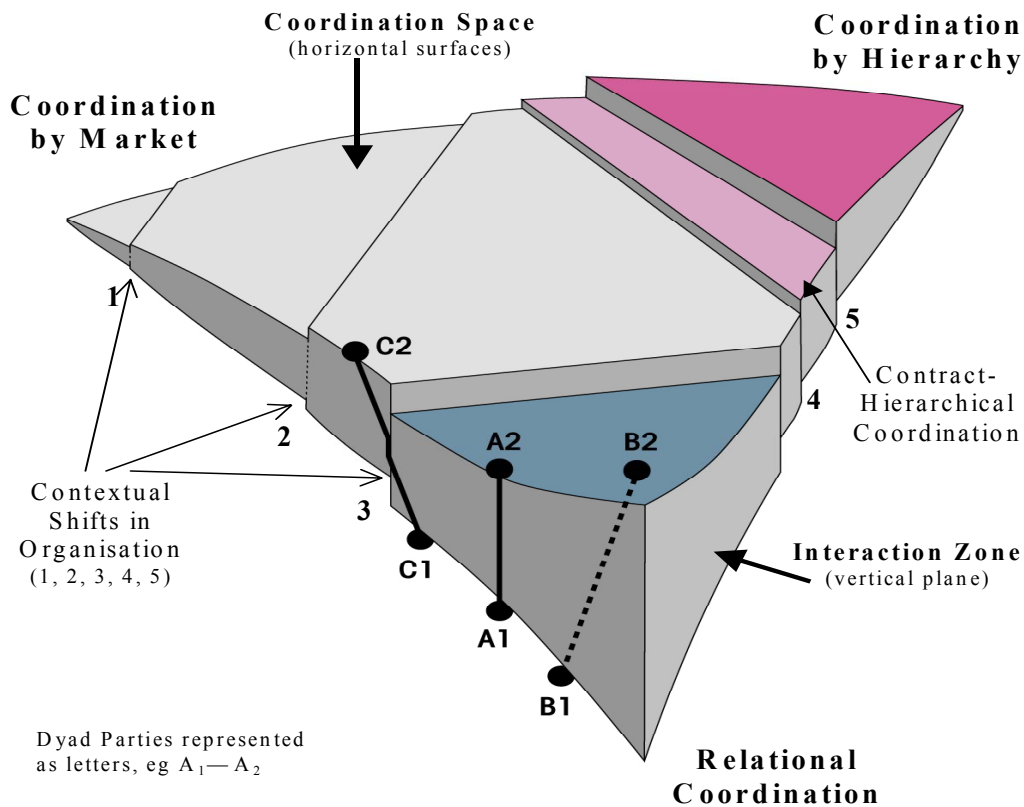
bond types and the opposition of two firms across an interaction space. The three ideals

represent market, relational and hierarchical coordination and follows previous work by

Campbell (1985) and Möller and Wilson (1995). Consequently, in the IPS model three ideal

coordination methods are anchored in different dimensions according to the level of firm

aggregation/organization and the social/legal context (see figure 3).

FIGURE 3. Ideal Coordination Contexts

|  | Market Coordination | Relational Coordination | Contract-Hierarchy Coordination |
|---|---|---|---|
| Coordination Context | Market within host society | Relationship in economic and social network | Contract within legal framework of host society |
| Time horizon | Short term | Long term | Long term |
| Level of organization | Firm | Relationship | Supra-firm Master and slave |

*Source: Adapted from Alajoutsijärvi et al. (1999)*

While the coordination contexts presented by Alajoutsijärvi, et al. (1999) were essentially

dyadic, the transition from one ideal to another was hypothesised to be gradual. Yet in reality

organizational forms change dramatically (Boyle et al. 1992) and it is likely that preferred

coordination modes also shift fundamentally between ideals. This is suggested by Luhmann's

(1979) argument that trust switches on and off and by the discussions above that highlight the

importance of difference across a relationship. To account for these contextual shifts the IPS

model portrays a fractured horizontal "coordination plane". While these "contextual shifts"

have been identified in the literature (see figure 4), others may exist or these may overlap.

FIGURE 4. Contextual Shifts

| Contextual Shift (refer to figure 2) | Author | Coordination Shift (from – to) |
|---|---|---|
| 1 | Dwyer, Schurr, and Oh (1987) | discrete to continuous market transactions |
| 2 | Cannon, Achrol, and Gundlach (2000) | market to plural forms of coordination |
| 3 | Dwyer, Schurr, and Oh (1987) | to relationship coordination |
| 4 | Cannon, Achrol, and Gundlach (2000) | plural modes to contract-hierarchy |
| 5 | Stinchcombe (1985) | contract-hierarchy to pure hierarchy |

However, the purpose of the model is only evident when dyadic parties are considered. In figure 2, the vertical "interaction zone" provides a view of the possible freedom of interaction that results from two firms' preferred modes of coordination. There are three aspects to be contemplated with regard to the "interaction zone" and each has methodological implications.

First, an interaction zone always separates both dyad parties, for interaction is necessarily two-fold (Buber, 1923, translated by Smith, 1958), with firms dancing (Wilkinson and Young, 1994). Thus, there remains an interaction zone at the market and hierarchy ideals (note small vertical lines in figure 2), even when there is no distinction between the parties' preferred coordination modes and the possibilities for freedom of interaction are minimal.

Second, the vertical depth of the IPS model portrays the varying interaction possibilities inherent in each coordination mode. Thus, the interaction zone increases in depth, as one moves from one-off transactions to continuing transactions and onto plural coordination modes, as a result of the increasing number of options provided by facets of relational and hierarchical coordination. Conversely, as dyads approach hierarchical coordination the number of interaction options is again constrained by the more powerful party seeking their own ends. However, as dyads move deeper into relationship mode the influence of societal norms and legal rules are reduced and the agreement between parties allows wider parameters of interaction. Thus, there is increasing scope for elasticity of interaction. In addition, more differentiation in time is possible (Luhmann 1979) between actor intent, activities, resource-use and relationship outcomes.

Third, the interaction zone allows consideration of differences in preferred coordination mode between parties. Thus, the depth and angle of intervening interaction zone between dyad parties provides a 'graphic' understanding of actor bond structure. For example, in figure 2 similarities in coordination mode (eg $A_1$---$A_2$) would equate to close actor bonds of a

relational form, while differences in coordination modes (eg $C_1$---$C_2$) would display dissonance in the actor bond structure between dyad parties.

The next section considers methodological implications that arise from consideration of the IMP perspective and the IPS model.

## *METHODOLOGICAL IMPLICATIONS*

The IPS model suggests a number of methodological implications, based upon the possible variations across the interaction zone as preferred coordination modes change. First, as an interaction zone necessarily separates firms, two specific firm models of preferred coordination modes are required. Given the two-sided nature of interaction evident within the IMP perspective there is also the suggestion market exchange theory may benefit from modelling two firms.

Second, as firms have differences of intention and vary on levels of self and collective interest, it is likely that quite complex models of firms and dyads must be developed. For example, underlying the concept of actor bonds is an assumption that two separate models of firm behaviour are interacting with a single dyad level model. Qualitative research by the IMP Group (Ford, 1990, Håkansson, 1982, Håkansson and Snehota, 1995) suggests that this is a reasonable assumption for relational coordination. However, this assumption cannot be extended across the whole IPS. This means different dyad models are likely to be found for each type of relational coordination and also for other forms of inter-firm interaction.

Thus, a number of models of dyad organization potentially exist. For example, with relational coordination two firms may interact, each with their own self and collective interest models, to achieve relationship performance. Medlin, et al. (Forthcoming) have examined this more complex model empirically for single firms: the next step is a categorization of dyads

according to variations in perceptions of relationship performance. This procedure should provide a measure of relationship closeness, while also revealing the classes of interaction that result in relationship performance. Importantly, this procedure does not require composition rules to arrive at dyad level constructs (Chan 1998); rather it bypasses the problem and relies upon segmentation techniques to find patterns of interaction between firms.

When other coordination contexts are considered within the IPS, the nature of the dependent variable must logically change. Thus, with market coordination, each firm follows its self-interest model in interaction with a collective model, as represented by the industry and society model, to achieve firm profit. However, as each firm necessarily has different knowledge of the collective model and different ability to interact (following Giddens, 1979) a number of forms of interaction must result. By contrast, in the contract hierarchy situation, it seems likely that there would be two self-interest models interacting with a collective model controlled by the more powerful firm, with the two firms seeking to maximise their total profit. However, in this situation, it is probable that variations in perceptions of the collective model and the power of each firm to interact must lead to a number of forms of interaction.

There are three immediate suggestions from this discussion of dyad models. First, it is necessary to determine the active and inactive coordination constructs in each context (cf Wilson, 1995) as well as how these constructs change across contextual shifts (cf Sharma, et al. 2001). Second, until this theoretical work is more complete, it is not advisable to treat relationship data, or more specifically dyad data, in too aggregate a form. Thus, segmentation methods must be explored to disaggregate data. Third, it is also necessary to develop

techniques that allow simultaneous analysis of the two components of firm intention within dyadic data (ie self and collective interest).

*Segmentation Techniques*

Segmentation offers means to disaggregate relationship and dyadic data. As the purpose is prediction so as to locate groupings of dyads within the IPS, two categories of techniques are available. The first involves a priori and arbitrary segmentation based upon theoretical grounds. For example, segmentation might be conducted according to:

(1) coordination mode of the firms (market, hierarchy, contractual hierarchy, relational, relational-contract, etc),

(2) industry, or network purpose (ie network boundary), and

(3) actor resource levels.

However, segmentation on theoretical grounds informs on the factors distinguishing between the bases for segmentation, rather than leading to the discovery of organization models of how firms are interacting. Thus, a priori segmentation leads to an improved understanding of the coordination mechanisms and the factors affecting them, rather than to an elucidation of the reality of coordination mechanisms at work in relationships. That is to say, in another way, a priori segmentation provides information on the horizontal plane of the Interaction Possibility Space, while what is required is elaboration of firm interaction models.

The second option is to rely upon post hoc predictive segmentation, where firm and collective models are determined after data collection. These methods provide models of firm and relationship behaviour positioned within the Interaction Possibility Space. The techniques of clusterwise regression (Aurifeille, 2000, Wedel and DeSarbo, 1995) allow models of dyad coordination to be found by different clusters of behaviour leading to a

dependent performance variable. These techniques can be extended so that self and collective interest models of dyadic structure may be examined simultaneously (Aurifeille and Medlin, 2001).

However, the efficiency of clusterwise regression is reliant upon the choice of a dependent variable for the self and collective interest models of firm behaviour. Necessarily this choice depends upon the location of the dyad within the IPS model, as well as which of the three ideals is dominant. Thus, the dependent and independent variables are likely to be those presented in figure 5. In addition, interaction suggests that models of self and collective interest must lead to the suggested dependent variables also presented in figure 5.

FIGURE 5. Models of Firm Behaviour

| | Market Coordination | Relational Coordination (Medlin et al. Forthcoming) | Contract-Hierarchy Coordination |
|---|---|---|---|
| **Dependent variable** | Firm performance relative to competitors | Relationship performance relative to competitors | Supra-firm performance relative to competitors |
| **Collective interest model** | Limited future | Trust Commitment Future expectations Past relationship experience | Trust in contract Commitment to contract |
| **Self-interest model** | Economic goal Self-interest constructs | Economic goal | Control Acquiescence Level of supra-firm performance secured by each firm |

Finally, in the matter of relationship models, it is likely that both a priori and post hoc segmentation techniques should be used, depending on the theoretical direction of the study. In fact, given contextual shifts, it may be that a priori and post hoc segmentation techniques will be used in the one study.

*FUTURE RESEARCH*

The IMP framework and the methods outlined above provide tools for conducting continuing research into the shape of the 'interaction possibility space' and they way it is populated by

dyads, for it is likely that complex attractors will exist within the space. Furthermore, the IPS model displays the research questions clearly and these are outlined below.

First, with regard to the coordination plane a series of questions are apparent. For example: Are three dimensions enough to incorporate all coordination modes? Must other contextual shifts be included? Are contextual shifts composed of a series of minor shifts? How do contextual shifts overlap to create even more complex forms of coordination? For example, what is the essence of a combination of contractual-relational coordination?

Second, with regard to the interaction zone much theoretical work remains to be completed. The present conceptualization is based upon a possibility space, so as dyads preferred coordination mode becomes relational the zone inflates. However, dyads do not have to use all aspects of the possibilities that are open to them. Thus, it is likely that dyads will be attracted to specific modes of interaction within the possibility space. It is likely that only certain sections of the IPS will be populated with relationships and firms. Considerable empirical work will be required to examine this matter.

Third, what coordination constructs are at work in each part of the IPS and how are they transformed across contextual shifts? It is known that trust and commitment are associated with relational coordination (Håkansson and Snehota, 1995, Morgan and Hunt, 1994), but it is possible that other constructs may also characterize this context. There also remains the question of how trust and commitment are re-shaped under hierarchical influence. It seems unlikely that trust and commitment will not play a part in hierarchical coordination, but how they mutate under different coordination modes (Sharma, et al., 2001) will require considerable research and theory development.

Finally, how do different mixtures of coordination constructs explain interaction between parties and how does interaction create coordination contexts? The interaction zone between firms remains the most difficult to comprehend, for interaction is forever indeterminate, based on process and subject to emergence (Håkansson and Snehota, 1998). Thus, this area of research will remain the most elusive, yet the most intriguing.

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