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## **Collaborative planning, forecasting and replenishment (CPFR) as a relational contract: an incomplete contracting perspective**

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**Abstract:** This paper analyses collaborative planning, forecasting and replenishment (CPFR) from an incomplete contracting perspective. In the absence of economic incentive problems, CPFR enables trading partners to improve operational efficiency through a structured process of learning by both sharing and utilising information across firm-level boundaries. From a review of the incomplete contracts literature and a case study of the CPFR arrangement between P&G and Wal-Mart, this paper posits CPFR as a relational contract for managing economic incentive problems, which can arise in a vertical supply relationship due to transaction costs, agency costs, and relative bargaining positions.

Theoretical propositions are developed regarding when this IT-supported intermediate form of vertical contracting is preferred to other governance modes and how CPFR can be an effective relational contract to support economic exchange and to create intellectual capital between trading partners. With efficient vertical coordination and enhanced specialisation incentives for mutual commitment, CPFR allows contracting parties to avoid the difficulties of formal contracting while realising the benefits that would be anticipated from vertical financial ownership.

**Keywords:** CPFR; information sharing; mutual commitment, relational contract; vertical integration.

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## 1 Introduction

Collaborative planning, forecasting and replenishment (CPFR) is a new supply chain practice wherein trading partners use information technology (IT) and a standard set of business procedures to learn by combining their intelligence in the planning and fulfilment of customer demand (VICS, 2004).<sup>1</sup> By linking sales and marketing information to supply chain planning and execution processes, CPFR can result in a simultaneous reduction in inventory levels and an increase in sales for both retailers and suppliers (Aviv, 2005; Schwarz, 2004). In the Operations Management literature, CPFR is considered superior to the earlier electronic data interchange (EDI)-based supply chain practices since it is based on much broader cooperative arrangements where retailers and suppliers jointly develop forecast by sharing point-of-sale (POS), inventory, promotions, strategy and production information (Terwiesch et al., 2005).

Potential economic benefits of CPFR are well-recognised and have been publicised in practice by successful retail businesses such as Wal-Mart. Despite anecdotal success stories, however, considerable controversy still surrounds CPFR and most collaboration initiatives in practice have not gone beyond the pilot stage (Kurtulus and Toktay, 2004). For example, according to the CPFR baseline study by KJR Consulting, 67% of Grocery Manufacturers of America (GMA) (2002) member companies are engaged in some forms of CPFR practice, with only 19% moving beyond pilot studies to implement CPFR with their trading partners (GMA, 2002).

When implemented properly, collaborative supply chain relationships enable trading partners to create intellectual capital and economic value that no single firm could have created alone in the vertical chain (O'Keefe, 2001). For many companies, however, the

attempts could be a costly failure because, along with increased economic benefits, collaborative arrangements also present a set of economic incentive problems due to increased dependencies (Blois, 2002). Specifically, asymmetric information sharing and imbalanced relation-specific investments could change *ex post* bargaining positions and thus affect *ex ante* risk assessment by contracting parties (Cachon and Netessine, 2004). In order to both create intellectual capital and to appropriate the economic value from a collaborative arrangement, trading partners must analyse the governance structure of vertical relationship and account for the economic incentive problems arising from information sharing and relation-specific investments.

Theoretical development regarding CPFR has been underway mostly in the discipline of operations management. While many research papers investigate the economic value of sharing information in a supply chain, the extant literature on CPFR assumes either that the information available to the trading partner is exogenously given or that the information is always shared truthfully (Aviv, 2001). Under either of these assumptions, CPFR always results in both parties being better off, which falls short of explaining the lack of widespread adoption of CPFR in practice. A purely operational or technical approach on CPFR does not address the challenges of contracting economic intangibles and the difficulties of aligning economic incentives between contracting parties. In the absence of the analysis of economic incentive problems inherent in vertical contracting, the prediction of preferred organisational form will be indeterminate (Mahoney, 1992).

The current paper analyses CPFR from an incomplete contracting perspective. In this paper, CPFR is defined as a (type of) *relational contract* in which electronic information sharing and common organisational procedures for joint activities play a critical role in coordinating interdependent tasks between trading partners in the vertical chain. By drawing on the incomplete contracting literature, this paper examines the benefits and costs of CPFR practice as a distinct governance mode of a relational contract in vertical relations.<sup>2</sup> Systematic and repeated interactions between trading partners under the CPFR arrangement could improve the mutual learning of business objectives and strategy and further induce reciprocal relation-specific investments in intellectual capital over time as an adaptive response to collaborative exchange environment. In addition, by analysing a case of the CPFR arrangement between Wal-Mart and Procter and Gamble (P&G), it also identifies new challenges created by this new business practice and provides theoretical insights into better understanding of the incomplete contracting theories and managerial implications for this IT-supported supply chain practice.

Although CPFR initiative is grounded in an operational efficiency concern for the supplier-buyer relationship, CPFR extends beyond traditional operational issues to emphasise vertical coordination and governance of the transactions in the vertical supply chain. Effective collaboration will only be possible if there is an effective governance structure that addresses potential economic incentive problems between the contracting parties. To the extent that information and actions are observable and that relation-specific investments are reciprocal under CPFR arrangement, CPFR provides an effective deterrence to *ex post* opportunism and further induces cooperation across firm-level boundaries. Greater efficiency gains from specific knowledge between CPFR partners are the reinforcing factors that make this intermediate form of relational contracting superior to standard vertical contracting or vertical financial ownership.

Economic analysis of incentive problems in vertical relationship has primarily been based on organisational economics of incomplete contracting including transaction costs

theory, agency theory, and property rights theory (Mahoney, 2005). These perspectives cover a wide range of possible contractual problems that arise from asymmetric information, bounded rationality and relation-specific investment. Information sharing between contracting parties plays a crucial role in these theories, with the general prediction that more or better information sharing will usually improve inter-firm governance and economic performance for both parties. Although there is considerable research on economic incentive issues in vertical relations, there is limited research on economic incentive problems that are related to the sharing of intangible assets in contractual settings in which there is an absence of enforceable property rights or viable vertical integration options.<sup>3</sup> This paper provides an incomplete contracting analysis of when and how increased and systematic information sharing and joint activities mitigate a set of economic incentive problems in vertical relationships. Specifically, theoretical propositions developed in the paper examine 'when this IT-supported intermediate form of vertical contracting is the *preferred* governance mode in hosting vertical relationship, and how CPFR can be an *effective* relational contract to support economic exchange and create intellectual capital between trading partners'. The application of incomplete contracting theories into new and increasingly important forms of IT-supported vertical contractual arrangements advances our understanding of firm-level boundary decisions and supply chain management.

The remainder of the paper proceeds as follows. Section 2 reviews prior research studies concerning the incomplete contracts literature while focusing on the role of information sharing in relational contracting. Section 3 examines a case of CPFR arrangement between P&G and Wal-Mart. Section 4 provides theoretical propositions on the CPFR arrangement as a relational contract. Finally, Section 5 presents discussion and conclusions.

## **2 Theories and literature**

Prior studies in the field of supply chain management practices suggest that, in order to develop a successful collaborative business relationship, the contracting parties must invest in obtaining relevant data, generating forecasts and then exchange their forecasts to form a single shared forecast for joint decision-making (Aviv, 2002; Cachon and Fisher, 2000; Cetinkaya and Lee, 2000; Lee and Whang, 2000). While information sharing and improvement efforts by one party could benefit both contracting parties, reliance on the other party is also to be increased over time as a result of repeated interactions with the chosen trading partners. Both contractual parties can either cooperate or decide to act non-cooperatively, foregoing the economic benefits of intellectual capital (Teece, 2000). These are the options that are open in the classical case of a prisoner's dilemma game and potential failure in (vertical) coordination.

Transaction costs theory maintains that markets rely on formal contracts that are largely enforceable by a court, but because formal contracts are typically incomplete, relational contracts may be needed in order to overcome some of the difficulties with formal contracts (Williamson, 1975, 1985). Especially when vertical financial ownership is not a viable option, both supplier and buyer could circumvent difficulties in formal contracting by adopting a relational contract approach to realise long-term mutual benefits from the exchange.<sup>4</sup> A relational contract allows trading partners to utilise detailed knowledge of their specific activities and to adapt to new information as it

becomes available (Macneil, 1980). For the same reasons, however, relational contracts cannot be enforced by the courts and so must be self-enforcing. For example, game-theoretic modelling studies on relational contracts in modern property rights tradition suggest that each party's reputation must be sufficiently valuable that neither party wishes to renege on their agreements (Baker et al., 2002; Gibbons, 2001; Halonen, 2002).<sup>5</sup> In contrast, research studies from the transaction costs and classical equity perspective consider relational contracts as fixing the nature of contractual adjustment processes towards a balance between shares of ex ante sunk-cost investment and shares of ex post joint surplus (Crocker and Masten, 1991; Hackett, 1994; Williamson, 1985).<sup>6</sup>

### 2.1 *Incomplete contracts perspective on vertical relationship*

Formal contracts are incomplete in the sense that there are inevitably some circumstances that are left out of the contract and that there will remain some residual rights of control that are not specified in the contract. Accordingly, all residual rights to the asset not expressly assigned in the contract accrue to the party who owns the asset. The allocation of the residual rights of control will thus have an important effect on the bargaining position of the parties to the contract since a party that owns the essential asset will be in a position to capture the economic benefit from the transactions which was not explicitly allocated in the contract by threatening to withhold the asset otherwise.

According to the incomplete contracting perspective by Grossman and Hart (1986) and Hart and Moore (1990) – or the GHM models – the dilemma of providing economic incentives to the parties when the contract is incomplete can be mitigated if those parties are assured a substantial share of economic value they create by providing them with the *ex post* bargaining power inherent in *asset ownership* in terms of the residual rights of control. This incomplete contracts approach seeks to improve economic incentives through ownership of essential assets. In general, the GHM models suggest that an agent who is indispensable to an asset should own that asset, and that complementary assets should be owned by the same agent when complete contracts are infeasible. However, the GHM models limit the type of assets to tangible assets, such as machines and factories, because they are alienable and thus can change ownership.

Brynjolfsson (1994) extends the GHM models and considers a setting where production requires the use of physical and *information assets*, focusing on optimal allocation and ownership of these assets.<sup>7</sup> According to Brynjolfsson (1994), when the two complementary assets of production – i.e., inalienable information and alienable physical assets – are separately owned by contracting parties, giving the informed party ownership of the physical asset will improve the informed party's bargaining power to capture a higher value on the surplus in bargaining and economic incentives to invest ex ante. However, it will reduce the investment incentives of the other party as it takes bargaining power away from the previous owner of the physical asset. Whether this loss is outweighed by the improved economic incentives to the informed party will be a function of how necessary the information is to the production and how important it is to maximise the incentives of the informed party relative to those of the other party. The more important it is to provide economic incentives to the informed party, the more likely it is that it will be optimal to give the informed party ownership of the physical asset.<sup>8</sup>

This incomplete contracts approach enables us to examine how different level of the alienability and contractibility of the information asset affects the *economic incentives* of

contracting parties, thereby influencing inter-firm governance and economic performance of vertical relationships.<sup>9</sup> More specifically, when we compare the economic value created under the best possible ownership structure when information is alienable to the economic value created under the best possible ownership structure when information must be owned by a particular party, we can define the difference as the net economic value of alienability. In some circumstances, this net economic value can be quite large, which suggests that transforming information in a contractible form can create high economic value even without increasing the stock of knowledge itself. Economic incentives for IT investments in ways to make information alienable will be strongest if the economic value of alienability is high. In particular, the digital revolution has led to the creation of numerous alienable information assets. In addition, positive externalities of IT adoption suggest that more information will fall into this category. As a result, the reduction in information costs enabled by IT is leading to substantial new approaches to the organisational challenge of co-locating information and decision rights across firm boundaries.<sup>10</sup>

Jensen and Meckling (1992) provide a useful framework for studying the issues of information assets, organisational structures and economic incentives in vertical relationships. Informational variables are fundamental to the structure of organisations because the quality of decisions is determined by the quality of information available to the decision-maker and therefore *the co-location of pertinent information and decision rights* enables the decision-maker to make optimal decisions. Co-location, however, has potential agency problems, since the economic interests of the informed party are seldom served in ways that correspond perfectly with the economic interest of the other party in its entirety. Hence, a trade-off arises between the use of better information and the control of behaviour that fails to create the aligned economic interests of the contracting parties. The inter-firm governance in vertical relationship can be understood as an attempt to locate decision rights so as to minimise the sum of the economic costs arising from poor information and agency problems.

According to Jensen and Meckling (1992), there are two fundamental ways to bring information and decision rights together: *the information technology solution*, which transfers the information required for the decision to the decision-maker, using the organisation's IT systems, or *the organisational redesign solution* which redesigns the organisational structure so that the decision-making authority is where the pertinent information is located. The implementation of this co-location depends on the nature of the pertinent information.<sup>11</sup> By definition, general knowledge, which is useful for decision-making, calls for the IT solution because it can be transferred at low cost. In contrast, when specific knowledge plays a key role in a decision the best solution calls for restructuring decision rights to provide decision authority to the one who possesses or has access to the pertinent information since the transfer of specific knowledge is too costly. If the structure of organisations is an efficient response to information costs, a change in information costs may induce a change in the organisational structure. In particular, new IT-supported business practices can change organisational structure and firm-level boundaries by facilitating certain information flows and by turning knowledge that used to be specific into general knowledge.

While useful, Jensen and Meckling's (1992) deterministic view on information costs and organisational structure has limitations in addressing potential incentive problems between organisations under information sharing agreements. For example, Demsetz (1992) maintains that the distribution of knowledge within a firm is endogenous to

management decisions as the firm decides what knowledge or information to acquire. This decision, once made, sets the knowledge content of the firm and changes the distribution of this knowledge within and between firms. The more basic determinants of organisational structure, then, are the governance and economic incentives that influence its decision as to what stocks of knowledge to acquire from and share with trading partners and to create intellectual capital in vertical relationships. Therefore, in order to examine the effects of information sharing on the economic incentives under CPFR arrangements, it is necessary to examine not only the ownership patterns of the complementary assets, but also the governance structure of information sharing relationships.

## 2.2 Information sharing and relational contracts

When information is shared between vertically adjacent firms, an important governance issue is the nature or level of information sharing. For example, some retailers share information related to the inventory or sales of the products while other retailers sell such information to suppliers. Initially, a retailer would share the information that creates the most economic value for the retailer and that reduces the retailer's *relative bargaining power* the least. As the retailer shares more information, the relative effect that information sharing has on its bargaining position will tend to increase in the given vertical relationship. At some point, the economic costs of sharing additional information will outweigh the economic benefits and this is the point at which the retailer will stop sharing information. This approach explains why retailers share varying levels of information with different suppliers in competitive bargaining relationships.

Seidmann and Sundararajan (1998) define four different levels of inter-firm information sharing based on the impact it has on the parties that contract to share the information to support the exchange in vertical relationship: ordering information, operational information, strategic information, and strategic competitive information. The base case of information sharing is the arrangement where the parties exchange just *ordering information* through electronic data interchanges (EDI), which are the most common forms of supply chain arrangements. At this basic level, both parties gain from reduced inventory levels and cycle times but the value gained is not necessarily symmetric since each party improves efficiency independently.

Sharing *operational information* occurs when one party owns valuable information, while the other party possesses the skill to use this information more efficiently. An example of the situation is vendor management inventory (VMI) where the vendor manages inventory and replenishment for the retailer. The vendor has specialised knowledge of the production schedule of the products in question. This firm-specific and product-specific knowledge reduces the supply-side uncertainty, which will lower average inventory for the retailer. Another economic benefit that can be achieved in this cooperative arrangement is an increase in the retailer's sales. However, the retailer's costs of ordering and fulfilment are now born by the vendor, which increases supply-side costs.

Sharing *strategic information* occurs when one party possesses information that is can derive little independent economic value from, but another organisation can use this information to generate strategic benefits for itself.<sup>12</sup> For example, a retailer possesses point-of-sale (POS) data on all the products it sells. In isolation, this information is not strategic for the retailer. However, a vendor can improve their demand forecasts and

production planning by analysing detailed transaction level POS information gathered from many retailers. In principle, both the vendor and the retailer could gain from improved vertical coordination. The retailer gets improved operational efficiency and reduced transaction costs while the vendor is able to generate accurate demand forecasts and production planning. However, it is not clear how much the retailer actually captures such benefits from information sharing. One benefit that may not be immediately tangible comes from relation-specific knowledge with the current trading partners.

At the highest level of information sharing, it is possible for a retailer to allow some trading partners to access broader market information that provides additional competitive benefits to the vendor. Under exclusive category management or category captainship arrangement,<sup>13</sup> for example, the chosen vendor can derive economic value from this *strategic competitive information* that other competitive vendors could not access. This form of information sharing does not give the vendor competitive advantage over the retailer, but provides substantial advantage over other vendors in the same category. Privileged access gives that vendor not only strategic benefits (from improved demand forecasts and production planning) but also competitive benefits (from sales and demand information about the whole product category), in addition to operational benefits (from superior inventory and replenishment management). It can also reduce the retailer's operating costs substantially – not only are all order management costs eliminated, but also the retailer deals with only one vendor per category and hence has a substantial reduction in its transaction and merchandising costs.

From the incomplete contracting perspective, high level of information sharing between contracting parties may induce superior governance of *relational contracting* in vertical relationship, which substitutes for standard vertical contracting or vertical financial ownership. Research studies have suggested that vertical coordination and control are often achieved not by financial ownership but by dense flows of information, technology, capital and human resources across firm-level boundaries and these flows are backed in part by promise and reputation rather than entirely by court-enforced contracts (Williamson, 1985).

More recently, Baker et al. (2002) develop an economic model of relational contracts and analyse the collaboration incentives of contracting parties for their interdependent tasks. In this economic model of repeated games, the collaborative relationship between contracting parties takes centre stage, and the ownership of the assets or integration decisions are regarded as instruments to provide economic incentives for relation-specific investments in the service of that relationship. For example, in a supply relationship between an upstream vendor and a downstream retailer, the downstream party would like the upstream party to take actions that improve operational efficiency in the downstream distribution process (i.e., economic incentives to make relation-specific investments for quasi-rents). But, when each party's actions are unobservable (moral hazard) and outcomes are observable but not verifiable (non-contractibility), the vendor may give attention to the alternative buyers so as to improve its bargaining position with the current partner while the retailer would like to capture all quasi-rents generated in the relationship. Such opportunistic actions by the vendor and the retailer would dissipate economic value that they could create from relation-specific investments and cooperation. However, in a given environment, a desirable relational contract might be feasible either under integration (i.e., relational employment contract) or under non-integration (i.e., relational outsourcing contract) (Baker et al., 2002).<sup>15</sup> For example, under either ownership structure, the downstream party can promise to pay the upstream

party a bonus contingent on superior outcomes that are observable but non-contractible.

According to Baker et al. (2002), the outcome of this repeated games model depends on the size of the economic incentive to renege on a relational contract – i.e., the extent to which the short-run economic payoff from defection exceeds the long-run economic payoff from cooperation. The key question is whether integration or non-integration can make a given promise self-enforcing. If the downstream party reneges on the bonus under integration, he still owns the good. But, if the downstream party reneges on the bonus under non-integration, he cannot use the good without buying it for at least its value in its alternative use. In this sense, non-integration gives the upstream party more recourse if the downstream party should renege on the promised bonus. But non-integration creates an economic incentive for the upstream party to increase the value of the good in its alternative use, in order to improve her bargaining position with the downstream party [Baker et al., (2002), pp.41–42]. Thus, the guiding principle is to induce efficient collaborative actions and to discourage inefficient opportunistic actions by implementing the best possible relational contract which uses informal or flexible instruments, including information sharing and mutual learning, in tandem with formal instruments of asset ownership to ameliorate potential hold-up problems.<sup>16</sup> However, the drawback of any relational contract is that it cannot be fully enforced by the courts and so must be self-enforcing. In particular, having a relational contract between firms that utilises the contracting parties' specific expertise typically makes it prohibitively expensive for the courts to adjudicate contractual disputes. Therefore, to be effective, each party's concern for its reputation and gains from the long-term relationship must outweigh that party's economic incentive to renege on the relational contract (Baker et al., 2002).

When it is infeasible or too costly to vertically integrate interdependent tasks, contracting parties might try to build effective economic deterrence to contractual hold-up (Williamson, 1983). The key to effective economic deterrence is to give each contractual party sufficient means to respond to any opportunistic behaviour by the other contractual party. However, there will be insufficient economic deterrence if the economic gain that one party can get from opportunistic behaviour more than offsets the economic penalty the other can possibly impose. Such an economic situation can be remedied if the favourably positioned party provides the vulnerable party with an economic bond to support exchange.<sup>17</sup> Reciprocity transforms a unilateral relation into a bilateral relationship, where both contracting parties understand that the exchange will be continued only if economic reciprocity is observed (Chi, 1994). One way to avoid contractual hold-up and thus to support economic exchange is for the buyer and supplier to devise a mutual reliance relationship. Mutual commitment can serve to equalise the risk exposure of the contractual parties, and thereby reduce the economic incentive of any contractual party to behave opportunistically in the exchange process *ex post* (Kim and Mahoney, 2006).

In sum, one way to avoid inefficient actions in vertical relationship is to devise a *mutual reliance relationship*, in which the potentially opportunistic contractual parties reciprocally invest in relation-specific assets and processes, such as inter-organisational IT system, just-in-time practice or co-location of production facilities, which create intellectual capital and greater economic value only in the current exchange relationship. If the non-salvageable economic value of mutual commitment is substantial for both the buyer and the supplier, an efficient exchange outcome is to be expected. Reciprocal exposure to commit credibly to the contractual agreement is accomplished through

sunk-cost investments in relation-specific assets and processes in which high switching costs are strategically incurred if any attempt is made to change contracting parties or to renegotiate contracts opportunistically.

### **3 An illustrative case: P&G and Wal-Mart**

This section describes the development and evolution of IT-based vertical relationship between Procter and Gamble (P&G) and Wal-Mart. There are at least two purposes for adopting this exploratory approach. First, it illustrates how relational contracts, which have been examined mostly in the formal contracting literature, emerge and evolve over time in practice as a collaborative supply chain arrangement in the vertical chain. Second, careful observation of the case provides further insights to examine what the analytical models of relational contracts predict under a set of assumptions. New findings and insights from this case study enable development of theoretical propositions and future research agenda that have not fully addressed in the extant research literature.

#### *3.1 Initial conditions and early efforts*

Wal-Mart has pioneered many aspects of retailing including information management by heavily investing in IT system. By 1987, Wal-Mart completed its communications network installation that sends data from all stores to headquarters, providing real-time inventory data. As a result, Wal-Mart merchandise was tailored to individual markets and stores through its 'traiting' practice which is a process that indexed product movements in the store to over a thousand store and market traits. This efficient distribution and merchandising system enabled Wal-Mart to offer lower prices to customers than traditional grocery retailers. Wal-Mart gave its store managers more latitude in setting prices than did centrally priced chains. Store managers priced products to meet local market conditions in order to maximise sales volume and inventory turnover (Foley and Mahmood, 1996). In its vendor relationship, Wal-Mart eliminated manufacturers' representatives from negotiations at the beginning of 1992 and centralised its buying at the head office, with no single supplier accounting for more than 2.4% of its purchases.

P&G is one of the largest manufacturers supplying grocery retailers and wholesalers and a leader in designing branded consumer goods. P&G had developed a reputation for aggressive and successful world-class development and marketing of high-quality consumer goods. The strong consumer pull provided the company with an advantage in dealing with retailers and wholesalers (Clark and McKenny, 1995). Relationships between P&G and the buyers through 1980 had primarily been based on negotiations over short-term initiatives and promotions. The reliance on a multitude of promotional programmes increased buyer inventories and required manufacturers to also maintain large inventories in order to be able to meet the high demand artificially created by forward buying during these promotional periods. Information sharing between P&G and the buyers was limited often as a result of conventional business practices. Brand managers with meet-sales-quota-or-else directives to retail buyers were rewarded mainly based on low-cost purchase volumes (*InformationWeek*, 2001). Because there was no collaborative sharing of sales data, the supplier could not see the discrepancy between what the retailer bought and what it actually sold to consumers until weeks later, if at all, from third party research firms that aggregate and sell POS data.

In the mid 1980s, P&G launched several projects to improve supply logistics and reduce channel inventory by implementing a process that eventually was called continuous replenishment process (CRP). In 1985, P&G tested this new approach to channel logistics for replenishment ordering with a moderate-size grocery chain. This test involved using EDI to transmit data daily from the retailer to P&G on warehouse product shipments to each store. P&G then determined the quantity of products to be shipped to the retailer's warehouse by using shipment information rather than retailer-generated orders. The results of this initial experiment were impressive in inventory reductions, service improvements, and labour savings for the retailer (Grean and Shaw, 2002).

A key element of the new practice was the development of common databases for product pricing and product specifications. The common databases in CRP implementation were designed to provide data directly to the buyer's own system electronically. This electronic link resulted in dramatic reductions in invoice deductions for the retailers using the new pricing database to verify or confirm purchase order information. In April 1988, P&G began shipping products based on retail sales data and placing orders automatically for the retailer.

More importantly, in order to strengthen their CRP operations, P&G overhauled its time-honoured system of compensating brand managers. The company eliminated sales quotas and created business-development teams with trading partners, starting with its most important one, Wal-Mart. By 1993, Wal-Mart had become P&G's largest customer, doing about \$3 billion in business annually, or about 10% of P&G's total revenue and P&G was one of the first manufacturers to link up with Wal-Mart by EDI. In response, Wal-Mart suggested that P&G simply ships products on a just-in-time basis by sharing its retail sales data in real-time.

By understanding potential benefits from their complementary information and supply chain practices, the relationship between P&G and Wal-Mart began to change from adversarial to cooperative one. To emphasise their strong commitment to the new collaborative practice, the P&G and Wal-Mart team developed a common mission statement:

"The mission of the Wal-Mart/P&G business team is to achieve the long-term business objectives of both companies by building a total system partnership that leads our respective companies and industries to better serve our mutual customer – the consumer." [Grean and Shaw, (2002), p.160]

With top executives from both companies committed to rapid adoption as an organisational enabler of process improvement efforts, implementation of CRP with Wal-Mart took less than two months in total (Lok et al., 2005).

### *3.2 Evolution to CPFR arrangements*

In an attempt to fully capture the advantages associated with informed decision-making in the vertical chain, CRP relationship between P&G and Wal-Mart had evolved into vendor management inventory (VMI). VMI is a vertical arrangement where P&G takes on the responsibility of managing the inventory at Wal-Mart's warehouse for the products it supplies, thereby achieving co-location of pertinent information and decision rights in the supply chain.

Initially, VMI was guided by a long-term contract that specifies the financial terms, inventory constraints and performance targets such as service measures. This vertical

arrangement can be mutually beneficial for the retailers and the supplier. The retailer is relieved of the burden to specify, place, and monitor purchase orders, while maintaining guaranteed service levels. The supplier benefits from substantially reduced demand uncertainties and safety stocks, reduced logistics costs and lead-times and improved service levels (Aviv, 2002).

Mutual reliance and understanding of their businesses developed in the process of implementing a series of supply chain initiatives further induced their commitments to their long-term collaborative relationship. As P&G and Wal-Mart began to increase the level of information sharing and joint activities from inventory to sales forecasting and strategic planning, their VMI partnership had evolved into collaborative, planning, forecasting, and replenishment (CPFR) relationship. CPFR was started by Wal-Mart in 1993 as its internal experiment, and CPFR was coined through piloting the practice with Warner Lambert. The subsequent goal was to develop industry standards for vertical collaboration using the internet, much like what was done with EDI for CRP practice in the 1980s. The successful CPFR pilot led to the creation of the voluntary inter-industry commerce standards (VICS) sponsored by CPFR Working Group in 1996 and is in active existence today. Using private and public exchanges, CPFR became accessible to both large and smaller companies as the best practice in the supply chains.

Because CPFR uses a set of formal procedures and technological models that are open yet allow secure communications between trading partners, it is considered the most structured collaborative business framework. Setting up a CPFR relationship with a trading partner is a structured nine-step process that has been hashed out over several years by the VICS group. Successful implementation of CPFR boils down to trading partners setting expectations up front about information sharing and joint activities and then implementing a sequence of common procedures adaptively. Combined with electronic sharing of information over the Internet link, CPFR partners are able to engage in total supply chain visibility and forecasting (Schwarz, 2004).

In its CPFR partnership with P&G, Wal-Mart's marketing information is integrated with P&G's manufacturing systems to make better consumer-based decisions across their firm-level boundaries. For example, Wal-Mart's POS data show the transaction-level information about consumer's choices, thus providing the actual demand information on what is selling and the selling price. P&G's products are then developed, manufactured and delivered to meet those customer needs in a timely manner. CPFR pilot with P&G provided a structured contractual platform for joint forecasting and planning activities between Wal-Mart and its vendors that ultimately drive the replenishment process through the entire supply chain. By 2003, Wal-Mart has established over 600 trading partners through CPFR to reduce its operating expenses to the lowest in the industry. Successful collaboration with CPFR partners allowed Wal-Mart to price its products 10% below most of the competitors (Andraski and Haedicke, 2003).

The case study of the CPFR arrangement between Wal-Mart and P&G reveals that successful implementation of CPFR depends not only on extensive information sharing but also on mutual learning about as well as commitment to the dedicated partners from the repeated interactions. It grows out of first gaining an awareness of its contractual partners' business needs by asking: "What is competitive advantage of your partners? What is the competitive advantage to you if you combine them with yours? What kind of business relationship does that create?". Thus, successful implementation of CPFR requires higher levels of communication including the exchange of strategies and objectives between partners at the beginning of a planning period.

To sum up, the previous case provides the following insights on the CPFR arrangement. First, the CPFR arrangement improves overall visibility in the vertical chain from electronic information sharing and thereby enhances operational efficiency in vertical contractual relations. This arrangement allows trading partners to reduce inventory costs and to increase retail sales by synchronising demand forecasting and production planning. These factors provide trading partners economic incentives to jointly develop this IT-supported governance mode of vertical contracting.

Second, the impact of information sharing is not merely operational. Information sharing also alters the relative bargaining power of the contracting parties in the vertical relationship. Additionally, developing cooperative relationship requires substantial time and efforts for both parties to better understand their interdependent activities and business objectives. Therefore, without anticipation of substantial long-term economic benefits for both parties, there are potential economic incentive problems between the contracting parties, which will make it difficult to develop CPFR relationships in the vertical chain.

Third, in a successful CPFR relationship, the retailer has stronger economic incentives to further specialise in collecting and sharing as much information as possible that is of economic value to the vendors and the retailer. Similarly, the vendor, who has privileged access to the retailer's information and decision-making authority, has economic incentives to specialise in making effective replenishment and production decisions which will make its activities more valuable in the given relationship. Such reciprocal specialisation incentives are the reinforcing factors to realise greater economic benefits from the CPFR partnership.

Finally, CPFR provides trading partners a set of structured organisational procedures and technological standards where contracting parties systematically increase mutual reliance on each other's business from increased information sharing and delegation of decision-making on interdependent value-chain activities. The structure of bilateral reliance for joint forecasting and planning under the CPFR arrangement could induce cooperative actions by CPFR partners over time toward a mutual commitment to their long-term relationship.

The case study of the evolution of vertical relationship between P&G and Wal-Mart provides supporting evidence for the predictions of the incomplete contracts literature but also reveals some limitations of the formal contracting approach in explaining the role of informal mechanisms in their adaptive efforts toward mutual commitment. Consistent with the incomplete contracts literature that has been reviewed in the previous section the case study illustrates how increased communication and joint activities from the repeated exchange could lead to superior vertical coordination without resorting to costly vertical integration while overcoming the difficulties of formal contracting in vertical relations. More specifically, successful implementation of CPFR requires high levels of information sharing between contracting parties, as suggested by Seidmann and Sundararajan (1998) and the delegation of decision rights and the use of IT solutions for the co-location of pertinent information and decision rights as suggested by Jensen and Meckling (1992). Effective CPFR partnership in vertical relations is also supported by combining the complementary assets of information and production and jointly realising economic benefits from the repeated exchange with the current trading partners as implied by Baker et al. (2002) and Williamson (1983). The CPFR arrangement between P&G and Wal-Mart provides them with a cooperative platform to further improve

operational efficiency and vertical coordination across firm-level boundaries. The sources of economic value creation and incentive problems under the CPFR arrangement are detailed, focusing on the role of IT-based information sharing and mutual adaptation efforts between buyer and supplier in the retail industry.

However, the case study also reveals that successful CPFR arrangement between P&G and Wal-Mart is rather an exception and it has not been effectively extended to other vendor-retailer relationships in practice. While previous research studies in the formal contracts literature highlight the nature of the incentive problems by providing analytical models of vertical contracting under a set of assumptions, they are limited in addressing the conditions and difficulties of implementing a relational contract in practice. More specifically, formal contracting studies often ignore the importance of simultaneously managing bargaining power and information asymmetries, transaction contingencies and informal coordination mechanisms in the development of collaborative vertical relationship which requires mutual learning of interdependent activities in the vertical chain. In our efforts to contribute to theory building, next section will focus on these new insights from the case study and develop theoretical propositions regarding the conditions for successful implementation of CPFR as a relational contract in comparison to other governance modes in vertical relations.

#### **4 CPFR as a relational contract**

From the review of the incomplete contracts literature and the case study of CPFR arrangement between P&G and Wal-Mart, this paper posits CPFR as a relational contract which becomes an alternative governance mode to standard vertical contracting or vertical financial ownership. In the strategic management literature, Mahoney (1992) identifies advantages (e.g., coordination and control, audit and resource allocation, motivation and communication) and disadvantages (e.g., bureaucratic, strategic and production costs) of vertical financial ownership and suggests that every motive for vertical financial ownership may be achieved alternatively by an appropriate vertical contract when agency and transactions costs are assumed to be absent. Similarly, the current paper suggests that, if agency and transactions costs can be substantially reduced under the CPFR arrangement in the vertical chain, this governance mode of relational contracting allows the trading partners to achieve efficient vertical coordination and jointly create greater economic value than those from standard vertical contracting or from vertical financial ownership.

One of the new findings from the previous case study of P&G and Wal-Mart is that, as new technology and supply chain practices become available and as their business environments change over time, the governance between P&G and Wal-Mart has eventually evolved in order to better manage their vertical relationship and maximise mutual benefits from the repeated exchanges. According to Baker et al. (2002): "Relational contracts within and between firms help circumvent difficulties in formal contracting" (p.40). "In a given environment, the efficient organizational form maximizes the total surplus. For some parameter values, relational employment will be the efficient organizational form; for others, relational outsourcing will dominate" (p.58). Similarly, in the comparative institutional analysis of governance structures, Williamson (1985, p.408) concludes that: "Flawed modes of economic organisation for which no superior feasible mode can be described are, until something better comes along, winners nonetheless". As

discussed in the literature, relational contracts offer important advantages over standard formal contracting and vertical financial ownership, but relational contracts are vulnerable to renegeing. Therefore, implementing the best feasible relational contract, such as CPFR in the current paper, requires further evaluating necessary and sufficient conditions with respect to transaction contingencies, relative bargaining power and information asymmetries between trading partners, and specialisation and cooperation incentives in the service of their collaborative relationship.

4.1 CPFR versus standard vertical contracting

As described in Table 1, when transaction costs are low (i.e., both demand uncertainty and asset specificity are low), vertical financial ownership is not a preferred governance mode. In such a vertical relationship, the adoption and performance of CPFR as a relational contract over standard vertical contracting will be determined mainly by potential agency problems and CPFR’s impacts on agency costs (i.e., information asymmetry and task complexity) and relative bargaining power between contracting parties.

**Table 1** Impacts of CPFR on organisational economics and inter-firm governance

		<i>Transaction costs due to demand uncertainty and asset specificity</i>	
		<i>High</i>	<i>Low</i>
			Relational contracting <sup>a</sup>
Agency costs due to information asymmetry and task complexity	High	Vertical integration	⇐ CPFR <sup>c</sup>
	Low	Long-term contracting <sup>b</sup>	⇓
			Standard contracting

Notes: <sup>a</sup>Relational contracting: Obligations of principals and agents are specified and self-enforced by contracting parties.  
<sup>b</sup>Long-term contracting: Obligations of principals and agents are specified and enforced by third parties.  
<sup>c</sup>CPFR: Electronic information sharing and formal organisational procedures for joint activities in CPFR lead to improved visibility in the vertical chain and mutual understanding of business objectives and strategies. Such repeated interactions between CPFR partners induce reciprocal relation-specific investments for interdependent tasks as an adaptive response to collaborative exchange environment.

Without fully understanding trading partner’s business objectives and economic incentives, both retailers and suppliers would be initially reluctant to share their proprietary information in the pilot stage of CPFR project because of the possibility that their contractual partners will take advantage of information sharing and interdependence. For instance, a retailer’s sales forecasts provide information about what the retailer intends to do in a given future state of the world. These intentions, however, are not fully verifiable and cannot be enforced by the third party. The courts may not be able to accurately distinguish between a supplier who properly reserved capacity but failed to fill the order for reasons beyond its control, and a supplier who wilfully ignored the buyer’s request or abused the shared information for purposes outside the contract to its own private benefits. Therefore, there can be an economic incentive problem under

*asymmetric information* between the self-interested buyer and the supplier, and it makes efficient vertical coordination and economic value creating exchange between them difficult to emerge.

More specifically, the sharing of forecasting and planning information under *standard vertical contracting* may cause at least two types of economic incentive problems. First, from the supplier's standpoint, prior research has suggested that, in the absence of verifiable and enforceable contractual obligation for the buyer to purchase what it has forecasted, the buyer may have an economic incentive to inflate forecasts to assure sufficient supply (Cachon and Lariviere, 2001). The buyer offers the supplier a contract to build capacity for a specialised component for which the supplier is the only source. To better manage its capacity and inventories, the supplier would prefer the most accurate information possible. However, the supplier often suspects the buyer of submitting phantom orders, i.e., forecasts of high future demand that do not materialise. Complicating matters, it is difficult to uncover the nature of such orders. The buyer might have truly expected high demand, but random events could still lead to a low demand realisation. Without mutual understanding, the supplier might prefer to delay its actions to a point in time when the buyer is willing to credibly commit to its forecast, which often results in numerous lost sales, hurting both parties. If the supplier does not trust the orders from the buyer at all, there will be no exchange between them, leading to a market failure.

Second, from the buyer's standpoint, there is the risk of information poaching in contractual relationship: information that is transferred from the buyer to the supplier for purposes specified in the contract will deliberately be used by the supplier for purposes outside the contract, to its own economic benefit, and to the detriment of the buyer that provided the information (Clemons and Hitt, 2004). Information poaching is a relevant concern in a wide variety of information activities that can be outsourced. For example, an insurance company using the service of a third-party account administration firm provides their company records on customer accounts so that the account administrators can process and service accounts. The firm with privileged access now has the capability to identify the most profitable customers from the company data, which they can pass on as sales leads to competitors or resell to third-party marketing firms. "At a minimum, this could cause a loss of business. In addition, it could also cause substantial reputational damage to the insurance company if companies and individuals believed their insurer could not be trusted to protect their private information" [Clemons and Hitt, (2004), p.95]. Especially when there are weak intellectual property protection, existence of complementary assets in the supplier, limited predictability and limited observability, it becomes more difficult to deter information poaching, which thus leads to less learning due to reduced sharing of information between trading partners than would be optimal absent poaching risks.<sup>18</sup>

Information poaching is one component of opportunistic behaviours, along with the risk of hold-up, when the buyer has become dependent upon the supplier's services but cannot monitor performance and abuse of power. The research studies in organisational economics have identified a variety of possible governance mechanisms for addressing the contractual risks under information asymmetry. Many traditional remedies, however, have limited ability to address the problems of forecast inflation or information poaching. For example, the classical solution to hidden action problems is to use economic incentive contracts in which compensation to the supplier is based on some observable measure of the output. For the most part, these types of economic incentive contracts

through standard vertical contracting have limited direct use in reducing information poaching problems because the effect of information poaching is typically difficult to observe in output. Alternatively, direct monitoring or outside monitoring may be an effective remedy, although the efficacy of input monitoring is limited by the difficulty in proving wilful forecast inflation, especially if it relies on third-party enforcement with a burden of proof.

As discussed in the literature review, when explicit incentive contracts are difficult to apply in standard vertical contracting, firms can structure a relational contract where loosely defined contractual agreements set the rules for future negotiations, but remain flexible to allow ongoing organisational adaptation (Williamson, 1985). Relational contracting is often supported by a high levels of information sharing and joint activities between trading partners as a part of adaptive learning processes (Salvato, 2003). Since relational contracts often require greater levels of information sharing than standard vertical contracting, the likelihood of information poaching may increase. Thus, the success of structuring CPFR as relational contracting is often contingent on observability of informational activities. As indicated in the case study, however, structured information sharing procedures based on a common IT system and the ongoing negotiation process and joint activities under CPFR can make it more likely that information poaching is observable. To the extent that information poaching is observable through repeated interactions, there will be an effective deterrent to renegeing.

**Proposition 1** As a relational contract, CPFR will be preferred to standard vertical contracting when high task complexity and information asymmetry between contracting parties is mitigated by IT-supported information sharing and repeated interactions.

Compared to standard vertical contracting, structuring mutual reliance and power balance is critical to sustained economic value creation from relational contracting in vertical relations. For instance, prior to information sharing agreement, the retailer is the owner of the information, and will therefore tend to have a bargaining advantage during the negotiation process. However, this bargaining advantage by itself does not insure that all the economic value will accrue to the retailer, as the vendor is responsible for generating economic value from the use of the shared information and may take advantage of this fact to negotiate for a larger share. More specifically, when there are no dominant vendors, small vendors may agree to participate in the CPFR arrangement that is initially unfavourable, as this eliminates the threat of an even more unfavourable situation where a rival vendor gets an exclusive access to strategic and competitive information from the retailer. In this situation, it may be possible for the retailer to actually capture most of the economic value from the CPFR arrangement. However, economic value creation from the relationship will be restricted because limited value appropriation by small vendors *ex post* would weaken their specialisation incentives to relation-specific knowledge *ex ante*. Therefore, it will be difficult for the retailer to initiate and develop true collaborative CPFR relationships, foregoing greater economic benefits from the development of intellectual capital with the CPFR partners.

When there are dominant vendors in a category, as described in the case study, the bargaining considerations change. P&G was the most favourable candidate for a successful CPFR partnership with the category management practice, as efficiency gains for Wal-Mart from having P&G manage their own inventory and merchandise were high.

As a dominant vendor, expected value appropriation by P&G from the CPFR agreement was also high. Once established, CPFR has enhanced their economic incentives for mutual commitment to the current trading partners as a relational contract, which will balance their relative bargaining positions over the additional value creation from relation-specific knowledge and intellectual capital – i.e., relational rents (Dyer and Singh, 1998). As a result, the governance between P&G and Wal-Mart has evolved to better manage their business relationship with the current partners and maximise economic benefits from the repeated exchange.

When the repeated vertical transactions are supported by the CPFR arrangement of electronic information sharing and formal organisational procedures, economic incentive problems of opportunistic renegotiation between trading partners are further reduced due to enhanced visibility and learning in the vertical chain. A relational contract allows trading partners to utilise detailed knowledge of their specific activities and to adapt to new information as it becomes available (Macneil, 1980). Because CPFR uses a set of formal collaboration processes and technological models, it is one of the more structured collaborative business arrangements that place a heavy emphasis on audits and verification on the accuracy of partners' information. When high degree of non-separable team effort is required due to interdependent and complex nature of the vertical exchange, CPFR increases the capability of trading partners to programme their tasks. To the extent that information and actions are observable, CPFR provides an effective deterrence to *ex post* opportunism. As a set of formal inter-organisational routines, CPFR enables trading parties which perform *interdependent tasks* to develop shared understandings about what actions will be taken in a specific instance. These shared understandings help CPFR partners better coordinate the decisions and actions while adapting to variations in the internal and external environment (Feldman and Rafaeli, 2002). Greater expected economic gains from intellectual capital developed in the long-term vertical relationship under the CPFR arrangement are the reinforcing factors that make this intermediate form of relational contracting an effective governance mode in vertical relations, which is superior to standard vertical contracting.

Proposition 2 As a relational contract, CPFR will be preferred to standard vertical contracting when relative bargaining power between contracting parties is balanced by structured joint activities for interdependent tasks.

Proposition 3 CPFR will lead to superior economic value creation when contracting parties adaptively improve visibility and mutual learning for intellectual capital and maintain the balance of bargaining power based on mutual reliance structure.

#### 4.2 *CPFR versus vertical financial ownership*

From the incomplete contracts perspective, CPFR also becomes an alternative governance mechanism to *vertical financial ownership* when CPFR partners jointly achieve efficient vertical coordination and adaptation of managerial hierarchy while retaining strong incentives for specialisation in market exchange. Vertical integration and intense collaborative arrangement are most appropriate when the tasks and activities faced by contracting parties are *highly interdependent and too complex* to be resolved individually and rely on joint activities based on extensive sharing of proprietary information and knowledge. For less complex and independent problems, simply sharing

operational information and synchronising related value-chain activities may be more efficient approach for each party to achieve their goals. Thus, contracting parties should realise that not all vertical relationships require intense collaborative efforts. In some cases, standard vertical contracting of related activities through an EDI-based straightforward exchange of operational information may be sufficient to support the exchange.

As shown in Table 1, when agency costs are high due to high information asymmetry and task complexity, standard vertical contracting is not a preferred governance mode. In such a vertical relationship, the adoption and performance of CPFR as a relational contract over vertical financial ownership will be necessarily determined by its impacts on transaction costs under high demand uncertainty and asset specificity in addition to agency costs (i.e., information asymmetry and task complexity) while controlling for the feasibility of vertical integration due to relative bargaining power between trading parties.

Effective collaboration is a difficult process even under the CPFR arrangement because it requires substantial specialisation efforts and mutual commitment to the current relationship. An intense collaborative approach is appropriate only in situations where such efforts are justified as both parties expect substantial long-term gains from learning and cooperation. For the vertically related firms to address highly complex problems of managing *various complementary activities* in the vertical chain there is a need for sharing proprietary knowledge that specialised partners possess. In standard vertical contracting, however, sharing of knowledge by one party could make itself vulnerable to opportunism due to the conflicts of interests between contracting parties. Thus, vertically related firms often resort to costly vertical financial ownership in order to internalise economic benefits from asset complementarity while addressing incentive problems between independent contracting parties.

However, research studies in the strategic management literature have also identified the implementation problems of vertical financial ownership. First, vertical integration into internal organisation of managerial hierarchy may be more costly than the market mechanism because of the loss of high-powered incentives (Williamson, 1985). When a norm of reciprocity and mutual forbearance between internal divisions develops, the economic benefits of reducing transaction costs will be lost. Second, while vertical financial ownership may eliminate the problem of asymmetric information between contractual parties in the vertical chain, it may also result in a loss of access to valuable information and market intelligence from broader relationships with various specialised manufacturers and distributors (Mahoney, 1992). Third, a vertically integrated firm that does not produce in a sufficient amount to achieve minimum efficient scale will be at a cost disadvantage against firms that contract out to an efficient supplier achieving full economies of scale in production. Thus, efficiency gains possible through vertical financial ownership may be overestimated and do not necessarily compensate for higher production costs (Walker and Weber, 1984).

When it is too costly to vertically integrate interdependent tasks, or infeasible due to balanced bargaining power between contracting parties, contracting parties might try to build effective economic deterrence to renege on relational contracts. As discussed in the literature, reciprocal economic deterrence transforms a unilateral relation into a bilateral relationship, where both contracting parties understand that the exchange will be continued only if economic reciprocity is observed (Chi, 1994). One way to develop reciprocity in a vertical relationship and thus to support economic exchange is for the

buyer and supplier to devise a mutual reliance structure such by investing in relation-specific assets and by performing joint activities for greater mutual benefits (Kim and Mahoney, 2006). As an IT-supported business practice, CPFRR requires both retailers and suppliers to jointly invest in a common IT system for electronic information sharing and adaptively improve common organisational procedures for joint activities. Thus, mutual commitment under the CPFRR arrangement can serve to equalise the risk exposure of the contractual parties, and thereby reduce the economic incentive of any contractual party to behave opportunistically in the exchange process ex post.

**Proposition 4** As a relational contract, CPFRR will be preferred to vertical financial ownership when high demand uncertainty and asset specificity is managed by reciprocal relation-specific investments in a common IT system by contracting parties.

Within the assumptions of the incomplete contracts approach, Rajan and Zingales (1998) define access as the ability to use, or work with, a critical resource and suggest *privileged access* as an alternative mechanism to vertical financial ownership for economic value creation and control in vertical relationship. The party who is given privileged access to the resource gets no new residual rights of control. All the supplier gets is the opportunity to specialise in its own assets to the resource and to make it more economically valuable. If the critical resource is information, access implies being able to utilise the broad range of economically valuable information that the retailer possesses. The amount of economic value creation that the supplier gets from privileged access to the retailer's information is often more contingent on 'indirect capabilities' [Araujo et al., (2003), p.1256] of making the right relation-specific investment to the current trading partner (e.g., by making optimal replenishment and production decisions) than the economic value creation that comes from vertical financial ownership itself.

When the assets are highly complementary, the right to offer access belongs to anyone who has command over complementary assets for relational rents. The regulation of access to economic intangibles can be used as a governance mechanism to foster relation-specific knowledge even absent an exogenous enforcement system. In the case of the CPFRR arrangement between P&G and Wal-Mart, P&G is given access to the information of Wal-Mart but gets no new residual rights of control over the shared information. All P&G has is the residual right to withdraw its relation-specific knowledge in efficient replenishment and production activities. What access does is to let P&G make these activities more economically valuable in the current relationship with Wal-Mart by giving itself the opportunity to specialise in complementary assets and activities that are tailored to Wal-Mart's operations. Under the CPFRR arrangement, the bargaining power over relational economic rents that P&G gets from the privileged access to Wal-Mart's economically valuable information is likely to be more contingent on making the right specialisation investment in intellectual capital than the control directly coming from vertical financial ownership. Similarly, in order to induce P&G's specialisation efforts in the CPFRR arrangement, Wal-Mart has strong economic incentives to generate and share valuable information with P&G as mutual commitment.

**Proposition 5** As a relational contract, CPFRR will be preferred to vertical financial ownership when complementary assets are separately owned by but exclusively accessible between by power-balanced contracting parties.

- Proposition 6 CPFR will lead to superior economic value creation when contracting parties reciprocally extend privileged access to intellectual capital and enhance their specialisation incentives in the current relationship towards mutual commitment.

## **5 Discussion and conclusions**

By drawing on the incomplete contracting literature, this paper has examined the costs and benefits of CPFR practice to become an effective governance structure in vertical relations. As it focuses on the organisational economics of the CPFR arrangement, which has often been ignored or treated only as incidental implementation issues, the current paper has identified both critical governance issues and the efficiency implications of this IT-supported vertical contractual arrangement. In addition, by analysing the development and evolution of the CPFR arrangement in the discount retail industry, this research identifies new challenges created by this increasingly important business practice and further provides insights into our understanding of relational contracting theories as well as supply chain practices. Theoretical developments in the paper are presented in theoretical propositions that address the role of CPFR arrangement as a relational contract.

The case study of the CPFR arrangement between P&G and Wal-Mart suggests that initially, economic value creation from the CPFR initiative came from its efficient utilisation of shared information via IT infrastructure across firm-level boundaries, which creates the co-location of decision rights and pertinent information in the vertical chain. Extensive information sharing and joint decision-making under the CPFR arrangement further improved mutual understanding and visibility into their interdependent activities in the vertical chain. Reciprocal learning and specialisation efforts into the current relationship were an adaptive response to the new collaborative exchange environments, which are essential to greater economic value creation from their repeated transactions.

From the review of incomplete contracts literature and the case study, it is proposed that CPFR could improve not only operational efficiency but also economic incentives towards mutual commitment, which constitutes a relational contract in the vertical chain. As a relational contract, the CPFR arrangement enables trading partners to replicate the advantages of vertical financial ownership (i.e., efficient coordination and adaptation) while avoiding the disadvantages of standard vertical contracting (i.e., incentive alignment under information asymmetry and asset specificity). As a non-hierarchical and non-market organisational form, CPFR can provide superior governance when the contracting parties involved in this supply chain arrangement share proprietary information and make relation-specific investments reciprocally to develop a long-term collaborative relationship which generates intellectual capital and relational rents. It is non-hierarchical because each contracting party remains independent under the contractual agreement and collaborates in ways that do not correspond to managerial directive or authority within the traditional hierarchy (Baker et al., 2002). It is non-market because it does not use price mechanisms or competitive switching for additional efficiency gains but motivates mutual commitment and cooperation between trading partners (Kim and Mahoney, 2006).

The insights developed in this paper provide a base for future empirical research on the strategic use of IT and the governance of information sharing in vertical relationship. While the current paper highlighted the benefits of CPFPR as a relational contract, it also recognised potential economic incentive problems related to information sharing. In this regard, the success of CPFPR to create economic value and competitive advantage depends on effective governance of economic incentives and management of economically valuable information and technology across firm-level boundaries. By examining the mechanisms of information sharing and economic incentive alignment in the CPFPR arrangement, the current paper also emphasises the importance of managing the development and implementation processes of a relational contract. In practice, selecting and changing CPFPR partners will be more difficult when managers must terminate one relational contract but preserve enough credibility to begin another. Thus, successful adoption and implementation of CPFPR requires both managers' motivations and their capabilities concerning complex contracting situations in the vertical supply chain.

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## Notes

- 1 VICS (2004) suggests that CPFR consists of nine steps:
  - 1 develop front-end agreement (roles, measurement, readiness)
  - 2 create joint business plan (strategies and tactics)
  - 3 create sales forecasts independently
  - 4 identify exceptions in sales forecasts
  - 5 resolve exceptions (agree on a single sales forecast)

- 6 create order forecasts independently
  - 7 identify exceptions in order forecasts
  - 8 resolve exceptions (agree on a single plan for orders)
  - 9 order generation.
- 2 Gibbons (2001) defines a relational contract as an evolving flexible agreement and codes of conduct that allows the contracting parties to utilise their knowledge of a specific situation and to adapt to new information, which thereby helps circumvent difficulties in formal contracting.
  - 3 According to Alchian and Demsetz (1973), a configuration of property rights is posited to be an economically efficient response to a contractual situation. In this respect, the CPFR arrangement can be considered an institutional arrangement to partition and allocate property rights on the valuable information assets to contracting parties in an economically more efficient way than single ownership (Kim and Mahoney, 2007). Helper et al. (2000) called such arrangements as 'pragmatic collaborations' through learning by monitoring – a relationship in which trading partners continuously improve their joint products and processes without the need for a clear division of property rights.
  - 4 A formal contract must be specified *ex ante* in terms that can be verified *ex post* by the third party, whereas a relational contract can be based on informal agreements on outcomes that are observed by only the contracting parties *ex post*, and also on outcomes that are prohibitively costly to specify *ex ante*.
  - 5 For example, Gibbons (2001, p.190) notes that: "Therefore, relational contracts must be 'self-enforcing', in the sense that each party's concern for its reputation must outweigh that party's temptation to renege on the relational contract." Also, Baker et al. (2002, p.50) state that: "The core of the analysis is therefore checking whether reputation concerns in fact outweigh the temptation to renege on a given relational contract."
  - 6 Using experimental methods to treat the process of transaction-specific investment and the process of surplus share negotiation, Hackett (1994) find that, *when relation-specific investments are observable*, relational exchange emerges in settings *where individual reputations are absent*.
  - 7 Ownership of an asset is ownership of specific property rights to the asset (Coase, 1960). Thus, changes in property rights to the information asset and *ex post* distribution of economic rents from information sharing affect economic incentives for value-creating activities *ex ante* (Kim and Mahoney, 2007).
  - 8 This is an application of Hart and Moore (1990)'s Proposition 6 that, due to the benefits and costs of integration, an agent who is indispensable to an asset should own that asset, and Proposition 8 that complementary assets should be owned by the same agent when complete contracts are infeasible.
  - 9 According to Jensen and Meckling (1992), alienability is defined as the right to sell or transfer rights and the right to capture the proceeds of exchange. Activities within and between firms are distinguished by whether alienability is transferred to agents along with the decision rights. In this respect, contractibility of information makes it possible to transfer information across the boundaries of the firms without the rights to alienate the decision rights.
  - 10 If information is fully contractible, then there are no residual rights so the ownership of the information is irrelevant. Making information alienable improves economic incentives by making new ownership patterns feasible, but it still falls short of the first best since any party not obtaining control of the information asset is potentially subject to being held up. In contrast, making information fully contractible could potentially give every party the optimal incentives, at least with regard to this complementary asset.
  - 11 Jensen and Meckling (1992) distinguish between 'specific knowledge' which is localised, difficult to represent and transfer, and depends on idiosyncratic circumstances, and 'general knowledge' which can be easily summarised, communicated and shared by decision-makers.
  - 12 Accordingly, four different levels of information sharing reflect the differences not in the content of the information shared, but in the impacts the information sharing has on relative bargaining power and economic benefits (Seidmann and Sundararajan, 1998).

- 13 A retailer may endow one of the vendors in a particular category with decision rights such as merchandising product assortment, determining retail prices, and allocating shelf space over all the products supplied for that category and provides them with extensive POS information.
- 14 Grossman and Hart (1986) define integration in terms of the ownership of individual assets, instead of the ownership of the entire firm, and develop a model to explain when one firm will desire to acquire alienable assets of another firm (p.693). In this regard, the model does not distinguish between employees and outside contractors in the case in which a firm provides all the tools and other assets used by the contractor. In a similar vein, Hart and Moore (1990) maintain that the crucial difference for party 1 between owning a firm (i.e., integration) and contracting for service from another party 2 who owns this firm (i.e., non-integration) is that, under integration, party 1 can selectively fire the workers of the firm if he is not satisfied with their performance, whereas, under non-integration, he can fire or stop dealing with only the entire firm: the combination of party 2, the workers, and the firm's assets (p.1120). Baker et al. (2002) follow GHM's terminology of integration: when the downstream party owns the asset, the transaction is integrated (i.e., the upstream party is an employee, working with an asset owned by the firm); when the upstream party owns the asset, the transaction is non-integrated (i.e., the upstream party is an independent contractor, working with an asset she owns) (p.41).
- 15 More specifically, Baker et al. (2002) maintain that it is not possible to locate all governance structures on a line between markets and hierarchies, and suggest the four alternative governance structures as the combinations of asset ownership and governance regimes (Figure 1, p.46). Consistent with common usage, they refer to the vertically integrated case as employment, and the non-integrated case as outsourcing, distinguishing relational employment (where the downstream party owns the asset and there is a relational contract) and relational outsourcing (where the upstream party owns the asset and there is a relational contract). To compare such definitions to previous definition in the transaction costs literature, Williamson (1975)'s emphasis on the advantage of firms over markets is analogous to the comparison of spot outsourcing to relational employment in Baker et al. (2002, p.47). While Williamson (1975) emphasises the importance of *relational contracts within firms* (relational employment), Williamson (1985) introduces *relational contracts between firms* (relational outsourcing).
- 16 This relational contracts approach parallels Williamson (1975) in that relational contracts may overcome some of the difficulties with formal contracts since relational contracts may allow the parties to utilise their detailed knowledge of their situation to adapt to new contingencies as they arise.
- 17 For example, Klein and Leffler (1981) maintain that franchisees may be required to make sunk-cost investments in transaction-specific capital as a way to safeguard the franchise system against free-riding and consequent quality shading, which can damage the entire franchise system.
- 18 In the case of the CPFR arrangement between P&G and Wal-Mart, when asked about the effectiveness of the CPFR initiatives, Ronald K. Ireland, a former VP who was in charge of CPFR implementation at Wal-Mart, says: "It's been very effective, but not nearly to the point that we have first envisioned... There are reasons for it. A lot of the customer-facing teams, the key account teams of manufacturers, are very protective of the data that are shared, like Wal-Mart's *Retail Link* data. That's because Wal-Mart would shoot you if you let that data leak out to competitors. So a lot of guys are so fearful that they don't want to share that data with their own corporate headquarters, which would drive the sales and operations planning processes." (*Managing Automation*, 2005, <http://www.managingautomation.com>).

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