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Beyond Supply and Assembly Relations: Collaborative Innovation in Global Factory Systems

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Abstract

Synthesizing strands of literature from internalisation theory and the resource-based view of the firm we develop a rationale for the adoption of outsourced collaborative ventures in innovation in rapidly changing business environments within the context of global factory systems. Improvements in capability and communication within the global supply base and increased recognition of the complementarities between leading MNEs and specialist contractors have increased the incentives for collaboration within functions traditionally undertaken in-house. Supporting our arguments with the illustration of Apple and Foxconn in consumer electronics, we argue that collaborative relations with an outsourced partner offer benefits in the creation of additional value, more efficient identification of opportunities, effective safeguarding of technologies, and suppression of opportunism. We discuss the implications of our analysis for the structuring of collaborative ventures, management of lead firm subsidiaries, and the upgrading of contract partners.

Keywords: Collaborative ventures; Innovation; Apple-Foxconn; Global factory

1. Introduction

A fundamental characteristic of international business is its ability to adapt to changing global conditions. In recent years significant developments in the organisation of international business activities have emphasised the rise of emerging economies (Hanson 2012; Timmer et al. 2014), the growing regional concentration of value creation (Gereffi 2014), as well as the increasing use of externalised or outsourced forms of exchange including contract manufacturing and supply (United Nations 2011). Conceptually these developments have been encapsulated in the idea of the global factory (Buckley 2011). The global factory reflects the contemporary manifestation of an increasing number of multinational enterprises (MNEs) that combine internal management and external

contracting of activities across a diversity of locations with the aim of minimising the sum of production and control costs.

The global factory is effectively a commercial network, at the heart of which are complex flows of knowledge, intermediate products, and management skills. It is typically directed by a lead or 'flagship' (Rugman and D'Cruz 2003) firm, often a brand owner or a leading retailer. Traditionally the use of outsourced relations by MNEs has focused primarily on supply and assembly functions where external providers can offer advantages of lower cost, greater scale, specialised expertise, and flexibility (Contractor et al. 2010).
However, growing experience with outsourcing as well as the increasing sophistication of the potential supplier base (Liesch et al. 2012) has encouraged a move towards more complex exchange including business services (Merino and Rodriguez 2007), marketing partnerships (Agostini and Nosella 2015), and, most recently, innovation (Lee et al. 2012). In a range of industries including clothing, electronics and vehicle production, some contract manufacturers are assuming responsibility for a growing number of stages of the global production system and are, in effect, intermediating between design and retail. The growing scope and capability of many contract providers means that they are increasingly seeking to upgrade their role and to contribute to more than assembly. In some cases they offer distinct capability in process technology, supply chain management, and product development. A distinctive feature of the global factory is its ability to prosper in a volatile global economy by tapping into specialist outside skills that contribute to sustainable competitive advantage through flexible strategies and structures. This is perhaps the defining difference between the global factory and the more traditional MNE. In essence, international businesses are evolving from being "system integrators", focusing on transactions largely internal to the firm, to becoming "orchestrators" of a wide range of value adding activities undertaken both internally and externally (Pitelis and Teece 2010).

A key issue that international business theorists need to address is how this evolution from internalised to externalised relations can be explained. Traditionally, the internalisation of value creating activities such as innovation, for example, was explained by the difficulties of transacting knowledge-intensive activities through the market, or the need to protect intellectual property (Buckley and Casson 1976). However, the way in which innovation is undertaken has evolved from closed systems (internalised within a single enterprise), to collaborative innovation (alliances of partner organisations), to encompass open innovation (innovation utilising the skills and resources of a range of outside organisations), through to co-innovation (the development of platforms for the co-creation of value). Co-innovation is encouraged by developments such as industry and technological convergence, the need to create value for a wider range of stakeholders, to appeal to new markets and consumer segments, and in response to new business models (Lee et al. 2012).

The aim of this paper is to elucidate thinking on the growing externalisation of innovation and in particular, to contribute to understanding how innovation is undertaken within global factory systems. Our argument is that in the contemporary global economy lead firms seek to combine disparate sets of globally dispersed resources in ways that provide sustainable advantage and in so doing create a compelling case for the adoption of collaborative ventures

as an efficient organisational mode for a number of functions, including innovation. We illustrate our arguments using the example of two leading partners in the consumer electronics industry, Apple and Foxconn.

We make a contribution in a number of areas. First. we conceptualise the global factory as an embodiment of recent thinking of the MNE as a bundle of assets, both internationally mobile and locationally bound (Dunning and Lundan 2010; Hennart 2015). This allows us to move beyond the traditional conception of transaction cost thinking with its focus on transaction cost minimisation, to include production costs. In this way we incorporate production considerations to examine situations where collaboration might augment value creation. Implicit in this type of thinking is the possibility that two firms facing similar transaction cost considerations might still differ in their sourcing decisions. Indeed, the consumer electronics industry and competition between the leading producers Apple and Samsung, illustrates exactly this. Samsung is a highly vertically integrated producer while Apple has long adopted a strategy of outsourcing of component supply and assembly.

We draw together a disparate literature that examines resource characteristics and relate these to internalisation thinking to consider how the distinct characteristics of both firms and resources affect incentives to collaborate with outside partners. We discuss the ways in which firm characteristics, including scope, heterogeneity, technological capability, and existing network relations impact on collaboration. Resource characteristics including tacitness, specificity, and uncertainty also influence the likelihood of adoption of a collaborative venture.

Second, we extend thinking on collaborative innovation ventures by adopting a broader and more dynamic conception of innovation. We take the perspective of innovation as more than product innovation, and see it as also encompassing process and organisational innovation. In terms of dynamism, we are concerned with the ongoing ability to innovate, rather than in the integration of a single technological innovation (Teece et al. 1997). This enables us to consider a specific group of assets: co-specialised resources (assets whose value when used in conjunction, exceeds the value of each in its next best use).

Third, we consider the utility of collaborative ventures in a rapidly changing industry context. We illustrate our arguments through the example of a well-known collaborative partnership in the electronics industry: that between Apple and Foxconn (Liang 2016). High rates of environmental change affect the attractiveness (and otherwise) of alternative organisational modes. For example, under conditions of technological convergence, innovative assets may be possessed by parties outside the focus industry and the identification, development and utilisation of such assets may require non-traditional approaches. Under such conditions flexibility may also be a significant determinant of governance structures (Enderwick 2017).

Finally, we take up Hennart's (2009) call for less MNE-centric theorising as we develop arguments for the effective outsourcing of innovation, a function traditionally regarded as most likely to be internalised. We contribute to this Special Issue in terms of both how to outsource (note 4) and when to choose an outside partner (note 5). In terms of how to

outsource we illustrate how firm and resource characteristics affect both behaviour and the structuring of relations in the global economy. This also has important implications for supplier relations and upgrading. In relation to note (5), when to outsource, we discuss the influence of pre-existing supply relations, the role of both firm and transaction characteristics, and the possibility of developing alternative contractual safeguards.

The paper is organised around five sections. Section 2 develops our conceptual framework seeking to explain why, in the case of innovation, outsourcing in the form of collaborative ventures may offer a superior organisational mode. In section 3 we provide an illustration of these concepts through the collaborative example of Apple and Foxconn. We discuss the implications of our approach in section 4. Section 5 provides concluding comments.

2. Determinants of the Choice of a Collaborative Venture in Innovation

In this section we review pertinent theory that provides an explanation for the adoption of collaborative modes in innovation and how such modes can be organisationally superior. Following our exposition of the theoretical "main case" – internalisation theory, we then examine the resource-based view as an adjunct explanation and consider theoretical alternative modes of resource acquisition and the (potential) incentives to collaboration, some of which are context–specific.

2.1 Core Theory: Internalisation

Internalisation theory analyses the decisions on the boundaries of the multinational firm within a broad based intellectual framework deriving from the work of Ronald Coase (1937). Buckley and Casson (1976) showed how seemingly unrelated aspects of the operation of multinational firms and their decisions, such as technology transfer and international trade in semi-processed products, can be understood using a single unifying concept – the internalisation by the firm of imperfect markets (Buckley 2009). The balance between externalisation (outsourcing) and internalisation shifts over time but the principles determining the boundary between the firm and the market remain. The costs of internalisation have frequently been underestimated. Where costs exceed benefits, markets will not be internalised and market solutions such as outsourcing, external licensing, and contract manufacturing will be preferred. Because the market for market transactions has expanded over time (Liesch et al. 2012), the opportunities for external collaborative relations – including those that foster innovation - have increased. There is thus an expanded space for the potential division of entrepreneurial labour between a (foreign) multinational firm and a (domestic) small entrepreneurial venture (Buckley and Prashantham 2016). Such a division of labour may be intended to foster innovation in its widest sense. Management techniques, evolving from a simple model of outsourced production, have enabled MNEs to "fine-slice" activities such that individual tasks can be separately located and orchestrated either through internal management control or through market based contractual relationships (Buckley 2011). "Global factories" control the entire global supply chain even though they do not own

the whole of it. This coordination is largely due to the control of information – not just market intelligence on demand (and future demand), but also on the technical aspects of supply and innovation. The global factory combines central control with network systems to achieve coordination.

2.1.1 Locational Aspects of the Theory

In considering the locational aspects of the internalisation theory of the MNE, it is essential to see the global system aspects of the approach (Buckley and Hashai 2004; Casson 2000). The individual elements of the global factory's supply chain are located according to least cost location principles. However, we contend in this piece that collaborative innovation may be a factor that influences elements of this integrated supply chain. Country-specific factors, when combined with appropriate resource conditions, can attract elements of the global factory as collaborative hubs.

2.2 Resource Based Theory: An Adjunct

Internalisation theory provides valuable insights into decisions as to when transactions are best undertaken through the market, internalised under hierarchy, or managed through some form of hybrid mode. Central to such decisions are transaction costs. However, transaction costs are not independent of resource characteristics. For this reason we consider the contribution of the resource-based view (RBV) that provides insights into such characteristics. Combining RBV insights with internalisation theory helps illustrate the conditions under which a hybrid collaborative mode to innovation might be adopted. The resource based view (RBV) suggests that firm-specific resources are the primary determinant of differentiated and superior performance, and that such resources are unevenly distributed between firms (Peteraf 1993). In particular, these resources enjoy isolating characteristics such as causal ambiguity, organisational embeddedness, and path dependencies that can produce competitive barriers.

The idiosyncratic nature of firm-specific resources makes them difficult to trade through markets and the conventional view is that they are accumulated internally (Dierickx and Cool 1989). Isolating mechanisms are reinforced when competitive advantage is based on a combination of resources, rather than a single resource (Lippman and Rumelt 2003). Clearly, it is more difficult for a competitor to match a set of embedded processes than to replicate easily observable product features. The internal accumulation of resources requires appropriate and complementary investments over time to ensure that competitive advantage is sustained. Such investments are challenging for management since they require skills in the identification, creation, and utilisation of assets that are compatible with the firm's existing resource set. In fast changing environments, sustaining competitive advantage requires not simply ownership of firm-specific resources, but their effective utilisation. This highlights the importance of developing dynamic capability in the effective deployment of a firm's resources (Teece 2007).

A firm's resources take several forms: generic; specialised; and co-specialised. Generic resources are those that have value in a wide range of applications. Specialised resources

have value only in specific applications, for example, when they must be applied to a specific innovation. For our discussion, co-specialised resources are the most interesting and are characterised by bilateral dependence and application to a complementary asset. The high level of specialisation (fine-slicing), and widespread use of outsourcing relations characteristic of the global factory, mean that co-specialised resources are likely to be a defining feature of innovation within such firms.

Co-specialised resources create significant challenges in their effective management. Co-specialised resources are not simply complementary: their value is determined by their joint use, in isolation they are of limited value. Since such resources are not decomposable they create problems of irreversibility (investments cannot be reversed and in isolation resources have no residual value or use). Since their value is the result of joint use, co-specialised resources require strategic assurance of firm- or project-specific asset alignment (Ghemawat and del Sol 1998). Co-specialisation of resources also creates a small-numbers bargaining problem in that the very thin markets for such resources preclude 'cherry picking' of assets by competitors (Makadok 2001).

These characteristics of co-specialised assets seem to reinforce the argument that such resources are best managed internally. Internalisation of transactions in co-specialised resources could help to overcome the small-numbers bargaining problem and facilitate effective alignment in the identification, development, and deployment of complementary resources. However, our argument is that the changing demands of innovation, and the increased opportunity to draw upon the assets and capabilities of external partner organisations, mean that collaborative ventures in innovation can offer an attractive alternative to internalisation.

2.3 Resource Acquisition in Global Factories

The modern MNE, what we term a global factory, is best described as a differentiated network of value creating activities that uses this network to exploit firm- and location-specific advantages. Key in this role is the subsidiary. Differentiation among subsidiaries enables them to perform important roles in locating, creating, utilising, and sharing new ideas, technologies, and business models (Verbeke and Kano 2016). It is at the subsidiary level that many of the entrepreneurial initiatives of the MNE occur, both internally and externally (Rugman et al. 2011). The diverse nature of subsidiaries and the range of activities that they undertake, makes their management through centralised hierarchical structures a challenge (Rugman and Verbeke 2001). A number of studies have acknowledged that a particular subsidiary may be associated with several functions concurrently, and that effective management requires a clear understanding of local opportunities, the degree of local embeddedness (Forsgren et al. 2007), and the level of integration within the corporate network (Meyer et al. 2011).

Once a lead firm or its subsidiary has identified the appropriate resources and possible ways these might be combined, it must consider a strategy to acquire such resources. The extant literature highlights four key routes to acquiring resources: internal replication of the other party's resources; trade through output or asset services markets; trade in the market for assets themselves; and the equity market (Chi 1994). Each offers various advantages and disadvantages (Chen 2010).

Replicating internally the complementary resources of another organisation is one way to combine two sets of specialised resources. In effect, this is best done through the guidance of the present owner of the resources. The challenges of this strategy are considerable. Many desired resources are characterised as being imperfectly imitable, meaning that there is considerable uncertainty regarding their creation (Lippman and Rumelt 1982). Such uncertainty is often the result of causal ambiguity that arises because the causal links between strategic decisions and economic outcomes are indistinguishable. It is also unclear why a firm would seek to assist another in the replication of its strategic resources: in most cases if imitation is anticipated a more effective strategy is to sell the targeted assets. Replication is more likely in the case of mature technologies where resource valuation issues are less significant.

As an alternative to internal replication an asset-seeking firm may use various markets. However, where assets are imperfectly mobile, trading presents difficulties (Peteraf 1993). Because resources are firm-specific, the market for them is likely to be thin, or even non-existent. Transactions in the output or asset services market mean that a firm contracts to buy technological outputs. The difficulties of undertaking arms length transactions in technology are well documented (Buckley and Casson 1976; Davidson and McFetridge 1984) and such a strategy is most appropriate when a buyer is seeking discrete and codified technological outputs, commonly in the form of licensing. Our focus, however, is on collaboration for the creation and application of uncertain technological innovations and as such, is not amenable to the purchase of outputs.

An alternative mode of obtaining desired resources is for the two organisations to agree to one selling the assets required for serving the output market to the other. This might take the form of a partial acquisition or asset sale where only the pertinent assets are sold. This may be possible if the targeted firm is organised by division for example, but is fraught with difficulties when assets within the firm are co-specialised, and separation lessens their value.

There are a wide range of impediments to both replication and trade in resources or resource services. As mentioned above, causal ambiguity is a common problem affecting the identification and valuation of resources. Underlying this ambiguity are resource characteristics such as tacitness (where replication of a resource involves learning by doing) (Penrose 1959), complexity (where many routines and capabilities exist and are related) (Nelson and Winter 1982), specificity (where the resource has a specialist use or depends on a unique relationship with other resource owners) (Reed and DeFillippi 1990; Williamson 1985). Causal ambiguity is often associated with information asymmetry creating issues of

adverse selection that can affect the choice of both trading and acquisition partners. Tacitness can contribute to problems of moral hazard (shirking) because of the difficulties of measuring performance. This problem can impact acquisitions when the (former) owners experience diminished incentives to share knowledge or skills (Holmstrom 1989).

A fourth mode for obtaining desired resources is acquisition through the equity market. In this case one firm acquires another, in totality, by purchasing the equity of the asset-holder. In the general case it is assumed that the technology developer will acquire the operations of a manufacturer or assembler to undertake technological exploitation. While forward integration is perhaps the most common route, integration can occur in both directions, as Figure 1 illustrates.

Figure 1 Here

In Figure 1 two organisations possess complementary, co-specialised resources, with one focusing on product technologies, the other process technologies. It is assumed that the joint use of the two sets of resources results in a combined level of rents greater than the total generated if each set is used separately. It is also assumed that there are barriers to one firm replicating the resource set of the other. In this case the incentive and direction of trade or acquisition depends on the complexity of the two types of technology or, the ease with which they can be integrated. Backward integration will occur when the brand or lead firm, strong in product technology, is willing to undertake manufacture or assembly and acquires a former contractor possessing the necessary process technology (cell 3). Alternatively, if process technology is more difficult to integrate than product technology the contractor undertakes forward integration to acquire the brand owner (cell 2). If there are similar levels of integration difficulty, then acquisition could occur in either direction (cell 4).

An interesting case is presented in cell 1 where technology integration involves significant costs and acquisition may no longer be the most attractive option. In such a case the two firms may remain independent, retaining ownership over their respective resources, but in recognition of the potential returns from collaboration, may seek to collaborate. High costs of resource integration are particularly likely in the case we are considering because the two firms are highly specialised, operate at different stages of the value chain, and have limited direct experience of the other's capabilities. The creation of future technologies also adds to the complexity and uncertainty of exchange and integration, discouraging acquisition.

The critical question then is when will a collaborative venture (cell 1 in Figure 1) be preferred to trade or acquisition? We suggest that innovative development involving co-specialised resources within a dynamic business environment creates a variety of incentives to collaboration (or disincentives to integration). We illustrate these factors and their links to the likelihood of the adoption of a collaborative innovation venture in Figure 2.

Figure 2 Here

2.3.1 General Incentives

Figure 2 identifies six sets of conditioning factors that influence the incentive to create a collaborative innovative venture. The first of these is that neither of the two firms possesses all the technological resources necessary to sustain advantage and lacks the capacity or inclination to develop the requisite assets internally. This condition provides a key motivation for a strategy of asset augmentation.

2.3.2 Barriers to Trade and Acquisition

A further set of influences on the choice of a collaborative venture are the impediments to acquisition or trading as modes for resource augmentation. The attraction of collaboration increases if trading of assets or asset services, is not feasible. Asset markets operate poorly when resources are immobile or transactions are impeded by imperfections such as information asymmetries, causal ambiguity, and tacitness. Similarly, acquisitions become less attractive when desired assets are inseparable, acquisition brings additional, unwanted assets, there are adverse incentive effects, or the challenges of post-acquisition integration are considerable (Chen 2010). In such situations collaboration may provide a viable alternative for acquiring desired resources. Collaboration is also encouraged when acquisition is not feasible due to problems of identifying, valuing, separating or integrating desired resources (Chi 1994; Hennart 1988). Collaborative ventures may substitute for trade and acquisition strategies when asset and equity markets are imperfect (Chen 2010).

2.3.3 Transaction and Resource Characteristics

The third set of factors illustrated in Figure 2 relate to transaction and resource characteristics that affect the efficacy with which they can be undertaken through markets, hierarchy or collaboration. Collaborative relations are effective in facilitating the formation and transfer of tacit knowledge, which is central to innovation creation and application (Loasby 1994). Asset specificity can create difficulties in exchange. For example, it is easier to contract for generic assets than it is for specialised (or co-specialised) ones (Hennart 2009). Specialised assets provide opportunities for hold-up making contractual negotiations more challenging and increasing the need to invest in contractual safeguards. The traditional organisational response to problems such as this has been internalisation under common governance since such arrangements bring closer alignment of incentives, greater choice in administrative processes and controls, and ease of adjustment over time (Leiblein and Miller 2003). However, in the case of co-specialised resources, a collaborative relationship can be used to tie outcomes to cooperation, creating a potential situation of mutual hostage or forbearance (Buckley and Casson 1988). Structuring the rewards in such ventures in ways that provide efficient residual claimancy can also discourage opportunism (Chi 1994).

Pre-existing exchange relations may also encourage adoption of a collaborative mode. An existing relationship means that the parties are likely to have a better understanding of each

other's capabilities, to have developed party-specific communication routines (Mitchell and Singh 1996), and have a shared understanding of technical issues (Buckley and Casson 1976). Previous or concurrent trading experience increases trust between the parties as well as incentives to cooperate in any new relationship as a way of protecting existing contracts. This form of 'lock-in' reinforces processes of reciprocity. Previous experience between partner organisations also offers possibilities for increasing value through the creation of collaboration-specific quasi rents in that the bundling of transaction-specific (use of the resources) and firm-specific (users of the resources) quasi rents, can augment returns through synergy. In essence, collaboration enables a level of return that the partners could not achieve in its absence (Madhok and Tallman 1998). Such returns depend critically on the way the collaborative venture is managed and not simply on its existence. One key source is superior interest alignment of employee contributions (Gottschalg and Zollo 2007).

Environmental conditions surrounding any collaboration also influence its utility. Where rates of change in technology, business models and consumer behaviour are high, collaborative ventures tend to be looked upon more favourably (Hagedoorn 1993). In such situations diverse skills and resources are required to maintain competitiveness and collaboration offers a flexible means for the continuous rebundling of resources. In dynamic environments the sources of competitive advantage can swiftly become competitive constraints as the value of existing assets falls sharply creating inertia (Balakrishnan and Wernerfelt 1986). The strategic value of resources is also affected by the nature of the operating environment. Miller and Shamsie (1996) found greater returns to property-based resources in stable environments, but a premium on knowledge-based resources in periods of change.

Uncertainty surrounding a project also impacts on the choice of organisational mode. Uncertainty adds to the difficulties of trading resources because it increases the number of contingencies that must be anticipated, compounds the difficulties of measuring inputs and thus the danger of shirking, and hinders the coordination of interrelated activities, creating the possibility of maladaptation and associated costs (Leiblein and Miller 2003). Empirical evidence suggests that modest levels of uncertainty (such as might be expected between familiar parties pursuing innovation), are most conducive to the formation of collaborative ventures (Hoetker 2005). Collaborative ventures have useful attributes in the face of uncertainty. They provide both flexibility and the possibility of decision reversal in the event of unanticipated change. In many ways they are similar to real options in that investments can be shared, staged, and terminated with greater ease than is possible under vertical integration (Leiblein and Miller 2003).

2.3.4 Firm Characteristics

Our fourth group of factors are firm characteristics that can influence the adoption of collaborative modes. One criticism of transaction cost economics is that it pays little regard to

factors other than transactions costs. This makes it difficult to explain why, for example, firms facing similar levels of transaction costs, adopt different modes of exchange. An explanation could be provided by firm heterogeneity. For example, a firm with sufficient slack resources may have less need to engage in a joint venture than one with severe resource constraints. Experience with managing outsourced relations, or equally, a lack of experience with complementary resources or processes, could, all other things equal, encourage collaboration.

The cost of technological innovation is also relevant. Developing innovations (and the capabilities that underpin the process) is costly and collaboration enables the sharing of such costs (Dunning and Lundan 2010). The scope of a firm's activities could affect opportunities to utilise technologies: the greater the firm's scope, the greater are opportunities for using or selling technologies (Leiblein and Miller 2003). In terms of technological capability, collaboration enables the parties to enjoy higher levels of specialisation that can be conducive to technological development, but collaboration brings a closer link at the stage of technological embodiment (when for example, innovative process technology is integrated with product technology). Closer relations facilitate the transfer of what is likely to be largely tacit knowledge at this stage.

More generally, technological capability provides strong generic skills in managing partner relations. Technological understanding may help overcome technological information asymmetries leading to superior partner selection, the more effective crafting of contingent contracts, better monitoring of progress, more realistic expectations, and incentives to discourage opportunistic acts (Leiblein and Miller 2003). As a simple illustration, the idea of absorptive capacity provides one indication of ways in which technological understanding can affect partner relations (Cohen and Levinthal 1990).

The network structure of global factory systems also helps lead firms and their primary partners to overcome some of the limits to growth (Dunning and Lundan 2010). Collaboration can be used to overcome the 'Penrose effect' of resource constraints that limit the rate and direction of firm development (Augier and Teece 2007), currently observable in the automobile industry as it struggles to incorporate revolutionary technologies around vehicle electrification, autonomous driving, and new concepts of mobility. In the same way, collaboration reduces the dangers of organisational inertia that can develop when routines and processes become 'sticky' and resistant to necessary change (Szulanski 1996).

2.3.5 Contractual and Relationship Safeguards

A further attraction of collaborative ventures is that they can provide alterative mechanisms for handling the contractual difficulties that can impede efficient exchange.

Trust, which is an intrinsic element of successful collaborative ventures, provides additional protection against opportunism complementing existing contractual safeguards (Verbeke and Greidanus 2009). This occurs through more positive interpretations of a partner's actions and

a greater willingness to share knowledge (Krishnan et al. 2006). As mentioned earlier, reciprocity in concurrent relations also serves to reduce the likelihood of opportunism and can create a situation of mutual forbearance (Chen 2010). The existence of a mutually shared orientation can also restrain opportunism, reduce the need for other contractual safeguards, and increase value creation if it results in a more effective bundling of resources (Madhok and Tallman 1998). Indeed, a shared focus and a recognition of the interdependency of rewards can serve to discourage misappropriative behaviour even when trust is embryonic.

At a more general level, we would argue that a collaborative venture offers a valuable way of shielding capabilities from competitors at a time when the growing use of outsourcing and similar market-based relations increases the risks of intellectual property leakage and imitation (Dunning and Lundan 2010). A collaborative approach to innovation, characterised by complementary streams of activities embedded in complex but separate organisations, and blended only upon exploitation, presents a high level of causal ambiguity, a major impediment to resource replication (Gooris and Peeters 2016).Collaborative ventures, carefully designed, can play a role in setting optimal incentives under conditions of potential opportunism (Grossman & Hart, 1986, Hart 1995, Hart & Moore 1990). The property rights approach to the firm suggests that joint ventures might be a valuable alternative to asymmetric bargains between buyers and sellers of intermediate products where trust and mutual forbearance (Buckley and Casson 1988) substitute for contracts. Such arrangements may transfer the focus from ex ante investment incentives to the removal (or at least improvement) of ex post inefficiencies (countering Williamson's (2002) criticism).

2.3.6 Division of Entrepreneurial Labour

Differentiation in the global factory system arises from the division of entrepreneurial labour between MNEs and SMEs (Buckley and Prashantham 2016). Interdependence within the system relies on differences in capabilities, facilitated through network orchestration and adaptation across space (to differentiated markets) is achieved through trans-global factory institutional support. Innovation is achieved by combining assets of largeness (and oldness) in the MNE with the greater nimbleness and agility of SMEs. The incentives to innovation therefore arise from specialisation and mutual support across the global factory system. Figure 2 suggests that these conditions are positively related to the likelihood of two organisations adopting a collaborative innovation venture in a high paced technological environment.

Collaborative ventures allow differentiation in the entrepreneurial abilities of the focal firm and associated SMEs (Geroski and Markides, 2004) allowing the orchestrator and satellite firms to play complementary roles (Acs, Morck, Shaver and Yeung 1997; Buckley 2006; Ceccagnali, Forman, Huang and Win 2012; Yang, Zheng and Zhao 2014). Collaboration can

overcome the vulnerabilities of SMEs in contracting with large multinationals (Katila, Rosenburger and Eisenhardt 2008; Alvarez and Barney 2001) although focal firms can be both cooperative and demanding (Casciaro and Piskorski 2005).

Orchestrators of global factories often play the role of "ecosystem developers" which involves integrating innovation and platform leadership to a constellation of participant SMEs (Nambisan and Sawhney 2011). Collaborative ventures help to ensure against the risk that SMEs do not buy too heavily into an ecosystem that proves to be unsuccessful (Iansiti and Levien 2004) or that the global factory duplicates the SME's domain of activity (Gawer and Cusumano 2002) – today's collaborator can easily become tomorrow's competitor and dialogue between the focal firm and SME is critical (Gawer 2014). SMEs need to be careful in dealing with the competing goals they face when participating in interfirm networks (Nambisan and Baron 2013). Cooperative ventures may help to focus SMEs on their most strategically important collaborations, rather than following a more random "scattergun" approach.

3. Apple-Foxconn as an Illustration

We illustrate our theoretical arguments with an example drawn from the consumer electronics industry: Apple and Foxconn. These two companies draw heavily on each other in two key ways: first in a long-standing component supply and assembly relationship; and second, in a co-specialised innovation development relationship. The supply and assembly relationship is the result of Apple's decision a decade ago to focus at the two extremes of the value chain - product design and development and marketing, and to outsource assembly (primarily to Foxconn). Interestingly, the relationship, certainly as it applies to current products such as the iPhone, could be described as a 'born global' one (Liang 2016) since assembly was outsourced right from the start and always occurred overseas in China.

The relationship between the two businesses is also a deep one: it goes well beyond a simple supply relationship. In effect, Foxconn is responsible for not just product assembly but also manages much of the component value chain, sourcing components from a wide range of suppliers in the East Asian region.

In line with our focus on value creation, the relationship between Foxconn and Apple is a market creating one. Their collaboration, in producing a low cost, high quality and highly valued product, has added significantly to global demand for smart phones. Around 700 million iPhones have been sold to date. This deepening of the market is the result of both product innovation (Apple) and process innovation (the responsibility of Foxconn).

An interesting characteristic of the relationship is its focus not simply on a single product or technology, but on the effective management of the supply chain. This has enabled both parties to specialise in the areas of value creation where they have greatest comparative advantage (design and marketing for Apple) and manufacturing and supply chain management (for Foxconn). Specialisation has allowed both organisations to make the best use of their resources and to develop very high levels of capability in their respective

elements of the value chain.

Their collaboration in innovation takes this specialisation to the next stage, where they share responsibility for product (Apple) and process (Foxconn) technologies. In this case, fine slicing has occurred within, rather than between, value chain stages and both internal and external activities are recombined. Foxconn enjoys considerable economies of scale and experience. Their largest iPhone plant in Zhengzhou has 94 production lines, is capable of producing up to half a million iPhones per day, and has assembled more than 230 million iPhones in total (Barboza 2016). As well as the advantages of specialisation, collaboration has provided a very high level of flexibility in that Foxconn is able to rapidly adjust scale and product mix. For example, in 2012 in gearing up for the launch of the iPhone 5, Foxconn had to increase employment at its Zhengzhou plant by 100,000 in the four month period from June to October. In responding to worker discontent and to attract additional employees, Foxconn raised wages, but also eroded its operating margin on iPhones from 5.4 percent in 2007 to 2.4 percent in 2011 (Mishkin and Palmer 2012).

A further source of flexibility is the co-existence of quite distinct management styles and cultures. While many organisations have struggled to coalesce dual labour forces, with separate groups employed under different terms and conditions, a collaborative venture enables the separation of such structures. For example, Apple may choose to implement a more embracing culture focused on creativity, while Foxconn operates a more regimented, cost-focused style. While the regimented management style employed in Foxconn's plants has created significant employee discontent and been subject to considerable criticism (Ngai and Chan 2012), for our purposes, the key point is the ability of the global factory system to separate and isolate such distinct management cultures within a networked entity. It is also likely that Foxconn pursues similar differentiation between its assembly workforce and technical and managerial staff.

The Apple-Foxconn example is also one where collaboration in innovation is feasible because levels of trust and mutual understanding are high, in large part because of the existence of long standing supply and assembly relations. Collaboration is facilitated because of the development of a high level of mutual understanding and ease of communication.

Cooperation between Apple and Foxconn also occurs in ways that tend to minimise many of the transaction difficulties that have been identified in the literature. Opportunism is discouraged by effective partner selection (a high level of prior knowledge), an ability to more readily identify resources and capabilities, and relational investments in co-specialised assets that signal commitment. Quality cheating is minimised where the two parties have an established supply relationship and the potential reputational effects (immediate for Apple, and indirect for Foxconn if switching was to occur) are high. Reciprocity is created by the existence of two distinct exchange relations (component assembly and innovation). The risk of intellectual property leakage or the creation of a future competitor is also low because Foxconn appears to be committed to the role of contract supplier and does not seem to have plans to try to compete directly with Apple. Investments in relational capital also reduce risk

for Foxconn as the dependent partner because they raise switching costs for Apple. If Apple switched to a new component supplier and assembler it would lose any collaboration-specific rents in innovation that result from synergies in resource combination and which would not be attainable in the absence of collaboration (Madhok and Tallman 1998). The lower level of risk and significant commitment is reflected in Foxconn's willingness to invest in new and additional facilities in China and its attempts to also encourage its suppliers, such as Samsung, to produce in China, closer to the point of assembly.

The partnership is also used for strategic technology sourcing. In 2016 Foxconn acquired the ailing Japanese electronics producer Sharp and has announced plans for a major investment in China in the production of OLED displays, a technology dominated by Korean producers Samsung and LG. Apple would like to move beyond LCD into OLED displays for its mobile devices but is reluctant to increase dependence on its major rival Samsung. Foxconn provides a vehicle for obtaining the desired technology and appears willing to make a major investment in producing OLED displays. This provides advantages to Apple in consolidating its supply base and reducing reliance on Samsung: it also enables Foxconn to produce higher margin components and to strengthen its links with Apple (Mochizuki 2016).

The Foxconn-Apple partnership also illustrates the growing geographical concentration of global value creation and the increasing importance of the East Asia region (Lee and Gereffi 2015). Indeed, the combination of the two firms highlights the importance of combining mobile and locationally bound resources. Apple possesses highly mobile assets in design and marketing, while Foxconn is able to tap into locational advantages offered by China. The benefits that state and local officials have provided to Foxconn are extensive and help the contractor to maintain very low production costs.

The subsidies provided, covering construction and infrastructure, energy costs, logistics, taxes and employee recruitment and training, provide strong location-bound assets encouraging Foxconn to maintain component manufacture and assembly in China (Barboza 2016). In addition, many key component suppliers for the iPhone are located in other parts of the East Asian region including South Korea, Taiwan and Japan, some of whom have also made investments into China. While production of Apple devices could be switched to other locations including the United States, locational stickiness is high with China and the Asian region the key source of raw materials such as rare earth minerals and critical components including LCD panels, batteries and DRAM and flash memories.

The importance of these country-specific advantages have been noted in a number of studies of internationalisation of emerging market firms (Buckley et al. 2007; Kolstad and Wiig 2012) and provide valuable cost advantages to Foxconn, some of which are likely to be appropriated by the firm itself. Foxconn's unique relationship with leading Chinese officials is also of considerable value to both collaborative partners and, in particular, helps Apple to overcome negative perceptions in China that may result from its size, technological strength and political influence. The attractions of China are reinforced by the fact that the country is now much more than simply a low-cost production site: it also offers a large and rapidly growing market for Apple products. China now provides around a quarter of Apple's revenue

and some of its largest profit margins (Barboza 2016).

4. Discussion

We have argued that global factories are increasingly able to combine the benefits of both internalisation and externalisation in the execution of their production systems. In particular, we see such networks progressively adopting outsourced relational structures as complements to trade or hierarchical governance. In our particular application we argue that collaborative ventures can be effective in areas such as innovation, a function traditionally internalised. Our discussion has some important implications for business thinking.

First, our analysis suggests that outsourced relations should not be seen simply as substitutes for hierarchical modes, but rather as complements. This is likely to be the case when desired assets and capabilities are heterogeneously distributed and difficult to trade, where learning occurs, or where there are strong advantages of specialisation. We have also suggested that firm specialisation (in our case between product and process technologies) facilitates the innovation process. In particular, it is likely that specialist skills and accumulated experience strongly favour the identification of new opportunities for investment in co-specialised resources. The growth of global market in specialist providers, offering complementary technological and entrepreneurial skills increases the complementarity of outsourced relations (Buckley and Prashantham 2016; Liesch et al. 2012).

Second, we see outsourced collaborative ventures as creating a number of positive benefits. Such ventures offer the possibility of additional joint value, that is they may generate collaboration-specific quasi rents, that would not be available if resources are used separately. Such rents are the result of both lower governance costs (value of trust, reduced need for contractual safeguards, reduced likelihood of opportunism) as well as the creation of additional value (through better identification of opportunities, more effective safeguarding of technology, closer alignment of interests, and the recombination of resources) (Dyer 1997; Zajac and Olsen 1993). Such arguments see the outsourced relationship as a valuable asset in itself (Madhok and Tallman 1998).

In addition, collaborative outsourcing also provides a number of efficient mechanisms for managing transactions. These include the use of residual claimancy when there are difficulties in measuring partner performance (Chi 1996), isolating mechanisms including causal ambiguity when resources are developed within separate organisations (Gooris and Peeters 2016), the fostering of trust to reduce opportunism and facilitate commitment, and concurrent relations as a disincentive to holdup. Collaborative outsourcing relations can also offer advantages in interest alignment and reduced likelihood of misappropriation (Gottschalg and Zollo 2007; Larsson et al. 1998).

A third important implication is the importance of recognising that it is not merely the existence of a collaborative venture that is important; rather how such a relationship is

structured and managed is the critical issue. Our analysis suggests that collaborative ventures are not simply about minimising transaction costs, but also about maximising production value (Madhok 2002). In effect, the two parties are not simply transacting resources, they are also creating them. This highlights the need to ensure the appropriate selection of a partner organisation (and the role of past experience, concurrent transactions and goal compatibility), as well as the management of the relationship to ensure the most effective outcomes. A particular issue is the substitution of lead firm coordination skills for managerial fiat in ensuring consistent and timely investment in co-specialised resources (Dierickx and Cool 1989). Conventionally, this has been an advantage of vertical integration where senior management is assumed to have the oversight of incremental investments (Ghemawat and deSol 1998).

Outsourced collaboration, while yielding advantages in identifying investment opportunities in co-specialised resources, does not offer a clear solution to the coordination challenges at the resource development stage. Discussions of effective coordination are largely confined to the resource combination and utilisation stages. The challenges of ensuring investment coordination in co-specialised resources between parallel organisations is an area that seems poorly understood. This also raises the issue of whether coordination skills are a transferable capability (Teece 2007). For example, are the skills that result from managing across a supply chain as valuable when managing within a value stage such as innovation? With widespread outsourcing and the bundling of resources, orchestration may be the distinguishing capability of the successful global factory (Pitelis and Teece 2010).

Our analysis also has interesting implications for the market impact of global factory firms. Traditionally, internalisation has been seen as a mechanism for MNEs to overcome market failures (Buckley and Casson 1976). Internalisation creates internal markets that are assumed to be more efficient that imperfect external markets. However, the entrepreneurial activities of MNE management in pursuing outsourcing helps in the creation of new markets as the market for outside contractors expands (Buckley and Prashantham 2016; Liesch et al. 2012). These markets may, however, remain thin and be subject to considerable transaction costs. Again, the appropriate structuring of outsourced ventures is the solution to overcoming such costs and may help explain why some contract suppliers have evolved into large and highly successful MNEs themselves.

Fifth, our discussion has important implications for the economic and social upgrading of partner firms. A significant literature in the area of global value chains suggests that upgrading is largely a bottom-up process facilitated by both the efforts of contract suppliers to improve their position (Humphrey and Schmitz 2002), and the strategies used by regions and governments to help develop local firms (Barrientos et al. 2011). Our analysis suggests a more complex picture. While local officials may provide of a range of assistance (as in the case of Foxconn), it is not clear that this facilitates upgrading, rather it appears to constitute a location-bound resource that the lead firm (Apple in our example) is able to combine with globally mobile assets (design and marketing expertise). The impact is more likely to be reflected in cost competitiveness and growth of a local cluster. At the same time it is

decisions of the lead firm (Apple) that set the parameters for upgrading of the local partner. Any such upgrading arises from economic cooperation and is not independent. Similarly, we would expect upgrading to be primarily economic (the range of activities that the outsource partner is involved in) rather than social (a sharing of the economic benefits). Co-creation also questions the belief of Applebaum (2008) that the consolidation of transnational suppliers such as Foxconn in emerging markets like China will counterbalance the power of lead firms. Co-creation suggests that the primary rebalancing of power is more likely to be between collaborating members of a particular global factory system and between competing systems.

From an international business perspective the success of co-creation in innovation and the upgrading of advantage is critically dependent on subsidiary management within the global factory system. The type of behaviour we have described corresponds to a Pattern V subsidiary in the analysis of Rugman and Verbeke (2001) with the local operation engaged in "global market initiatives". Birkinshaw (1997) suggests that optimising the operations of such subsidiaries requires a high degree of autonomy, adequate resources, and limited parent-subsidiary direction. It is important for a subsidiary involved in innovative co-creation to be able to challenge head office decisions. The test for headquarters management is to somehow manage a state of balance between the subsidiary's corporate integration and its local embeddedness.

Finally, it is necessary to acknowledge some of the disadvantages of outsourced cooperative ventures. Incentive structures may be weakened where two parties develop a long-term, close relationship. One party is more likely to overlook failures by the other, when normally this might lead to expulsion from the relationship, a second chance may be granted. Delays might occur if the parties incorporate lengthy and costly mediation processes before any termination, and they may be more willing to incorporate unexpected cost increases or other contingencies. Differences in power and legitimacy across the global factory may result in exploitation of weaker firms within the system. These drawbacks should be balanced against reduced transaction cost and increased value creation (Hoetker 2005).

5. Conclusions

In this paper we have considered the case for outsourced collaborative ventures within a global factory system, the increasingly common network manifestation of global businesses. We have argued that outsourced relations may offer an effective organisational mode for innovation, a function traditionally internalised within the firm. While we have made a general case for such relations, we recognise that our discussion and illustration do represent something of a special case. We have emphasised the value of co-specialised resources (generic resources may be traded more readily), under conditions of rapid change and uncertainty, and between complementary partner organisations who show no inclination to replicate one another's capabilities. It is necessary to try to generalise these arguments to consider a broader array of activities and environmental conditions.

We have attempted to embed our analysis within contemporary thinking on the MNE. We see such lead firms as part of broader global factory systems that utilise both internal and external markets. We see transaction cost thinking incorporating the possibly of additional value creation and not focusing simply on transaction cost minimisation. From such a perspective the lead firm acts as an agent seeking to bundle and recombine diverse resources with varying degrees of mobility with the aim of creating sustainable advantage. This occurs not just within the firm but increasingly externally, through outsourcing. We have examined the structural and efficiency benefits of collaborative ventures (Carson et al. 2006; Poppo and Zenger 2002) identifying the substitute contractual safeguards (trust, flexibility, dualism, interest alignment and mutual forbearance) they offer in comparison to resource trading, acquisition, and vertical integration.

There are a number of areas where our analysis would benefit from further development. One is the entrepreneurial role of MNE subsidiaries within the global factory and how such subsidiaries are best managed by headquarters. While there is some relevant literature (Andersson et al. 2007; Birkinshaw and Hood 1998; Vora et al. 2007) this would benefit from a more focused application to resource co-creation. A subsidiary within a global factory system is part of an interdependent production system with a particular role to play in contributing to the overall efficiency of the global system. This involvement has been termed corporate embeddedness (Forsgren at al. 2005). The subsidiary will face pressure from the headquarters to emphasise this role as the latter seeks to optimise system integration. However, the local subsidiary is also a conduit for identifying, accessing, and integrating capabilities offered by external partners. The more important are such capabilities to the global factory system, the more systemic power (Astley and Zajac 1991), and influence the subsidiary is likely to enjoy. The challenge for headquarters is to ensure a balance between the immediate needs for system efficiency, and hence coordination, and future needs for upgrading. Further understanding of how headquarters manages this balance when the emphasis is on co-creation is needed. One area of interest would be whether local subsidiaries can achieve sufficient embeddedness simply through local scanning, or if the creation of an outsourcing relationship is required to access the necessary information.

Second, the coordination of orchestration skills of lead firms are of considerable significance. Some authors suggest that these are now the defining capability of lead firms (Augier and Teece 2007). We have considered a situation where the lead firm (Apple) has partially substituted these skills for knowledge of process technology (held by Foxconn) and structured a relationship that enables the refinement of such capabilities with little danger of leakage of know-how. Analysis of the how coordination of a significant area of development can be devolved to a partner, undergo further refinement, and be subsequently integrated into a global production system is a further area where we would benefit from additional work. In particular, issues of cost sharing, compatibility of information systems, and protection of proprietary knowledge, appear to be of central importance. These could be usefully explored using case study approaches.

We also recognise that our discussion emphasises operating environments characterised by high rates of technological change and uncertainty. Further analysis is necessary to consider alternative industry and competitive conditions. For example, in sectors experiencing slower rates of technological and environmental change, or where technological convergence is less of an issue, how are the incentives for collaborative innovative ventures affected?

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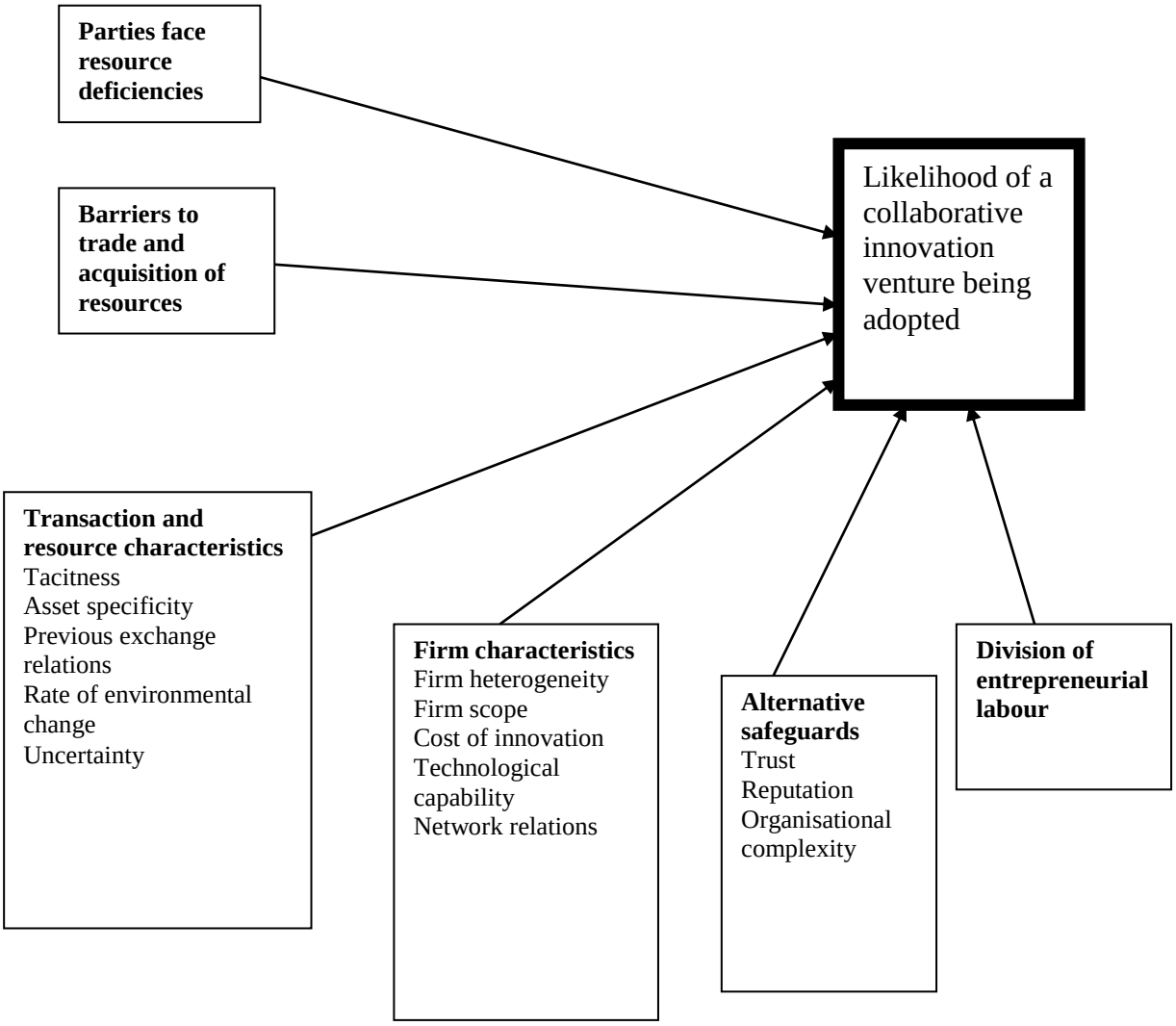
Figure 1 Technological Complexity, Integration Cost and Choices

Cost of Integrating Product Innovation

Cost of Integrating Process Innovation	High	Low
High	Collaborative Arrangement (1)	Contractor acquires brand leader (Forward integration) (2)
Low	Brand leader acquires contract partner (Backward integration) (3)	Acquisition occurs either way (4)

Figure 2 Factors Influencing the Adoption of Collaborative Ventures



Highlights

* draws on literature from internalisation theory and the resource-based view to develop a rationale for outsourced collaborative ventures in innovation

* identifies and discusses a range of variables influencing the adoption of outsourced collaborative ventures

* arguments are illustrated using the example of collaboration between Apple and Foxconn

* discusses the benefits and challenges of managing outsourced collaboration in functions traditionally internalised within the firm