Factors Determining the Choice of Governance Structure for Product Innovations

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This paper presents factors and propositions behind the choice of governance structure to explore, develop, and commercialize innovation projects while mitigating market and technical uncertainties. We propose that 10 factors are likely to be influential in the choice: market uncertainty, technical uncertainty, risk of leakage of private information, speed, capability considerations, preemption strategies, past experiences with a governance structure, potential profit, antitrust consideration, peer's pressure. We develop propositions about how differences across these 10 factors influence the choices that firms make in terms of governance structure. In addition to looking at how these dimensions affect the choice of governance structure, we add to the literature by looking at this choice over time. Thus, we state propositions regarding the importance of each factor among the stages of the innovation cycle: idea generation/ prototyping, manufacturing/production, commercialization/marketing. We also hypothesize how the decision making process may be different depending on the type of innovation. We conclude with suggestions on how to test those propositions.

Many authors have written about the importance of innovation. Brown et al. (2003; p1) stated that "Innovation is the lifeblood of successful businesses. […] [It] has become every firm's imperative as the pace of change accelerates. The challenges of this imperative increasingly require leaders to manage uncertainty and pursue learning and innovation across the boundaries of firms". Successful companies, like Google, devote a significant share of their time to

innovation (Iyer et al., 2008). The Boston Consulting Group (2006) surveyed executives in their 2005 innovation survey. The group found that 90% of the surveyed executives believe organic growth through innovation is essential and nearly three-quarters of these executives will increase spending on innovation (The Boston Consulting Group, 2006). McKinsey surveyed top executives and found that more than 70% consider that innovation will be at least one of the top three drivers of growth for their company in the next three to five years (Barsh et al, 2008). The agribusiness sector is no stranger to this phenomenon. Over the last 150 years, it has seen several waves of innovation related to machinery, chemistry, seed, information management (Graff et al., 2003; Gray et al., 2004).

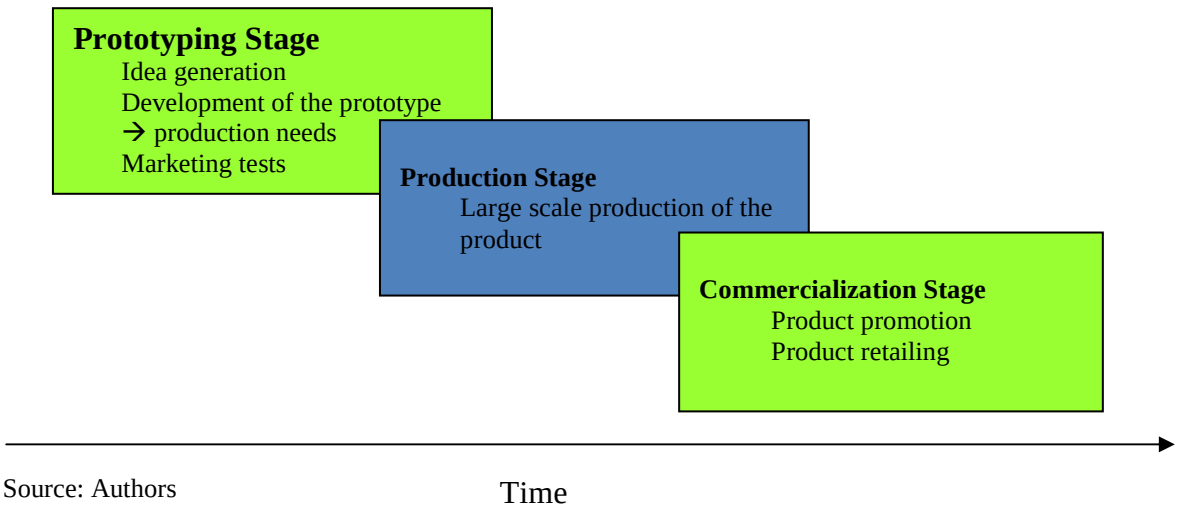
While innovation is clearly seen as important, it faces challenges. One of the challenges related to innovation – and the focus of this paper – is the associated uncertainty (Boehlje et al., 2005). To mitigate uncertainty, companies have used governance structures as a way to share risk with other firms (McGrath and MacMillan, 2000). Because uncertainty is evolutionary, the choice of governance structure has to be dynamic, i.e., governance structures have to evolve over time. The objective of this paper is to study the factors affecting the choice of governance structure for product innovations, and as the product moves through the innovation cycle. . Wang and Zajac (2007) stated that only 14 percent of companies developed specific policy guidelines or criteria for choosing between forming an alliance and acquiring a potential partner.

Definitions

Following Christensen et al. (2004), we categorize innovation into sustaining and disruptive innovations. Sustaining innovations deal with improving a current product. Disruptive

innovations refer to the creation of a new product or value proposition. Using Castañer et al.(2008) and Garcia and Calantone (2002), we segment the innovation cycle into the following stages: Research/development/prototyping, manufacturing/production and marketing/commercialization (see Figure 1). The stage research/development/prototyping refers to the generation of the idea; the research to develop, prototype a product, and determine the production needs; and the marketing tests to determine the demand. The manufacturing/production stage, as indicated, refers to the manufacturing and production of the product full scale and in large quantities. Marketing/commercialization consists of promoting the product and making it available in the retail arena (Hauser, 2008).

Figure 1. Stages of the Product Innovation Cycle

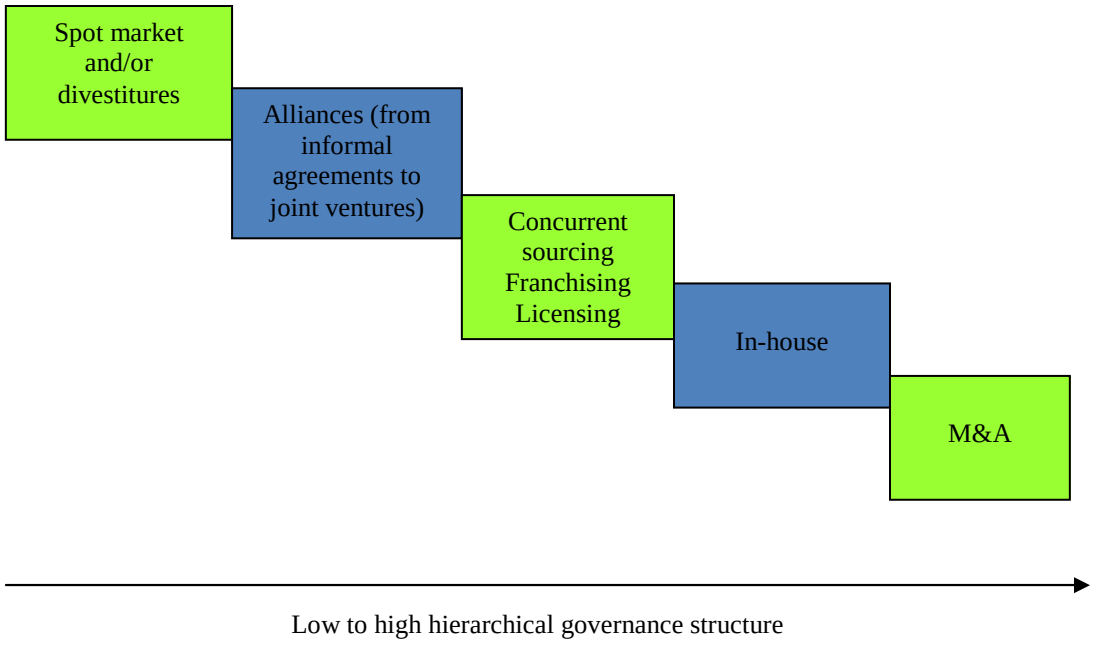


Source: Authors

Our concern in this paper is how the strategic, marketing, economic and environmental factors influence the level of hierarchy of the governance structure along the full integration continuum. The integration continuum refers to governance structures organized from non-hierarchical (also called market governance) to highly hierarchical (also called ownership governance). One can also think of the continuum in terms of commitment levels -- commitment in the sense of the

level of investment and/or the strategic and constraints/barriers the firm is facing with the structure.

Figure 2. Examples of Governance Structures along the Integration Continuum



Source: Authors

The creation of these various governance structures/inter-firm relations is motivated by diverse considerations besides uncertainty mitigation and management. The use of governance structures may be a way to acquire technological capabilities such as knowledge, expertise, business experience with the technology, and intellectual property rights (King and Schimmelpfennig, 2003; Ahuja and Katila, 2001). Some companies use inter-firm relations to learn new skills (Gulati, 1995); or reap economies of scale and scope (Sampson, 2007). Other companies see governance structures as a means to access markets or improve market power; achieve production efficiency; enhance financial flexibility; and to gain access to key personnel or

governance resources (Richards and Manfredo, 2003; Lorenzoni and Lipparini, 1999). Strategic reasons such as competitive preempting[1] can also be at the cause of a governance structure choice (Stanek, 2004; Hagedoorn, 1993; Orelli, 2008). In this paper, we focus on the reasons behind the choice of a governance structure specific to innovation projects.

Factors Affecting the Choice of Governance Structure for Product Innovation

Dodourova (2003) presented an extensive list of factors affecting the choice of a governance structure. Sakakibara (2002) investigated industry and company's factors on the firm's rate of participation in R&D's consortia. Using an event history technique on a dataset of 312 Japanese firms in 74 industries for the period 1969-1992, he showed that firms with weak competition and appriopriability conditions are more likely to engage in consortia. He further reported that a firm's R&D capabilities, a firm's encounter with other firms through past relationships and in the market, a firm's past experiences with organizational structure, and a firm's age also positively increase the likelihood of consortia formation.

Following Sakakibara (2002), we focus on the factors to consider when choosing a governance structure to discover, implement, or commercialize innovation projects. We propose that 10 factors are likely to be influential in the choice: market uncertainty, technical uncertainty, risk of leakage of private information, speed, capability considerations, preemption strategies,

[1] Competitive preemption consists of a firm forming alliances to block a competitor from forming similar ones or to discourage a competitor from entering a market (Stanek, 2004).

experience with a governance structure, expected profit, antitrust considerations, and peer's pressure. Each of these 10 factors will be discussed in turn (see Figures 3 and 4 for a summary). It is important to note that this is study of the choice of governance structure and not the characteristics to look for in a partner; we assume the availability of compatible target firms (Peterson et al., 2001). Compatibility requires that the target firm not be too different from the firm initiating the relation from a resource and knowledge standpoint (Sampson, 2007). Compatible firms also have similar decision making processes and interests (Peterson et al., 2001) and similar agendas. A financially stable target firm is also a key condition for a sustainable relationship.

Market and Technical Uncertainties

McGrath and MacMillan (2000) proposed two types of uncertainties: market and technical uncertainties. Market uncertainty refers to the lack of knowledge at the market and demand level. Major sources of uncertainty are the potential revenue/demand, the regulatory aspects, the associated cost, and the upstream supply chain reaction to the innovation project. Technical uncertainty comes from the lack of information about the viability of the innovation. The firm does not know whether or not the technology can be developed, and which inputs and skills are needed. The firm also does not know how and if the user will know how to use the product. McGrath and MacMillan (2000) suggested an inverse relationship between uncertainty and a hierarchical governance form to create flexibility. They propose limiting the firm's downside exposure to risk and loss until the upside potential of the project is demonstrated. In other words, they encourage flexibility until the uncertainty subsides. To limit the downside exposure, a non-hierarchical governance structure has to be chosen. As uncertainty increases, a less committing

transactional arrangement will be preferred (Pisano, 1989; Roucan-Kane et al., 2008; Wolter and Veloso, 2008; Podolny, 1994; Diez-Vial, 2007; Geyskens et al. 2006). For example, in highly uncertain environments (from a market or technical standpoint), risk averse agents will choose a structure that mitigates the sunk costs (Pena, 1998). Uncertainty is particularly high for disruptive innovations.

Proposition 1a: High market uncertainty suggests a non-hierarchical governance structure, ceteris paribus[2].

Proposition 1b: Market uncertainty will have a greater impact in the choice of governance structure for disruptive innovation than for sustaining innovations.

Proposition 2a: High technical uncertainty suggests a non-hierarchical governance structure, ceteris paribus.

Proposition 2b: Technical uncertainty will have a greater impact in the choice of governance structure for disruptive than for sustaining innovations.

Market uncertainty is greater at the prototyping stage. Once the prototype has been tested, focus groups, commercialization tests in selected markets and surveys can be used to determine how customers will react to the prototype/product and therefore decrease market uncertainty.

Proposition 1c: Market uncertainty is likely to have a greater impact at the prototyping stage than at the production and commercialization stage.

Technical uncertainty is the greatest at the prototyping stage. Once the product reaches the production and commercialization stages, most of the technical demands of the products are known.

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[2] Ceteris paribus is a latin expression which signifies everything else held constant.

Proposition 2c: Technical uncertainty is likely to have a greater impact in the choice of governance structure at the prototyping level than at the production and commercialization stage.

Risk of Leakage of Private Information

When several parties are involved and the innovation cannot be segmented into components (Boudreau, 2008), risk of leakage of private information is often common, making monitoring necessary (Peterson et al., 2001; Gray et al., 2006; Diez-Vial, 2007; Lee and Veloso, 2008; White and Lui, 2001). When the risk of leakage of private information is high, monitoring costs and measurement problems may be so large that governance integration can be justified (Villalonga and McGahan, 2005; Castañer et al., 2008; Diez-Vial, 2007). These risks may endanger the first-mover advantage in an innovation project and the associated expected profits, particularly if access to property rights (endogenous learning, patents or copyrights, etc.) do not exist or are limited (Pena, 1998; Boehlje et al., 1999; Ross and Westgren, 2008). The stakes are particularly high for disruptive innovations - which usually serve non-customers (Christensen et al., 2004) - because the key to their success is novelty. This typical transaction cost argument leads to the following proposition.

Proposition 3a: Risk of leakage of private information suggests a more hierarchical governance structure, ceteris paribus.

Proposition 3b: The risk of leakage of private information will have a greater impact in the choice of governance structure for disruptive innovations than for sustaining innovations.

One could argue that the risk of leakage of private information is stronger earlier in the product lifecycle, suggesting that a more hierarchical structure may be needed for product prototyping

and manufacturing. Once the product is built and reaches the market, it is harder for a competitor to determine the components of the product and to off-set the first mover advantage. Therefore, more committing/hierarchical governance structures may be more appropriate at the commercialization stage.

Proposition 3c: The risk of leakage of private information will have a greater impact in the choice of governance structure at the prototyping and manufacturing stages than at the commercialization stage.

Speed

Besides monitoring costs, speed may be an important consideration. Boehlje (2001; p10) states "the ability to respond quickly to changes in the economic climate is critical to maintaining profit margins and to extracting innovators' profits". Speed may be important all along the innovation product cycle: prototyping an idea before competitors, getting first access to a rare input, being the first to commercialize the product, bringing it to market and obtaining the first-mover advantage. On one hand, responding quickly requires effective communication systems and knowledge of the supply chain which is harder to accomplish in a non-hierarchical governance structure (Chaudhuri and Tabrizi, 1999; Argyres and Zenger, 2008; Boudreau, 2008). Time cannot be wasted in writing contracts and renegotiations. On the other hand, acquiring capabilities and successfully integrating them into the firm's system is also time consuming (Stylianou et al., 1996). One could argue that sustaining innovations serving satisfied, underserved, and overserved customers particularly, require speed to guarantee competitors will not commercialize the product before the firm itself. Because disruptive innovations are so

sudden and new, competitors may be less likely to have the same idea/project. In this latter case, speed may not be as critical as the uncertainty associated with the project.

Proposition 4a: When speed is critical to the success of an innovation, managers must consider whether regularly renegotiating contracts associated with a less committing governance structure will be more or less time consuming than successfully integrating new capabilities into the firm's overall structure through a more hierarchical structure, ceteris paribus.

Proposition 4b: Speed will have a greater impact in the choice of governance structure in the case of sustaining innovations than in the case of disruptive innovations.

Capability Considerations

Capability considerations (also called the resource- and capability-based view (Lorenzoni and Lipparini, 1999; Jacobides and Winter, 2005; Castañer et al., 2008)) are also important. Insinga and Werle (2000) and Chaudhuri and Tabrizi (1999) highlight that firms should analyze how their capabilities fit those needed for the innovation project. Capabilities can come in different forms such as financial, physical, and human. The complementarity of the new capabilities with the firm's bundle of resources and projects, the rarity and specificity of the assets make a high hierarchical structure more desirable (Argyres and Zenger, 2008; Villalonga and McGahan, 2005). Indeed, capabilities that can also be employed in future or current innovation projects, and rare assets may be best leveraged through a hierarchical structure so the capability is available for the long-term. However, when human capital is critical to the success of an innovation, a hierarchical structure may not be recommended.

Complementary capabilities that are good candidates for high hierarchical governance structure are the ones that help the firm maintain or increase its competitive advantage. Potential for

competitive advantage is determined based on the firm's core competencies, the expected reaction of competitors.(their identity, their size and number, and their aggressivity) and the nature of the innovation in terms of the following four criteria: 1) How rare is the innovation?, 2) How durable is the innovation?, 3) How costly to imitate is the innovation?, and 4) How non-substitutable is the innovation? Obviously, only innovation projects that have potential for competitive advantage should be considered (Insinga and Werle, 2000). It is important to realize that the competitive advantage may not be in the entire product but in some of its components. In other words, within one stage of the innovation cycle, the firm may use a hierarchical governance structure to prototype, manufacture, or commercialize parts of the products that are key to the firm's competitive advantage, while using a low hierarchical governance structure for other components of the product that are not key to the firm's competitive advantage. Insinga and Werle (2000) insist that, if the firm does not have the necessary capabilities but there is potential for competitive advantage, the company needs to acquire the capabilities to access that competitive advantage.

One can think of tacit knowledge as a rare asset. Tacit knowledge refers to knowledge difficult to pass on, communicate, and replicate. Tacit knowledge can be considered unique and therefore more valuable for discoveries, because not all competitors will have access to the same information (Ross and Westgren, 2008). If specific tacit knowledge is the capability that needs to be acquired for the success of an innovation project, then the best way this capability can be leveraged is through a hierarchical governance structure (Gulati, 1995; Boehlje et al., 1999; Yin and Shanley, 2008).

Furthermore, if the capability is the key to the success of the innovation project, then to avoid holdup problems, a hierarchical structure should be chosen. Holdup problems arise when firms

invest in specific assets required for a specific transaction. Those assets are essential for the efficiency of a particular transaction, but cannot be reemployed into another transaction without some profitability sacrifice (Diez-Vial, 2007). Assets can be called specific when, for example, a specific location needs to be chosen. Specificity can also come in the form of physical or engineering properties that are specific to a relationship. Dedicated assets are also specific in the sense that an investment in an asset is made to satisfy a particular party. Finally, specificity can also take a human form in the sense that employees may have acquired skills, or know-how that are more valuable for a particular relationship/transaction than for others.

The difference between the profits a firm will make by deploying the specific assets in their intended use and the profits the firm would make in the best alternate use of the specific assets is called quasi-rents. Trading partners can hold up parties that have quasi-rents by trying to transfer the quasi-rent to their firm. This is called the holdup problem and is particularly likely when contracts are incomplete. Because of the holdup problem, contract negotiations can be extremely lengthy and parties can underinvest in relationship-specific assets (Besanko et al., 2000). To avoid these inefficiencies, firms tend to engage in more hierarchical governance structures (Besanko et al., 2000; Boehlje et al., 1999; Peterson et al., 2001; Diez-Vial, 2007; Parmigiani, 2007; Geyskens et al. 2006).

However, when human capital is critical to the success of an innovation, a hierarchical structure may not be recommended. At the roots of the innovation and its success is the development of an idea to respond to a needs. Creative ideas and designs are the result of people. Take the consulting design company, IDEO, as an example. IDEO is one of the most innovative companies (Tischler, 2009) and most of their resources lies in their employees. That is because talented employees can be unhappy in a new structure or a new management system, and leave

the company, taking with them the know-how that is key to the success of the company (Chaudhuri and Tabrizi, 1999; Yin and Shanley, 2008). Finally, at the marketing and commercialization stage, the use of human capital is critical. Individuals and their creativity are again at the roots of innovative marketing campaigns. Individuals are also instrumental in the sales process and its success. Creative minds and salespeople with personalities tend to thrive in creative environments with not much bureaucracy. High hierarchical governance structure are usually associated with bureaucracy.

Proposition 5a: When access to new capabilities is critical to the success of an innovation, managers must consider whether the capabilities are physical, rare, specific, and needed to build competitive advantage; or whether the projects require human talents. On one hand, physical capabilities that are rare, specific, and needed to build competitive advantage are best leveraged through hierarchical governance structures. On the other hand, talended employees may not thrive in a hierarchical and bureaucratic governance structure, ceteris paribus.

Because disruptive innovation usually falls outside the firm's core competencies, the need for new capabilities will be greater in the case of disruptive innovation.

Proposition 5b: Need for capabilities will have a greater impact in the choice of governance structure for disruptive innovations than for sustaining innovations.

Preemption Strategies

One additional strategic consideration may involve blocking competitors.. Some firms may create relationships with other firms to deprive competitors from potentially valuable allies (Kogut, 1988). Competitive preemption consists of a firm forming linkages to block a competitor from forming similar ones, or to discourage a competitor from entering a market (Stanek, 2004),

or “to gain market share before the industry stabilizes” (Moatti, 2007). These strategies can be important to secure and block competitors’ access to critical supplies (used, for example, for incremental, modular or radical innovations) or a distribution channel. These strategies can be particularly useful as an alternative when access to property rights or speed to market is not available. To maintain valuable allies unavailable to competitors for long-periods of time, tight linkages need to be created between the parties. In the case of sustaining innovations, it is likely that the involved parties will be the ones the firm has already been involved with, suggesting that all the preemption behaviors have probably already taken place. Disruptive innovations often involve new parties with which tight linkages have not yet been considered.

Proposition 6a: A preemption strategy suggests the use of a hierarchical governance structure, ceteris paribus.

Proposition 6b: Considerations of a preemption strategy will have a greater impact in the choice of governance structure for disruptive innovations than for sustaining innovations.

Experience with a Governance Structure

Expertise in the management of a specific governance structure (Peterson et al., 2001) and experiences (Roucan-Kane, 2008; Pena, 1998; Lin et al., 2008; Moatti, 2007) with a specific governance structure can also impact the choice. One can argue that firms with past or current experience with one governance structure may be more effective at managing the same type of governance structure. This learning effect may make firms more likely to choose the same type of governance structure in the future (Villalonga and McGahan, 2005; Sakakibara, 2002; Wang and Zajac, 2007). Furthermore, firms familiar with a specific governance structure may be biased in their decision-making process, and may forget to even consider other types of governance

structure. Argyres and Liebeskind (1999) add the notion of governance inseparability. They point out that prior contractual commitments (that include union wage agreements, long-term supply contracts, exclusive dealership and franchise agreements, debt covenants, customer warranties, etc) may limit the firm's ability to change future governance structures. Villalonga and McGahan (2005) also showed how recent experience with a governance structure may have more effect on future choices than older experience. Finally, while it is slowly changing, firms that have had the experience of doing a lot of closed innovation (innovation by themselves) may have the perspective that "they are smarter than everybody else".

Proposition 7: Past experiences in a specific governance structure make the selection of the same governance structure more likely in the future, ceteris paribus.

Expected Profits

Transaction cost considerations and expected payoffs also affect the chocice of organizational structure. On one hand, long-term projects and projects with frequent transactions may also justify a more integrated governance structure (Wang and Zajac, 2007; Sawler, 2005; Geyskens, 2006). Long-term projects increase the risk of leakage of private information making the writing of a complete contract critical. However, writing a complete contract is hard to achieve (Milgrom and Roberts, 1992). Frequent transactions create numerous opportunities to renegotiate contracts. Writing of complete contracts and contract renegotiations are time-consuming and costly, making a high hierarchical governance structure more likely.

The level of potential for competitive advantage (possible, probable or highly likely) and the repartition of the intellectual property rights among the involved firms will determine the expected payoffs. Expected payoffs may also depend on the market share of the firm as a result

of the choice of a governance structure. Sawler (2005) mathematically show that mergers between two or more firms may give away some of the market share to non-merging competitors. The higher the potential for expected payoffs, the more motivated the company is in reaching the majority of the revenues generated by the innovation, which can only be accomplished by a more hierarchical governance structure.

On the other hand, a high hierarchical organizational structure often faces the problem of moral hazard with their employees (Milgrom and Roberts, 1992). Moral hazard takes place when there are not sufficient incentives and monitoring to encourage employees to maximize their productivity (Milgrom and Roberts, 1992). High hierarchical structures often result in the integration of other company's culture into the acquiring company's culture. The integration process is time-consuming and often costly.

If the costs of integration and moral hazard associated with a more committing governance structure outweigh the increased revenues and the financial savings avoided by the negotiation of contracts, the company should consider using more of a market governance structure and even think of divesting the in-house capabilities it may have related to the project (Villalonga and McGahan, 2005).

Proposition 8: The firm's potential profit associated with each governance structure will affect the choice of governance structure, ceteris paribus.

Antitrust Scrutiny

Antitrust authorities and structiny may also affect the decision (Lin et al., 2008). If the choice of a governance structure is likely to make a company's market share critically high and jeopardize the competitive nature of the market, antitrust authorities are likely to prohibit the creation of the

structure. The market share threshold after which antitrust authorities are likely to react varies from one sector to another. Nevertheless, projects of higher hierarchical structure involving firms that hold large market shares will be more scrutinized by the antitrust system (MacDonald and Hayenga, 2003). This consideration leads to the following proposition.

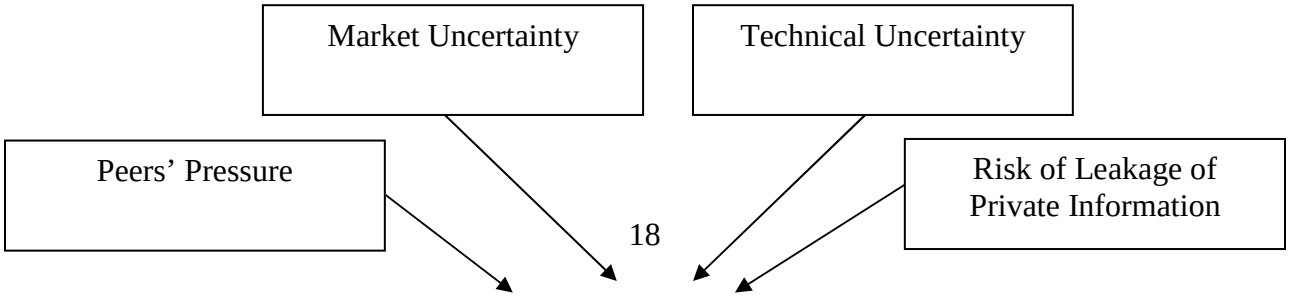
Proposition 9: As antitrust scrutiny increases, institutional and structural constraints are high and make coordination systems that are less hierarchical the best candidates, ceteris paribus.

Peers' Pressure

Finally, high status firms may influence the choice of governance structure (Yin and Shanley, 2008). Venkatraman et al., 1994 refer to isomorphic pressures: to remain competitive or "not to be shunned", firms often mimic high status firms. Moatti (2007) also argues that firms may mimic others because they believe high status-firms hold superior information that suggests the use of a particular governance structure. However as Kogut (1988) points out, an industry's choice of a structure may be more of a fad than a logical choice. Moatti (2007) also adds that in the case of an uncertain environment, the need for a company to quickly choose a governance structure will warrant firms from completing an extensive analysis of the factors and forces at play. Thus, imitating competitors' choice of structure will be the easy and quick choice.

Proposition 10: When high status firms tend to choose a governance structure, followers will make the same choice; ceteris paribus.

Figure 3. Theoretical Framework



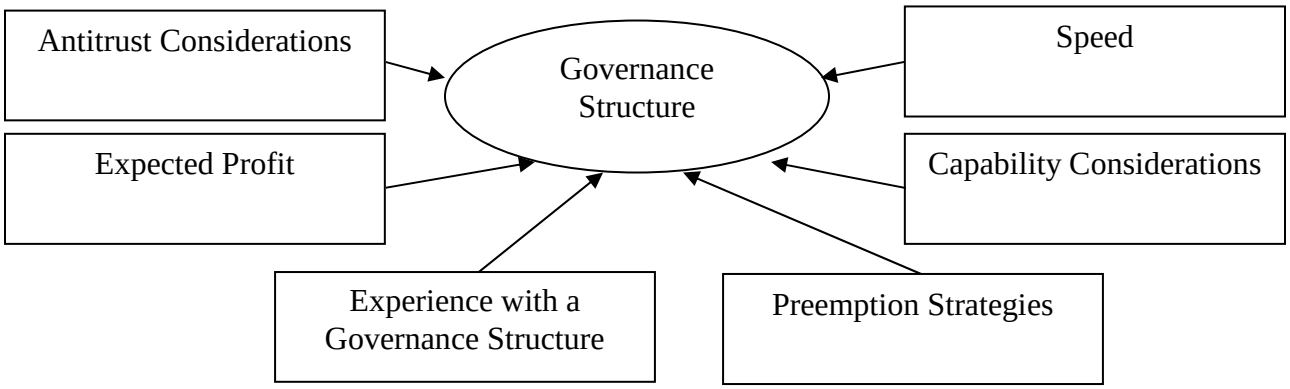


Table 1 summarizes the propositions. The first column lists the factors. The second column provides the definition of the factors. The third and fourth column indicate the hierarchical nature of the governance structure. Factors with a check-mark in the third column correspond to factors associated with a choice of a low committing/hierarchical governance structure. Factors with a check-mark in the fourth column correspond to factors associated with a choice of a high committing/hierarchical governance structure.

Table 1. Propositions' Summary

Factor	**Factor's Definition**	**Governance Structure**	
		Non Hierarchical	**Hierarchical**
Market uncertainty	Market uncertainty refers to the lack of knowledge at the market and demand level. Major sources of uncertainty are the potential revenue/demand, the regulatory aspects, the associated cost, and the upstream supply chain reaction to the innovation project.	X	
Technical uncertainty	Technical uncertainty comes from the lack of information about the	X	

	viability of the innovation. The firm does not know whether or not the technology can be developed, and which inputs and skills are needed.		
Risk of leakage of private information	Involved firms may share the private information with others affecting the likelihood of being the first mover or having a purely different product.		X
Speed	Speed may be important all along the innovation cycle: prototyping an idea before competitors, getting first access to a rare input, being the first to commercialize the product, bring it to market and get the first-mover advantage.	?	
Capability Considerations	Does the firm need access to new capabilities to successfully pursue the innovation project? Are the capabilities complemtary the the firm's core competencies? Are the capabilities needed rare? Are the capabilities specific to the transaction? Are the capabilities in the form of physical or human assets?	?	
Preemption strategies	Creating linkages with other firms (suppliers, retailers, …), to block competitors from accessing them or to block competitors from entering the market for the long-term.		X
Past experience with a governance structure	There is a learning curve associated with each governance structure making the choice of the same governance structure more likely. Past experience	?	

	with a governance structure may bias the choice of opportunities; one may be tempted to forget to consider other governance structures.		
Expected profit	Each governance structure has effect on revenues and costs.	?	
Antitrust consideration	Some governance structure may not be potential candidates because of antitrust scrutiny.	X	
Peer's pressure	The choice of a governance structure by a peer for a project may suggest that this is the best governance structure to adopt for the same kind of project.	?	

Illustrations

We propose two examples of innovation to illustrate this theoretical paper: one at the corporate level and one for a small business. First, we consider the example of Deere and Company and their disruptive innovation products in the area of precision farming. John Deere's history in precision farming dated back to 1994, with the introduction of a yield mapping system, and has evolved into five distinct categories: guidance, machine control, telematics, information management, and robotics.

Deere has historically prototyped and produced its precision farming products in-house with the help of selected universities, as well as the acquisition of companies such as NavCom technologies to gain capabilities in navigation technologies. Several reasons underlie these decisions. First, Deere and Company have extensive knowledge and a competitive advantage in complex machinery/product design and manufacturing suggesting a fairly hierarchical governance structure. Deere is also well known for high-quality products. This competitive

advantage is best obtained with extensive monitoring, i.e., a hierarchical governance structure. Second, Deere has historically focused on and has substantial experience in producing in-house, at least partially because of the challenges of negotiation of property rights associated with less hierarchical governance structure. Third, these products were expected to generate high profits, and Deere wanted to reach the maximum of the profit. Finally, those products were expected to reach current Deere's customers, so the market uncertainty was fairly low and Deere's dealers could provide more of a one-stop shopping location to the farmer. The acquisition and the collaboration with universities were useful strategies to gain capabilities Deere did not have. Finally, at the commercialization level, Deere has had experience working with their dealer network, thus relying on the dealers' human capital to attract and retain customers. Table 2 summarizes the factors affecting Deere and Company's decision. The + sign suggests a hierarchical governance structure while the – sign suggests a less hierarchical governance structure.

Table 2. Summary of Deere's Choice of Governance Structure

Factors	**Protyping Stage**	**Production Stage**	**Commercialization Stage**
Capability considerations	+	+	-
Past experience with a governance structure	+	+	+
Expected profit	+	+	-
Decision	In-house	In-house	"Franchising"

These propositions are also relevant for small businesses. Philippe Roucan is the father of one of the authors. He is a cattle farmer in France who has decided to innovate the product he sells – and incidently his business model - to respond to the lack of sales he was facing as a result of foot and mouth disease. Philippe used to wholesale his cattle, but is now selling most of his

production as a value-added product -- a 10 or 20 lb meat package composed of different pieces of meat. He continues to produce the cattle himself, outsources the packaging of the product, and sells the product directly by delivering to the customer (households and restaurants).

Philippe has decided to continue to raise his cattle because one of his competitive advantages is producing a meat of quality that is consistent. He also has always done that, i.e., used this governance structure of producing in-house. Finally, most farmers who are also proposing a similar product as his are producing the cattle themselves.

Philippe is outsourcing the packaging aspect of the business for several reasons. First, at the time the product was introduced, Philippe was facing urgency. His calves were growing bigger and bigger and there were no sales in the regular channel. He had to try to sell the packaged value-added product as far as possible. He had not time to build his own butchery and packaging plant. Furthermore, he did not have the human and physical capabilities to do so: he was not a butcher and would not have had enough employees. There was also significant market uncertainty: were the consumers going to like the packaging of the product, the delivering process, and the meat itself? Building a slaughter-house and a packaging plant that meet the regulatory constraints is also extremely costly. Philippe was not going to make enough money to finance such an investment unless he was to significantly increase the business and the supplies. He was not ready to do that. Finally, there was no significant competitive advantage for him in controlling that stage.

Philippe decided to sell and deliver the product himself rather than through a food retailer. Part of the value the customers perceive in the product is being able to connect with the producer. Philippe is also a great sales person, it is one of his competitive advantages. Table 3 summarizes

the factors affecting Philippe's decision. The + sign suggests a hierarchical governance structure while the – sign suggests a less hierarchical governance structure.

Table 3. Summary of Philippe's Choice of Governance Structure

Factors	Production Stage I: raising cattle	Production Stage II: Slaughtering and Packaging	Commercialization Stage
Capability considerations	+	-	+
Past experience with a governance structure	+		
Peers' pressure	+		
Market uncertainty		-	
Expected profit		+	
Decision	In-house	Outsource	In-house

A Proposed Empirical Test

As to future work, we will first conduct a survey of industry participants to test the validity of the propositions. The objective will be three-fold: 1) make sure the factors presented in this paper are the relevant ones to make an informed decision of governance structure, 2) determine which factors are the most influential in the choice of governance structure for disruptive and sustaining innovations, and 3) determine which factors are the most influential in the choice of governance structure for the different stages of the innovation cycle. Tables 2 and 3 present the expectations with respect to some of those factors. Because we have no expectations regarding the relative impact of potential for competitive advantage, past experience with a governance structure, potential profit, antitrust considerations, and peers' pressure in the choice of governance structure for disruptive versus sustaining innovations; these factors are not mentioned in Table 4. Because we have no expectations regarding the relative impact of speed, potential for competitive advantage, capability considerations, preemption strategies, past experience with a

governance structure, potential profit, antitrust considerations, and peers' pressure in the choice of governance structure for each of the stages of the innovation cycle; these factors are not mentioned in Table 5.

Table 4. Relative Impact of each Factors in the Choice of Governance Structure for Disruptive versus Sustaining Innovations

List of Factors Having More Impact for Disruptive Innovations than for Sustaining Innovations	List of Factors Having More Impact for Sustaining Innovations than for Disruptive Innovations
Market uncertainty	Speed
Technical uncertainty	
Risk of leakage of private information	
Capability considerations	

Table 5. Relative Impact of each Factors in the Choice of Governance Structure for each Stages of the Innovation Cycle

List of Factors Having More Impact at the:		
Prototyping Stage	**Production Stage**	**Commercialization Stage**
Market uncertainty	Risk of leakage of private information	
Technical uncertainty		
Risk of leakage of private information		

Following this survey and using the survey's results, a choice experiment survey will take place with industry stakeholders to test the propositions. The choice experiment survey will have five parts. The first part will focus on scenarios relative to disruptive innovations while the second part will offer scenarions relative to sustaining innovations. The third, fourth, and fifth parts will test scenarios referring to the prototyping, producting and commercialization stages of the innovation cycle respectively.

Conclusion

The choice of governance structure for innovation projects/activities is complex. In this paper, we have attempted to consider strategy, marketing, economy, and environment in the choice of governance structure for product innovations. We have presented a conceptual framework based on strategic factors (market and technical uncertainties, risk of leakage of private information, speed, capability considerations, experiences with a governance structure, expected profit, antitrust considerations, and peers' pressure. We have presented propositions about how differences across these 10 factors influence the choices that firms make in terms of the hierarchical level of the governance structure. In addition to looking at how several factors affect the choice of governance structure, we have examined this choice over time, i.e., across the product stages of the innovation cycle. Indeed, we focus on product innovation and state propositions regarding the importance of each factor among the product stages of the innovation cycle: idea generation/prototyping, manufacturing/production, commercialization, marketing. We have also hypothesized how the decision making process may be different depending on the type of innovation: disruptive versus sustaining innovation. To illustrate the propositions, we have presented two examples of innovation: one at the corporate level and one for a small farm operation. Finally, we have also explained how we plan to test these propositions.

Bibliography

Ahuja, G, and R. Katila (2001). "Technological Acquisitions and the Innovation Performance of Acquiring Firms: a Longitudinal Study." *Strategic Management Journal*, 22: 197-220.

Argyres, N. S. and J. P. Liebeskind (1999). "Contractual Commitments, Bargaining Power, and Governance Inseparability: Incorporating History into Transaction Cost Theory." Academy of Management Review, 24 (1): 49-63.

Argyres, N. And T. Zenger (2008). "Capabilities, Transaction Costs, and Firm Boundaries: A Dynamic Perspective and Integration." Working paper, Boston University:
Boston, MA.

Barsh, J., M. Capozzi, and J. Davidson (2008) "Leadership and Innovation." *The McKinsey Quarterly*, 1: 37-47.

Besanko, D; D. Dranove; M. Shanley (2000). "Economics of Strategy." Second edition. John Wiley and Sons, Inc.; Danvers, Massachussets.

Boehlje, M. (2001) "The Impact of Innovation and Technology Transfer on the Structure of Agriculture". Staff Paper 01-13.

Boehlje, M., A. W. Gray, J. D. Detre (2005). "Strategy Development in a Turbulent Business Climate: Concepts and Methods." *International Food and Agribusiness Management Review*, 8 (2): 21-40.

Boehlje, M. D., S. L. Hofing, R. C. Schroeder (1999). "Value Chains in the Agricultural Industries." Purdue University Staff Paper #99-10.

Boudreau, K. (2008). "Opening the Platform vs. Opening the Complementary Good? The Effect on Product Innovation in Handheld Computing." Working Paper.

Broring, S. (2008) "How Systemic Innovations Require Alterations Along the Entire Supply Chain: The Case of Animal-Derived Functional Foods" Journal on Chain and Network Science, 8 (2): 107-119.

Brown, J. S. and E. Olmsted Teisberg (2003). "Options Thinking for Leading Innovation." *University of Virginia, Darden School of Business.*

Busija, E. C., H. M. O'Neil, C. P. Zeithaml (1997). "Diversification Strategy, Entry Mode, and Performance: Evidence of Choice and Constraints." Strategic Management Journal, 18 (4): 321-327.

Castañer, X., Garrette, B., and P. Dussauge (2008). "Horizontal Alliances versus Autonomous Production." Paper presented at Druid, 25th Celebration Conference in Copenhagen.

Christensen, C. M., S. D. Anthony, E. A. Roth (2004). "Seeing what's next: Using the Theories of Innovation to Predict Industry Change." Harvard Business School Press, Boston Massachussets.

Christensen, C., and M. Raynor (2003). "The Innovator's Solution." Boston, MA: Harvard Business School Press.

Dacin, M. T., C. Oliver, J-P. Roy (2007). "The Legitimacy of Strategic Alliances: An Institutional Perspective". *Strategic Management Journal*, 28: 169-187.

Diez-Vial, I. (2007). "Explaining Vertical Integration Strategies: Market Power, Transactional Attributes and Capabilities." *Journal of Management Studies*, 44 (6): 1017-1040.

Dodourova, M. (2003). "Industry Dynamics and Strategic Positioning in the Wireless Telecommunications Industry: the Case of Vodafone Group plc." *Management Decision*, 41 (9): 859-870.

Fernandez-Cornego, J. (2004). "The Seed Industry in U.S. Agriculture: an Exploration of Data and Information on Crop Seed Markets, Regulation, Industry Structure, and Research and Development." Economic Research Service, Agriculture Information Bulletin No 786, accessed at url: http://www.ers.usda.gov/Publications/AIB786/

Garcia, R. and R. Calantone (2002). "A critical look at technological innovation typology and innovativeness terminology: a literature review." *The Journal of Product Innovation Management*, 19: 110-132.

Gawer, A. And R. M. Henderson (2005). "Platform Owner Entry and Innovation in Complementary Markets: Evidence from Intel." *NBER Working Paper* No. W11852.

Germain, R., C. Claycomb, C. Dröge (2008). "Supply Chain Variability, Organizational Structure, and Performance: The Modering Effect of Demand Unpredictability." *Journal of Operations Management*, 26 (5): 557-570.

Geyskens, I., J-B. E. M. Steenkamp, N. Kumar (2006). "Make, Buy, or Ally: A Transaction Cost Theory Meta-Analysis." *Academy of Management Journal*, 49 (3): 519-543.

Goes, J. B. And S. H. Park (1997). "Interorganizational Links and Innovation: the Case of Hospital Services", *Academy of Management Journal*, 40 (3): 673-696.

Gray, A. W., M. D. Boehlje, P. V. Preckel (2006). "Value Chain Risk and Reward Sharing and Governance Structures: Implications for Industry Strategy and Structure." *Journal on Chain and Network Science*, 6: 45-54.

Gray, A., M. Boehlje, V. Amanor-Boadu, and J. Fulton (2004). "Agricultural Innovation and New Ventures: Assessing the Commercial Potential." *American Journal of Agricultural Economics*, 86-5: 1322-1329.

Graff, G., A. Heiman, C. Yarkin and D. Zilberman (2003) "Privatization and Innovation in Agricultural Biotechnology." *Giannini Foundation of Agricultural Economics.*

Greene, W. H. (2005). "Econometric Analysis". Fifth Edition. Pearson Education.

Gulati, R. (1995) "Social Structure and Alliance Formation Patterns: A longitudinal Analysis." *Administrative Science Quarterly,* 40 (4): 619-652.

Hagedoorn, J (1993). "Understanding the Rationale of Strategic Technology Partnering: Interorganizational Modes of Cooperation and Sectoral Differences." *Strategic Management Journal*, 14: 371-385.

Hauser, B. (2008). "Innovation in Global Retail Banking." Diploma Thesis, Purdue University.

Henderson, R., and K. Clark (1990). "Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms." *Administrative Science Quarterly*, 35: 9-30.

Insinga, R. C. and M. J. Werle (2000). "Linking Outsourcing to Business Strategy." *Academy of Management Executive*, 14-4 :58-70.

Iyer, B. and T. H. Davenport (2008). "Reverse Engineering, Google's Innovation Machine." *Harvard Business Review*, April 2008: 59-68

Jacobides, M. G. and S. G. Winter (2005). "The Co-Evolution of Capabilities and Transaction Costs: Explaining the Institutional Structure of Production." *Strategic Management Journal*, 26: 395-413.

Judge, G. G., W. E. Griffiths, R. Carter Hill, H. Lütkepohl, T. Lee (1985). "The Theory and Practice of Econometrics." Second Edition. John Wiley and Sons.

King, John L., David Schimmelpfennig (2003). "Mergers, Acquisitions, and Stocks of Agricultural Biotechnology Intellectual Property." *AgBioForum*, 8-2&3: 83-88. Available on the World Wide Web: HTTP://WWW.AGBIOFORUM.ORG

Klos, Tomas B. and B. Nooteboom (2001). "Agent-based Computational Transaction Cost Economics." *Journal of Economics Dynamics & Control*, 25: 503-526.

Kogut, Bruce (1988) "Joint Ventures: Theoretical and Empirical Perspectives." *Strategic Management Journal*, 9: 319-332.

Kogut, B. and H. Singh (1988). “The Effect of National Culture on the Choice of Entry Mode.” *Journal of International Business Studies*, 19: 414-432.

Lee, J. and F. M. Veloso (2008). “Interfirm Innovation under Uncertainty: Empirical Evidence for Strategic Knowledge Partitioning.” *The Journal of Product Innovation Management*, 25: 418-435.

Leiblein, M. J. (2003). “The Choice of Organizational Governance Form and Performance: Predictions from Transaction Cost, Resource-based, and Real Options Theories.” *Journal of Management*, 29 (6): 937-961.

Lin, Z., M. W. Peng, H. Yang, S. L. Sun (2008). “How do Networks and Learning Drive M&As? An Institutional Comparison between China and America.” *Strategic Management Journal*, Forthcoming.

Lorenzoni, G. and A. Lipparini (1999). “The Leveraging of Interfirm Relationships as a Distinctive Organizational Capability: A Longitudinal Study.” *Strategic Management Journal*, 20: 317-338.

Luehrman, T. A. (1998). “Investment Opportunities as Real Options: Getting Started on the Numbers.” *Harvard Business Review* : 51-67.

MacDonal, J. M. and M. L. Hayenga (2003). “Concentration, Mergers, and Antitrust Policy.” Working Paper.

Makadok, R. and R. Coff (2009). “Both Market and Hierarchy: An Incentive-System Theory of Hybrid Governance Forms”. *Academy of Management Review*, 34 (2): 297-319.

McGrath, R. G., and I.C. MacMillan (2000). “The Entrepreneurial Mindset.” Harvard Business School Press, Boston, MA.

Milgrom, P., & Roberts, J. 1992. Economics, organization and management. Englewood Cliffs, NJ: Prentice Hall.

Moatti, V. (2007). “The Choice among Acquisitions and Alliances versus Internal Development: the Role of Imitation and Experience.” *Working Paper*.

MSU (2005). PowerPoint presentation for the 7th annual national value-added ag conference. 7th annual national value-added ag conference, Indianapolis, IN June 16 & 17, 2005. MSU product center for agriculture and natural resources.

Orelli, B. (2008). “Monsanto Seeds its Pipeline.” *The Motley Fool*. August 29, 2008. Available at http://www.fool.com/investing/general/2008/08/29/monsanto-seeds-its-pipeline.aspx.

Parmigiani, A. (2007). “Why do Firms both Make and Buy? An Investigation of Concurrent Sourcing.” *Strategic Management Journal*, 28: 285-311.

Pena, I. (1998). “Business Investment Strategy and Technological Innovation in Agribusiness Firms.” PhD Dissertation, Purdue University.

Peterson, H. C., A. Wysocki, S. B. Harsh (2001) “Strategic Choice along the Vertical Coordination Continuum.” *International Food and Agribusiness Management Review,* 4: 149-166.

Pisano, G.P. (1989). “Using Equity Participation to Support Exchange: Evidence from the Biotechnology Industry.” *Journal of Law, Economics and Organization*, 5(1):109-126.

Podolny, J. (1994). “Market Uncertainty and the Social Character of Economic Exchange”, Administrative Science Quarterly, 39: 458-483.

Pray, C., J. F. Oehmke, A. Naseem (2005). “Innovation and dynamic efficiency in plant biotechnology: An introduction to the researchable issues.” *AgBioForum*, *8*(2&3), 52-63. Available on the World Wide Web: http://www.agbioforum.org.

Richards, T. J. and M. R. Manfredo (2003). “Post-Merger Performance of Agricultural Cooperatives.” *Agricultural Finance Review*, Fall 2003.

Ross, B. and R. Westgren (2008). “Entrepreneurial Opportunities in Agri-Food Supply Chains: Modeling the Dynamics of Discovery and Exploitation.” Paper presented at the IAMA conference in Monterey.

Roth, E. A. and K. D. Sneader (2006). “Reinventing Innovation at Consumer Goods Companies.” *The McKinsey Quarterly*. Web exclusive. November 2006.

Roucan-Kane, M., I. Pena, M. Boehlje, J. Akridge (2008). “"Factors Influencing Organizational Structure in the Food Manufacturing, Chemical, Agricultural Wholesaling and Biotechnology Industries.” *Journal of Chain and Network Science*. In review.

Sampson, R. C. (2007). “R&D Alliances and Firm Performance: The Impact of Technological Diversity and Alliance Organization on Innovation.” *Academy of Management Journal.* 50.2: 364-386

Sakakibara, M. (2002). “Formation of R&D Consortia: Industry and Company Effects.” *Strategic Management Journal*, 23: 1033-1050.

Sawler, J. (2005). “Horizontal Alliances and the Merger Paradox.” *Managerial and Decision Economics*, 26: 243-248.

Stanek, M. B. (2004). “Measuring alliance value and risk: A model approach to prioritizing alliance projects.” *Management Decision*, 42 (2): 182-204.

Stylianou, A. C., C. J. Jeffries, S. S, Robbins (1996). “Corporate Mergers and the Problems of IS Integration.” *Information & Management*, 31 (4): 203-213.

The Boston Consulting Group (2006). “Innovation 2006. Senior Management Survey”, The Boston Consulting Group: 1-30.

Tischler, L. (2009). “#10 Ideo”, *Fast Company*, Febryary 11, 2009.

Villalonga, B. And A. M. McGahan (2005). “The Choice among Acquisitions, Alliances, and Divestitures.” *Strategic Management Journal*, 26: 1183-1208.

Wang, L. And E. J. Zajac (2007). “Alliance or Acquisition? A Dyadic Perspective on Interfirm Resource Combinations.” *Strategic Management Journal*, 28: 1291-1317.

Westgren, R. And K. Zering (1998). “Case Study Research Methods for Firm and Market Research”. *Agribusiness*, 14 (5): 415-423.

White, S. and S. S-Y. Lui (2001). “Distinguishing Costs of Cooperation and Control in Alliances.” INSEAD Working Paper.

Wolter, C. and F. M. Veloso (2008). “The Effects of Innovation on Vertical Structure: Perspectives on Transaction Costs and Competences.” *Academy of Management Review*, 33 (3): 586-605.

Yin, R. (1994). “Case Study Research: Design and Methods”, 2nd ed., Sage Publications, Thousand Oaks, CA.

Yin, X. and M. Shanley (2008). "Industry Determinants of the 'Merger versus Alliance' Decision." *Academy of Management Review*, 33 (2): 473-492.