Building a Decision Tree to opt for the Structural Mode of Service Innovation Alliances in High-Tech Sectors

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ABSTRACT

The distributed 'open' model of innovation development has been increasingly applied in service sectors to grasp the opportunities of networking. Till now, there have been many competing theoretical frameworks, with no universal model or consensus, to open innovation through networking. This paper applies a three-perspective theoretical framework, which embodies considerations of resource acquisition, opportunism minimization, flexibility and commitment to innovation and growth to build a decision tree opting for the organization form (hereinafter referred to as structural or governance mode) of innovation-targeted alliances in services. The model builds on a number of contingencies describing the joint impact of four decision parameters (trust, resource position, environment uncertainty and expected value) on firms' strategic concerns, and subsequently their preference for alliance governance.

1. INTRODUCTION

Pursuing and achieving service innovation is of outmost importance for firms operating in technologically evolved and knowledge-intensive service sectors (i.e. information technology, telecommunications, financial services) (Hertog, 2000; Dittrich & Duysters, 2007). The lack of market consolidation combined with the uncertainty – due to both market volatility and technology unpredictability - that such environments entail render the radical form of innovation developed in-house by a single firm as a rather risky venture. Innovation in high-tech service sectors relies more on the acquisition of valuable knowledge and transfer of technology resources to produce innovation in ever-shorter service life cycles (Sheehan, 2006).

Cooperative agreements, such as joint marketing or value added reseller agreements, have been traditionally used by firms in order to improve their position in the current market or enter new markets. Thus, the strategic objectives pursued by such alliances were mostly related with expansion of their services rather than diversification and innovation development. Since the mid 1980s, firms have increasingly formed alliances aiming at technological learning and knowledge creation. Such alliances are handled as an effective organizational form that allow firms to combine and integrate complementary knowledge and capabilities from a diversity of actors, and thus diversify their services and improve their innovative performance (Gilsing et al., 2007).

Based on Gadrey et al.'s (1995) definition, "*to produce a service […] is to place a bundle of capabilities and competences (human, technological, organisational) at the disposal of a client and to organise a solution, which may be given to varying degrees of precision*". This definition points out the modular nature of services, thus indicating their ability to be associated with a number of different people, technologies, and organizations. Gallouj and Weinstein (1997) define six innovation models that could be used for defining service innovation; a) radical innovation, b) improvement innovation, c) incremental innovation, d) ad-hoc innovation, e) recombinative innovation, and f) formalization innovation. Of special interest to this paper is the recombinative form of innovation. This mode of innovation is frequent in services but also in high-tech markets, such as biotechnology and micro-electronics. Innovation of this kind involves bundling diverse elements (i.e. resources, knowledge, technologies) into one service system. The various service elements are usually provided by a network of collaborative firms that cooperate for exploiting the

complementarity of their resources and capabilities to create innovative service offerings (Gallouj & Weinstein, 1997).

While distributed innovation offers exciting possibilities for a firm to capitalize on the creativity of its partners, the management of distributed innovation requires firms to re-examine the mechanisms they use to govern innovation-targeted alliances (Sawhney & Prandelli, 2000). At the one extreme, a firm can choose a hierarchical form of management and control by establishing a new entity (joint venture) or partially integrating the partner through a minority investment agreement. At the other extreme, a firm can choose to contract with the partners in order to settle their responsibilities and contribution to the alliance. Since these alternative forms of collaboration give a firm varied degrees of control and interdependence with its partners and require different resource commitments, choosing the appropriate governance mode constitutes a critical firm decision. The decision on governance becomes even more salient for firms operating in service markets where technology constitutes a challenge to increase effectiveness (cost minimization, quality improvement) or achieving diversification (innovation development). This is because the technology possesses a key strategic role as enabler of service innovation by firms.

A special feature of technology-based service industries is the rapid rate of change and the difficulty of forecasting change. Strategic decision making is difficult in such environments, not only because change is fast and sudden, but also because it is difficult to predict the significance of a change as it is occurring. The managers of firms operating in high-tech industries face several dilemmas. Successful strategies must be responsive to changing market conditions, and therefore must assure flexibility, but successful strategies also require long-term commitment to innovation. Moreover, while innovation exploitation strategies require decisions that aim at optimizing risk management and value creation, traditional strategies involve decisions that aim at acquisition of valuable resources and capabilities and cost-minimization.

This paper aims at unveiling the contingencies that firms' decision-makers face on the preferred structural mode (organizational form) of their alliance under the analysis of a three-perspective theoretical framework (Transaction Cost Economics, Resource- and Knowledge-based View of the firm, Real Options), which embodies considerations of resource acquisition, opportunism minimization, flexibility and commitment to innovation and growth. The proposed contingencies that are hereinafter used to build our decision tree prescribe alternative conditions that favour either the quasi-hierarchy (Q-H) or the quasi-market (Q-M) or an intermediate (I) structural mode of service innovation alliances. The proposed alternative conditions derive from the joint examination of critical decision parameters, which are associated with the prime strategic concerns of firms in alliances, as expressed by each of the above three theoretical perspectives.

2. THEORETICAL BACKGROUND

Most studies in the alliance governance literature have been based on the dichotomy of equity versus non-equity alliances (Pisano, 1989; Osborn & Baughn, 1990; Gulati, 1995; Narula & Hagedoorn, 1999; Pangarkar & Klein, 2001). Whereas equity alliances include joint ventures and minority equity alliances, non-equity alliances refer to all other contractual arrangements that do not involve equity exchange. Equity alliances are conceived as quasi-hierarchies, since they rely more on hierarchical governance mechanisms, while non-equity alliances are conceived as quasi-markets (Osborn and Baughn, 1990), since they mostly rely on arm's-length market transactions.

Three principal perspectives based on Transaction Cost Economics (TCE), Resource-based and Knowledge-based View of the Firm (RBV/KBV), and Real Options (RO) have been thoroughly applied to deal with organizational integration and alliance governance issues (Chen & Chen, 2003; Leiblein, 2003). Each of them provides a different perspective on conditions that motivate or influence the formation of strategic alliances, as well as factors that affect decisions on alliance governance modes. This paper argues in favor of integrating a set of antecedent factors and

propositions, sourced from the aforementioned theoretical perspectives, with the ultimate purpose of developing an integrative contingency model. This integration is pursued under the concern of investigating the complementary and balancing the conflicting effects of key factors sourced from the three perspectives, thus identifying a number of contingencies that may guide decisions to governance.

2.1 Objectives and Decision Factors derived from TCE

The prime considerations of Transaction Costs analysis are the assumptions of self-interest and bounded rationality of parties involved in cooperative agreements (Williamson, 1975). While the assumption of self-interest raises the issue of *behavioral opportunism*, the assumption of bounded rationality raises the difficulty for partners to *write complete contracts* where all details of the transactions will be explicitly and clearly stated, so that misunderstandings or misinterpretations are avoided. Due to the above conditions, costs of transacting through a quasi-market agreement become high enough, thus rendering hierarchical modes of transacting, which implicitly involve greater level of control, more efficient.
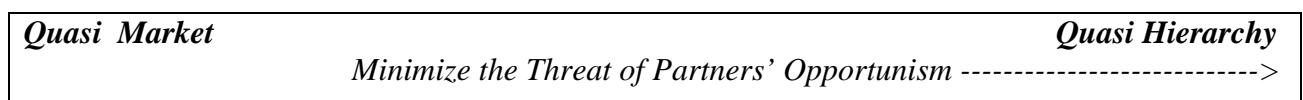
Under TCE, the alliance governance mode is dependent on two critical parameters: the type and degree of asset specificity involved in supplying the good or service of the alliance, and the uncertainty to which transactions are subject (Williamson, 1991).

Asset specificity can take a variety of forms, such as ownership of a rare resource, development of an advanced competence, a special privilege, or a patent. The higher the asset specificity, the higher the need for, and thus the costs of, alliance coordination. Thus, high asset specificity requires more complex institutional forms of alliance, where common administrative systems are set to govern the partner dependencies and appropriate resolution mechanisms are employed to handle possible disputes and contracting hazards (Williamson, 1991).

Quasi Market	***Quasi Hierarchy***
Benefit from High Asset Specificity ---------------------------->	

Service innovation-targeted alliances involve high levels of asset specificity, required to produce the recombinative mode of service innovation. Thus, the asset specificity is not handled as contingency factor in the context where strategic alliances are investigated in this paper.

Uncertainty about sources of opportunism is an important variable in transaction cost models of governance. Under conditions of no uncertainty about the sources of opportunism in an exchange, parties to that exchange are able to rely on relatively simple market-based cooperative agreements to manage their exchange. However, as uncertainty about partners' opportunistic behavior increases, it may be necessary for parties to adopt more hierarchical forms of alliances, including minority investment and joint ventures (Barney and Lee, 1998). In these governance modes, sources of opportunism in a transaction can be discovered over time, and appropriate protection and remedies can be developed through the appropriate control and conflict resolution mechanisms involved in hierarchical alliances. In general, high levels of ex ante uncertainty about sources of opportunism, in turn, leads to the adoption of progressively more hierarchical forms of governance (Williamson, 1975; 1985).

Quasi Market	***Quasi Hierarchy***
Minimize the Threat of Partners' Opportunism ---------------------------->	

The factor that can moderate the influence of such an objective is the existence of trust among partners. Specifically, Leiblein (2003) claims that firms able to identify trustworthy partners or to develop reputation for trustworthiness may mitigate concerns regarding opportunistic behavior, and therefore be more likely to utilize quasi-market governance forms.
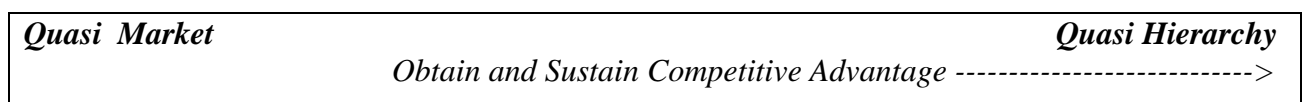
2.2 Objectives and Decision Factors derived from RBV/KBV

From an organizational perspective, the resource and capabilities of firms influence their ability and willingness to invest resources acquired to make alliance decisions (Nelson, 1991). In contrast to the transaction cost logic, which emphasizes on allying with the purpose of minimizing transaction and production costs, the resource-based rationale emphasizes value maximization of an alliance for a firm through pooling and utilizing valuable resources and capabilities from its alliance partners (Das & Teng, 2000).

RBV considers strategic alliances as strategies used to access partner resources for the purpose of concentrating otherwise unavailable competitive advantages and values to the firm. Thus, the overall rationale for entering into a strategic alliance is simple; to aggregate, share or exchange valuable resources with other firms, when these resources cannot be efficiently obtained through market exchanges or mergers and acquisitions (Das and Teng, 2000).

In knowledge-intensive service industries, equity alliances are preferred for the safe exchange of valuable knowledge, since contract-based alliances do not offer sufficient protection against opportunistic behavior and unintended transfer of resources (Das & Teng, 2000). According to Oxley and Sampson (2004), where the costs of knowledge leakage are deemed to be particularly high, a firm may choose between narrowing down the alliance scope to limit exposure and opting for a protective (equity-based) governance structure to control partner opportunism.

KBV emphasizes the significance of knowledge as a competitive asset to produce new products and services. It is not so much the cost of the transfer, as would be the focus of the transaction cost approach, but the effectiveness of the transfer and the ability or experience of the firm in accessing and handling new resources that may create the need for collaboration (Hagedoorn et al., 2000). An alliance may enable a firm to gain access to key knowledge-based capabilities of another firm without internalizing or acquiring that capability (Mowery et al., 1996). Especially in strategic technology alliances, where technological capabilities are frequently based on tacit knowledge, inter-firm knowledge transfer may be limited to only the codified information necessary to coordinate otherwise separable activities that draw on different knowledge domains (Hemphill and Vonortas, 2003).

Quasi Market	*Quasi Hierarchy*
Obtain and Sustain Competitive Advantage ----------------------------->	

The essence of RBV is that sustained competitive advantage for a firm comes from access to resources that are valuable, rare, and imperfectly imitable (Barney, 1991). Sapienza *et al.* (1997) argue that firms owning resources of competitive advantage are more likely to enter into alliances and are more attractive alliance partners as well. Based on argumentation of Resource- and Knowledge-based Views, quasi-hierarchy alliances (i.e. joint ventures) are encouraged under two conditions: 1) partners desire to acquire each other's knowledge-based resources, or 2) one firm wishes to maintain an organizational capability, while benefiting from its partners' current knowledge or cost advantage. Thus, the objective of obtaining and sustaining advantage raises the importance of a firm feature, the resource position of the partner, in deciding the preferred governance mode of an alliance.

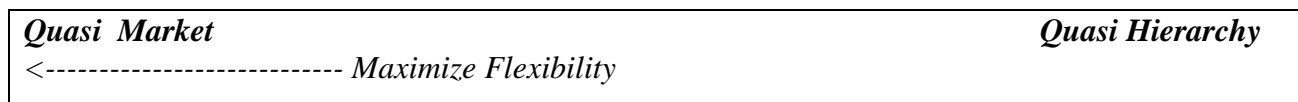## 2.3 Objectives and Decision Factors derived from RO

The Real Options theory has emerged as a compelling approach towards investing strategic decisions under conditions of uncertainty, such as decisions regarding investment in R&D and innovation-oriented activities, joint ventures (Kogut, 1991) and other entrepreneurial initiatives

(McGrath, 1997). In contrast to the transaction costs logic, where uncertainty is perceived in terms of partners' opportunistic behavior, real options identify technology evolution, market volatility and competition unpredictability as the primary sources of uncertainty in cooperative agreements.
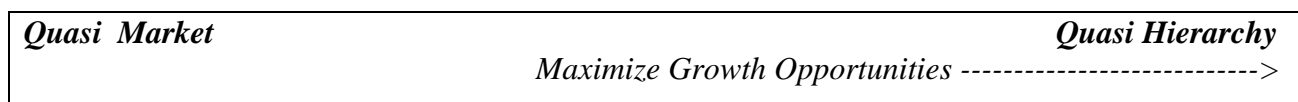
The two key assumptions behind Real Options are that: 1) managers are able to write contracts that provide implicit or explicit claims on future, follow-on opportunities, and 2) it is possible to specify an a priori distribution of expected returns associated with an investment (Leiblein, 2003). This last assumption implies that it is possible to develop estimates of the potential value associated with various options to abandon, defer, or increase investing in a given investment. An important implication of these assumptions is that the value that an alliance incurs may be divided into two parts: the *present value* deriving from current access to the partner's resources and skills, and the *expected value* derived from discretional future opportunities.

The real options theory approaches the environment uncertainty and its impact on the governance mode of alliances through the definition of two value options. Each of these value options describe a different way in which firms may lay claim to future rent generating opportunities through current investments.

The first and simplest means through which organizational governance decisions may create value is through "the option to defer" investment, also called as the "option of waiting". This option refers to cases where the critical objective of firms, when making governance choices under conditions of uncertainty, is the maintenance of their flexibility. Flexibility is desired in cases where firms wish to avoid the risk of committing irreversible resources to an alliance, since the expected future value of this investment is still uncertain. In these situations, there is more value for firms from delaying or deferring the investment to a quasi-hierarchy alliance. The value associated with the "option to defer" is greatest when uncertainty about the transaction environment is high and the estimated cash flows lost due to postponing in the innovation targeted alliance are relatively small. Thus, under conditions of high uncertainty about the viability and the success of the investment, service firms are more liable to opt for less hierarchical forms of governance to assure flexibility.

Quasi Market	***Quasi Hierarchy***
<----------------------------- *Maximize Flexibility*	

The second means through which real options analysis guides governance decisions is through the "growth option", also referred to as "call option". When firms have a clear strategic goal of growth, and do not address alliances as a survival or competition means, then they have greatest interest in high investment through more hierarchical alliances, which give them the right to further expand or innovate. Kogut (1991) provides the first set of theoretical arguments and empirical evidence that firms invest in joint ventures to obtain growth options and sequentially expand into new and emerging markets. However, hierarchical alliances provide valuable growth options, only if future circumstances turn out favorable, which means that expectations for future value of the investment exceed their estimations for the current losses.

Quasi Market	***Quasi Hierarchy***
	Maximize Growth Opportunities --------------------------->

As partners' current value of resources (resource position) is a priori known, mainly through the value of assets in place, the firm estimations on the alliance's expected value differentiate from partner to partner and become gradually fixed over the alliance duration, as firms gain information on the alliance, the partner(s) and the environment.

The following table summarizes the diverse strategic concerns of firms when entering networks, and more specifically alliances, as well as the factors (Column 3) that affect the intensity with which each concern is expressed (Column 2). The logic specifying the impact of each factor as well as the underlying strategic concern on the governance decision is prescribed by the above-mentioned theoretical perspectives (Column 1).

Theoretical Perspectives	Strategic Concerns	Decision Factors
Transaction Cost Economics	Protect from Partners' Opportunism (O)	Trust (T)
Resource- & Knowledge-based View of the Firm	Sustain Current and Obtain New Competitive Advantage (CA)	Resource Position (RP)
Real Options	Increase Flexibility (F)	Environment Uncertainty (EU)
	Pursue Growth (G)	Expected Value (EA)

The above analysis has revealed that each theoretical perspective adopts overly simplistic characterizations of the concerns of firms in making governance decisions. Transaction Cost Economics, the most commonly applied theory for explaining the governance issues of strategic alliances, addresses the cost aspects of strategic alliances and affect the balance between partners' protection and alliance efficiency. Nevertheless, factors that relate to value realized under conditions of uncertainty have been rather neglected by TCE. Such aspects are addressed by the Resource and Knowledge-based View of the firm in terms of competitive advantage, as well as the most recently applied Real Options theory in terms of gaining the option to future growth. This last perspective is especially applicable in examining decisions made under conditions of high uncertainty, which resemble those of service innovation alliances in high-tech sectors.

In the strategic management literature, little effort has been put to linking insights from Real Options with insights from Transaction Cost Economics and Resource- and Knowledge-based View of the firm in order to define an innovation-related strategic decision. In this paper, we argue that only by recognizing and taking into account the full range of the firms' concerns when forming innovation-targeted alliances, and how these concerns interact with each other, it will be possible to explain the way in which firms decide the organizational form that suits their innovation objectives.

3.   DEVELOPING THE PROPOSED CONTINGENCY MODEL

After that, the governance decision can be considered as a multi-criteria/ multi-purpose decision problem. The proposed contingency model includes definition of these criteria, as well as of the parameters (criteria) that guide the outcome of the decision function.

The development of a contingency model for the selection of decision strategies involves four steps which are jointly evolved as research progresses (Beach & Mitchell, 1978). First, the specific behavior of interest must be identified; the behavior must vary across decision-makers and across environment decisions, thereby implying that the characteristics of each may influence it. Second, a taxonomy of the decision-making environment must be developed, using those characteristics of the environment that account for variance in the behavior of interest. Third, characteristics or considerations of the decision-makers must be identified, characteristics that account for variance in their decision-making behavior. Fourth, links must be devised to relate the environment and the decision-makers characteristics to the behavior of interest.

In our research, the selection of structural mode of service innovation alliances in high-tech sectors constitutes the behavior of interest. The primary characteristics of the decision-making environment that are herein examined are *environment uncertainty*, including a number of sub-characteristics

(e.g. innovation rate of the industry, technology evolution, market demand, etc.), as well as *trust* between partners. The principal features of the decision-makers that may cause variance of the governance decision made are current *resource position* as well as expectations for the *expected value* of the investment made.

In order to build a decision tree on the structural mode of service innovation alliances, we examine the impact that each decision factor may have on the four above-mentioned strategic concerns. More specifically, we examine the impact of: a) high environment uncertainty, which stimulates the flexibility increase (F) objective, b) low trust, which stimulates the opportunity minimization objective (O), b) high resource position, which stimulates the pursuance of competitive advantage (CA) objective, and d) high expected value, which stimulates the growth (G) objective.

After that, we develop a number of contingencies prescribing conditions that guide the selection of each structural mode (quasi-hierarchy, intermediate, quasi-market). Based on these contingencies, a decision tree is finally built and a number of propositions are provided for further investigation and empirical testing.

3.1 Effect of Decision Factors on Objectives

Effect of High Environment Uncertainty on Objectives

Environment uncertainty may derive from a number of other sources, the most well-known of which are technology uncertainty, market uncertainty and competition unpredictability. Technology uncertainty is of prime importance for strategic technology alliances and primarily concerns the maturity stage of the technology that partners develop or exploit. The less mature the technology employed, the more uncertainty it generates for the technology partners. Market uncertainty derives from the customers' attitude towards new technology-based products and services, while competition predictability refers to the frequency of competition shifts in the partners' industry. In markets where changes in technology are not only fast but also discontinuous, market preferences are volatile, and there are frequent shifts of relative competitive positions, the increased need for flexibility may urge firms towards more flexible forms of collaboration (Hagedoorn and Narula, 1996; Osborn and Baughn, 1990; Vilkamo and Keil, 2003).

Real options logic suggests that the critical objective of firms making governance choices under conditions of uncertainty is the maintenance of their flexibility. The maintenance of flexibility under conditions of high uncertainty becomes a governance issue because some forms of governance are less flexible than others (Barney and Lee, 1998). In particular, it is generally assumed that it is more costly for firms to alter hierarchical forms of governance in response to the change of the level of uncertainty in an exchange than it is to alter less hierarchical forms of governance (Kogut, 1991). Altering hierarchical forms of governance involves changing numerous explicit and implicit contracts that constitute this form of governance (Mahoney, 1992). Instead, changing less hierarchical forms of alliances implies altering a smaller number of usually explicit contracts. This reasoning suggests that, under conditions of very high environment (i.e. technology, market, competition) uncertainty, firms will seek for quasi-market alliances.

Apart from its obvious positive effect on the objective of maximizing flexibility, environment uncertainty has also a negative effect on the objective of pursuing growth. Under conditions of uncertainty, firm cannot trust their current estimations on expected value of the innovation and thus, however high it may currently seem, they cannot be based on that for pursuing expansion and growth.

However, uncertainty in the environment of the alliance is expected to have a negative influence on the firm's aggressive strategy towards sustaining and obtaining new competitive advantage. Based on Resource-based View, firms are interested in assuring safe conditions for the exchange of their

resources. Moreover, environment uncertainty increases risk of exchanging valuable resources and knowledge, and thus has a negative effect on pursuing competitive advantage through quasi-hierarchy alliances. Following the basic assumptions of game theory, under conditions of high instability, the behavior of firms is determined by a tendency to cheat in order to maximize their individual gains at the expense of others. After that, firms increase their suspicions on their partners and raise their requirement for protection.

Effect of Low Trust on Objectives

Numerous definitions of trust and trustworthiness have been presented in the literature (Bradach and Eccles, 1989; Gambetta, 1988; Lewicki and Bunker, 1994). For purposes of this discussion, Sabel's (1993: 1133) definition of trust has been adopted: "trust is the mutual confidence that no party to an exchange will exploit another's vulnerabilities". In many ways, opportunism is the opposite of trust. A firm's actions are opportunistic to the extent that they take advantage of another's exchange vulnerabilities (Barney & Hansen, 1994). Relational contracting may lead to a level of "trust" that reduces the propensity for opportunistic behavior (e.g., Ring & Van de Ven, 1992), and thus acts as a substitute for more formal governance mechanisms.

Lack of trust by investing partner creates preference for control over decision-making which often manifests in equity ownership (Cravens et al., 2000). As result, alliances in which there is low trust between partners are more likely to be organized with more hierarchical governance structures than are those in which there is greater trust (Ring and Van de Ven, 1992; Gulati & Singh, 1998).

Flexibility may be a necessary condition for innovation alliances, which upset current ways of making decisions. Trust can even lower transaction costs over time and also make relationships more flexible. The relationship between uncertainty and quasi-market alliances is less positive when trust is high than when trust is low (Perry et al., 2004). Thus, trust affects negatively the objective of seeking more flexibility. If trust is high, the need for flexibility gets lowers, allowing partners to increase commitment through more hierarchical alliances. In contrast, if trust is low, the need for less commitment increases, thus affecting positively the objective of flexibility.

There is evidence that trust has important implications for market performance and efficiency (Aulakh et al. 1996; Bleeke and Ernst 1991). Barney and Hansen's (1994) research reaches the conclusion that, in some circumstances, trust can be a significant source of competitive advantage. On the flip side of that, the lack of trust has negative implications for the objective of either obtaining new or sustaining the existing competitive advantage. This occurs because of increased costs of monitoring the integration of partners' disparate tacit resources and capabilities effectively when the relationship is characterized by low trust (Dyer and Singh 1998).

Further, trust influences positively any expansion of the area of co-operation, thus increasing the possibility for growth in either the existing or new markets (Gulati, 1995). Instead, lack of trust in the future behaviour between partners leads to decreased motivation for pursuing a growth project (Hoffman & Schlosser, 2001).

Effect of High Resource Position on Objectives

Sapienza et al. (1997) argue that firms owning resources of competitive advantage are more likely to enter into alliances and are more attractive alliance partners as well. Based on argumentation of RBV/KBV, we can also argue that competitive companies are more likely to opt towards quasi-hierarchy alliances, which entail higher degree of control against property leakages, in order both to protect the value of their competitive resources and skills, and thus sustain current competitive advantage, as well as to obtain new competitive advantage.

Thus, firms that possess high resource position, and thus are considered highly competitive, are expected to have increased concern on their partners' opportunistic behaviour, but also increased interest in pursuing growth through collaboration. Instead, the concern of assuring flexibility becomes of lower importance, and thus its impact towards quasi-market alliances gets moderated.

Effect of High Expected Value on Objectives

Real option theory recognizes the importance of expected value in making heavy investments in complex alliances and thus pursuing growth. In fact, the option to defer investments and the option to growth and flexibility include two diverse options through which organizational governance decision may create value (Leiblein, 2003). The ability to delay or defer an irreversible investment can be an important source of flexibility in circumstances of high environment uncertainty. Instead, growth options are particularly valuable in high-technology industries where there are often weak appropriability regimes and inter-generational knowledge spillovers are significant. In these contexts, it will often be desirable to internalize activities associated with early generations of a product or technology in order to maintain a claim on the opportunity to participate in subsequent generations of that product or technology. The growth option is particularly stimulated by the future expected value of an investment. In cases where the expected value of the alliance is considered high, the growth will motivate more heavy investments, implied by quasi-hierarchy rather than quasi-market alliances.

High expected value of investment is also expected to decrease concerns on partners' opportunism as well as intensify the need for obtaining new competitive advantage through the investment made. After that, the presence of high expected value is anticipated to favour quasi-hierarchy and oppose to quasi-market alliances.

The following table summarizes the impact of each decision factor on each of the four objectives, derived from the background theory. Based on this table, in the next section, we extract a number of contingencies for the formation of service innovation alliances.

TO: *Influence FROM:*	*Protect from Opportunism (O)*	*Sustain & Increase CA (CA)*	*Pursue Growth (G)*	*Increase Flexibility (F)*
High Uncertainty	+	-	-	+ (primary effect)
Low Trust	+ (primary effect)	-	-	+
High Resource Position	+	+ (primary effect)	+	-
High Expected Value	+	+	+ (primary effect)	-

Table 1. Effect of Decision Factors on Objectives

3.2 Analysis of Contingencies

Contingency 1: High Environment Uncertainty

Folta and Leiblein (1994) found that under conditions of high environment uncertainty, increasing flexibility becomes more important than protecting from opportunism, and thus firms adopt less hierarchical forms of governance, in a way consistent with the real options logic.

TO:	*Protect from*	*Sustain &*	*Pursue Growth*	*Increase*

Influence FROM	Opportunism (O)	Increase CA (CA)	(G)	Flexibility (F)
High Uncertainty	+	-	-	+ (primary effect)
Preference for Governance Mode	**I**	**I**	**I**	**Q-M**

Proposition 1: *In a highly uncertain environment, the need for flexibility leads to <u>quasi-market</u> alliances.*

Contingency 2: Low Environment Uncertainty and Low Trust

The following matrix illustrates the impact of the two contingency factors (low uncertainty and low trust) on the prime strategic concerns, mentioned above. The signs in parentheses () express the reverse effect of each decision factor on the corresponding objectives. If the sign is (+) then the objective's effect is reinforced, otherwise the objective's effect is weakened. For instance, low uncertainty has a negative impact on (O) objective, which means that it weakens the favourable impact of the corresponding concern on quasi-hierarchy alliances. More specifically, low uncertainty decreases possibilities for the formation of quasi-hierarchical alliances. Nevertheless, this factor is not considered strong enough to lead to the exact opposite governance mode, that is quasi-market alliances. Instead, an intermediate form of alliance is most probable.

Influence FROM	TO: Protect from Opportunism (O)	Sustain & Increase CA (CA)	Pursue Growth (G)	Increase Flexibility (F)
Low Uncertainty	(-)	(+)	(+)	(-)
Low Trust	+ (primary effect)	-	-	+
Preference for Governance Mode	**Q-H**	**I**	**I**	**Q-M**

In contrast to the previous contingency, the combined impact of low uncertainty and low trust on each objective does not indicate a clear preference for any organization form. Thus, there is a need for also examining the impact of the rest two decision factors, current resource position and expectations for future value.

Contingency 2a: High Resource Position and High Expected Value

In this contingency, the prime objectives that are reinforced include opportunism minimization (O) and sustaining competitive advantage (CA), and growth (G), all of them driving to Q-H alliances. The following matrix illustrates the impact of each decision parameter on the alliance's prime objective.

Influence FROM	TO: Protect from Opportunism (O)	Sustain & Increase CA (CA)	Pursue Growth (G)	Increase Flexibility (F)
Low Uncertainty	(-)	(+)	(-)	(+)

Low Trust	+	-	-	+
High Resource Position	+	+ (primary effect)	+	-
High Expected Value	+	+	+ (primary effect)	-
Preference for Governance Mode	**Q-H**	**Q-H**	**Q-H**	**I**

Proposition 2a: *Given low uncertainty and low trust between partners, if both resource position and expected value are high, the pursuance of competitive advantage and growth leads to <u>quasi-hierarchy</u> alliances.*

<u>**Contingency 2b**</u>: ***High Resource Position and Low Expected Value***

In this contingency, the prime objectives that are reinforced include opportunism minimization (O) and sustaining competitive advantage (CA), both driving to Q-H alliances. The following matrix illustrates the impact of each decision parameter on the alliance's prime objective.

Influence FROM	***TO:*** *Protect from Opportunism (O)*	*Sustain & Increase CA (CA)*	*Pursue Growth (G)*	*Increase Flexibility (F)*
Low Uncertainty	(-)	(+)	(-)	(+)
Low Trust	+	-	-	+
High Resource Position	+	+ (primary effect)	+	-
Low Expected Value	(-)	(-)	(-)	(+)
Preference for Governance Mode	**Q-H**	**Q-H**	**I**	**I**

Proposition 2b: *Given low uncertainty and low trust between partners, if resource position is high but expected value is low, the pursuance of opportunism minimization and competitive advantage leads to <u>intermediate</u> governance modes.*

<u>**Contingency 2c**</u>: ***Low Resource Position and High Expected Value***

In this contingency, the prime objectives that are reinforced include opportunism minimization (O) and pursuing growth (CA), both driving to Q-H alliances. The following matrix illustrates the impact of each decision parameter on the alliance's prime objective.

Influence FROM	***TO:*** *Protect from Opportunism (O)*	*Sustain & Increase CA (CA)*	*Pursue Growth (G)*	*Increase Flexibility (F)*
Low Uncertainty	(-)	(+)	(-)	(+)
Low Trust	+	-	-	+

	Protect from Opportunism (O)	Sustain & Increase CA (CA)	Pursue Growth (G)	Increase Flexibility (F)
High Expected Value	+	+	+ (primary effect)	-
Low Resource Position	(-)	(-)	(-)	(+)
Preference for Governance Mode	Q-H	I	I	I

Proposition 2c: *Given low uncertainty and low trust between partners, if resource position is low but expected value is high, the pursuance of opportunism minimization and competitive advantage leads to <u>intermediate</u> alliances.*

Contingency 2d: *Low Resource Position and Low Expected Value*

In this contingency, the prime objective that is reinforced includes opportunism minimization (O) driving to Q-H alliances. The following matrix illustrates the impact of each decision parameter on the alliance's prime objective.

TO: Influence FROM	Protect from Opportunism (O)	Sustain & Increase CA (CA)	Pursue Growth (G)	Increase Flexibility (F)
Low Uncertainty	(-)	(+)	(-)	(+)
Low Trust	+	-	-	+
Low Resource Position	(-)	(-)	(-)	(+)
Low Expected Value	(-)	(-)	(-)	(+)
Preference for Governance Mode	I	I	I	Q-M

Proposition 2d: *Given low uncertainty and low trust between partners, if both resource position and expected value are low, partners have no interest in pursuing competitive advantage or growth, the pursuance of opportunism minimization leads to <u>quasi-market</u> alliances.*

Contingency 3: *Low Environment Uncertainty, High Trust and High Resource Position*

In this contingency, the prime objective that is reinforced includes sustaining competitive advantage (CA), driving to Q-H alliances. The following matrix illustrates the impact of each decision parameter on the alliance's prime objective. The impact of high resource position, combined with the impact of low uncertainty and high trust, is such that a definitive governance preference can be made, and there is no need for further investigating the impact of either low or high expected value.

TO: Influence FROM	Protect from Opportunism (O)	Sustain & Increase CA (CA)	Pursue Growth (G)	Increase Flexibility (F)
Low Uncertainty	(-)	(+)	(-)	(+)
High Trust	(-)	(+)	(+)	(-)
High Resource Position	+	+ (primary effect)	+	-

Preference for Governance Mode	Q-H or I	Q-H	Q-H	I

Proposition 3: *Given low uncertainty and high trust between partners, if resource position is high, the pursuance of competitive advantage leads to quasi-hierarchy alliances.*

<u>Contingency 4</u>: **Low Environment Uncertainty, High Trust, Low Resource Position and High Expected Value**

In this contingency, the prime objectives that are reinforced include pursuing growth (G), driving to Q-H alliances. The following matrix illustrates the impact of each decision parameter on the alliance's prime objective.

Influence FROM / *TO:*	*Protect from Opportunism (O)*	*Sustain & Increase CA (CA)*	*Pursue Growth (G)*	*Increase Flexibility (F)*
Low Uncertainty	(-)	(+)	(-)	(+)
High Trust	(-)	(+)	(+)	(-)
Low Resource Position	(-)	(-)	(-)	(+)
High Expected Value	+	+	+ (primary effect)	-
Preference for Governance Mode	**I**	**Q-H**	**Q-H**	**I**

Proposition 4: *Given low uncertainty and high trust between partners, if expected value is high, the pursuance of growth leads to quasi-hierarchy alliances.*

<u>Contingency 5</u>: **Low Environment Uncertainty, High Trust, Low Resource Position and Low Expected Value**

In this contingency, neither of the above objectives is directly reinforced by any decision factor. In such cases, we assume that other, less strategic, motives may drive alliances, and thus quasi-market alliances would be preferred to achieve the collaboration goals and avoid the risk of equity investments.

Influence FROM / *TO:*	*Protect from Opportunism (O)*	*Sustain & Increase CA (CA)*	*Pursue Growth (G)*	*Increase Flexibility (F)*
Low Uncertainty	(-)	(+)	(-)	(-)
High Trust	(-)	(-)	(-)	(+)
Low Resource Position	(-)	(-)	(-)	(+)
Low Expected Value	(-)	(-)	(-)	(+)

Preference for Governance Mode	I	I	I	Q-M

Proposition 5: *Given low uncertainty and high trust between partners, if resource position and expected value are low, then there is no need for pursuing high commitment alliances, thus more quasi-market alliances are preferred.*

Following, we present the decision tree that has resulted from the definition and analysis of the above nine contingency matrices. Each leaf corresponds to one research proposition, provided by this paper for further investigation and empirical testing.
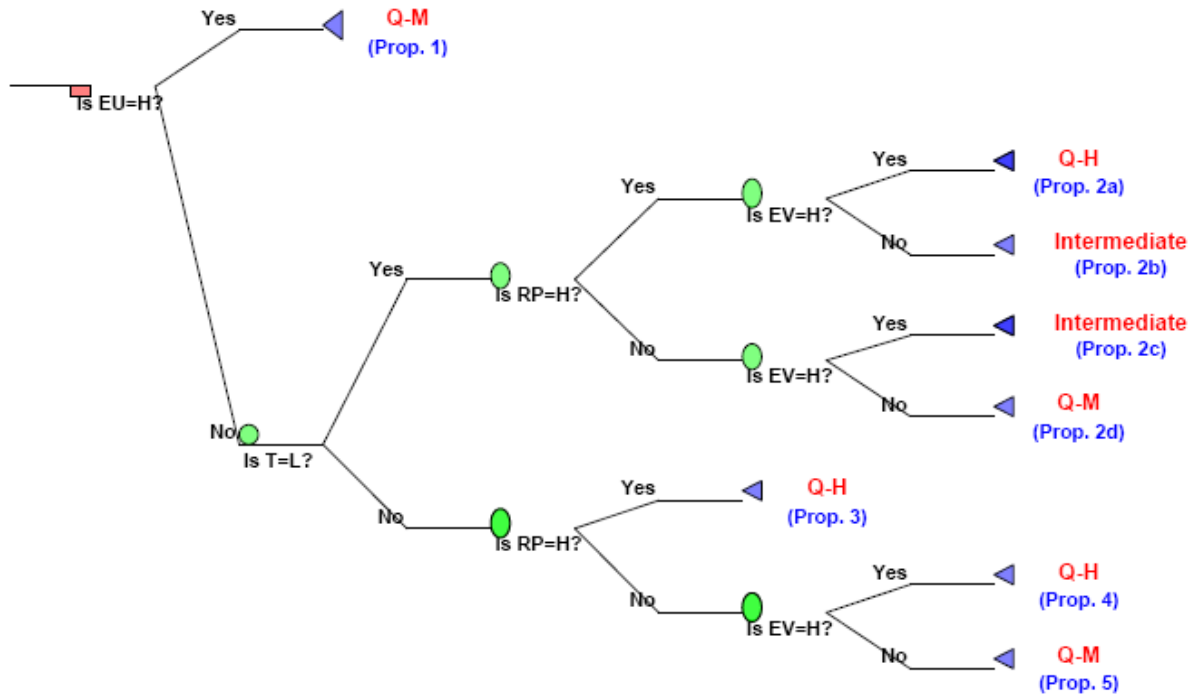

Figure 1. Decision Tree on Structural Mode of Service Innovation Alliances

4. CONCLUSIONS AND FURTHER WORK

This paper describes a research effort to combine the literature of TCE, RBV/KBV and RO in order to define the parameters that affect the decision on the governance of alliances aiming at developing technology-based service innovation. The prime features of the technology-based service industries have influenced the researchers in identifying the theories to be used as well as defining the parameters that play an important role in such alliances. After that, the theoretical investigations have resulted with a set of primary alliance objectives as well as a number of parameters affecting alliance decisions (e.g. formation, governance, management). The issue examined in this paper involves the governance, and more specifically the selection of the organization form under which alliances are structured in order to meet their strategic objectives.

Our literature research results with a number of propositions, described hereinafter as the baseline of a research model to be empirically tested in the future. More specifically, our literature research has concluded with the following arguments.

- Quasi-market (Q-M) alliances are preferred by firms mostly concerned about increasing flexibility (F) in an uncertain environment, or by firms that have low expectations for the future value of their alliance.

- Quasi-hierarchy (Q-H) alliances are preferred by firms having most highly rated the objectives of sustaining current or obtaining new competitive advantage (CA), pursuing growth (G), while at the same time they are highly concerned about their partners' opportunistic behavior (O).

- Intermediate alliances are preferred by firms having either low resource position or low expectations for the future value of their investment in an alliance.

Following the argumentation provided in building the proposed decision tree, the objective of flexibility is strong enough to drive towards Q-M alliances, regardless of the rest factors, while the objectives of growth (G) and sustaining competitive advantage (CA) are less strong and can drive to Q-H, only if resource position (RP) and expected value (EV) are high enough to justify the investment and commitment. If either the resource position (RP) or expected value (EV) is considered low, then intermediate forms of alliances may be preferred. Moreover, we argue that the objective of O is less important in the context examined, and thus can drive to any governance mode depending on the value of the decision factors. Specifically, if trust (T) is low and resource position (RP) and expected value (EV) are highly rated, then the need to protect from opportunism drives to Quasi-Hierarchy alliances. However, if trust is low but either the uncertainty is high or both the resource position (RP) and expected value (EV) is low, then the need to flexibility will surpass the need to protection leading to Quasi-Market alliances. Finally, if trust is low but either resource position (RP) or expected value (EV) is high, then the need to either sustaining competitive advantage or growth will increase the need to protect from partners through intermediate governance modes.

Future research could be directed towards developing a conceptual model describing the direct as well as indirect effects of the above decision factors on each of the strategic objectives, mentioned above, as well as on the governance mode of alliances. The above propositions could be decomposed to a number of research hypotheses, which would be worthwhile of testing in diverse high-tech service sectors, such as R&D, IT/telecommunications, finance and health services.

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