Decision making on governance of strategic technology alliances

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Abstract

Purpose – The purpose of this paper is to study the mechanism through which decisions on the preferred governance mode of strategic technology alliances are made at the firm level.

Design/methodology/approach – The author constructed a value-mediated governance model that is empirically tested through a survey of 57 strategic alliances in the Greek wireless services industry and estimated through a Structural Equation Modeling technique, namely Partial Least Squares.

Findings – Quasi-hierarchy governance modes are preferred by firms assessing their current value as high, and lacking fear of partners' opportunistic behavior. Quasi-market alliances are preferred by firms having high expectations for the future value of the alliance, and facing high endogenous uncertainty resulting from the existence of a competitive relationship with the partner.

Research limitations/implications – While the resource and cost perspectives are founded on diverse assumptions on firms' ability to write complete contracts, their implications for the firms' decision-making behaviour on the alliance governance issue seem to be complementary to those of the value perspective.

Practical implications – Transitional governance forms, quasi-market alliances that evolve to quasi-hierarchy alliances, seem to be preferred in emerging technology-based environments.

Originality/value – The Expected Alliance Value concept is introduced to explain how exogenous uncertainty characterizing the environment of emerging technology-based industries can influence the already investigated effects of the partner uncertainty and the firm's current value on the alliance governance preferences.

Keywords Governance, Strategic alliances, Uncertainty management, Asset valuation, Technology led strategy

Paper type Research paper

1. Introduction

In the emerging network and knowledge-intensive economy, the traditional firm dilemma whether "going it alone" or "collaborating" flags (Miles *et al.*, 1997). On the one hand, knowledge required to compete in emerging technology-based markets is becoming more diverse as markets converge and industries collide. On the other hand, firms are narrowing their knowledge base in an effort to specialize and focus. In this business environment, firms can no longer produce and manage knowledge-based services autonomously.

The need for strategic partnerships among different actors of technology-based service industries is imposed by the resource scarcity (Howarth, 1994), complexity of product/service offerings, the risks typically associated with innovation in such environments, as well as the need to pre-empt competitors' actions (Kotabe and Swan, 1995). Alliances have been defined as long-term cooperative relationships between firms that reflect mutual dependence between partners (Monczka *et al.*, 1998; Young-Ybarra and Weirsema, 1999). An alliance is considered as strategic when it

forms part of and is consistent with the partners' overall strategy, and contributes to the achievement of their major goals and objectives (Howarth, 1994).

Alliance governance typically involves choosing between equity and non-equity forms, also referred to as quasi-hierarchies and quasi-markets (Gulati, 1995; Narula and Hagedoorn, 1999; Osborn and Baughn, 1990; Pisano, 1989). Equity alliances include joint ventures and minority equity alliances, while non-equity alliances include contractual arrangements that do not involve equity exchange. The latter are further decomposed into relational contracts, which imply a moderate to long-term social-embedded relationship between the collaborating parties (Wang and Wei, 2007), and recurrent contracts, concerning collaborative relationships of rather moderate duration (Ring and Van de Ven, 1992). Figure 1 illustrates the four alliance governance modes along a market-hierarchy continuum.

The alliance governance issue is addressed in the strategic management field through a number of alternative perspectives, the most important of which are:

- *The cost perspective*, primarily expressed by Transaction Cost Economics (TCE) (Chen and Chen, 2003; Mahoney, 1992; Osborn and Baughn, 1990; Parkhe, 1993), according to which governance choices are determined by the balance between efficiency and protection that each partner anticipates to achieve from the collaborative transaction.

- *The resource perspective*, mainly grounded on the Resource-Based View (RBV) of the firm, according to which governance choices mainly depend on the type, amount, heterogeneity, and complementarity of the resources exchanged between the alliance partners (Chen and Chen, 2003; Das and Teng, 2000; Eisenhardt and Schoonhoven, 1996; Oxley and Sampson, 2004).

Both the above perspectives follow the assumption of bounded rationality. A direct implication of this assumption is that managers cannot write complete contracts, and thus cannot make accurate estimations on the future value of an alliance. As result, governance choices are made based on estimation of current value to be gained (resource perspective) and on risks to be avoided due to uncertainty (cost perspective).

In contrast to mature and stable industries, where uncertainty of the environment, if any, is considered low, emerging technology-based industries are characterized by not only high endogenous, due to asset specificity and challenges for opportunism, but also high exogenous uncertainty, due to technology evolution, market volatility, and competition unpredictability.

Collaborating in emerging technology-based industries introduces two considerations that alter the traditional prescriptions concerning the mature markets:
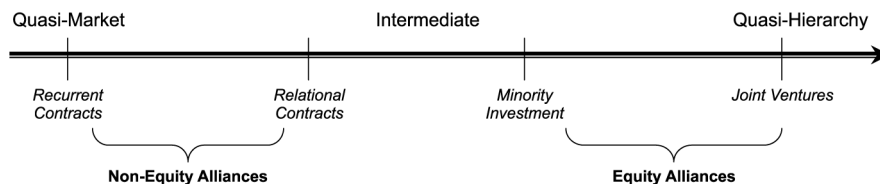

Figure 1.
Alliance governance
modes at hierarchical
continuum

(1) firms competing in new technology subfields are largely concerned with developing new capabilities and placing emphasis on learning and experimentation to achieve innovation (Madhok, 1997); and

(2) experimentation in uncertain environments may increase the risk and the cost of committing prematurely to equity alliances (Folta, 1998).

In this research, we argue that the inherent uncertainty prevailing in technology-based industries may significantly affect the expectations of firms for the future value of their alliance, which may also have a significant impact on their governance choice. Drawing on this observation, our research aims at investigating the governance choice dilemma under an integrative approach combining traditional cost- and resource-based arguments with the value perspective, studied through the analytic lens of the theory of Real Options (RO). We construct a value-mediated alliance governance model that is then empirically tested through a survey of strategic alliances in the wireless services industry, and estimated through a Structural Equation Modeling (SEM) technique, namely Partial Least Squares (PLS).

2. An integrative approach for examining alliance governance
2.1 The cost and resource aspects
Arguably, the majority of extant empirical studies on alliance governance ground their arguments on Transaction Cost Economics (Chen and Chen, 2003; Leiblein and Miller, 2003; Mahoney, 1992; Osborn and Baughn, 1990). TCE proposes that firms choose alliance governance structures under the concern of minimizing the sum of production and coordination costs (Williamson, 1981). The theory generally assumes that quasi-markets provide a more efficient, or lower-cost, mechanism for managing economic exchanges than quasi-hierarchies. However, given that the transaction may hinder uncertainty and that the market contracts are incomplete, the theory holds that, in certain situations, the costs of market exchange may increase substantially and surpass the efficiencies provided by the market (Leiblein, 2003). Therefore, TCE advocates that equity alliance forms should be preferred when protection from uncertainty outweighs efficiency in transactions (Hagedoorn and Narula, 1996; Osborn and Baughn, 1990).

Additional considerations from the Resource-Based View (RBV) of the firm are in support of governance forms that maintain a balance between allowing sufficiently open resource exchange to achieve alliance objectives, while controlling exchange flows to avoid unintended leakages (Oxley and Sampson, 2004). If both partners contribute to the alliance with knowledge-based resources, involving high level of tacitness, an equity alliance will be preferred not only to facilitate transfer and integration of complex and tacit knowledge, but also to control for resources' leakage (Oxley and Sampson, 2004).

2.2 The value aspect
While a great part of recent work on alliances (Chen and Chen, 2003; Yasuda, 2005) focuses on the dilemma between cost-saving and resource-acquisition logics, as expressed by TCE and RBV respectively, a more recent research stream argues in favor of applying a value-creation logic to the alliance governance dilemma (Ethiraj et al., 2002; Folta, 1998; Folta and Miller, 2002; Leiblein, 2003; Santoro and McGill,

2005). The value aspect is exemplified by theories examining the potential for value capture in an alliance, such as the theory of Real Options (RO), under conditions of environment uncertainty.

The Real Options theory approaches the environment uncertainty and its impact on the governance mode of alliances through the definition of two value options (Leiblein, 2003); the "option to defer" and the "option to growth". 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 future (expected) value of this investment in a dynamic environment remains uncertain. The value for the firm taking the flexibility option rests on waiting till new information on market demand, competitive conditions, and viability of new technologies are available, to make more informed decisions (Leiblein, 2003). Thus, under conditions of high uncertainty about the viability and the success of the investment, firms are more liable to opt for less hierarchical forms of governance to assure flexibility and avoid the cost of irreversible investments (Barney and Lee, 1998; Santoro and McGill, 2005).

The second means through which Real Options guides governance decisions is through the "growth option", also referred to as the "call option". Although delaying commitment may seem optimal under conditions of uncertainty, there may be opportunity costs to waiting. Firms may forgo cash flows or opportunities to learn, or the chance for innovation may be preempted by rivals (Folta and Miller, 2002). Thus, firms wishing to obtain competitive advantage have greatest interest in high investment, which gives them more opportunities to expand in the emerging market (Kogut, 1991). Moreover, the resolution of uncertainty for high-value investment may motivate firms to move from the option of waiting to the growth option, and thus transit from quasi-market to quasi-hierarchy alliances (Folta and Miller, 2002).

2.3 Integrating the three aspects

The above theoretical perspectives differentiate on the type of value, current versus future (also referred as realized versus expected) value, and the type of uncertainty, endogenous versus exogenous (also referred as partner versus environment) uncertainty prevailing the collaborative relationship.

Estimation of a firm's current value involves assessment of several firm-specific measures, such as size, resource value, market share, and stock value. Current value is contrasted to future value in terms of realization, since the last one is assumed to be tightly associated with the firm's strategic objectives and the returns that it anticipates to capture from its strategic actions (i.e. alliances). Exogenous uncertainty is conceptualized to denote the risk firms face from changes in one or more environment-related dimensions, such as market demand, technology status, national or international regulatory framework. Such a type of uncertainty is called exogenous, since it is specific to the industry subfield and exogenous to the control of individual firms. In contrast, endogenous uncertainty involves risk sourced from

partner's behavior. Such a risk can be propagated from within the partnership via individual firms' beliefs or actions.

TCE places emphasis on endogenous uncertainty and disclaims the firms' ability to estimate future value of their investment. Following the same assumption, RBV accentuates the importance of the firm current value as well as the current value of the resources exchanged through the alliance. Nevertheless, acknowledging the existence of profitable future opportunities and assuming a secure environment from both exogenous and endogenous perspective, firms are encouraged to make up-front investments for creating new resources whose value is currently ambiguous (Kim and Mahoney, 2005). Unlike TCE and RBV, RO assumes that managers are able to write contracts that provide implicit or explicit claims on both the current and the future value of an investment. It also implies a conception of exogenous uncertainty, where probabilities of potential outcomes under a range of market and competitive conditions can be specified a priori, thus guiding firms' current choice. While TCE emphasizes the downside risk in describing how uncertainty may lead to misappropriation or hold-up problems (Williamson, 1985), RBV and RO emphasize the upside profit creating opportunities associated with environment uncertainty (Leiblein, 2003). After that, the complementarity of the three perspectives arises from the need to integrate the different perceptions on the type and effect of uncertainty as well as to unite estimation of current and future value in the governance decision making process.

In this research, endogenous uncertainty is estimated in terms of partner compatibility, competitive relationship, and alliance history, while the primary parameters of exogenous uncertainty in a dynamic environment are considered to be competition intensity and environment uncertainty. Whereas the firm current value can be deduced by the firm size and competitive position, the firm expected value is hereinafter estimated in terms of achievement of the firm's strategic objectives, and thus is related to the firm's strategic orientation.

2.4 Defining Expected Alliance Value (EAV)

While the impact of the firm current value as well as the alliance exogenous and endogenous uncertainty on the governance choice has been investigated in several previous theoretical and empirical studies (Folta, 1998; Folta and Miller, 2002; Santoro and McGill, 2005), neither direct nor indirect effects of the expected value has been explicitly examined in prior research within the field of strategic alliances. In response, this paper provides a definition for the Expected Alliance Value (EAV) and seeks support for its effects on the governance choice.

Expected Alliance Value (EAV) has been defined as a multi-dimensional construct measuring the expected benefits incurred for a firm from its participation in a strategic alliance. The key assumption underlying the conceptualization of EAV is that the value expectations of firms are realized when their objectives for the alliance formation are accomplished. Based on that, the EAV concept has been conceptualized to include twenty cost-economizing and strategic positioning motives (Gulati and Singh, 1998; Hemphill and Vonortas, 2003; Tsang, 1998; Vilkamo and Keil, 2003), organized under seven dimensions (as defined in Contractor and Lorange's (2002) framework for strategic contributions of cooperative arrangements):

(1) risk reduction;

(2) vertical integration;

(3) complementarity;

(4) learning;

(5) co-option;

(6) economics; and

(7) social expansion.

EAV dimensions and items are illustrated in Table I.

The key premise of our research is that, under conditions of high endogenous and exogenous uncertainty, as in the case of technology-based industries, evaluating both the current and the expected value of the alliance is required to guide the governance decision.

3. An alliance governance model for uncertain environments

In what follows, we develop hypotheses on how a number of factors concerning firm's current value, partner uncertainty, and future value affect the dependent variable, that is the Preferred Governance Mode. The EAV concept is also introduced in the model as mediator in order to explain whether it mitigates the effects of either the current value or the endogenous uncertainty on the governance choice. Exogenous uncertainty is considered high in the examined environment, and thus its dimensions are addressed as constants, rather than variables, of the model.

3.1 Prime antecedents

Firm size is thought to affect the motivation of firms entering an alliance and the governance mode they prefer (Alm and McKelvey, 2000; Leiblein and Miller, 2003; Osborn and Baughn, 1990). Small firms usually opt towards less hierarchical governance modes from fear of losing their autonomy, while, based on RBV, large firms wish more hierarchical alliances to have the exploitation power over the resources but also the final outcome of the collaborative process (Tether, 2002).

H1. The larger the firm size, the more likely it is that firms will raise preference for quasi-hierarchy governance modes.

One way to define the strategic or competitive position of a firm is based on its resource position (Day and Wensley, 1988). Following the RBV logic, Hemphill and Vonortas (2003) argue that companies wishing to maintain or achieve competitive advantage in an environment where time-to-market and timing is critical, the rate of technological change is rapid, and the nature of future competition difficult to determine are more likely to opt towards quasi-hierarchy alliances in order to protect the value of their current competitive resources and skills, but also to acquire new competitive competencies through learning.

H2. The stronger the firm competitive position, the more likely it is that firms will raise preference for quasi-hierarchy governance modes.

Ansoff (1965) and Kotler (2000) argue that diversification and integration, usually pursued through alliances, are the two most aggressive growth strategies, aiming at both new service development and introduction to new markets. As importance attributed to these two strategies grows, the level of the required resource commitment

Constructs and items description	Item code
Firm size (single item)	
Indicate firm's size in no. of employees: (0-9, 10-49, 50-249, 250 + empl.)	SIZE1
Governance mode (single item)	
Select from the list the type of alliance that your firm has preferred, based on level of wished interdependence with the partner:	
(Recurrent contract, Relational contract, Minority investment, Joint venture)	GOV1
Strategic orientation (four items)	
(Scale: 1 = extremely low to null . . . 7 = extremely high)	
1. Indicate degree of importance that the firm's corporate strategy provides to the strategic goal of related diversification (differentiation on existing products/services)	STRAT_OR1*
2. Indicate degree of importance that the firm's corporate strategy provides to the strategic goal of unrelated diversification (differentiation on new products/services)	STRAT_OR2
3. Indicate degree of importance that the firm's corporate strategy provides to the strategic goal of vertical integration	STRAT_OR3*
4. Indicate degree of importance that the firm's corporate strategy provides to the strategic goal of horizontal integration	STRAT_OR4
Competitive position	
(Scale: 1 = much below the average . . . 7 = much above the average)	
1. *Resource position* (nine items)	
Rate firm's competitive strength in terms of the following resources:	
• Financial Resources (e.g. capital, investments)	RES_POS1
• Human resources (e.g. employees' experience, interfirm contracts)	RES_POS2*
• Physical Resources (e.g. geographic location, equipment, access to raw materials)	RES_POS3
• Technological Resources (e.g. equipment, networks, devices, standards)	RES_POS4
• Organizational Resources (e.g. patents, copyrights, registered designs)	RES_POS5*
• Tacit Know-How (e.g. efficient organizational processes, managers' insight)	RES_POS6**
• Market Knowledge (e.g. market info, customers' installed base)	RES_POS7
• Technological Knowledge (e.g. capabilities in technology usage/development)	RES_POS8*
• Management Systems (e.g. control and coordination systems, strategic planning)	RES_POS9
2. *Market position* (eight items)	
Rate firm's competitive strength in terms of the following market position advantages:	
• Low production costs	MARK_POS1*
• Time-to-market	MARK_POS2
• Product/Service quality	MARK_POS3
• Low prices	MARK_POS4*
• Quality of after-sales support	MARK_POS5
• Product/Service delivery	MARK_POS6*
• Promotion/Advertising	MARK_POS7
• Technological superiority of products/Services	MARK_POS8**
	(*continued*)

Table I.
Constructs and items
(questions)

Constructs and items description	Item code
3. *Performance position* (four items)	
Rate firm's competitive strength in terms of the following	
performance-related advantages:	
• Brand name	PERF_POS1
• Differentiated products/services	PERF_POS2
• Market share	PERF_POS3
• Return on assets	PERF_POS4

Compatibility
(Scale: 1 = strongly disagree . . . 7 = strongly agree)
Cultural compatibility (three items)

1.	Our partner's organizational values and social norms resemble ours	CULT_COMP1
2.	Our executives' philosophies/approaches to business dealings are consistent with those of our partner's executives	CULT_COMP2
3.	Our partner's strategic goals and objectives do not hinder ours	CULT_COMP3

Operational compatibility (three items)

4.	Technical capabilities/solutions of our partner and our firm are compatible with each other	OPER_COMP1
5.	The organizational procedures of our partner and our firm are compatible	OPER_COMP2*
6.	Employees of our partner have similar professional or technological skills to our employees	OPER_COMP3*

Resource complementarity (three items)

7.	Both companies need each other's resources to accomplish their strategic goals	RES_COMP1
8.	The resources contributed by both firms are significant for serving the principal purpose for which this alliance is formed (specified in A6)	RES_COMP2
9.	Resources brought into the alliance by each firm were very valuable for the other	RES_COMP3

Competitive relationship (two items)

1.	Please choose from the list your partner's relative geographic position: (Same country, other European country, other country)	LOC_OVER
2.	Please choose from the list your firm's and your partner's market sector:	MARK_OVER
	• Wireless network operators	
	• Virtual network operators	
	• Mobile device manufacturers	
	• Mobile device retailers	
	• Network equipment vendors	
	• Mobile/wireless internet service providers	
	• Mobile/wireless application service providers	
	• Positioning technology providers	
	• Content providers	
	• Mobile portals	

(continued)

Table I.

Constructs and items description	Item code

Alliance history (four items – two factors)
1. Has your firm been engaged with your partner in alliances other than the present one? (yes, no)
2. How many other alliances? — PREV_DUR
3. For how many years have you known each other?
4. What type of alliance(s) did you have? (Recurrent contract, relational contract, minority investment, joint venture) — PREV_GOV

Expected Alliance Value (EAV)
Indicate the level of your expectations for the following benefits that the alliance may incur. (Scale: 1 = extremely low expected ... 7 = extremely high expected)

Risk reduction (three items)
1. Share market risk (i.e. production of new or differentiated products/services) — RISK_RED1
2. Share technological risk (i.e. development of technologically advanced products/services) — RISK_RED2
3. Increase flexibility to rapid market and technological changes — RISK_RED3

Vertical integration (five items)
4. Enable provision of products/services in lower prices — VERT_INT1
5. Improve quality of after-sales support — VERT_INT2
6. Expand service delivery in new channels — VERT_INT3[*]
7. Benefit from partner's strong brand name — VERT_INT4[*]
8. Reduce time-to-market — VERT_INT5

Complementarity (two items)
9. Exploit complementary resources — COMPLEM1
10. Extend products/services range (new products/services) — COMPLEM2

Learning (four items)
11. Gain access to the partner's resources — LEARN1[*]
12. Internalize partners' capabilities (e.g. technological, production, marketing) — LEARN2
13. Deploy new skills and knowledge — LEARN3
14. Improve quality of products/services — LEARN4

Co-option (two items)
15. Differentiate existing product/services (new features) — CO_OPTION1
16. Deter entry of competitors — CO_OPTION2

Economics (three items)
17. Economize on the sum of production and transaction costs — ECONOM1
18. Increase Return On Asset (ROA) — ECONOM2[**]
19. Increase market share — ECONOM3[**]

Social expansion (one item)
20. Increase knowledge about the partner and its social network (e.g. suppliers, complementors) for formation of new alliances in the future — EXPANSION1

Notes: [*] Items excluded through the individual item reliabilities test; [**] Items excluded through the convergent validity test

Table I.

but also the fear of partner actions undermining one's strategic goals grow. Using the TCE argumentation, the increased need for protection against partner uncertainty will lead firms towards selecting more quasi-hierarchy alliances. Based on RBV, the requirement for committing and integrating a large amount of valuable resources will also point to the choice of more hierarchical governance modes to safeguard own assets and assure the partner's commitment to one's strategic goal.

H3. The higher importance is attributed to growth strategies (diversification and integration), the more likely it is that firms will raise preference for quasi-hierarchy governance modes.

Partner compatibility refers to the complementarity of resources, coupled with the cultural and operational compatibility between the partners (Parkhe, 1991). According to TCE, as cultural and operational compatibility increases, coordination costs decrease, thus rendering quasi-hierarchy alliances more efficient solutions (Gulati and Singh, 1998). Based on the RBV argumentation, firms are more likely to choose more hierarchical mechanisms for alliances in which partners contribute different or complementary resources, since they create greater appropriation concerns (Mitchell *et al.*, 2002).

H4. The greater the partner compatibility, the more likely it is that firms will raise preference for quasi-hierarchy governance modes.

Hamel *et al.* (1989) suggest that, when seeking collaborators for technology-related projects, firms should target partners whose strategic goals converge, while their competitive goals diverge. Both TCE and RBV provide explanations in favor of hierarchical governance mechanisms in highly competitive alliances. TCE argues in favor of quasi-hierarchy alliances, because they provide sufficient protection to induce extensive knowledge sharing among competitors. Also, RBV encourages the choice of more hierarchical governance modes, preferably with the form of joint ventures, for competitive alliances, where firms wish to maintain their organizational competence, but also benefit from their partner's current resource or cost advantage (Kogut, 1988).

H5. The more intense the partner competitive relationship, the more likely it is that firms will raise preference for quasi-hierarchy governance modes.

According to Gulati (1995), prior direct or indirect collaborations between partners increase trust. Partner uncertainty decreases, as partners gain mutual experience and trust. Based on TCE, a long alliance history lead to positive expectations about partner's behavior, thus reducing the need for the costly monitoring and control mechanisms of hierarchical alliances (Santoro and McGill, 2005). However, based on the RO argumentation, the decrease of partner uncertainty encourages partners to commit more resources, in order to opt for future growth. Thus, firms currently engaged in a contractual agreement may in time mitigate to a more hierarchical governance mode, given that they have developed trust from prior alliances.

H6. The longer the alliance history between partners, the more likely it is that firms will raise preference for quasi-hierarchy governance modes.

According to the RO theory, given high exogenous uncertainty, the ability to delay or defer an irreversible investment can be an important source of flexibility (Leiblein,

2003; McDonald and Siegel, 1986; Pindyck, 1991). Real Options recognizes the expected value associated with the flexibility option, and indicates that, under conditions of exogenous uncertainty, it may be better to form quasi-market alliances that provide greater flexibility.

H7. Under conditions of high exogenous uncertainty, high expectations for value are positively related with preference for quasi-market governance modes.

3.2 The mediating role of EAV
Further to assuming that the expected value of an alliance will have a direct effect on the governance choice, it is also worth examining the degree to which the hypothesized antecedent factors influence the value that organizations expect to capture from their participation in an alliance. In other words, EAV may mediate the relationship between the previous determinants and the dependent variable, further to its direct effect on the preferred governance mode.

H8a. The expected alliance value mediates the effect of the firm size on the preferred governance mode.

H8b. The expected alliance value mediates the effect of the firm competitive position on the preferred governance mode.

H8c. The expected alliance value mediates the effect of the firm strategic orientation on the preferred governance mode.

H8d. The expected alliance value mediates the effect of the partner compatibility on the preferred governance mode.

H8e. The expected alliance value mediates the effect of the partner competitive relationship on the preferred governance mode.

H8f. The expected alliance value mediates the effect of the alliance history on the preferred governance mode.

Figure 2 illustrates the structure and hypotheses of the value-mediation governance model. The signs $(+)/(-)$ are used to denote the positive/negative impact of a variable on the degree of hierarchical control that a firm wishes to obtain over the candidate alliance partner. An increase $(+)$ of the wished degree of hierarchical control means preference for a quasi-hierarchy governance mode, while a decrease $(-)$ means preference for a quasi-market governance mode.

4. Research design
4.1 Sampling method
Data used for the empirical validation of the model were obtained from strategic alliances in the market of mobile and wireless IT services in Greece, although many of the firms participating in these alliances were multinational. The alliance, under the perspective of each partner, was chosen as the unit of analysis for our study.

A list of primary sampling units, included in the Greek Telecoms, IT, internet, and New Media Observatory, 2003 (Strategic Observatory, 2003), was first compiled to include the industries to which players of the mobile and wireless services market belong (i.e. media, telecommunications, information technology, internet service
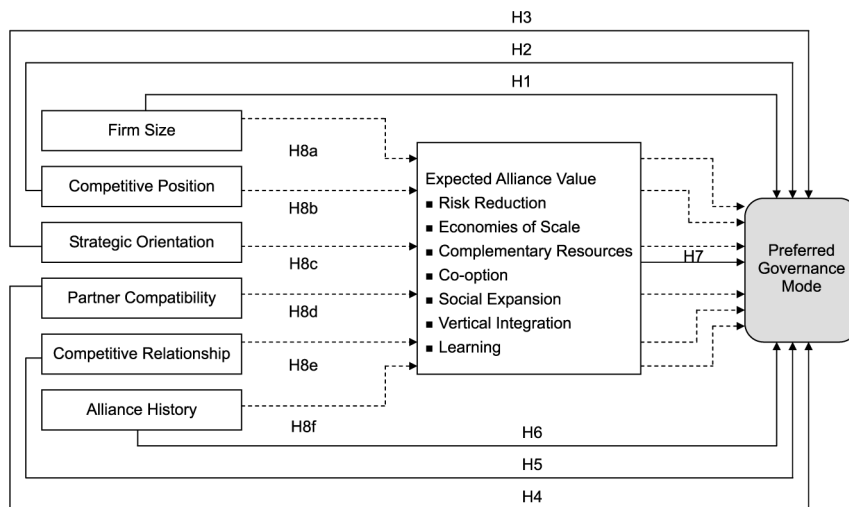
H3

H2

H1

Firm Size

H8a

Competitive Position

H8b

Strategic Orientation

H8c

Partner Compatibility

H8d

Competitive Relationship

H8e

Alliance History

H8f

Expected Alliance Value
■ Risk Reduction
■ Economies of Scale
■ Complementary Resources
■ Co-option
■ Social Expansion
■ Vertical Integration
■ Learning

H7

Preferred
Governance
Mode

H6

H5

H4

Figure 2.
The value-mediation
governance model
(hypothesized)

providers), and then the firms belonging to each of these industries. Since non-equity alliances (recurrent and relational contracts) outnumbered the population of equity alliances (minority investment and joint ventures), we employed stratified sampling to obtain an adequate sample of the last stratum.

Data collection proceeded in four stages, including in some cases a return loop from phase three to phase one with the purpose of gradually increasing the sample of interrogated firms, since the population of the sample was not a priori known. Phase one involved a survey of current or newly formed alliances in the Greek wireless market, which ended with a list of about 40 firms. Phase two included telephone contact with the listed companies, aiming at scheduling an interview with the person(s) in charge. Phase three consisted of questionnaire filling and interview for collection of further data on the firm's alliances, and ended by listing other firms of the same industry that have formed strategic alliances. In phase four, the questionnaire data was coded to conduct statistical analysis. At the completion of the data collection phase, a total of 60 questionnaires had been collected, of which 57 were retained for further analysis. Three cases were excluded, since they concerned advertising rather than strategic partnerships.

4.2 Sampling environment

This research places emphasis on investigating the governance decision for alliances within dynamic environments, the prime features of which are considered to be environment uncertainty and competition intensity. To run our empirical survey in the wireless services industry, we assumed, and therefore had to confirm, that the competition intensity and the uncertainty of the wireless market were perceived high by our sample of strategic managers.

To measure the environment uncertainty concept, we followed the Dickson and Weaver's (1997) construct, also adapted from Covin and Slevin (1989), including ten-items that assessed strategic managers' perceptions for diverse sources of

environment uncertainty, such as technological demand and volatility, general market volatility, predictability of customer demands, and competitor actions. The perception of strategic managers for the competition rivalry in their market sector was gauged through a four-item (service characteristics, promotional activities, access to distribution channels, after sales support) scale, used by Spanos and Lioukas (2001), and adapted by Achrol and Stern (1988). Both these two measures are described in the Appendix.

Table II demonstrates the confirmatory results of the one sample *t*-test executed to test our initial assumptions on the selected empirical environment. Since their confidence intervals lay entirely above 0.01, one can safely say that both parameters, competition intensity and environment uncertainty, are rated higher than the average value.

4.3 Construct definition

Since many of the variables used in this research were unobservable, a latent variable design with multiple indicators was adopted to measure these constructs (Hoyle, 1999). The latent variable design allows constructs to be represented by a combination of reflective and formative indicators. The constructs and the indicators used to measure the independent, the dependent and the mediating variables of our model, along with their measurement scales and the sources from which they were derived, are indicated in Tables III and IV.

4.4 Model estimation

We used structural equation modeling to evaluate both the errors in construct measurement and the errors in hypothesized relations of the conceptual model (Hulland, 1999). In our research, the PLS approach was preferred over a covariance-based approach, for several reasons. First, the objective was prediction. Second, the model aimed at creating a sound governance theory by incorporating different theoretical perspectives. Third, the relationships between the latent variables and their indicators were in different modes (i.e. formative and reflective). Fourth, there were several second-order factors, which were caused by first-order factors, and thus could be modeled only through PLS.

Last, but not least, PLS sample size requirements are more relaxed compared to co-variance based techniques. Minimal recommendations for PLS analysis range from 30 to 100 cases (Chin and Newsted, 1999; Gefen *et al.*, 2000). For a more accurate assessment, conducting power analysis on the proportion of the model with the largest

| | | | | | | Test value $= 3$ | |
| | | | | | | | 99% Confidence interval of the difference |
		t	df	Sig. (2-tailed)	Mean difference	Lower	Upper
Environment uncertainty		7.514	56	0.000	0.39474	0.2547	0.5348
Competition intensity		5.126	56	0.000	0.59649	0.2862	0.9068

Table II.
T-test for the "environment uncertainty" and the "competition intensity" measures

Variable/First-order construct	Type*	Operationalization	Items in scale	Item type**	Sources
Firm size (SIZE)	O	Observable variable assessing the size of the firm in terms of its number of employees	1	R	European Commission, 2003
Strategic orientation (STRAT_ORIENT)	L	The growth strategy that a firm plans to implement (the two most forward-looking growth strategies being diversification and integration)	4	R	Ansoff, 1965; Kotler, 2000
Competitive relationship (COMPT_REL)	L	We used two complementary measures of competitive overlap: market overlap and location overlap. Market overlap (MARK_OVER) is set to one if both partners have their primary business in the same sector. For multilateral alliances, MARK_OVER is set to one if at least two of the partner firms belong to the same sector. Location overlap (LOC_OVER) variable is set to one if alliance partners are established in the same country	2	F	Oxley and Sampson, 2004
Alliance history (ALL_HIST)	L	It includes three items: whether partners had previously collaborated or not, the number of alliances into which they have participated, and the number of years of their collaboration	3	F	Parkhe, 1993
Governance mode (GOV)	O	Ordinal variable indicating the degree of interdependence between partners according to the following scheme: 1) recurrent contracts (very low interdependence), 2) relational contracts (low interdependence), 3) minority investment (medium interdependence), and 4) joint venture (high interdependence)	1	R	Gulati and Singh, 1998

Notes: * Latent (L) or Observable (O); ** Reflective (R) or Formative (F)

Table III.
Measurement of
variables – first-order
constructs

Second-order construct	Operationalization	Type	First-order constructs	Items in scale	Item type*	Sources
Competitive position (COMPT_POS)	Competitive position is a high-order construct related to three elements (latent constructs): resource position advantages, market position advantages (customer value and costs), and performance advantages (market share and profitability)	F	Resource Position (RES_POS)	9	R	Day and Wensley, 1988; Das and Teng, 2000
			Market Position (MARK_POS)	8	R	
			Performance_Position (PERF_POS)	4	R	
Compatibility (COMPATIBILITY)	Partner compatibility is a second-order construct caused by three factors: resource complementarity, cultural compatibility and operational compatibility	F	Resource Complementarity (RES_COMP)	3	R	Parkhe, 1991; Anderson and Narus, 1990; Sarkar et al., 2001; Heide and John, 1992; Morgan and Hunt, 1994; Wilson, 1995
			Operational Compatibility (OPER_COMP)	3	R	
			Cultural Compatibility (CULT_COMP)	3	R	
Expected Alliance Value (EAV)	EAV consists of 20 items, organized into seven first-order latent constructs: risk reduction, vertical integration, complementarity, learning, co-option, economics, and social expansion	R	Risk reduction	3	R	Contractor and Lorange, 2002
			Vertical integration	5	R	
			Complementarity	2	R	
			Learning	4	R	
			Co-option	2	R	
			Economics	3	R	
			Social expansion	1	R	

Notes: * Reflective (R) or Formative (F)

Table IV.
Measurement of variables – second-order constructs

5. Empirical results

Using the PLS method, our model was analyzed and interpreted in two stages:

(1) Assessment of the outer measurement model.

(2) Testing of the inner structural model.

5.1 Outer (measurement) model

To evaluate the reliability of individual items, we inspected the loadings of all measures on their corresponding constructs. Out of the 58 total items of reflective latent variables, 13 items had loadings less than 0.50 (marked [*] next to their item codes in Table I), and thus were dropped.

We tested for internal consistency using the composite reliability measure recommended by Fornell and Larcker (1981). The internal consistency values for all the reflective constructs of our model exceeded 0.70 (Nunnally, 1978). Some of the reflective constructs did not satisfy the requirement for AVE > 0.50 requirement (Fornell and Larcker, 1981). To fix the problem, we deleted four items of these constructs having factor loadings above 0.50 but below 0.60 (marked [**] next to their item codes in Table I).

We also tested the discriminant validity of all latent constructs with reflective indicators. We found the square root of all constructs' AVE to be greater than all corresponding correlations, thus providing clear evidence of discriminant validity (Fornell and Larcker, 1981). We corroborated this finding by examining the outer residual covariance matrix, where we found all inter-block residuals to be less than 0.19 – in fact, most were close to zero (Falk and Miller, 1992, suggest that discrimination between constructs is questionable if several residual covariances are greater than 0.20).

Finally, we assessed the reliability of constructs including formative measures using their weights instead of loadings. We found the weights of the two items of the Competitive Relationship formative latent variable to be statistically significant, hence the latent variable was considered reliable as well.

5.2 Inner (path) model

In Table V, we report the beta coefficients and t-values for the model, along with the R^2 for the dependent variable. The t-values of Table V were calculated on the basis of 500 bootstrapping runs. The variance explained (R^2) for the dependent variable, GOV, was 0.328, which implies a large effect size ($R^2 > 0.26$).

Direct effects. Out of the seven hypothesized predictors of Governance (GOV), six were proved to be statistically significant: Firm size (SIZE), competitive relationship (COMPT_REL), partner compatibility (COMPATIBILITY), strategic orientation (STRAT_ORIENT), alliance history (ALL_HISTORY), and expected alliance value (EAV). It is worth noting that the partners' competitive relationship (COMPT_REL) was found to be negatively correlated to the governance choice, conversely to what we had hypothesized based on the TCE argumentation. From the three dimensions of the partner uncertainty concept, it is the only one having a reverse than hypothesized

Independent variables	Hypotheses	Beta weights and t-values for Governance (GOV)	Beta weights and t-values for Expected Alliance Value (EAV)
Firm size (SIZE)	H1 (Accepted)	0.176 (1.280)[*]	0.016 (0.159)
Strategic orientation (STRAT_ORIENT)	H2 (Accepted)	0.312 (2.580)[***]	0.094 (0.7439)
Competitive Position (COMPT_POS)	H3 (Rejected)	−0.152 (1.019)	0.111 (0.9813)
Partner Compatibility (COMPATIBILITY)	H4 (Accepted)	0.227 (1.794)[**]	0.216 (2.1652)[**]
Competitive Relationship (COMPT_REL)	H5 (Accepted[a])	−0.313 (1.683)[**]	−0.461 (3.2319)[***]
Alliance History (ALL_HISTORY)	H6 (Accepted)	0.339 (2.930)[***]	0.054 (0.4726)
Expected Alliance Value (EAV)	H7 (Accepted)	−0.295 (1.302)[*] $R^2 = 0.328$	

Notes: [*] $p < 0.10$; [**] $p < 0.05$; [***] $p < 0.01$; [a] Accepted in the opposite direction to that hypothesized

Table V.
Structural model estimates

effect on the governance choice. While the two previous dimensions (partner compatibility, alliance history), when positive, express lack of partner uncertainty, the competitive relationship dimension, when positive, expresses existence of partner uncertainty. The empirical research has thus showed that under conditions of high exogenous uncertainty, the existence of partner uncertainty does not lead, as traditionally prescribed by TCE and RBV, to quasi-hierarchy alliances. Based on our empirical data, the existence of a competitive relationship between partners will deter them from early investment in irreversible hierarchical relationships and drive them towards quasi-market alliances.

Mediating effects. We also tested the extent to which the expected alliance value (EAV) mediates the relationships between the antecedent factors and the governance decision (*H8a-f*), based on Hoyle and Kenny's (1999) prescription.

The significance of all indirect effects in our model was calculated based on Sobel (1982). Thus, the standard error of indirect effects (*ab*) was calculated as $SE_{ab} = sqrt(S_a^2 * b^2 + S_b^2 * a^2)$ and the corresponding *t*-value equals to ab/SE_{ab}. Following this procedure for all possible indirect paths, we found none of them to be statistically significant (Table VI).

Table VI demonstrates that EAV can only partially mediate the effect of the Competitive Relationship (COMPT_REL) on the governance choice. EAV causes COMPT_REL to have an indirect effect on the governance choice that is the reverse to the direct one. Thus, while COMPT_REL's direct effect is towards quasi-market alliances, its indirect effect favors quasi-hierarchy alliances. Explanation for this effect is provided in the next section.

As Hoyle and Kenny (1999) suggest, we should be cautious when interpreting the results of statistical tests on mediation due to three conditions that can affect the performance of these tests, thus resulting to underestimation of mediation effects:

(1) small sample size;
(2) collinearity between the independent and the mediator variable; and
(3) medium or poor reliability of the mediator.

In our research, the effects of two antecedent factors (partner compatibility, competitive relationship) on the EAV (mediator variable) are significant as shown in Table V. Moreover, EAV's reliability was acceptable – with all factor loadings ranging between 0.60 and 0.84 – but not very high (Chin, 1998). For the above two reasons, the mediation effects of EAV may have been underestimated.

6. Discussion of results
This research has aimed at identifying factors affecting decision making on the governance mode of strategic alliances in emerging technology-based industries. A decision model explaining how governance choices are made in such industries, where firms face numerous risks (i.e. technology risk, market volatility, regulatory inefficiencies) but also opportunities for value creation, is currently missing from the alliance research area.

The empirical part of our research, focused on an instance of technology-based industries has demonstrated that quasi-hierarchy governance modes are preferred by firms assessing their current value as high and lacking the fear of partner uncertainty. On the contrary, quasi-market alliances are preferred by firms having high expectations for the future value of the alliance and facing high endogenous uncertainty resulting from the existence of a competitive relationship with the partner.

More specifically, this research has showed that strategic managers drive their firms towards more quasi-hierarchy (equity) alliances, when their firms are large and when they place emphasis on achieving growth through the differentiation and/or integration strategic goals. Quasi-hierarchy alliances are also preferred as the historical relationship between partners gets longer and their compatibility (cultural, operational, and resource alike) increases. On the contrary, quasi-market (non-equity) alliances are preferred when managers expect to receive increased value from future opportunities that may not be currently apparent under conditions of high environment uncertainty. Moreover, quasi-market alliances are preferred when partners' current relationship is assessed as highly competitive.

While this last finding seems to contradict the TCE/RBV argumentation, an explanation can be given based on the RO logic. The existence of a competitive relationship among players of an emerging industry is usually associated with the

Independent variables	Indirect effects	SE_{ab}	t-value
Firm size (SIZE)	− 0.005	0.031	0.161
Strategic orientation (STRAT_ORIENT)	− 0.028	0.043	0.651
Competitive position (COMPT_POS)	− 0.033	0.042	0.786
Partner compatibility (COMPATIBILITY)	− 0.064	0.057	1.123
Competitive relationship (COMPT_REL)	0.176[*]	0.137	1.285
Alliance history (ALL_HISTORY)	− 0.016	0.036	0.444
Notes: [*] $p < 0.10$; [**] $p < 0.05$; [***] $p < 0.01$			

Table VI.
Indirect effects on the dependent variable (GOV)

phenomenon of information asymmetry. As firms increase knowledge about the competition in the new market (or market segment), the technology's capabilities and risks, and the customers' demand, they get more able to differentiate themselves in the emerging market. Thus, while they currently address their partners as competitors, the future may provide them with the opportunity to detect complementarity of resources/skills, and thus wish to opt for through contracting alliances of higher commitment with their partners.

To develop our decision model, we have considered it important to introduce the expected alliance value (EAV) concept, which denotes the future value that a firm expects to capture from its participation in an alliance. Through our empirical analysis, we have shown it to be a significant determinant of the governance choice – in the sense that quasi-market alliances will be preferred in cases of high expectancies for the alliance value in an uncertain environment.

We have also examined whether EAV also acts as mediator in the governance choice, thus exploring the impact of EAV on the effects of the current value and the partner uncertainty on the governance decision. The significant effects of two independent variables (partner compatibility, competitive relationship) on EAV, coupled with the relatively moderate reliability of the EAV latent variable, indicate low mediation effects for all the independent variables but the competitive relationship. The analysis of direct effects has showed that the competitive relationship, a significant source of partner uncertainty, urges firms' preference towards the more flexible quasi-market alliances. The strong mediation effect of EAV on competitive relationship has showed that when the expected value of the alliance gets high enough, firms may opt for quasi-hierarchy alliances to assure an opportunity to growth. Thus, it is showed that EAV may decrease the direct effect of partner uncertainty on the governance decision of strategic alliances.

7. Implications for academics and practitioners
7.1 Contribution to theory
Our research has contributed to the existing literature on alliance govenance by providing insight on the complementarity of cost-, resource- and value-based perspectives in explaining firm governance preferences. More specifically, while the majority of current studies in this field have grounded their arguments on either a cost or a resource perspective, we emphasized the need for examining the issue from another perspective; that of alliance value. Such a perspective concerns the firm expectations for the future follow-on opportunities of an alliance in an uncertain environment.

Through our empirical research, we indicated that TCE might not be sufficient by itself to explain how governance preferences are created for strategic alliances in dynamic environments featured by a high degree of environment uncertainty. Aligned with existing critique regarding TCE's over-reliance on opportunism, our empirical study provided support for several hypotheses that are based on TCE arguments (*H4*, *H6* supported), albeit also questioned hypotheses that emphasize on the opportunism and neglect value-related aspects of the alliance (*H5* supported in the opposite direction).

While TCE and RO are founded on two diverse assumptions regarding the ability of firms to write complete and explicit contracts, their implications for the

decision-making behavior of firms are not contradictory, since they address a different perspective of uncertainty; partner uncertainty for TCE and environment uncertainty for RO. While endogenous (partner) uncertainty may characterize alliances formed in any industry, exogenous (environment) uncertainty is a characteristic of emerging markets. Thus, in such markets, both perspectives of uncertainty may be present, and the question lies whether the need for protections, emphasized by TCE, outweighs the need for flexibility, stressed by the RO's "option to defer". Our empirical research has shown that, under conditions of high perceived environment uncertainty, the need for continuous change and innovation without considerable resource commitment may render the choice of quasi-market alliances more preferable.

Moreover, the RO's "option to growth" has been considered to be complementary to RBV through the notion of value. While RBV argues in favor of quasi-hierarchy alliances n cases where current alliance value is assessed to be high (*H1* supported), RO supports that high expectations of future value drive to quasi-market alliances (*H7* supported). The link between these seemingly different prescriptions rests on the firms' strategic objectives. When firms' strategic orientation involves growth, then they may pursue quasi-hierarchy alliances (*H2* supported), as RO's "option to growth" prescribes. However, given the environment instability, firms may increase fear of loosing their current competitive advantage (value), which may later drive them to growth, and thus prefer a less complex and resource-assuming alliance governance mode as long as the uncertainty remains high. When the instability gets somehow resolved, quasi-market alliances may evolve to quasi-hierarchy alliances, and thus the need for safeguarding current value may step aside, giving rise to the firms' strategic growth.

Thus, RO arguments may counterbalance and complement the arguments of the cost and resource-related perspectives that have been traditionally used to study strategic alliance governance decisions in rather stable environments.

7.2 Practical implications

Recognizing that strategic managers play a critical role in alliances, and that this role becomes more difficult under the pressure of competition and uncertainty prevailing in high-tech environments, our research has demonstrated that managers decide on the appropriate governance mode of their prospective alliances under the following concerns:

- Exploiting firm large size to invest in new ventures with smaller companies possessing resources or skills of competitive advantage (firm size concern).
- Growing via pursuing product/service diversification and integration (strategic orientation concern).
- Taking advantage of trust developed through prior cycles of the same or other alliances with the same partner(s) (alliance history concern).
- Reaping the benefits of partner compatibility for exchanging skills and resources, and thus producing new products and knowledge (partner compatibility concern).
- Assessing the degree of current or future competition that may develop between their firm and its partner(s) (competitive relationship concern).

· Capturing value by fulfilling the strategic objectives that the firm has set at the alliance outset and taking into consideration the uncertainty prevailing in technology-based environments (expected alliance value concern).

The continuous change in technology-based industries forces managers to be highly considerate of hidden value and risks incurring from strategic alliances. Transitional governance forms, quasi-market alliances that evolve to quasi-hierarchy alliances, are preferred in such settings for two primary reasons; first, they give firms the chance to gain flexibility and avoid the opportunity costs associated with high exogenous uncertainty, and second, firms gain time to get in more acquaintance with their partners, thus increasing alliance history, and partner compatibility, which drive to more hierarchical alliances.

Our research aimed at developing a tool able of analyzing strategic managers' cognitive processes in deciding on the governance mode of their alliance. Future research efforts is encouraged to be oriented towards producing those analytical and decision-aiding tools that will help strategic managers to make efficient management decisions throughout the alliance lifecycle.

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Appendix. Measurement of environment uncertainty and competition intensity
Environment uncertainty (ten items)
(Scale: 1 = strongly disagree ... 7 = strongly agree)

1. The environment is very risky, one false step can mean my company's undoing.
2. The environment is rich in investment and marketing opportunities.
3. It is an environment that the company can control and manipulate to its own advantage.
4. Technologically, a very sophisticated and complex environment.
5. The rate in which products and services are getting obsolete is very high.
6. Our firm must change its marketing practices frequently.
7. Demand and consumer tastes are almost unpredictable.
8. The technology used for production and delivery of our products/services change often and in a major way.
9. There is intense R&D activity in our sector.
10. Actions of competitors are almost unpredictable.

Competition intensity (four items)
(Scale: 1 = strongly disagree ... 7 = strongly agree)

1. The competitive intensity regarding product/service characteristics (e.g. quality, package, etc.) in our sector is extremely high.
2. The competitive intensity regarding advertising/promotional activities in our sector is extremely high.
3. The competitive intensity regarding access to distribution channels in our sector is extremely high.
4. The competitive intensity regarding after-sales support to customers in our sector is extremely high.

About the author
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