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## **Open innovation and NIH syndrome through the lens of transaction cost economics**

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### **Abstract**

Open innovation has long been considered as a better alternative to closed innovation when there are barriers to the latter, especially in conditions of scarce financial resources and knowledge. However, some recent studies, e.g. by Drechsler and Natter (2012) and Kurtmollaiev and Pedersen (2012), find that firms do not open up their innovation process to fill knowledge gaps, which indicates so-called "not-invented-here" (NIH) syndrome. In this theoretical paper the transaction cost economics is used to examine the phenomena of open innovation and NIH syndrome. Based on the developments of transaction cost perspective on inter-organizational (inter-firm) relationships, the specifics of governance structure for open innovation are described.

# Open innovation and NIH syndrome through the lens of transaction cost economics

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## Abstract

Open innovation has long been considered as a better alternative to closed innovation when there are barriers to the latter, especially in conditions of scarce financial resources and knowledge. However, some recent studies, e.g. by Drechsler and Natter (2012) and Kurtmollaiev and Pedersen (2012), find that firms do not open up their innovation process to fill knowledge gaps, which indicates so-called “not-invented-here” (NIH) syndrome. In this theoretical paper the transaction cost economics is used to examine the phenomena of open innovation and NIH syndrome. Based on the developments of transaction cost perspective on inter-organizational (inter-firm) relationships, the specifics of governance structure for open innovation are described.

**Keywords:** transaction cost economics, “not-invented-here” syndrome, knowledge sharing, knowledge transfer, open innovation

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## 1. Introduction

Innovation practice in many cases does not rely only upon organization’s own resources. Inspired by the concept of open innovation (Chesbrough, 2003), more and more researchers study innovation as the outcome of an interactive process between the firm and its stakeholders, addressing questions of what (different interpretations of open innovation content), where and when (internal and external environment characteristics), and how (the process of opening and various practices) (Dahlander and Gann, 2010, Huizingh, 2011).

However, in the most cases the question of why gets only a casual mention and remains vague. Most of researchers consider open innovation as a remedy for improving internal innovation process, reducing uncertainty and costs, and accessing missing knowledge (Gassmann and Enkel, 2004, Chesbrough, 2006, Keupp and Gassmann, 2009), but others see it as a tool for stimulating growth (Chesbrough and Crowther, 2006, Van de Vrande et al., 2009). In other words, these two groups of reasons represent reactive and proactive approach towards open innovation, respectively.

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The idea of innovation as a response to certain negative factors is not new. For example, Greve (2003) finds that organizations launch innovation to improve low performance. As for open innovation, many authors, describing reasons for its emergency and increasing popularity, mention first of all challenges for closed innovation activity. Thus, in his best-seller “Open Innovation: the new imperative for creating and profiting from technology”, Chesbrough (2003) explains a shift in innovation paradigms towards open innovation by so-called “erosion factors”: the increasing availability and mobility of skilled workers, the venture capital market, external options of ideas sitting on the shelf and increasing capability of external suppliers. Gassmann and Enkel (2004) see the reasons for the shift in shorter innovation cycles, industrial research, high R&D costs and lack of resources. Based on the analysis of the German manufacturing industry, Becker and Dietz (2004) find that R&D cooperation is used as a complement to internal resources to obtain expertise, which cannot be generated in-house, and it enhances the probability of developing and realizing new products. Chesbrough (2006) asserts opening up the business is needed to lower the costs of innovation, to get faster to the market and to share risks with others. In the study of R&D outsourcing in UK pharmaceuticals, Howels et al. (2008) conclude that the main reasons for external sourcing of research and technology are lack of expertise available in-house, high development time and costs, need for support in technology change, need for sharing risks and uncertainties. Lichtenthaler (2009) assures that higher degree of technological turbulence, higher transaction rates and competitive intensity strengthen the positive effects of outbound open innovation strategies. In turn, Keupp and Gassmann (2009) explicitly insist on a positive correlation between influence of impediments to innovation and innovation openness as a response to overcome internal rigidities. The authors focus on information-, capability- and risk-related hindrances. Lichtenthaler (2011) indicates knowledge exploration as a motive for inbound open innovation, and commercialization of technological knowledge as a reason for outbound open innovation.

The whole concept of open innovation is actually built on the idea of knowledge sharing, and it can be easily noticed that lack of expertise, information, know-where, know-how and other constituents of knowledge (Davenport and Prusak, 1998; Lin et al., 2012) is often regarded as a reason for opening up the innovation process. Some recent studies, however, do not find evidence for supporting this idea. For example, Elche-Hotelano (2011) concludes on a decreased likelihood of influence of external knowledge sources (customers and suppliers) on innovation intensity, while internal knowledge sources have an opposite effect. Drechsler

and Natter (2012), studying a firm's openness decision in innovation, find scarce financial resources and effective intellectual property protection to be drivers of higher degrees of openness, but they also discover that knowledge gaps and competitive threats prevent firms from being open. In turn, Kurtmollaiev and Pedersen (2012) find no support for the direct relationships between lack of knowledge and open innovation. These studies show that firms are generally unwilling to internalize external knowledge, and might be an indicator of so-called "not-invented-here" (NIH) syndrome (Katz and Allen, 1982). The existence of this syndrome is usually explained by cultural aspects that derived from prior experience, unwillingness to disturb the internal routines, problems in interorganizational communication, desire for keeping a monopoly of knowledge, and other similar reasons (Lichtenthaler and Ernst, 2006). However, Foss et al. (2010) in their review of knowledge sharing research, as well as Foss (2007), criticize the literature on the topic for its preoccupation with macro-level constructs and lack of attention to formal governance mechanisms and organizational design.

Thus, in this work I intend to examine open innovation and "not-invented-here" syndrome based on transaction cost economics (TCE). This theory is characterized by the micro-analytical approach that lies in regarding transaction as a basic unit of analysis (Foss, 2005), and has the goal to define which institution will be chosen to govern a specific transaction (Speklé, 2001; Hennart, 2008). I begin with a brief overview of open innovation and explanation of the NIH syndrome, followed by description of TCE. Next, I discuss this topic based on the analysis of the previous literature that links TCE and knowledge transfer. Finally, I pay attention to the specifics of governance structure for open innovation, based on the developments of transaction cost perspective on inter-organizational (inter-firm) relationships.

## **2. Brief overview of open innovation and transaction costs economics**

### *2.1. Open innovation and NIH syndrome: fashion always returns*

The notion of open innovation, introduced by Chesbrough (2003), is one of the most discussed topics in current innovation literature now (Fredberg et al., 2008; Dahlander and Gann, 2010; Huizingh, 2011; Lichtenthaler, 2011). It is defined as "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology" (Chesbrough, 2003, p. xxiv).

The need for open innovation has emerged due to changes in society and industry that have broken up boundaries of the previous innovation model based on self-reliance (Fredberg et al., 2008).

Open innovation is not a homogeneous concept. An organization can open up its innovation process through inbound innovation (knowledge from external sources incoming to the organization) and outbound innovation (knowledge outgoing from the organization), each of them being either pecuniary or non-pecuniary (Dahlander and Gann, 2010). Moreover, open innovation can differ with respect to its outcome that can be closed or open one (Huizingh, 2011).

It is usually considered that the growth of academic interest on the topic has followed Chesbrough's (2003) idea (Lichtenthaler, 2011), but the phenomenon of open innovation itself is far from being new. One of the examples is provided by Allen (1983), who discusses the history of technical advance in the British iron and steel industry during the nineteenth century. Allen uses a phrase "collective invention", which has meaning, similar to "open innovation", but has not become as popular as Chesbrough's term. Teece (1988) notices that until the late nineteenth century and the first half of the twentieth century almost all American manufacturing firms in fact conducted R&D activities outside of the firm in stand-alone research organizations. The author gives an example of Thomas Edison's industrial research laboratory that became very famous for many inventions, including the light bulb. Furthermore, von Hippel (1986), based on studies published in 1963-1982, claims that in some product areas (especially, in process manufacturing) and scientific investments most of the commercially successful product innovations had been developed by users. Cohen and Levinthal (1990) argue that the absorptive capacity (which is the ability of a firm to recognize the value of external information, assimilate it and exploit it) is critical to its innovative capabilities.

Thus, truly closed innovation approach had been rather rarity, but the depth and breadth of openness (Laurson and Salter, 2006) remained very limited until the end of twentieth century, when technological progress, increased labour division and globalization led to increased openness of innovation process and growth of interest to outsourcing, networks and other types of collaboration. No surprise that in these conditions Chesbrough's works have become a topical issue (Huizingh, 2011).

Explaining the new paradigm, Chesbrough (2006, p. 1) describes open innovation as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively”. In other words, inter-firm knowledge sharing is considered as the most important tool, necessary for realization of open innovation process. However, such knowledge sharing is not easy, and in many cases might be even inhibited by NIH syndrome, which is “a negative attitude to knowledge that originates from a source outside the own institution” (Lichtenthaler and Ernst, 2006, p. 368). As Davenport (1997) notes, sharing knowledge is often unnatural act, because managers tend to hoard knowledge and look at using external knowledge as a putting their job at risk. The consequences of NIH syndrome for innovation process might be hazardous, varying from wrong evaluations of external knowledge and project delays to complete failure of a project, and, as a result, lower business performance (Lichtenthaler and Ernst, 2006).

Although some studies (e.g. Menon and Pfeffer, 2003) questioned existence of this syndrome, concluding on the preference for outsider knowledge, recent works by Drechsler and Natter (2012), Elche-Hotelano (2011) and Kurtmollaiev and Pedersen (2012) provide evidence that NIH phenomenon is still real, and it is closely related to knowledge gaps inside the organization.

## *2.2. Transaction cost economics: governing costly interactions*

TCE is undoubtedly one of the most influential theories in the economics of the firm, widely used for studies of management and organizations (David and Han, 2004). It originates from works by Williamson (1971, 1975), who was inspired by Coase’s (1937) idea of minimizing a cost of using the price mechanism as the main reason of establishing firm. The basic unit of analysis in TCE is transaction, which is “a transfer of a good or a service across a technologically separable interface” (Foss, 2005, p. 8). Such exchange entails certain costs (known as transaction costs), required for searching information, evaluating, negotiating, writing and executing contracts (Foss and Klein, 2007), and it is assumed that these costs depend on certain characteristics of human behaviour. First, humans are not capable to know or predict everything, and therefore limited (“bounded”) in their rationality, which results in a fact that “all complex contracts are unavoidably incomplete” (Williamson, 1996, p.37). Second behavioural assumption is opportunism, and it means that humans might behave dishonestly in order to take advantage of the vulnerabilities of their partners (Macher and Richman, 2008). Since it is almost impossible to predict whether parties will cheat or not,

they need safeguards: special governance structures for exchange agreements, and the goal of TCE is to define which institution is chosen to govern a specific transaction (Speklé, 2001). Hence, TCE is used to study alternative ways to organize economic activity by explaining why some transactions are more likely to occur within certain forms of organization, while being absent in other organizational modes.

Commonly it is supposed that there are three alternative governance structures: the markets (rely on free competition to ensure control), hierarchy (rely on authority), and hybrids (Williamson, 1991). In markets mode transactions are governed by classical contract law, buyers and sellers are independent, suppliers are continuously meeting bids in the spot market, and the contract law is interpreted in a very legalistic way. Hybrid governance structures are supported by neoclassical contract law and characterized by higher mutual adaptation and flexibility; partners become interconnected and interdependent while still maintaining autonomy. Finally, hierarchy corresponds to internal organization, or the firm by itself.

The choice of governance structure depends on three key dimensions of transactions: asset specificity, frequency and uncertainty. The term “asset specificity” embraces all types of assets, such as physical and human ones, site, brand name, dedicated assets etc. (Williamson, 2002) and refers to “the extent to which the resources, used in a transaction, have a value therein that is higher than in any other use or to any other user” (McGuinness, 1994, p. 69). Specific investments may cause lock-in, which means situation when it becomes more efficient to deal with the same party rather than change partners (Gibbons, 2010), so asset specificity might be regarded as a measure of bilateral dependency (Williamson, 2002). If asset specificity is high (i.e. it is costly to redeploy), switching costs are high, and opportunity of exploitation of the less flexible party by the more flexible one is high (Hennart, 2008). According to Foss (2005), parties would try to avoid situation of being held up, and in absence of contractual safeguards may decide to make less specific investments in less productive technology. As a logical consequence, the markets are considered to be more suitable for low asset specificity, hybrids for intermediate asset specificity, and firms for high asset specificity.

As regards frequency of transactions, Williamson (1985) assumes that in case of large recurring transactions it is more economical to use hierarchy, while for low levels of transaction frequency it is better to choose markets. However, Williamson (1991) does not

rule out the possibility of emergence of reputation effects with the increase in transaction frequency, so that a party benefits from the experience of others without entering into hierarchical contractual relationship. As Macher and Richman (2008) notice, these two effects are competing, and it might be a cause of difficulties in empirical investigation of the role of frequency.

Uncertainty may be defined as “unanticipated changes in circumstances surrounding an exchange” (Noordewier et al., 1990, p. 82), or “disturbances to which transactions are subject” (Williamson, 2002). Uncertainty is closely intertwined with assumptions about bounded rationality and opportunism, but it is still unclear how uncertainty by itself influences choice of governance structure due to mixed empirical results (Macher and Richman, 2008). Similarly, Foss and Klein (2007) describe it as a “frozen” dimension, and according to Williamson (1991), who considers it in combination with asset specificity, the level of uncertainty matters mainly for hybrid form: if frequency of disturbances increases, hybrids become inefficient.

### **3. Linking open innovation and transaction cost economics**

Since innovation process is usually characterized by high costs, high level of uncertainty and technological complexity (Nightingale, 2003) and knowledge is a specific asset (Aubert et al., 2004), according to TCE perspective this process should be conducted within the boundaries of the firm. For example, Mowery (1983) argues that having internal R&D ensures lower costs compared to acquiring knowledge from the outside. The author considers firms without in-house research facilities as “handicaps” in their ability to pursue R&D and innovation (p. 369). Teece (1998) explains reluctance of firms to rely on external research facilities via markets by high uncertainty, disclosure and “lock-in” problems, costly production of precontract information, extreme difficulty of determining the price for a yet-non-existent product, etc. Distinguishing between two types of innovation: autonomous (does not require modification of other components) and systemic (requires significant changes in different parts of the industry/system), Teece argues that the latter might be subject for opportunistic behaviour. Thus, without integration parties would be unwilling to make specific investments and to exchange information, needed for launching systemic innovation.



Chesbrough's idea, however, implies erosion of the boundaries of the firm and suggests choosing hybrids for the purpose of bringing down innovation costs and sharing uncertainty, instead of trying to avoid it. Inter-organizational relations and networks become a key dimension of open innovation (Vanhaberbeke, 2006). Coombs and Metcalfe (2000) also pay attention to the preference for specific hybrid forms of governance structure in the present-day innovation processes rather than for firms or markets. Similarly, Oerlemans and Meeus (2001) notice that it is time to shift the TCE focus from studying the "make" versus "buy" decision to "make" versus "cooperate" decision. These claims are supported empirically: for example, Nesheim (2001) finds evidence of positive correlation between asset specificity and the level of collaborative relationships. Becker and Dietz (2004) conclude that R&D cooperation enhances R&D intensity and increases the probability of developing and realizing product innovations. In turn, Lui et al. (2009) claim specific investments improve performance and increase level of trust via generating cooperative behaviour rather than reducing opportunism. Does it mean that one of the theories is wrong?

This contradiction might be explained by dramatic technological changes in twentieth century, which considerably reduced transaction costs. It is proved by a famous example of the cost of 3-minutes telephone call from New York to London: it was \$250 in 1930, \$60.42 in 1960, \$6.32 in 1980, \$0.40 in 2000 (Arnold, 2008). Now, when monthly pays for using Internet unlimitedly are in fact fixed costs, conversations and video-conferences are held actually for free. Thus, transaction costs nowadays are much lower than they were in time of shaping TCE, and the advantages of using collaboration and information from external sources might be much higher, than transaction costs, associated with it. As Poppo and Zenger (1998) suggest, in conditions of rapid technological changes performance might be simply damaged by increasing the firm specificity of an internal activity due to rigidity of internal routines, culture, and embedded knowledge.

In the case study of innovation process in Volvo Group, Wikhamn and Knights (2011) give an example of ideas generation during so-called "Innovation Jams", which are regular sessions held on virtual online forum during scheduled time frame, where Volvo employees from all over the world create ideas and discuss opportunities for the company. Although this activity is not paid and not included in working hours, in May 2010 more than a thousand employees took part in such event, providing 350 new ideas and more than 1500 comments that resulted in 7 projects. The sessions, which cost almost nothing for the company now, just twenty years could be unbearably expensive.

However, if transaction costs of knowledge transfer are low, which makes it logical to assume that firms would use open innovation as an opportunity to get insufficient knowledge and fill their knowledge gaps, why are they reluctant to do so? The answer might be suggested by numerous empirical studies, investigating antecedents of knowledge transfer.

For instance, Brockhoff (1992) finds that high transaction costs are related to lack of experience with cooperation, formality of agreements, early and later stages of a technological life cycle, arrangements with medium number of partners and international cooperation. He also mentions that nonfamiliarity with market or technology may be related to uncertainty. As Oerlemans and Meeus (2001) claim, the innovation potential depends on the firm's ability to recognize and utilize external knowledge, and this requires the presence of knowledge bases in the firm. Cummings and Teng (2003) assert that success of knowledge transfer is positively associated with the extent to which parties share similar understandings and ideas about the project and the degree of overlap of the knowledge bases of the parties. The results of the study by Aubert et al. (2004) demonstrate that the presence of technical skills has positive correlation with decision about the contracting of an activity to an external supplier, while uncertainty is the main hindrance to outsourcing. Kim et al. (2012) report interesting findings with respect to TCE: opportunism has negative impact on knowledge sharing when knowledge complementarity is low, but it becomes irrelevant for situation of high knowledge complementarity. The results of their study are similar to one by Faems et al. (2007), who also points out the importance of extensive technological complementarities and expectations for long-term relationships as well as low level of market threats. The authors mention that the ability to acquire and internalize external knowledge highly depends on what is already known by a "learner" partner.

These examples show that for successful open innovation firms need (or rather perceive to need) internal knowledge, complementary to the one, coming outside. Partners want to control activities, but if one of them has knowledge gaps, controlling would be very inefficient, providing a more knowledgeable party with a lot of opportunities to take advantage of the situation.

Many authors (e.g. Dyer and Chu, 2003; Bonte, 2008; Langfield-Smith, 2008) emphasise importance of trust in reducing the perception of uncertainty and lowering transaction costs for partners involved in inter-organizational relationships, which facilitates knowledge sharing. As Hwang (2006) shows by using analytical approach, "fear of exploitation" grows

linearly when specific investments are made, but it grows exponentially with the deterioration of the trust and/or time horizon. Langfield-Smith and Smith (2003) argue that the development of trust can mitigate opportunistic behaviour and inequality of bargaining power. Therefore, when a party does not have sufficient knowledge to control and monitor the activity, the perception of uncertainty and possibility of opportunistic behaviour would be high, while the level of trust would be low, so the party would not involve in open innovation, trying to avoid exploitation and post-contractual dependency. In addition, a firm without necessary internal knowledge might be just unable to start the process of open innovation, because it would experience difficulties in searching and evaluating external knowledge.

#### **4. Governance structure for open innovation: all-in-one**

As it was mentioned, open innovation presupposes the choice of hybrid governance structure (Simard and West, 2006; Trkman and Desouza, 2011), and although it is generally considered that hierarchy is a more efficient form, when asset specificity is high, hybrid might be a good alternative, if managers are able to generate trust and stimulate long-term relationships (Hwang, 2006).

According to van der Meer-Kooistra and Vosselman (2000), hybrid form is a kind of transitional structure, so it can be based more on features of either market or hierarchy. Taking into account the role trust plays in inter-organizational relationships, the authors suggest three control patterns: 1) a market based pattern; 2) a bureaucracy based pattern; and 3) a trust based pattern.

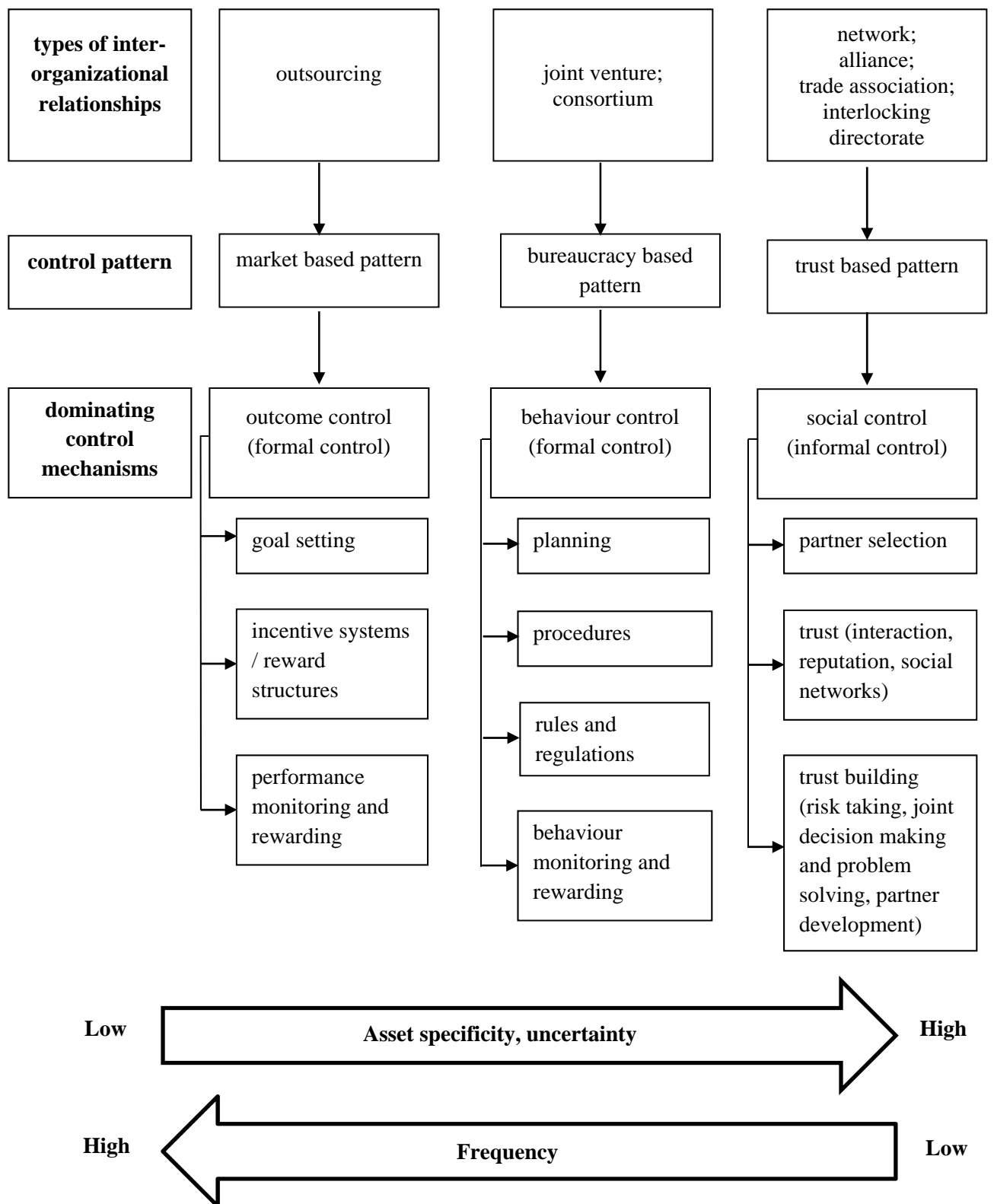
The market based pattern is present in markets governance structure. Contractual relationships are characterized by competitive bidding, and the client can choose between and use multiple vendors, thus, stimulating the present supplier to work effectively and efficiently. Control mechanisms consist in regular measurement and evaluation of the quantity and quality of supplier's output and the timeliness of delivery. The bureaucracy based pattern originates from a bureaucratic mechanism which is dominant in hierarchy and is notable for existence of specified norms, standards, rules and prescribed procedures. Control mechanisms include system of surveillance, evaluation and direction; well-developed system of information processing. In the trust based pattern inter-firm relationships are based on trust, risk-sharing and principles of fairness. Trust may arise due to previous contractual

relationships or reputation of trustworthiness. Control mechanisms are process oriented and culture based. However, it is important to notice that these patterns are extreme types, which hardly exist in their pure form. On the contrary, there is usually mix of them, but with at least one as a dominating type in a contractual relationships (van der Meer-Kooistra and Vosselman, 2000). Interestingly, it is assumed that asset specificity is higher for the trust based pattern, while frequency of transaction is highest for the market based pattern. It is in contrast to TCE logic, where high asset specificity and high frequency entail choice of the governance structure with bureaucratic controls.

In turn, Dekker (2004) suggests distinction between formal and informal control mechanisms in inter-organizational relationships. Formal control refers to contractual obligations and formal organizational mechanisms for cooperation. There are two types of formal control mechanisms: outcome control mechanisms, which specify outcomes to be realized by the partners and monitor the achievement of these performance targets, and behaviour control mechanisms, which specify how partners should act and monitor whether actual behaviours comply with the pre-specified behaviour. Informal control, or social control, relates to informal cultures and systems influencing members and based on mechanisms inducing self-regulation (Dekker, 2004).

Figure 1 shows the proposed model of linking of control patterns (van der Meer-Kooistra and Vosselman, 2000), control mechanisms (Dekker, 2004) and types of inter-organizational relationships that may occur in the open innovation process. The latter are based on classification by Barringer and Harrison (2000), who define six forms of inter-organizational relationships (joint venture, network, consortium, alliance, trade association and interlocking directorate). The term “outsourcing” here is used to reflect market solution for open innovation (Hallikas et al., 2004).

The model suggests that governance structure for open innovation might have variety of control patterns and mechanisms, depending on what type of inter-organizational relationships is chosen. Each control pattern has one assigned type of control mechanism, which is regarded as dominating, but it does not exclude possibility of using other types, because control mechanisms are not mutually exclusive. Going further, it might be assumed that the choice of the type is influenced by a goal, which is pursued by the decision about open innovation. For example, if a firm wants to reduce costs, outsourcing might be the best alternative, while growth goals may require creation of joint ventures or non-equity alliances.



**Figure 1. Specifics of hybrid governance structure**

Finally, it might be conjectured that with the course of time, if the level of trust between parties increases, the control pattern can evolve from the market or bureaucracy based pattern to the trust based one even without changing the type of inter-organizational relationships.

## 5. Conclusions

TCE and open innovation seem to be conflicting concepts at first sight: TCE's founder and chief developer, Oliver Williamson, got the Nobel Prize for the analysis of boundaries of the firm, while Henry Chesbrough, the "father of open innovation", claims their blurring. The innovation process, which is supposed to be kept inside the firm from the TCE perspective, should be conducted via firm collaboration according to open innovation concept. However, this paper shows that this contradiction can be solved, when taking into account recent developments of TCE with respect to inter-organizational relationships. In this case the application of TCE to open innovation issues may provide interesting theoretical and practical contributions.

This paper also explains that present-day NIH syndrome is a manifestation of the high perception of uncertainty and opportunistic behaviour as well as the low level of trust due to lack of internal knowledge. It is important to understand, though, that a firm that rejects external knowledge in "the era of open innovation" risks becoming an innovation laggard and getting a reputation of an old-fashioned lone wolf. In the same time for the one, who accepts the idea of effectiveness of hybrid governance structures for innovation process, TCE might be a useful tool for defining the best alternatives of control mechanism with respect to different types of inter-organizational relationships.

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