Journal of Business Studies Quarterly　　　jbsq.org

Intended and Unintended Knowledge Transfers in Alliances: A Theoretical Perspective on the Role of Social Networks

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Abstract

Prior research suggests alliances promote both intended and unintended knowledge transfers. Drawing on the social network perspective, in this theoretical paper, we argue that the number of common partners between the firms forming an alliance, the network centrality of the partners as also as the partner average network centrality increase the intended knowledge transfer while reducing transfer of unintended knowledge. We also propose that the prealliance network distance between the partners negatively impacts the intended knowledge transfers while positively impacting the unintended knowledge transfers. Nevertheless, we propose that partner's network resources increase both intended and unintended knowledge transfers in alliances.

Keywords: Alliance, Knowledge Transfer, Social Networks.

Introduction

As the risks of innovation continue to grow, firms have adopted various alternatives to supplement their in-house R&D. One such alternative is R&D alliances. R&D alliances enable firms to access complementary knowledge and technologies residing in other firms (Teece, 1986). Evidence suggests that R&D alliances continue to proliferate various technology intensive industries, such as biotechnology, semiconductors, robotics, and software. Apple, which has been ranked as the most innovative company by both Fortune and Business Week, has formed 259 alliances since its first alliance in 1987, out of which 108 are R&D alliances. IBM, which has also been on top of these lists, has had 1514 alliances since its first alliance in 1984, out of which 361 have been R&D alliances[1].

Sharing and developing knowledge has long been recognized as an important motive for alliances. In Transaction Cost Economics (TCE) the focus has been on the costs associated with this organization form such as appropriability hazards, and the mechanisms available to contain these hazards (e.g. the choice between equity/non-equity; the degree of equity). In contrast, studies in the Resource Based View (RBV) tradition emphasize the coordination benefits associated with alliances and the mechanisms by which they create value in light of various

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[1] These data are drawn from Securities Data Corporation's alliance and acquisition database, which is considered one of the most comprehensive database on inter firm activities.

costs. In the Knowledge Based View increased coordination has been identified as one of the primary reasons why knowledge is more effectively shared and created within the firm when compared to pure arm's length arrangements (Kogut and Zander 1992).

The network perspective builds on the notion that the most important aspects of an organizational environment is its social network of external contacts and that economic actions are influenced by the social context in which they are embedded (Granovetter, 1985). Based on the argument that the network structure can develop a firm's ability to identify and develop opportunities, research has started looking at the role of interfirm networks in alliances. Three categories of networks benefits have been identified: access, timeliness, and referrals (Burt, 1992). Stuart (2000) argues that alliances are access relationships and that the advantages a focal firm derives from a portfolio of strategic alliances depends on the resource profiles of its alliance partners. Linkages generate access in a timely manner offering advantages over those who lack comparable connections. Referrals offer the opportunity to bypass formal, impersonal channels. Thus, in alliances, the cumulative effects of networks on economic outcomes can be significantly positive.

In this theoretical paper we are arguing that examining knowledge transfers in alliances, is incomplete without taking into consideration the firm's network structure. We believe that there is an important distinction between intentional and unintentional knowledge flows that should be made. The economic actions can be influenced by the position of the actors in social networks. Similarly, the willingness to transfer technological capabilities can be influenced by the position of a firm in the network. The social structure can determine the spread of knowledge, new ideas and practices by shaping patterns of interaction within the network (Burt, 1992). As firms keep creating new alliances and maintain previously created alliances, they create a network of direct and indirect ties. Social networks characteristics such as centrality, density, weak ties (Granovetter, 1973), strong ties (Uzzi, 1997), direct and indirect ties, structural holes (Ahuja, 2000) can influence the behavior of firms regarding the transfer of technological capabilities in a network. Partners are different in how they behave in order to achieve their goals and may behave opportunistically, willfully extracting knowledge with intent to outlearn the partner (Hamel, 1991). We argue that network structure, by being a predictor of opportunistic behavior will influence the transfer of unintended knowledge by reducing it, while it will increase the transfer of intended knowledge. So far, aspects of the social network such as partner centrality, average network centrality, common number of partners, network distance and network resources have not been taking into account when looking at the transfer of technological capabilities in R&D alliances.

Therefore, the research question that we attempt answering in this paper is: how is the social network position of a firm affecting the transfer of technological capabilities, both intended and unintended, between R&D alliance partners? We are arguing that alliances contribute far more to intended knowledge creation and to less unintended knowledge transfers when the focal firms have a high number of common partners and high centrality as also as when it has a high average network centrality. We are also arguing that the distance between the firms in their network previous to the alliance formation is going to influence positively both the unintended as also as the intended knowledge transfers. However, when a partner with low network resources partners with a firm with high network resources, it has more to learn and therefore its post-alliance innovative activity will be higher.

Theory and Propositions

Alliances are complex organizational forms that are viewed as incomplete contracts between firms, since detailed interactions between the partners can rarely be fully pre-specified due to human's bounded rationality (Simon, 1947). Not all the skills are intended to be transferred in an alliance, only those that serve the common purpose of the alliance. And while firms are in an alliance for cooperation there is also a competition between the partners (Hamel, 1991) that creates a tension and impacts the dynamic of the learning process. If contracts could be perfect and stipulate all possible ways in which a firm could appropriate the resources of its partner in an alliance, then unintended knowledge transfer would not be a problem. However, as Williamson (1975) remarks perfect contracts are impossible to write and despite all efforts, a contract does not fully specify what each party must do under every conceivable circumstance.

From a transaction cost perspective the focus has been on opportunism defined as 'self-interest seeking with guile' (Williamson, 1975). To be successful, firms have to find the right equilibrium between maintaining an open knowledge exchange to achieve the goals of the alliance while also preventing unintended leakage of knowledge. Doz (1996) notes that firms enter collaborations with shared, explicit expectation but also private expectations. Initially, partners only have a tentative understanding of each other's private motives. Their initial expectations, implicit and explicit, will influence the behavior within and around the venture. Firms know when they enter an alliance that there will be unintended knowledge transfers, the question is how much and how it will affect the success of the alliance and of each firm post-alliance. Hence, preventing opportunism within an alliance is a concern.

Firms are dependent on each other to learn from a new alliance (Pfeffer & Salancik, 1978) and while they want to learn, they also need to protect themselves from possible opportunistic behavior from their partner. Alliances are self-enforcing agreements and such an arrangement implies high mutual interdependence between the partners and creates exposure to a partner's potential opportunism. If one party violates the agreement, the other party's only recourse is to terminate it.

Unlike Transaction Cost Economics, some of the alliance literature has emphasized the importance of inter-personal relationships and trust in an alliance. Kale, Singh and Perlmutter (2000) develop the notion of relational capital defined as the level of mutual trust, respect and friendship that arises out of the close interaction at the individual level between alliance partners. Relational capital or trust is built over a long period of time and positively influences the willingness to transfer knowledge. Relational capital is linked to alliance success and learning but is also known to be limiting partner's opportunism (Kale et al. 2000). If trust exists, one can expect that transferred knowledge is not exploited by the partner. Same authors argue that a communication intensive process reduces management conflict which in return leads to less appropriation since the alliance partners clearly define how each one of them contributes to the relationship.

Rules that reduce the risk of unintended knowledge transfer can at the same time reduce intended knowledge transfer. Hamel et al. (1989) argues that gatekeepers as organizational roles can control external knowledge transfer and reduce the probability of unintended knowledge transfer but can also negatively affect intended knowledge transfer. Also, the same authors make the argument that the number of channels of interaction increases knowledge transfer but reduces control and thus increases the probability of unintended knowledge transfer. Organizations can risk low intended and unintended knowledge transfer by taking too many protective measures or

can risk depreciation of knowledge assets by transferring too much. Therefore, a balance between these two needs to be found in order to achieve alliance success.

While some authors argue that alliances are rarely a sustainable means for creating competitive advantage, involving costs in terms of coordination, reconciling goals with an independent entity and creating competitors, the idea that alliances are an important source of value creation has been supported by a number of studies (Anand & Khanna 2000; Kale et al. 2000; Williamson 1991; Dyer et al. 2001). However a new stream of research has started focusing on how the collaborating firms split the value created (Khanna et al. 1998; Lavie 2007). Alliances have quite a few benefits for the firms that are involved in the alliance, since acquiring new knowledge is a goal by itself. The creation of an alliance would enable the partners to learn from their differences. The new alliance would approach issues in new and innovative ways that are less likely to be found in either of the partner organizations. Strategic alliances have become an important tool for achieving sustainable competitive advantage, being a fast and flexible way to access complementary resources and skills that reside in other companies (Dyer et al., 2001). Firms use strategic alliance for a variety of other reasons: to access or internalize new technologies and know-how beyond firm boundaries, to exploit economies of scale and scope or to share risk or uncertainty with their partners (Kale et al., 2000).

While R&D alliances provide various advantages, they are also prone to significant costs and hazards. An important cost associated with alliances is that they also lead to unintended knowledge transfers to the partner, either in the form of leakage or in the form of appropriation of valuable technologies. This aspect has received extensive attention, both in the popular press as well as academic research (e.g. Hamel 1991; Gulati & Singh 1998).

The role of interfirm network structure in alliance knowledge transfer

Embeddedness theory acknowledges that "the on-going networks of social relations between people discourage malfeasance" (Granovetter, 1985). Firms guide their choices based on past actions with other firms and continue to deal with those they trust. Better than the statement that a firm is known to be reliable is information from a trusted informant that has dealt in the past with that firm and has found it to be so. The preference for transacting with firms of known reputation implies that few are those who rely on generalized morality or institutional arrangements. One incentive not to cheat is the cost of damage to one's reputation (Granovetter, 1985). Relational capital which is important in alliances (Kale et al. 2000) also plays an important role in the context of network structure.

Most of the network literature has stressed the positive contribution of networks to economic performance. Social capital does refer to firm's relationships with other companies that have important resources. Gulati (1995) defines social context as the accumulation of prior alliances between firms. Network structure can develop firm's ability to identify and develop opportunities. Firms embedded in social networks gain access to information from their direct partners, but also from the firms that are connected with indirectly thru their alliance partners. As mentioned above, three categories of networks benefits have been identified: access, timeliness, and referrals (Burt, 1992).

Since alliances are characterized by instability that arises from uncertainty concerning a partner's future behavior, successful cooperation cannot be achieved between the partners of an alliance without constrains on the partners to perform according with each other's expectations. Based on previous behavior, networks of existing ties provide information on collaboration

opportunities and signals of partner's reliability (Gulati, 1995). Network formation is path dependent and the early partner choices have a significant impact on the future collaborations (Walker et al. 1997). Since economic actions are embedded in social networks of relationships and are influenced by the position of the actors in the social network (Granovetter, 1985), the position of a firm in a network is a means of enforcing norms of behavior among of individual or corporate actors and acts as a constraint as well as a resource (Walker et al. 1997). These constrains in an alliance contribute to the success of the alliance and increase the level of knowledge transfer, knowledge that otherwise would have been hindered by the expectation that the partner would behave opportunistically and the innovation performance.

In order to explain alliance formation behavior it is needed to consider both the inducements and the opportunities approaches (Ahuja, 2000). According to the opportunities view, a firm's ability to form new relationships depends on its position in the prior network structure. In order words, a firm not only has to want to form an alliance but it also must be attractive to potential partners. Finding an alliance partner with these characteristics that is also trustworthy requires access to information, information that can be obtained from the firm's network.

Common Partners

The number of common partners is likely to influences partners' ability and incentives to share information, which affects the transfer of technological capabilities and the innovation performance. The position that a firm holds in an alliance is a function of both its own past alliances and those r firms in the network (Gulati, 1995). Interfirm network structure is a predictor for opportunistic behavior and common partners are an important basis of enforcing trust. When two firms are partners in an alliance but they also have a common partner, it is extremely likely that the behavior of the two partners that formed the alliance is going to be reported to the common partner. Therefore, the third party argument is based on the information benefits and the trust-enhancing properties of common ties (Gulati, 1995). An actor's information on the behavior of its partner with respect to third parties is the decisive determinant of reputation (Raub & Weesie, 1990). Gulati (1995) found that the larger the number of common third partners shared by two unconnected firms, the more likely they are to enter an alliance. Similarly, we argue that the larger the number of common parties shared by two firms, the greater the transfer of total intentional knowledge and the lesser the total transfer of unintentional knowledge.

Proposition 1a

The greater the number of common partners, the greater the total transfer of intended knowledge.

Proposition 1b

The greater the number of common partners, the lesser the total transfer of unintended knowledge.

Network Distance

In order for reputation to be effective, information about parties' behavior must flow throughout the system. Having strong ties to other will promote interfirm trust and norms of reciprocity that may facilitate the exchange of knowledge between the firms and its partners

(Granovetter, 1985; Lavie, 2007). Being close in terms of distance in the social network provides firms with more information about their partners. The closer the firms are in a network before the alliance formation, the faster the information is going to flow. In this case, firms are less tempted to act opportunistically and willfully extract knowledge from their partners since this information would be rapidly diffused amongst their direct partners. Most likely reputation will be affected and future collaboration might be compromised. When firms are more distant in a network, the information flow is not as effective as in when firms are closer and thus could behave more opportunistically. The information about their opportunistic and non-cooperative behavior might never reach their direct ties and future collaboration with their current ties might not be affected. Also, being at distance in the network before the alliance formation, might also mean that they have no common third parties. The reason for their network distance could be also technological distance and in the case of forming an alliance, each partner might be willing to extract as much knowledge as possible, without taking into account reputational considerations. Therefore, we argue that the more distant two firms are in a network previous to the alliance formation, the greater the unintended knowledge transfer and the lesser the intended knowledge transfer.

Proposition 2a

The distance between the firms in their network prior to the alliance formation will be negatively related to intended knowledge transfers.

Proposition 2b

The distance between the firms in their network prior to the alliance formation will be positively related to unintended knowledge transfers.

Network resources

Although Transaction Cost Economics is one of the traditional ways to explain alliance formation (Williamson 1991; Hennart 1988), the emphasis has been on the Resource Based View. According to this view, the reason for alliance formation is to access previously unavailable resources and to create new resources. Since resources are significantly heterogeneous across firms, each firm's resources are in some ways unique and alliances fill critical resource gaps that exist within the firm. Gulati (1999) switched the focus from the resources that are internally available to firm to the resources that are available as part of an alliance network in which the firms are embedded.

Network resources are external resources embedded in the firm's alliance network that provide strategic opportunities, affect firm's behavior and value (Lavie, 2007), shape alliance formation decision (Gulati, 1999) and enhance a firm's market performance. Firms accrue network resources from the interfirm networks in which they are located (Gulati, 1999). Firms with high stocks of knowledge in their network are the most viable opportunities for their partners to learn new routines and acquire new technological capabilities. The weak partner gets exposed to more knowledge than its partner therefore leading to increased potential for knowledge appropriation. Stuart (2000) concludes that firms that partner with other firms that have higher technological capabilities will have a higher innovation rate. Based on the above arguments we hypothesize that the firm that has less resources in its network will have more to gain from an alliance than its partner that is in a network with higher resources. Both the

intended and unintended knowledge transfers that the firm with less network resources receives will be higher than those knowledge transfers that its partner receives.

Proposition 3a

Intended knowledge transfer received by the firm with lower network resources will be greater than the unintended knowledge transfers received by the firm with higher network resources.

Proposition 3b

Unintended knowledge transfer received by the firm with lower network resources will be greater than the unintended knowledge transfers received by the firm with higher network resources.

Network centrality

Firms have various network characteristics and one of the most important is centrality. Centrality is a measure of how embedded a firm is its network and captures a firm's positional advantage and status within the network. Network centrality implies greater degree of access to information and resources (Burt, 1992) which leads to the idea that network centrality is a source of power. From a resource dependency perspective centrality creates asymmetrical resource dependencies. The dependence of one organization on another derives from the concentration of resource control (Pfeffer & Salancik 1978). Therefore firms with higher centrality have more access to resources through their networks than peripheral firms (Burt, 1992). Further, access to valuable information through the network can lower the search costs and reduce opportunism.

Because central firms have more access to resources it becomes more desirable to form an alliance with a central firm. Being deeply embedded in the network, firms have a high number of connections with other influential firms and therefore have access to these resources also (Lavie, 2007). Most of the times, higher centrality means more access to resources. When partnering with a central firm, opportunism decreases from the firm that is less central, as the firm with higher centrality can sanction the opportunistic behavior more efficiently. The firm that is less central can benefit from this alliance more than the firm with high centrality so it will limit its opportunistic behavior as it knows that the benefits of opportunistic behavior will not outweigh the benefits that could result from the success of this alliance. However, while it may seem ideal to form an alliance with a firm that has a high centrality, there are also possible disadvantages. Centrality enables access to knowledge transmitted directly from partner to partner and makes organizations an obligatory passage point for the information flowing through a network structure (Owen-Smith & Powell 2004). The more connections the central firm has the more chances are that it will transfer unintentionally the intended knowledge from a previous alliance to a current partner. This becomes a problem when the previous and the current partners are competitors. A central firm has a high resource flow in both directions, from other firms to the central firm but also from the central firm to the firms that are part of its network. A central unit has the ability to extract more knowledge from its partners and diffuse this knowledge through the network. Therefore, besides providing access to network resources, centrality can provide the benefits of combined unintended knowledge transfer from its partners.

Proposition 4a

The transfer of intended technological capabilities is positively influenced by the centrality of the partner.

Proposition 4b

The transfer of unintended technological capabilities is negatively influenced by the centrality of the partner.

Not only will the partner's centrality influence the transfer of technological capabilities but also the centrality of all the firms in the partner's network. Therefore, the partner's networks average centrality plays an important role in diffusing the knowledge in the network. The more central the firms in the network are, the more they will diffuse the information throughout their network.

Proposition 5a

The transfer of intended technological capabilities is positively influenced by the average degree of centrality in the partner's network.

Proposition 5b

The transfer of unintended technological capabilities is negatively influenced by the average degree of centrality in the partner's network.

We summarize the previous proposition by using the next function description of intended and unintended knowledge transfers:

$$IK = f(NC, -d(F_{t-1} - P_{t-1}), (\sum_{i=1}^{n}(V_i + V_f) - (\sum_{i=1}^{m}(V_i' + V_p), C_{p,} \frac{\sum_{i=1}^{m} C_i + C_p}{m+1})$$

$$UK = f(-NC, d(F_{t-1} - P_{t-1}), (\sum_{i=1}^{n}(V_i + V_f) - (\sum_{i=1}^{m}(V_i' + V_p), -C_p, -\frac{\sum_{i=1}^{m} C_i + C_p}{m+1})$$

(1)

Where,

UK=unintended knowledge received from the partner

IK= intended knowledge received from the partner

NC=the number of common partners between F_i and P_i

$d(F_{t-1} - P_{t-1})$ =The network distance between partners before the alliance formation.

$(\sum_{i=1}^{n} V_i + V_f)$=The total resources in the focal firm network, including the focal firm's resources

$(\sum_{i=1}^{m} V_i' + V_p)$ = The total resources in the partner firm network, including the partner firm's resources

$C_{p,}$ =The centrality degree of the partner measured as the number of partners

$\frac{\sum_{i=1}^{m} C_i + C_p}{m+1}$ =The average centrality degree of the partner's network.

Discussion

Knowledge has been one of the important resources for firms (Ho and Madden-Hallett, 2011). As a result, researchers have long been interested in alliances as a mechanism for acquiring knowledge. However, there has been limited work aimed at understanding the types of knowledge flows within alliances and the factors that impede or promote these types of knowledge flows.

Partners are different in how they act in order to accomplish their goals and may behave opportunistically. When forming an alliance, firms should expect their partner to act opportunistically and therefore should choose their partners carefully. It is always ideal to partner with a firm that has higher resources in its network. Also, partnering with a high central firm can be a double edge sword, since while it can provide more access to resources by having a high number of connections, it can also unintentionally diffuse the acquired knowledge throughout the network. Close attention should be paid to the centrality of the allies of the partner since their centrality could be a means for transmitting the knowledge through the network.

Both intended and unintended knowledge transfers are positively influenced by the same factors, such the network resources that each partner possesses. This can also lead to the conclusion that unintended knowledge transfer is a necessary feature of alliances and a byproduct of effective knowledge transfer. From a practical stand point, this work suggests that while managers should choose their alliance scope carefully and institute various safe guards to prevent unintended knowledge flows, they should nevertheless expect some degree of unintended flows to occur for effective intended knowledge flows to happen.

These propositions could be tested in Research and Development alliances using patent data and the measure of intended and unintended knowledge developed by Oxley and Wada (2009). Related knowledge flows are measured as the increase in cross citations in the technologically overlapping areas of the two partners, while unrelated knowledge flows are measured as the increase in cross citations of a firm in the technological areas in which the partner is not patenting. Oxley and Wada (2009) argue that knowledge flows in related areas are intentional, whereas knowledge flows in unrelated areas are unintentional. Based on these measures, Oxley and Wada (2009) find that Joint Ventures promote related knowledge transfers, while reducing knowledge flows in unrelated areas when compared to contract based alliances.

Future research could build on this paper in various ways. First, as mentioned above future research could empirically test these relationships. Further, future research could examine the role of information technology in influencing the transfer of intended and unintended knowledge. The way knowledge is being transferred has changed over time especially because of information technology, since IT may help a firm achieve a balance between sharing to much knowledge and protecting from appropriation. Also, another possible future research question is whether firms should try to limit unintended knowledge transfer as much as they can or should they allow some leakage since it might increase the transfer of intended knowledge transfer?

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