14 – Strategic Management

Competitive Session

A Social Networks Lens on Constructing the Innovative Team: An Exploratory Analysis of Team Innovativeness in the Automobile Manufacturing Industry

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ABSTRACT:

In this study, we argue that an innovative research team requires its members to fulfill 3 distinct roles: the idea bringer, the resource bringer, and the publicist/champion. We further argue and show that team members execute these roles through the specific structure of their ego-networks. While the idea bringer needs an ego-network full of structural holes, the resource bringers need to be structurally embedded to the overall network and the publicist/champion requires a central position within it. We demonstrate an evidence for our arguments by using patent applications data made to multiple patent authorities by Suzuki and BMW from 1990-2012 and through investigating research teams responsible for those applications.

Keywords:
Strategy, innovation, networks, technology innovation

INTRODUCTION

Innovation, how it comes into being, what its determinants are, and how it is disseminated – has received substantial interest in the last decades in strategy, organizational theory, economics, and organizational behavior areas (see reviews by Ahuja, Lampert, & Tandon, 2008; Becheikh, Landry, & Amara, 2006; Galende, 2006; Malerba, 2006). Although neoclassical models treat innovation no more than a parameter in the production function, the revival of Schumpeterian tradition has brought attentions of many researchers in strategy to the innovation process (Ahuja et al., 2008; Fagerberg, 2003).

A century ago, a typical image of an inventor would be an isolated scientist working hard in his/her own laboratory, as fictions and movies often portray. Today, on the other hand, we see more and more that inventors interact with each other through diverse forms of social interactions in their endeavor to innovate. This is especially so, since innovations overtime have become more complex as the knowledge content continuously changes and evolves. Accordingly, potential innovators need to efficiently acquire large amounts of knowledge and information (Anand, Glick, & Manz, 2002). Since it is almost impossible to possess all the required knowledge and information nor to possess all the necessary resources to act upon those ideas by a single actor (individual, team, or an organization), innovators both exchange knowledge with each other and enter into collaborative relationships.

Focusing on this need for social relationships, network approach has contributed substantially to the innovation research since it has been introduced into the field in the late 1980s. Most early network studies on innovation, however, have focused on the innovation diffusion (Burt, 1987; Coleman, Katz, & Menzel, 1966; Michaelson, 1993; Swan & Newell, 1995; Valente, 1996), specifying how the social and professional networks affect diffusion of innovations. With the ever-growing interests in examining the innovation process in recent decades, network researchers have also directed their focus to understanding the role of networks in the innovation process (de Man & Duysters, 2005; Pittaway, Robertson, Munir, Denyer, & Neely, 2004; Zhong & Ozdemir, 2010). The emphasis of this research, however, has been predominantly placed on how the network position of particular actors (individuals, teams, organizations) within the overall network cultivates their creativeness and propensity to innovate (Ahuja, 2000; Argote, McEvily, & Reagans, 2003; Burt, 2004; Fleming & Marx, 2006; Hansen, 1999).

Of course, the potential inventors not only interact with each other but also enter into collaborations and work together on projects, as a form of collective rather than actor-based innovation (Allen, 1983). And, actually, groups (such as research teams) have replaced individuals as the source of most innovations. Powell, Koput, and SmithDoerr (1996), for example, argue that the locus of innovation rests not with particular actors but is the network of actors. Although the structural and social-networks-related factors that affect actor-level innovativeness is well understood, our knowledge about the effects of social networks on the innovativeness of collectives, such as research teams composed of individual actors or research alliances composed of distinct organizations, is still in its infancy stage. Ahuja et al. (2008, p. 16) highlight that, the literature still needs to elaborate “the mechanisms through which networks influence the innovation process". In this study, we investigate how social network analysis can help us elucidate how to construct research teams that will deliver higher quality innovations. Focusing on the configuration of the research team, we argue that innovative teams are composed of members who perform a distinct set of roles within the team: the idea bringer, the resource bringers, and the publicist / champion. We further demonstrate that these members fulfill their roles inside the team during the innovation process through the structure of their social networks.

Using patent applications data, we test these arguments in the automobile manufacturing industry. We investigate the innovativeness of research teams inside Suzuki and BMW from 1990 until 2012. Inside both Suzuki and BMW contexts, we find that an innovative team needs one idea bringer, who is able to reach a diverse set of contacts and bring in diverse viewpoints through an ego-network that is rich in structural holes. Further, the remaining members of the team should focus on execution and bringing in needed resources. These members have an ego-network rich in structurally embedded ties in order to ensure resource acquisition into and resource mobilization within the team. Lastly, Suzuki case demonstrates that an innovative team also needs one publicist, who would be able to put the project and its output on the map within the organization and possibly beyond. This person, with his/her connections to other influential actors in the organization places his/her endorsement on the project, champions it, and promotes its results. Such a role, however, seems not crucial to team innovativeness inside BMW. We also demonstrate that the idea bringer and the publicist need not be the same person, but they can be, and in Suzuki's case are – separate people. In the next section, we discuss these roles in detail and explain the social network theoretical arguments behind them. In the third section, we present the data and discuss methodology. Fourth section presents and discusses the results. Fifth section concludes the study.

THEORY

Innovation essentially entails the idea of doing things differently. It, first of all, requires an effort to search potential knowledge bases for ideas and problems. In this manner innovation and invention is largely a process of recombinant search (Fleming, 2001; Gilfillan, 1935; Henderson & Clark, 1990). The primary aim of this search is to recognize and identify needs. The search, in general, and collating knowledge and information that can be useful, in particular, thus, is at the heart of the innovation process. In order for the research team to be successful at this step, therefore, the team should be able to pinpoint a need that is currently unsolved or that requires a new solution. This requires the team to receive information from diverse perspectives rather than repetitively receive the same information.

Information access advantages of brokerage positions are well elaborated in network theory. An actor is said to hold a brokerage position if he/she is at the intersection of diverse social worlds and if his/her ego network contains many structural holes. The alters of such an actor is unconnected with each other, making the focal actor the primary means of connecting those in his/her ego-network. Actors with brokerage ego-networks minimize the likelihood of receiving similar information by tapping into different segments of the overall network more efficiently (Burt, 2005; Ibarra, 1995). Placing themselves at such a position gives them an opportunity to both mediate relationships between unconnected alters and obtain potentially different information that alters from these diverse social worlds possess. It is argued that actors in brokerage positions, and therefore those who have many structural holes in their ego networks, are able to gather diverse feedback and data on ideas (Greve & Salaff, 2003), find out sooner where the information is accumulated within the overall network, and potentially receive less redundant information (Bruderl & Preisendorfer, 1998; Burt, 2005). Similarly, Sing, Hills, Hybels, and Lumpkin (1999) shows that, within a 12-month period, actors with brokerage ego-networks identified a more opportunities than those with denser ego-networks.

Given the benefits of brokerage ego-networks on searching the overall network for ideas and problems, the research team should have a member who has such an ego network. This particular member will be the ideas person of the team. His/her primary responsibility will be bringing diverse information, identifying needs that require solution, and being the information conduit in general of the team. Therefore, we hypothesize:

Hypothesis 1: An innovative research team needs a member (the ideas person) who will be able to identify needs and bring diverse ideas into the team. Such a member would perform this role through an ego-network rich in brokerage opportunities (structural holes).

An immediate question is whether the research team should have one such member only or can afford to have more. The answer to this question lies in what is needed in the remaining steps of the innovation process that we focus on next.

Once the team identifies the “need” to focus on, the next crucial task becomes one of acting upon the diverse set of ideas that is brought into the team and drawing together, combining, and recombining resources required during the innovation in novel as well as familiar ways (Arthur, 2009). The first step in this part of the innovation process is identification of what kind of resources might be needed. Simply put, in order to be able to capitalize on the need that is identified, the team should have access to other auxiliary resources that is needed for this process. These resources can be knowledge, information, know-how and experience captured by employees (i.e. human capital), physical capital such as machinery, and financial capital. Some of these resources are available through formal chains within the firm. Many, however, are only available through the informal relationships. The second crucial step would be to actually acquire these resources. While the publicist and champion of the team may help with accessing resources through formal chain (and we will discuss this role in detail below), in order for the team to be able to access the resources held within the informal system, they need to have members who are socially embedded within the organization. This is because resource flow is not necessarily automatic. Therefore, in order for team members to be able to bring in those resources needed during the innovation process, they have would need to have access to other employees that have those resources and they would have to be able to convince those resource holders to part with or share their resources. While some of these resources, such as data and basic information may flow easier and may be transferred easily, most other resources requires some form of embeddedness in order to flow between two connected actors (Hansen, 1999; Ozdemir, Moran, Zhong, & Bliemel, 2014). Just having a connection to another does not mean resources would immediately and easily flow. One primary form of embeddedness that has been emphasized for its essentiality in resource acquisition and resource mobilization process is structural embeddedness (Ozdemir et al., 2014).

Structural embeddedness is the extent to which the actor and the alter share ties to the same others (Feld, 1997; Granovetter, 1992; Moody & White, 2003). The higher the number of mutual acquaintances they share, the more structurally embedded they are. Structural embeddedness facilitates the acquisition of resources by creating a mutual understanding between the actor and the alter and by helping the alter develop the trust needed to be comfortable in aiding the focal actor. The mutual understanding is created by shared contextual understanding via group identity (Hite & Hesterly, 2001; Ibarra, Kilduff, & Tsai, 2005). Structural embeddedness enables the focal actor, the alter, and the mutual acquaintance(s) to develop a common familiarity. Consequently, the formation of a group identity and shared contextual understanding through mutual acquaintances facilitates the flow of resources to the entrepreneur (Cook, Emerson, Gillmore, & Yamagishi, 1983; Hansen, 1999). Furthermore, structural embeddedness develops trust between the focal actor and the alter by giving the alter assurances that the focal actor will conduct the relationship in an appropriate manner that accords with expectations. The focal actor faces an enforced incentive to act socially (Leana & Van Buren, 1999), which helps the alter to trust that the focal actor will honor the norms of the relationship. This less personal form of trust also increases the willingness of the alter to share resources with the focal actor and hence the research team.

In sum, in order to acquire and mobilize the resources they need during the innovation process, the research team should have members who are structurally embedded in the overall network. Therefore, we hypothesize:

Hypothesis 2: An innovative research team needs members (the resource bringers) who are able to acquire and mobilize the needed resources from formal and informal structures within the firm. They would perform this role through having structurally embedded connections with others in the overall network.

Throughout these steps of need identification, diverse information accumulation, and resource acquisition/mobilization, the research team may also need one member to essentially organize the whole endeavor. This particular team member would guide the process and endorse it through his/her involvement. Moreover, when the process results in tangible outputs, this team member will be the one who has the capability to publicize the results and encourage its adaption within the organization. The aim is to ensure that its output and the new resources that resulted from the innovation process can be retained and form the basis for future innovation efforts. In order to be able to carry out this task, this member should be somebody who carries his/her weight in the formal, and especially informal, structures of the organization.

The network literature highlights the advantages that is enjoyed by those actors occupying a central place in the informal structure. Dubbed the Matthew Effect (Merton, 1968), researchers found that those actors in the center are the ones that obtain greater recognition and the ones that other actors (and especially those in the periphery) follow. These central, and by definition high status and high prestige actors, also receive higher rewards (Podolny, 1993). Academics who have higher status get cited more for an equal quality academic work (Azoulay, Stuart, & Wang, 2014). Firms who have higher status have lower transactions costs (Uzzi & Lancaster, 2004), obtain capital more easily from banks or financial markets (Fombrun & Shanley, 1990), and get more from their partners (Castelucci and Podolny, 2003). More importantly, the benefits of status does not rest only with the high status actor, but their connections also obtain spillover status benefits. For example, Stuart, Hoang, and Hybels (1999) demonstrate the endorsement benefits of being affiliated with the high status actor. Similarly, Stuart, Ozdemir, and Ding (2007) show that biotechnology firms that have high status scientists on their advisory board have an increased likelihood of research alliances with pharmaceutical firms and universities.

In the research team setting we focus on, this would mean that having a high status actor in the team will help the efforts of the team to be recognized more easily. Furthermore, based on arguments above, others investigating various teams within the firm may associate a higher performance to the outputs of the team with the high status actor. In doing so, the high status actor will serve two purposes. He/she will be able to obtain the left-over needed resources that the resource bringers were not able to obtain (probably those required from formal chains rather than informal structure) and will be able to passively (and actively if needed) promote and publicize the work of the research team.

In other words, having a high-status member is important for the research team. To attain high status, this member should be a central actor in the overall network of social relations in the organization. Therefore, we hypothesize:

Hypothesis 3: An innovative research team needs a member (the publicist, the champion) who will act as a guide and endorser for the team and who will be able to put the efforts of the team on the map inside and outside of the firm. Such a member performs this role by occupying a more central position within the overall network.

METHODOLODY

In order to test the hypotheses, we have compiled a large database of research teams and their performance inside two automobile manufacturing companies from 1990 until 2012. The first firm is the Japanese automobile-manufacturing firm Suzuki, while the second firm is the German auto manufacturer BMW. For this purpose, we have utilized the patent applications Suzuki and BMW made to various patent granting authorities. Automobile manufacturing industry is an innovation-oriented industry where patenting is both a crucial and a standard practice. Since it has become available in the U.S. in easily accessible computerized form, patent data has been widely used in studying innovation activities (Ahuja & Katila, 2001; Podolny & Stuart, 1995). Number of patents granted or applied is a regularly used measure of innovativeness (Basberg, 1987; Devinney, 1993; Tortoriello & Krackhardt, 2010) and the patent-citation-based technology indicators have been accepted as being important to the field of science and technology indicators (Griliches, 1990).

As patents are very close to the R&D function, they are a very good choice for uncovering the relationship among R&D researchers, as they work together in patent applications. Each patent application provides information on the nature and name of the firm, if any, to which the patent property right is to be assigned, the name of the inventors/researchers, the residence of each inventor, the dates of the patent application, and a detailed technological classification for the patent. We have obtained all patent applications of Suzuki and BMW and used the inventor/researcher information in those applications to generate a who-worked-with-whom-within-the-firm social network. We use name, middle name, surname, and address information to distinguish employees. Once we generate the universe of all employees that authored patent applications during the time frame for each of the companies separately, we link co-authors of a patent with each other. In other words, the basic interaction mechanism that defines a tie between two employees is the co-authorship (i.e. working together on a patent) relationship (also see Fleming, King, & Juda, 2007). Beyond the initial collection of patents, the name matching and constructing a list of unique R&D employees inside both Suzuki and BMW were done manually. At the end, we have 5378 unique R&D employees who worked on 16063 patent applications (i.e. 16063 different research projects/teams) over the 23-year period for Suzuki. The number for BMW are 8048 unique R&D employees who worked on 11583 patent applications (i.e. 11583 different research teams). Figure 1 represents the full network from 1990-2012 and Figure 2 presents a up-close look at the main component of the overall network for Suzuki, while Figures 3 and 4 do the same for BMW.

[Insert Figures 1, 2, 3, 4 About Here]

Dependent Variable – Team Innovativeness:

There are a number of alternative patent quality measures one can use to measure the innovativeness of the research team. These include citations the patent received (Trajtenberg, 1990), patent renewal decision (Lanjouw, Pakes, & Putnam, 1998; Wang, Chiang, & Lin, 2010), and patent family size (Lanjouw & Schankeman, 2004). Since we are investigating the applied rather than granted patents, the first two measures are less suitable for this study. As a result, we measure the innovativeness of the output of research team by investigating whether these companies applied for a patent through only one authority or if they applied for it in many patent authorities, i.e. existence of a patent family with more than one member. We construct a dummy variable to denote that the patent is applied in many authorities (coded 1) or only in one authority (coded 0). The mean for this variable is 0.122 for Suzuki, meaning that 12.2% of the patents Suzuki applied between 1995 and 2012 are applied through multiple patent authorities and the remaining 87.8% has been applied through only one patent authority. For BMW, 35.2% of patents are applied through multiple authorities, while the remaining 64.8% are applied only in one patent authority.

Independent Variables:

In order to calculate network related independent and control variables, we use a 5-year moving window. In other words, for a patent application made by a research team in 2000, we look at the ego-networks of team members in years 1995-1999, inclusive. This requires us to start the empirical analyses from 1995, since the first 5 years is used to generate initial network measures.

Hypothesis 1 requires us to investigate the ego-networks of research team members and assess whether they have brokerage networks or not. We use Burt (1992) constraint score to capture this. As this score increases, the ego-network would have less and less brokerage opportunities. To assess whether the team has an idea bringer, i.e. a member with a brokerage network, we take the minimum of constraint scores among all members. As this score becomes lower, the team would have a member with a network suitable to execute the idea bringer role.

We measure whether the members of the team would be able to acquire and mobilize resources by measuring the density of their ego-networks. Then we take the average density of all team members. As this variable increases, holding constant the constraint score of the member in idea-bringer role, the higher would be the likelihood of team members being able to acquire resources.

Lastly, we measure the existence of a high status actor in the team by calculating eigenvector centrality scores (Bonacich, 1987, 2007) of the team members and then taking the maximum of these scores. The research team with a high status actor would have a high maximum centrality score.

Control Variables:

To ensure that the effects we observe are not due to other network characteristics of the team members, we control for the size of the ego-networks of the team members (i.e. number of connection they have). We also control for the average centrality of team members. Lastly, since we have over 15 years of data in the regressions, we introduce year dummies to capture varying macro-economic conditions and changes in Suzuki's and BMW's potential patenting behaviour. Table 1a shows the summary statistics for the variables in the empirical analyses for Suzuki and Table 1b for BMW.

[Insert Table 1a and 1b About Here]

RESULTS AND DISCUSSION

Left and Right panels of Table 2 show the results of logistic regression for Suzuki and BMW, respectively. Here, the dependent variable is whether the patent was applied in multiple authorities or not. The robust standard errors are shown below the coefficients. In both tables, Model 1 introduces just the control variables, while Model 2 has all the variables in it.

[Insert Table 2 About Here]

According to Hypothesis 1, we would expect the coefficient of minimum constraint score of any member of the team to be negative on team innovativeness. In both Model 2 of Table 2, this expectation is met, presenting a strong support for Hypothesis 1. As the minimum constraint score of the members of the research team increases, the lower the likelihood that the team has a member with ability to execute idea bringer role, and as a result the lower the innovativeness of the research team.

In Hypothesis 2, we argued for the importance of resource acquisition and resource mobilization for the innovativeness of the team and the crucial role team members who are structurally embedded within the overall network play for this purpose. We observe that the coefficient for average density of the ego-networks of team members are positive and significant in both regressions for Suzuki and BMW, supporting Hypothesis 2. As the team members become more structurally embedded, the easier it is for them to acquire necessary resources and the higher the innovativeness of the team.

In Hypothesis 3, we highlighted how crucial the member with the publicist and the champion role is for the team innovativeness. We expected the coefficient of maximum status within team to be positive. Left panel Model 2 of Table 2 confirms our expectations. According to our results, a member that can occupy the champion role is important for team innovativeness inside Suzuki. On the other hand, this variable, while being in the right direction (positive) is not statistically significant in the results for BMW. This lends only a partial support for Hypothesis 3. We certainly need more studies to investigate the difference in the effect for these companies. One answer probably lies in the cultural differences between the two companies. One speculation would be that, in Suzuki, with its Japanese tradition with potentially high power distance in play, status plays a much more crucial role in putting the research on the map and obtain higher level support, whereas in BMW with its German roots and lower power distance in play, status takes a back stage in executing the publicist role.

CONCLUSIONS

In this study, we offered a social networks lens to designing innovative team. We hypothesized and using data on patent applications Suzuki and BMW made between 1990 and 2012, we have demonstrated that an innovative research team has three essential roles that its members need to fulfil. These roles are idea bringer, resource bringer, and publicist/champion.

We argued that the member with idea bringer role is tasked with bringing in diverse information and identifying needs that needs a solution. We claimed that an ego-network rich in structural holes is a suitable to execute this role. Our analyses enabled us to conclude that if the team has one member that has such an ego-network, the innovativeness of the team increases. Second, we argue that team member(s) that occupy the resource bringer role should be embedded structurally to the overall network. This would enable them to convince the (informal) resource holders to part with or share their resources with that member, and hence, with the research team. Without acquiring and mobilizing these much-needed resources, the performance and the innovativeness of the team would suffer.

Lastly, we hypothesized that an innovative research team needs a member who can champion the innovation process. This member would also publicize its results either actively through his/her connections to other influential actors in the network or passively by placing his/her endorsement on the project of the research team. We found a strong support for this inside Suzuki, whereas this role was not crucial in BMW.

We believe that using a unique and network rich dataset that spans more than 20 years to study both team innovativeness and team networks contributes to both innovation and social networks literatures. Future studies should use similar data sources to test for team innovativeness from both network and other research streams' angles. Our study presents an early attempt at using such rich data to study team innovativeness and shows the importance of the structure of social networks of team members.

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Figure 1: Overall Network of Patent Collaborations Inside Suzuki 1990-2012

Note the largest component and a number of smaller groups of R&D employees unconnected to others. Small circles are R&D Employees and lines represent collaboration on a research team.

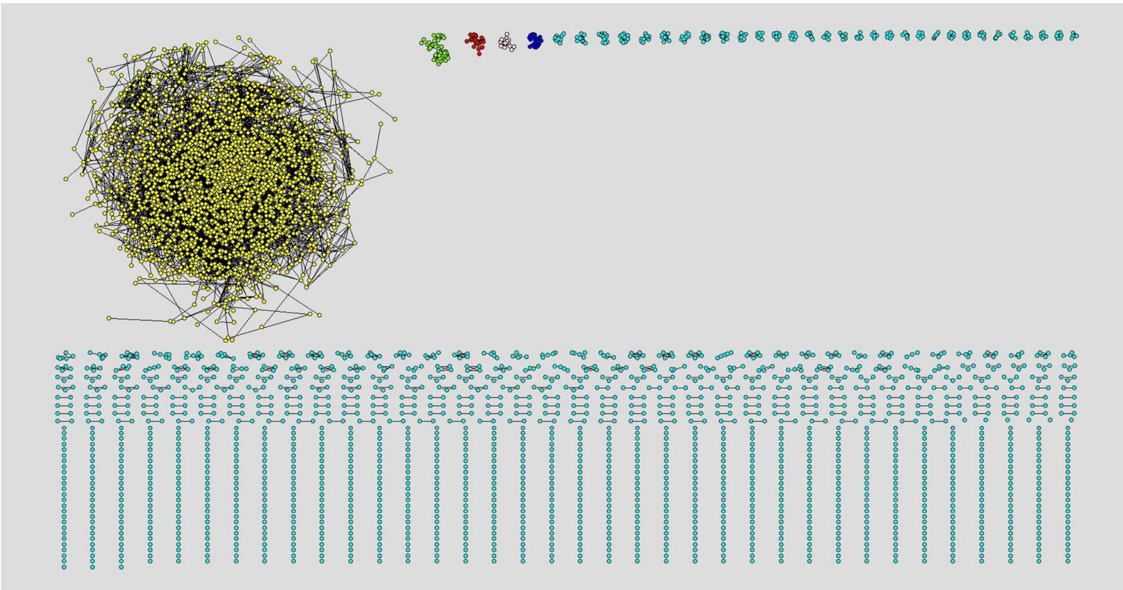

Figure 2: A Closer Look at the Largest Component inside Suzuki

Small circles represent R&D Employees and lines represent collaboration on a research team. Repeated collaborations are represented by thicker lines

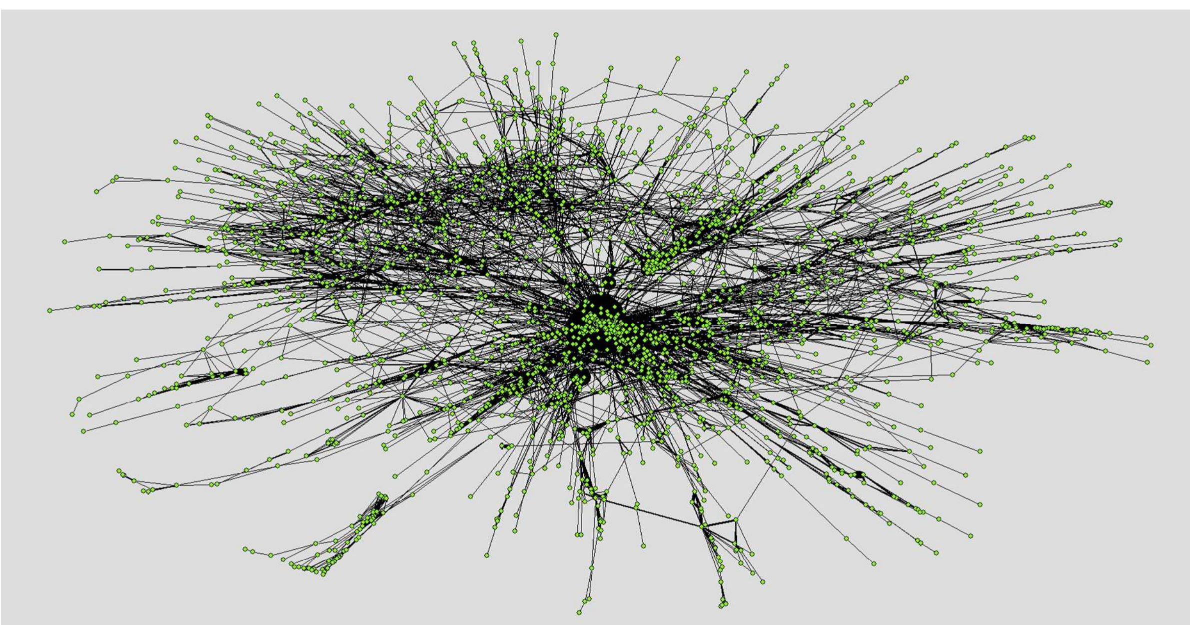

Figure 3: Overall Network of Patent Collaborations Inside BMW 1990-2012

Note the largest component and a number of smaller groups of R&D employees unconnected to others. Small circles are R&D Employees and lines represent collaboration on a research team.

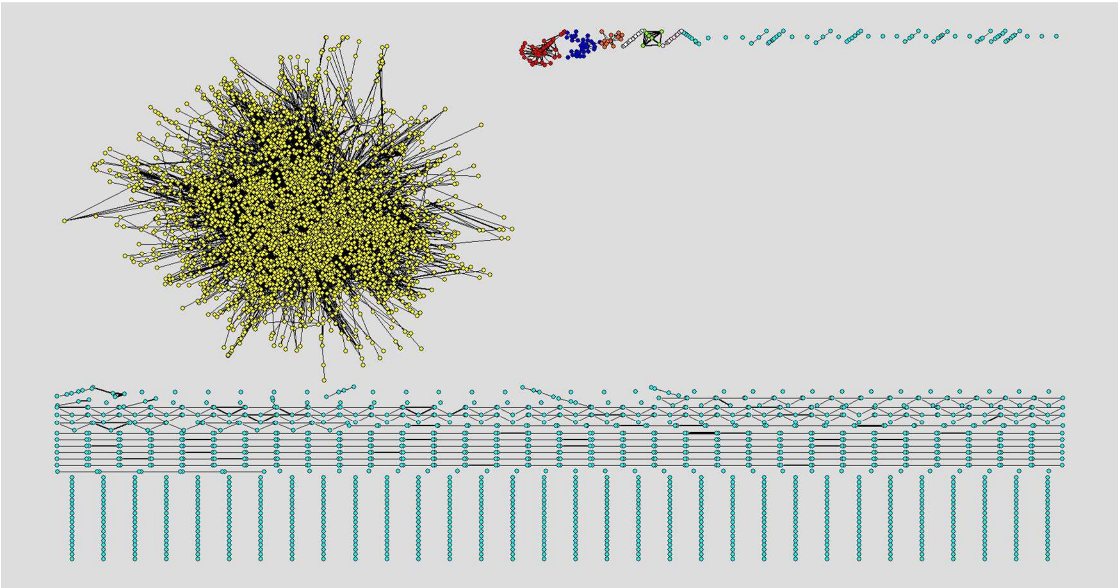

Figure 4: A Closer Look at the Largest Component inside Suzuki

Small circles represent R&D Employees and lines represent collaboration on a research team. Repeated collaborations are represented by thicker lines

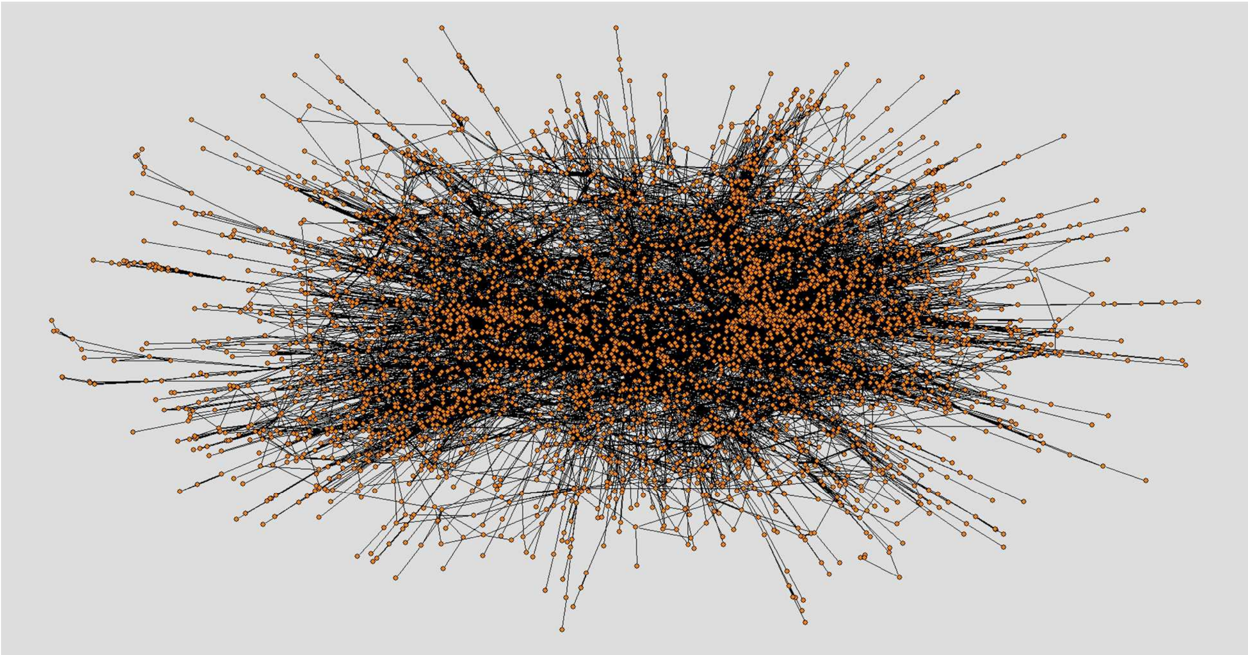

Table 1a : Descriptive Statistics for Suzuki Analyses

Number of observations is 11241 rather than 16063 due to a number of the patents are applied solely by those who appear for the first time in the data. These research teams don't have any available network related measures. In robustness checks, those research teams in Suzuki on average had much lower likelihood of having their patent applied in multiple authorities.

Variable	Obs	Mean	Std. Dev.	Min	Max
Patent is Applied in Multiple Authorities	11241	0.122	0.327	0.000	1.000
Average Centrality of Team Members	11241	0.005	0.042	-0.254	1.000
Maximum Centrality of any of Team Members	11241	0.007	0.055	-0.239	1.000
Maximum Connections of any Team Member	11241	0.249	0.236	0.043	3.020
Average Ego-Network Density of Team Members	11241	0.847	0.177	0.232	1.211
Minimum Constraint of any Team Member	11241	0.815	0.204	0.167	1.211

Table 1b : Descriptive Statistics for BMW Analyses

Number of observations is 7772 rather than 11583 due to above explained reason.

Variable	Obs	Mean	Std. Dev.	Min	Max
Patent is Applied in Multiple Authorities	7772	0.373	0.484	0.000	1.000
Average Centrality of Team Members	7772	0.011	0.075	-0.429	1.000
Maximum Centrality of any of Team Members	7772	0.017	0.099	-0.429	1.000
Maximum Connections of any Team Member	7772	0.332	0.322	0.030	2.937
Average Ego-Network Density of Team Members	7772	0.725	0.225	0.117	1.156
Minimum Constraint of any Team Member	7772	0.661	0.255	0.117	1.156

Table 2a and 2b: Results of logistic regression with applying for the particular patent in multiple authorities being the dependent variable. Results for Suzuki are the left panel and BMW results are presented in the right panel.

	Suzuki		BMW	
Variables	Model 1	Model 2	Model 1	Model 2
Average Centrality of Team Members	0.452	-3.713**	0.048	-0.108
	[0.993]	[-2.764]	[0.145]	[-0.126]
Maximum Connections of any Team Member	-0.033	-1.659***	0.143+	-0.405***
	[-0.293]	[-6.594]	[1.931]	[-3.426]
Maximum Centrality of any of Team Members		3.463***		0.167
		[3.369]		[0.247]
Average Ego-Network Density of Team Members		2.764***		0.642*
		[5.845]		[2.363]
Minimum Constraint of any Team Member		-4.099***		-1.420***
		[-8.534]		[-5.271]
Year = 1996	0.581**	0.527*	0.213	0.217
	[2.668]	[2.421]	[1.202]	[1.209]
Year = 1997	1.373***	1.246***	-0.116	-0.136
	[6.819]	[6.128]	[-0.674]	[-0.782]
Year = 1998	1.602***	1.483***	0.225	0.190
	[8.041]	[7.333]	[1.339]	[1.117]
Year = 1999	1.322***	1.165***	0.089	0.029
	[6.462]	[5.612]	[0.551]	[0.175]
Year = 2000	1.769***	1.663***	0.219	0.126
	[8.782]	[8.130]	[1.347]	[0.759]
Year = 2001	1.138***	1.001***	0.262	0.151
	[5.177]	[4.489]	[1.643]	[0.928]
Year = 2002	1.657***	1.524***	-0.603***	-0.722***
	[7.570]	[6.851]	[-3.676]	[-4.335]
Year = 2003	1.429***	1.342***	-0.320*	-0.437**
	[6.558]	[6.110]	[-1.991]	[-2.678]
Year = 2004	1.088***	0.990***	-0.083	-0.224
	[4.250]	[3.856]	[-0.520]	[-1.368]
Year = 2005	0.906***	0.797**	-0.016	-0.144
	[3.345]	[2.907]	[-0.097]	[-0.862]
Year = 2006	1.316***	1.244***	-0.232	-0.381*
	[4.966]	[4.656]	[-1.466]	[-2.360]
Year = 2007	1.851***	1.812***	-0.632***	-0.786***
	[7.869]	[7.673]	[-3.913]	[-4.771]
Year = 2008	1.661***	1.438***	-1.071***	-1.270***
	[6.796]	[5.613]	[-6.430]	[-7.407]
Year = 2009	1.849***	1.901***	-0.779***	-0.955***
	[8.152]	[8.359]	[-4.845]	[-5.778]
Year = 2010	2.152***	2.124***	-0.331*	-0.522**
	[10.683]	[10.513]	[-2.078]	[-3.189]
Year = 2011	2.216***	2.120***	-0.389*	-0.561***
	[11.349]	[10.712]	[-2.464]	[-3.471]

Year = 2012	2.782***	2.638***	-0.705***	-0.892***
	[13.406]	[12.635]	[-4.010]	[-4.935]
Constant	-3.464***	-1.999***	-0.300*	0.474*
	[-19.612]	[-5.545]	[-2.267]	[2.343]
Observations	11,241	11,241	7,772	7,772
Number of Variables	19.000	22.000	19.000	22.000
Log-likelihood	-3951.802	-3901.574	-4999.711	-4978.615
Wald Chi	389.582	506.556	258.278	296.298

Robust z-statistics in brackets

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1