Paper to be presented at
the DRUID16 20th Anniversary Conference
Copenhagen, June 13-15, 2016

INTERORGANIZATIONAL NETWORK, BOTTLENECKS AND ARCHITECTURAL ADVANTAGE IN AN EMERGING INDUSTRY

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Abstract

Firms seek to influence the architecture of an industry to maximize their share of value appropriation. One way to achieve that is through alliances aimed at creating strategic and technological bottlenecks. Despite a recent surge of interest in ecosystems, platforms and architectures, we still know little about mechanisms through which alliances contribute to create bottlenecks and shape an industry's architecture. This paper specially investigates the link between network centrality and value capture in the electric vehicles industry. We draw preliminary conclusions from a dataset of 30 companies involved in 267 alliances in the year 2010. We show that network centrality highly correlates with market share as a proxy for value capture, indicating the high influence of bottleneck positions on architectural advantage in this emerging industry.

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ABSTRACT

Firms seek to influence the architecture of an industry to maximize their share of value appropriation. One way to achieve that is through alliances aimed at creating strategic and technological bottlenecks. Despite a recent surge of interest in ecosystems, platforms and architectures, we still know little about mechanisms through which alliances contribute to create bottlenecks and shape an industry's architecture. This paper specially investigates the link between network centrality and value capture in the electric vehicles industry. We draw preliminary conclusions from a dataset of 30 companies embedded in an industry network of 267 alliances in the year 2010. We show that network centrality highly correlates with market share as a proxy for value capture, indicating the high influence of bottleneck positions on architectural advantage in this emerging industry.

Keywords: interorganizational networks; industry architecture; bottlenecks; architectural advantage; emerging industry

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INTRODUCTION

Jacobides et al. (2006) argue that firms can achieve a so-called “architectural advantage” in the value chain, where they excel in value appropriation, through their ability to shape and manipulate the industry architecture e.g. by boundary changes, lobbying, innovation or standard setting, without necessarily integrating into specific or all value chain steps. The industry architecture also influences who actually profits from innovation, i.e. the innovator itself or other industry participants that are better able to adopt and exploit the innovation due to a favorable position (e.g. bottlenecks characterized by low mobility and competition, protected by high entry barriers) in the value chain (Jacobides et al., 2006; Jacobides & MacDuffie, 2013; Pisano & Teece, 2007).

We already know from other theories and literature streams that firms seek positions in a corporate or industry network where they can create dependencies and exert power over resources (Pfeffer & Salancik, 1978) and information flows (Burt, 1992). However, we still know very little about how firms use strategic alliances to achieve architectural advantage (Jacobides et al., 2006) as one source of competitive advantage from an industry architecture perspective. Alliances that develop technological standards or components that are non-replaceable in final products create bottlenecks within an industry. Firms that hold such bottleneck positions (“kingpins” according to Tae & Jacobides, 2011) thus become what Jacobides and MacDuffie (2013) call the “least replaceable player” (or groups of players in the context of alliances as bottlenecks) that are able to claim a higher share of the rents within an industry. Pisano and Teece (2007) already emphasized the importance of ownership and control of bottleneck assets in the value chain for sustained commercial success. Recent work on bottlenecks shows that dynamic architectural capabilities are the foundation that actually provides firms with the necessary ability to create and manage bottlenecks in a complex technical system embedded in an industry architecture (Baldwin, 2015). Strategic alliances are a way to gain access or jointly create such architectural capabilities through the pooling of resources such as information, knowledge, practices, technologies and assets not available or achievable for the single firm (e.g. Dyer & Singh, 1998; Kogut, 1988). Literature shows that, for instance, standard-setting alliances are actually able to create technological bottlenecks within an industry (Axelrod et al., 1995), which is particularly prevalent and relevant in the emergence of an industry where different technological designs compete for market dominance (Grodal et al., 2015; Abernathy & Utterback, 1978).

Our work is the first that links literature on inter-organizational networks (e.g. Koka et al., 2006; Madhavan et al., 1998), bottlenecks (e.g. Baldwin, 2015) and industry architecture (e.g. Jacobides & Winter, 2005; Jacobides et al., 2006). The inter-organizational network perspective on industry architecture views the alliance network between companies as the sum of multiple dyadic ties among players engaged in value creation and appropriation within an industry. Our study examines the outcomes of this network structure in terms of technology bottlenecks and ultimately value appropriation in the form of market share. We focus our analysis on the electric vehicles industry as an emerging industry in the automotive sector and build on a unique dataset of 267 international alliances. In line with work that emphasizes that managerial action can shape networks in order to generate competitive advantage (e.g. Madhavan et al., 1998), we argue that companies engaged in alliances in an emerging market, can obtain more than the sum of their technology development efforts, and that achieving a dominant position in the industry architecture can produce a lever effect which enables greater value appropriation. We posit that the mechanism underlying this value appropriation is the creation of bottlenecks (Baldwin, 2015), which occur thanks to the firms' position in the alliance network.

THEORY

Bottlenecks and architectural advantage

The industry architecture perspective has its roots in evolutionary economics (Nelson & Winter, 1973, 1982). It assumes that industries follow lifecycles similar to products or technologies (Abernathy & Utterback, 1978; Klepper, 1997), and shift from integration to disintegration, and, in some cases, re-integration of value chain activities (Dietl et al., 2009).

Described as sector-wide templates that circumscribe the division of labor among co-specialized firms (Jacobides et al., 2006), industry architectures define roles and value creation and appropriation patterns within sectors (Pisano & Teece, 2007). Regulations, IPRs and technology standards shape the emerging architecture of an industry (Tee & Gawer, 2009). As it stabilizes, firms initially holding superior technological, organizational or financial capabilities are in an advantageous position to capture large parts of the industry profits (Cacciatori & Jacobides, 2005; Grodal, 2006; Leijponen, 2006).

An architectural advantage, allowing some actors to appropriate more value than others from a given industry structure, may be achieved by controlling a critical activity in the value chain, and by strategically managing complementarity and factor mobility through the introduction of new standards or practices (Ferraro & Gurses, 2009; Jacobides et al., 2006). By positioning themselves as industry bottlenecks, firms may enjoy the benefits of limited mobility in the segment in which they are present, while nurturing competition in complementary assets (Baldwin & Clark; 1997; Iansiti & Levien, 2004). Moreover, they can drive the pace and direction of technological change, and influence the distribution of returns from innovation (Pisano & Teece, 2007).

To protect the strategic bottlenecks they control, and the related rent streams, firms may, on one hand, use property rights to exclude others from using specific resources, and on the other hand, enhance modularity in their production systems (Baldwin & Henkel, 2014). While there is evidence on the effectiveness of these mechanisms when a single firm controls a bottleneck, there is very limited research on how they work when, as typically occurs in business ecosystems, knowledge and property rights are distributed among different actors. Although prior studies (Jacobides et al., 2006; Leijponen, 2006) have acknowledged the importance of gaining a better understanding of how bottlenecks may be managed to achieve an architectural advantage when they originate from the cooperative efforts of several firms, little progress has been made towards that direction, leaving some questions still unanswered.

Interorganizational networks and strategic positioning

Interorganizational networks shape industry architectures and have high impact on individual firm performance (Madhavan et al., 1998). Scholarly work on interorganizational networks has focused so far on the impact of exogenous events on industry networks (e.g. Madhavan et al., 1998), change patterns of interfirm network evolution (e.g. Koka et al., 2006) and the impact of network structure on innovation (e.g. Ahuja, 2000; Gay & Dousset, 2005; Gilsing et al., 2008). Fundamental is the view that interorganizational networks constitute strategic resources and actors that are part of this network can shape the network in order to increase the value of these network resources (e.g. Lavie, 2007; Madhavan et al., 1998).

In this paper we view the architecture of an emerging industry as an interorganizational network of firms, i.e. the sum of dyadic ties between firms that generate industry networks

(Nohria, 1992). We know from literature on interorganizational networks that firms seek to attain favorable positions within an industry network through strategic action and from taking advantage of environmental changes (Koka et al., 2006). The more central players are in an industry network the more network resources they have access to, which has a positive influence on their power within the network (Galaskiewicz, 1979) and the higher its competitive advantage. A way to increase a firm's centrality is to form alliances with more central players and a change in this relative centrality of companies indicates a structural change of industry networks over time (Madhavan et al., 1998). Thus, firms strategically form and terminate ties with other industry players in order to optimize their network positions (Koka et al., 2006).

DATA AND METHODS

Alliance data

The alliance dataset was built starting from Thomson Reuters' SDC Platinum database containing alliances and joint ventures between firms. A selection of all the alliances in the automotive industry was made for the years 2000-2015 (alliances initiated within this timeframe) by extracting all alliances involving auto manufacturers and then adding any alliances mentioning passenger vehicles in the description field. From this initial list of alliances, a manual extraction was made of all keyword combinations found in the descriptions of the alliances and this keyword list was then used to extract relevant articles from 2000 till 2010 from the Factiva database. As previous academic work has shown that SDC is incomplete with regards to alliances, this step was necessary to obtain a complete overview of the alliance data. We then proceeded to code all the alliances in Factiva in the electric car market complementing information stored in each press article with data from company websites, Google searches and the Bloomberg New Energy Finance database, where necessary. Besides alliance information, we also recorded longitudinal information on alliances' evolutions, including terminations, extensions and re-negotiations over time. The coding was performed by nine different people including the authors of the paper, from September to November 2015. All coders worked collaboratively on a shared Excel document and used the same coding manual in order to ensure consistency.

As a next step we merged the SDC alliance dataset and the dataset obtained through Factiva and deleted redundant alliances. From this final dataset of 560 alliances, we only extracted alliances that were active in 2010 and were related to electric and hybrid vehicle technology. We ended up with a dataset of 267 alliances that has been used for the preliminary analyses reported in this proposal. The alliances include in total 417 company dyads that were used to construct the alliance network within UCINET. This initial dataset on alliance and company information, however, will be extended on a continuous basis to cover the whole timeframe from 2000 to 2015.

Due to the novelty of the topic and the emerging industry selected for our analysis, it was decided to propose an exploratory study (Robson, 2002) in order to identify the key trends emerging in the data and prepare for further analysis. To this end, we examined the network structure and the relationships between the key variables listed below.

Variables

Dependent variables. We included two dependent variables: (1) patent citations (as a measures for the importance of a patent as a signal for value capture in the industry) and (2) market share for electric vehicles in percent (% firm sales). We calculated cumulative patent citations by extracting data from granted patents from Orbis that matched a list of CPC patent classification codes for the electric vehicles industry (see Table 1 below) for all companies in the sample. For the market share data we extracted sales data per company (number of vehicles sold) from Bloomberg New Energy Finance and calculated the relative market share per company for the years 2010 to 2015. Since we are examining the outcomes of the alliance network in terms of value capture, we selected in this case only the OEMs in our sample that were operating on the electric passenger vehicle market between 2010 and 2015. This brought us to a final sample of 30 companies.

TABLE 1: Patent Classification Codes and Descriptions

Type	**CPC***	**Description**
Propulsion of electric vehicles	B60K1	Arrangement or mounting of propulsion units in vehicles: of the electric storage means for propulsion
	B60L9	Electric propulsion with power supply external to vehicle
	B60L11	Electric propulsion with power supplied within the vehicle
	B60L15	Methods, circuits or devices for controlling the propulsion of electrically-propelled vehicles, e.g. their traction-motor speed, to achieve a desired performance
	B60W20	Control systems specially adapted for hybrid vehicles
Charging / Network	H02H3	Battery pack overcharge protection system
	H02H7	Emergency protective circuit arrangements specially adapted for specific types of electric machines etc.
	H02J7	Circuit arrangements for charging or depolarizing batteries
	H02K1	Details of the magnetic circuit (magnetic circuits or magnets

		in general, magnetic circuits for transformers for power supply etc.)
	H02M7	Conversion of ac power input into dc power output; Conversion of dc power input into ac
	H02P1	Arrangements for starting electric motors or dynamo-electric converters
	H02P3	Arrangements for stopping or slowing electric motors, generators, or dynamo-electric converter
Battery itself	H01M2	Battery: Constructional details, or processes of manufacture, of the non-active parts: Electrode connections
	H01M6	Primary cells; Manufacture thereof: Grouping of primary cells into batteries
	H01M10	Secondary cells; Manufacture thereof: e.g. Machines for assembling batteries etc.
Testing / Methods	G01R31	Arrangements for testing electric properties; Arrangements for locating electric faults
	G01N27	Investigating or analyzing materials by the use of electric, electro-chemical, or magnetic means
	G05D23	Control of temperature (automatic switching arrangements for electric heating apparatus etc.)
	G06Q30	Method of operating a multiport vehicle charging system
Other	Y02E	Reduction of greenhouse gases emission, related to energy generation, transmission or distribution
	Y02T	Climate Change Mitigation technologies related to transportation

* CPC: Cooperative Patent Classification

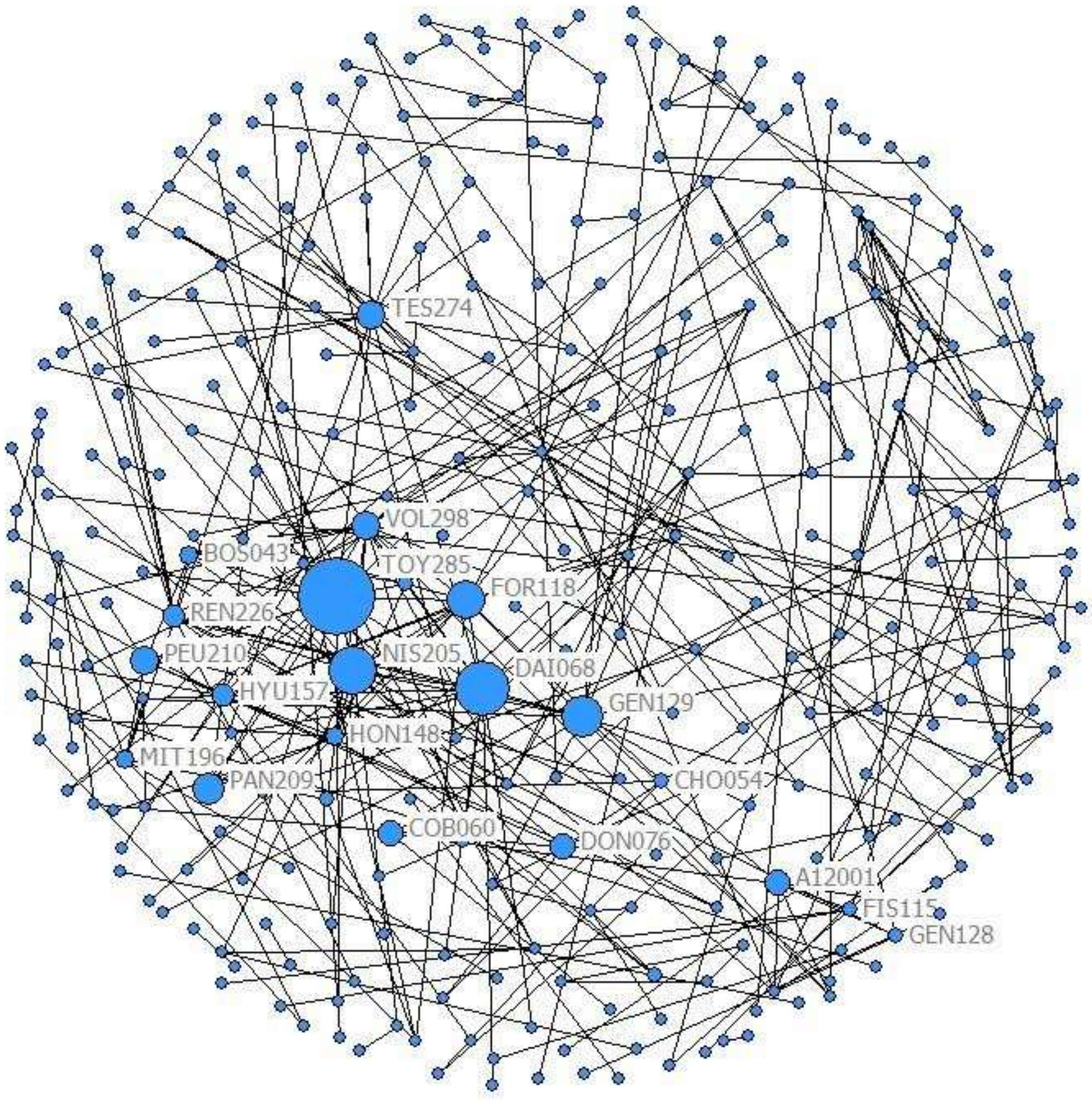
Independent variables. For the focus variable we chose betweenness centrality (Freeman, 1979) as our network centrality measure per company. This centrality measure best covers the idea of a company that is central in a network and controls resources or information (brokerage position) and thus acts as a bottleneck in an industry (Madhavan et al., 1998; Gilsing et al., 2008: 1723). It is calculated as the fraction of shortest paths between other companies that pass through the focal firm (Gilsing et al., 2008: 1723). We used UCINET 6.344 to calculate the betweenness centrality. In order to calculate the centrality, we used the full network comprising all players in the value chain.

Control variables. We added the number of employees as a measure for size and thus resource endowments, as well as R&D expenditure for a measure of innovativeness, and Net Income as a measure of a company's investment capacity, as all these dimensions might have an influence on the value capturing of a company. We extracted all data from Compustat and Orbis.

RESULTS

As a first step in our exploratory analysis, we examined the network diagrams associated with the industry and its evolution. Initially the network was rather disconnected, with small clusters of companies and grew slowly. However the network growth accelerated around 2007 and by 2010 there was a densely connected network, with players spanning the entire value chain, as can be seen in Figure 1. The relative sizes of the nodes, representing the centrality of each firm show how the main OEMs have taken up a central position within the network, both through alliances with other OEMs and with different types of suppliers.

FIGURE 1: Network Diagram with Nodes Proportional to Firm Centrality in 2010 (for acronym description see Appendix)



We now report the results from a preliminary correlation analysis of the variables involved in this study (see Table 2 below). We show that our centrality measure for bottlenecks in the industry network highly correlates with the market share in the industry (market share

2010: 0.66; market share 2015: 0.70). This indicates that firms with bottleneck positions in the industry network are able to capture higher revenues and, thus, more value in the electric vehicles industry. It’s also interesting to notice, that the correlation between the centrality in the 2010 network architecture and the market share per year increases until it reaches the peak value of 0.7122 in 2013, after which it decreases once again. It seems therefore that the alliance network takes around three years to exert its full potential on the value capturing process. If instead we look at other variables such as the Patent Citation Stock and the R&D Expenditure, we can see that their peak correlation with the market share can be found in 2014 and 2015 respectively, indicating that their effects on firms’ value capture become evident over a longer time span than the effect of the network architecture. This would seem to suggest that gaining an important position in the interfirm network is a faster means to capture market share than the more traditional R&D and patenting approach.

TABLE 2: Correlations Between Variables*

	MS 2010	MS 2011	MS 2012	MS 2013	MS 2014	MS 2015	Centrality	Employees	Net Income	R&D	Patent Citations
Market Share (MS)	--	--	--	--	--	--					
Centrality	0.6642	0.6518	0.6817	0.7122	0.7005	0.7014	1				
Employees	0.3996	0.4391	0.4428	0.4487	0.4604	0.4793	0.6988	1			
Net Income	0.1745	0.2564	0.251	0.2589	0.2838	0.2966	0.5527	**0.7328**	1		
R&D	0.5458	0.6065	0.6086	0.6139	0.6267	0.6369	0.7273	**0.7999**	**0.7531**	1	
Patent Citation Stock	-0.0745	0.1146	0.0798	0.0875	0.1326	0.1301	0.4085	0.3848	0.5268	0.5043	1

* We only included n=29 companies in the analysis as one company was an outlier.

The findings also indicate a weak correlation (0.41) between a central network positions and patent activity (importance of granted patents measured through patent citations) as an alternative proxy for value capture in the industry architecture.

We also hypothesized treating market share and patent citations as two alternative dependent variables, and it is interesting to note that the correlation between these two variables is very low. This would indicate that, treated as an independent variable, patent citations would not explain variations in market share. In fact, it seems that R&D expenditures have a higher explanatory power for value capture than patent activity. This may be consistent with an emerging market scenario, where patents may not yet be the preferred means through which R&D results are captured.

The relatively higher correlation results for centrality (compared to patent citations and R&D expenditures) and market share might indicate that a central position in an industry network (strategic bottleneck) would help to appropriate additional value over the sum of the firms' technology development efforts. A dominant position in the industry architecture, could thus produce a lever effect, which enables greater value appropriation.

In a next step, regressions will be conducted to analyze these preliminary results and relationships in more detail.

IMPLICATIONS

Our paper is in line with other work that applies a network perspective to explore questions in the field of strategic management and competitive strategy (e.g. Koka et al., 2006; Madhavan et al., 1998). This work seeks to extend our nascent understanding of how interfirm alliances shape the industry architecture and thus the value appropriation in an emerging industry.

Through the stepwise extension of our dataset to cover alliance activity and firm-level indicators from 2000-2015 we seek to generate an evolutionary perspective on this topic. Our objectives are threefold. First, we aim at obtaining more in-depth knowledge on the co-evolution of interfirm networks and industry architectures in an emerging industry context in order to identify patterns of how to create architectural advantage. Second, this work aims to advance scholarly work by further integrating the different literature streams on industry architecture, innovation ecosystems, technology and strategic bottlenecks, and inter-organizational alliances. Third, this study contributes to extending the static view on the firm-industry nexus to an evolutionary and systems-based perspective on interrelated cause and effect mechanisms.

In this paper we report preliminary results from a dataset of 267 international alliances in the electric vehicles industry. This study has strong implications for industry players. We show that bottleneck positions in this emerging industry have high impact on the value appropriation of firms. Our findings suggest that firms need to increase their network centrality over their efforts in technological development in order to extend their architectural advantage.

REFERENCES

Abernathy, W. J., & Utterback, J. M. 1978. Patterns of industrial innovation. **Technology Review,** 64: 254–228.

Ahuja, G., 2000. Collaboration networks, structural holes, and innovation: A longitudinal study. **Administrative Science Quarterly,** 45(3): 425–455.

Axelrod, R., Mitchell, W., Thomas, R. E., Bennett, D. S., & Bruderer, E. 1995. Coalition formation in standard-setting alliances. **Management Science,** 41(9): 1493-1508.

Baldwin, C. Y. & Clark, K. B. 1997. Managing in the age of modularity, **Harvard Business Review,** Sept/Oct: 81-93.

Baldwin, C. Y. 2015. Bottlenecks, modules and dynamic architectural capabilities. Working Paper, Harvard Business School.

Baldwin, C. Y., & Henkel, J. 2014. Modularity and Intellectual Property Protection. **Strategic Management Journal,** 36: 1637-1655.

Burt, R. S. 1992. **Structural holes: The social structure of competition.** Cambridge, MA: Harvard University Press.

Cacciatori, E., & Jacobides, M. G. 2005. The dynamic limits of specialization: vertical integration reconsidered. **Organization Studies**, 26: 1851-1883.

Dietl, H., Royer, S., & Stratmann, U. 2009. Value creation architectures and competitive advantage: lessons from the European automobile industry. **California Management Review**, 51(3), 24-48.

Dyer, J. H., & Singh, H. 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. **Academy of Management Review**, 23, 660-679.

Ferraro, F., & Gurses, K. 2009. Building architectural advantage in the US motion picture industry: Lew Wasserman and the Music Corporation of America. **European Management Review**, 6(4), 233-249.

Freeman, L. 1979. Centrality in social networks: Conceptual clarification, **Social Networks**, 1, 215-239.

Galaskiewicz, J. 1979. **Exchange networks and community relations.** Beverly Hills, CA: Sage.

Gay, B., & Dousset, B. 2005. Innovation and network structural dynamics: Study of the alliance network of a major sector of the biotechnology industry, **Research Policy,** 34(10) 1457-1475.

Gilsing, V., Nooteboom, B., Vanhaverbeke, W., Duystersg, G., & van den Oorda, A. 2008. Network embeddedness and the exploration of novel technologies: Technological distance, betweenness centrality and density, **Research Policy,** 37(10): 1717-1731.

Grodal, S. 2006. The Emergence of New Industries: Contestation and Negotiation between Nanotechnology Communities. Working Paper, Stanford University, STVP.

Grodal, S., Gotsopoulos, A., & Suarez, F. 2015. The co-evolution of technologies and categories during industry emergence. **Academy of Management Review**, 40(3), 423-445.

Iansiti, M. & Levien, R. 2004. **The keystone advantage: What the new dynamics of business ecosystems mean for strategy, innovation, and sustainability**, Boston: Harvard Business School Press.

Jacobides, M. G., & MacDuffie, J. P. 2013. How to drive value your way. **Harvard Business Review**, 91(7), 92-100.

Jacobides, M. G., & Winter, S. G. 2005. The co-evolution of capabilities and transaction costs: Explaining the institutional structure of production. **Strategic Management Journal**, 26(5): 395-413.

Jacobides, M. G., Knudsen, T., & Augier, M. 2006. Benefiting from innovation: Value creation, value appropriation and the role of industry architectures. **Research Policy**, 35(8): 1200-1221.

Klepper, S. 1997. Industry life cycles. **Industrial and Corporate Change**, 6, 145-182.

Kogut, B. 1988. Joint ventures: Theoretical and empirical perspectives. **Strategic Management Journal**, 9(4), 319-332.

Koka, B. R., Madhavan, R., & Prescott, J. E. 2006. The evolution of interfirm networks: Environmental effects on patterns of network change. **Academy of Management Review,** 31(3): 721-737.

Lavie, D. 2007. Alliance portfolios and firm performance: A study of value creation and appropriation in the U.S. software industry. **Strategic Management Journal,** 28(12): 1187-1212.

Leijponen, A., 2006. National styles in the setting of global standards: the relationship between firms' standardization strategies and national origin. In: Zysman, Newman (Eds.): How Revolutionary was the Revolution? National Responses, Market Transitions, and Global Technology in the Digital Era. Stanford University Press, 350-372.

Madhavan, R., Koka, B. R., & Prescott, J. E. 1998. Networks in transition: How industry events (re)shape interfirm relationships. **Strategic Management Journal,** 19(5): 439-459.

Nelson, R. R., & Winter, S. G. 1982. The Schumpeterian tradeoff revisited. **American Economic Review**, 72(1): 114-132.

Nohria, N. 1992. Introduction: Is the network perspective a useful way of studying organizations? In N. Nohria & R. Eccles (Eds.), **Networks and organizations: Structure, form and action:** 1-22. Boston, MA: Harvard Business School Press.

Pfeffer, J., & Salancik, G. R. 1978. **The external control of organizations: A resource dependence perspective.** Stanford University Press.

Pisano, G. P., & Teece, D. J. 2007. How to capture value from innovation: Shaping intellectual property and industry architecture. **California Management Review**, 50(1), 278-296.

Robson, C. 2002. Real world research. (2nd ed.), Oxford, Blackwell.

Tae, J. C., & Jacobides, M. G. 2011. How value migrates within an industry architecture: Kingpins, bottlenecks, and evolutionary dynamics. **Academy of Management Annual Meeting Proceedings**, 1-45.

Tee, R., & Gawer, A. 2009. Industry architecture as a determinant of successful platform strategies: A case study of the i-mode mobile Internet service. **European Management Review**, 6(4), 217-232.

APPENDIX

Acronyms and Descriptions of Companies from Industry Network

Acronym	Company Type	Company Compustat/Orbis Name
TOY285	OEM	TOYOTA MOTOR CORP
DAI068	OEM	DAIMLER AG
NIS205	OEM	NISSAN MOTOR CO LTD
GEN129	OEM	GENERAL MOTORS CO
FOR118	OEM	FORD MOTOR CO
PAN209	Battery supplier	PANASONIC CORP
VOL298	OEM	VOLKSWAGEN AG
PEU210	OEM	PEUGEOT SA
TES274	OEM	TESLA MOTORS INC
DON076	OEM	DONGFENG AUTOMOBILE CO LTD
COB060	Battery supplier	Cobasys
A12001	Battery supplier	A123 SYSTEMS INC
REN226	OEM	RENAULT SA
HYU157	OEM	HYUNDAI CORP
HON148	OEM	HONDA MOTOR CO LTD
MIT196	OEM	MITSUBISHI CORP
BOS043	Drivetrain supplier	BOSCH CORP
FIS115	OEM	Fisker Automotive
CHO054	OEM	CHONG QING CHANGAN AUTOMOBL
GEN128	Infrastructure provider	GENERAL ELECTRIC CO