Network dynamics and action space

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Abstract

Purpose – In today's business settings, most firms strive to closely integrate their resources and activities with those of their business partners. However, these linkages tend to create lock-in effects when changes are needed. In such situations, firms need to generate new space for action. The purpose of this paper is twofold: analysis of potential action spaces for restructuring; and examination of how action spaces can be exploited and the consequences accompanying this implementation.

Design/methodology/approach – Network dynamics originate from changes in the network interdependencies. This paper is focused on the role of the three dual connections – actors–activities, actors–resources and activities–resources, identified as network vectors. In the framing of the study, these network vectors are combined with managerial action expressed in terms of networking and network outcome. This framework is then used for the analysis of major restructuring of the car industries in the USA and Europe at the end of the 1900s.

Findings – This study shows that the restructuring of the car industry can be explained by modifications in the three network vectors. Managerial action through changes of the vector features generated new action space contributing to the transition of the automotive network. The key to successful exploitation of action space was interaction – with individual business partners, in triadic constellations, as well as on the network level.

Originality/value – This paper presents a new view of network dynamics by relying on the three network vectors. These concepts were developed in the early 1990s. This far, however, they have been used only to a limited extent.

Keywords Car industry, Network dynamics, Action space, Network vectors

Paper type Research paper

1. Introduction

Companies are continually engaged in interaction to maintain and improve the performance of the resource constellations and activity patterns in which they are involved. These relationship efforts generate strong linkages among interconnected resources and activities. Such connections, shaped through successive modifications over time, are central for corporate efficiency and effectiveness. In this way, most operational changes are undertaken through mutual adaptations in long-term business relationships based on an established network logic. At the same time, however, these structural features constrain the possibilities to undertake changes that are not in line with the current network logic. Joint investments and prevailing embeddedness tend to create lock-in effects. Therefore, attempts to generate major modifications of the basic setting normally will be met with opposition, because such changes tend to decrease the value of previous investments (Håkansson and Snehota, 1995).

Now and then, however, the features of established network logic become challenged. Such situations may follow from strategic ambitions of some actors to restructure the network, either to improve performance or to affect their positions. Moreover, technological development may enable new conditions for coordination of activities and/or combining of resources. Actors interested in using such new opportunities can expect resistance from some of their current business partners, because reorganizing of resources and activities might be perceived to break with proven network logic (Håkansson *et al.*, 2009).

Therefore, actors with ambitions to modify prevailing network structures must challenge the current network logic by loosening, and sometimes break with, established connections in the network. In the vocabulary applied in this paper, they need to generate an "action space" to realize the potential for restructuring they have recognized. It is through such action spaces that change agents will be able to create the new network connections required.

The overall objective of this paper is to investigate two crucial aspects of network dynamics. The first is to analyze potential action spaces for network restructuring. The second is to examine how such action spaces can be exploited and the consequences associated with this implementation. This approach is in line with what is characterized as "process

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thinking," identified as "considering phenomena dynamically – in terms of movements, activity, events, change, and temporal evolution" (Langley, 2007, p. 271).

2. Continuity and change in business networks

Network actors are all the time involved in efforts aiming at improvements of their operations. In terms of the framing of the IMP approach, they strive to enhance the efficiency of their activities and make the best use of their resources (for example, Håkansson *et al.*, 2009). Prosperous outcome of these attempts require collaboration with other actors because internal activities and resources are never isolated but embedded in larger settings. The connections to these other entities are formed through business relationships, network triads and other constellations of business actors. In these assemblages, activity links and resource ties cross the boundaries of individual firms, in turn establishing strong bonds between the actors. The network couplings build on mutual adjustments of activities and adaptations of resources and impose interdependencies among the actors. Each actor is involved in adjustments and adaptations of its internal activities and resources, as well as encouraging others to such actions. Because these efforts are beneficial to performance, they lead to the evolvement of a strongly integrated network, containing closely intertwined activity patterns and resource constellations.

These network features are favorable because they contribute to operational improvements that represent substantial economic value created jointly by the actors. Such achievements have required considerable resource investments in terms of time, money and knowledge. For these reasons, the actors have a common interest in maintaining the established structure. Moreover, in the integrated network arrangements, the single actor is normally closely connected to a limited number of counterparts, implying multidimensional interdependencies among actors. Altogether, these conditions make it difficult to change the established structure – in the short term it is to a large extent a given.

Owing to these conditions the evolution of business networks feature a struggle between change and stability. Firms strive for stability to secure efficiency in their current operations. They also strive for change to enhance effectiveness by modifying and adapting their operations for the future. This struggle – or rather the interplay – between change and stability has been an ongoing theme in IMP studies – see, for example, Gadde and Mattsson (1987), Håkansson and Snehota (1995) and Fonfara *et al.* (2018).

The interplay between change and stability is illustrated by the fact that even seemingly stable network configurations can be characterized by considerable modifications over time. In any business relationship, there is continuous development ongoing in successive steps in the form of combining and recombining of resources and mutual coordination of activities. In this way, the single company evolves together with its most important counterparts. In the long term, such minor changes may affect the network features substantially. As long as changes are undertaken jointly by the actors, they tend to preserve the established network logic by increasing the integration among actors, activities and resources.

At the same time, however, the small stepwise changes impact on the connections between the three network layers. Any modification will affect the linkages between actors, activities and resources and induce further options for change. For example, exploitation of a new resource may not only contribute to improvements of the current activity structure, but also open opportunities for alternative arrangements of activities. Similarly, an actor considering restructuring of activities may find that a firm outside the current network configuration might be a more useful business partner than the prevailing ones. Such conditions represent potential action spaces for dynamics grounded in restructuring of established network arrangements. In this paper we are concerned with situations where the existing network logic is challenged through novel conditions in the actor, activity and resource layers.

3. Frame of reference

Network dynamics originate from modifications in the interdependencies between activities, the interfaces among resources and/or the interaction between actors (Freytag *et al.*, 2017). Moreover, analysis of dynamics needs to consider not only these conditions within each network layer, but also the connections between the layers. As indicated above, the potential for change in one of the network layers may stem from conditions residing in one of the other. Therefore, it is important also to analyze the connections between the network layers and in what ways these inherent connections relate to potential action spaces, which is the theme in subsection 3.1. In subsection 3.2, we explore how action space can be generated through changes of established connections. Owing to the complexity of business networks, any action to affect the interdependencies must be based on some understanding of this complexity. Therefore, subsection 3.3 is devoted to discussion of how managers "make sense" of the business reality of which they are part. Together these three sections lead to the research issues of the study, presented in subsection 3.4.

3.1 Network vectors and action space

A business network has been characterized as "a fabric whose component strands are knotted, twisted or otherwise fastened to form an open mesh" (Håkansson and Johanson, 1993, p. 27).

In the exploration of this mesh, they conclude that the basis for the network is the interdependencies that exist across company borders between the three layers of the network: actors, activities and resources. These interdependencies function as a set of dynamic forces as soon as single actors initiate change, for example to create new action space. These forces are based on the interdependencies between two of the network layers and the impact on the third layer (Håkansson and Snehota, 1995, p. 275). In this way three forces are identified based on the interdependencies related to actors–activities, actors–resources and activities–resources. These forces are identified as *network vectors* and represent "basic ingredients in networks as they develop the connections between actors, activities, and resources" (Håkansson and Johanson, 1993, p. 24). The vectors are in this way based on systematic combining of the interdependencies in the network.

Therefore, they provide a platform for analysis of potential action spaces for the involved actors.

The *activity–resource* vector is patterned by the interdependencies between these two layers and is a significant determinant of the performance of the network operations. The ways in which activities are allocated to resources impact significantly in this respect. Moving a specific activity from one type of equipment to another one will affect capacity utilization and thus the value the single resource can generate. Activities and resources are in this way systematically related to each other in accordance with the network structure. In the ambition to create action space, this vector can evolve in two directions. The first and strongest – *structuring* – is based on further reinforcing and strengthening of the existing interdependencies between activities and resources by adhering to the established network logic. The action space that can be created is quite limited and directly related to current logic. The second direction – *heterogenizing* – breaks with the prevailing logic, consequently leading to restructuring. When this approach is applied the potential action space is much broader in terms of options for relating activities and resources. In this situation, the problem is to mobilize other actors in favor of a new solution because they might be locked into the previous one.

The *actor-activity* vector is crucial for two important network features impacting on the efficiency of operations. The first one relates to the division-of-work in the network. At a certain point-in-time the network activities are undertaken by some specific actors. Changes of this allocation of tasks will impact on the performance of activities and consequently increase or decrease operational efficiency. Outsourcing and insourcing of activities are significant strategic means for actors to generate new action space. While this feature regards the efficiency of individual activities, the second aspect concerns the linkages between activities. Managerial action dealing with synchronization of activities have substantial impact on network performance. The actor-activity vector is critical in these ambitions because activity links often cross the boundaries of the firms. Regarding this vector, the action spaces can be identified in relation to *specialization* and *generalization*. Specialization implies action spaces based on concentration to fewer activities and resources. This approach requires stronger connections to business partners to secure performance, which leads to a narrower action space in that respect. Generalization entails action spaces built on broadening of operations, which makes it necessary to weaken connections to individual actors, because of the diversity of their inherent features. In both specialization and generalization, the action spaces are dominated by the existing resource structure.

The *actor–resource* vector is primarily concerned with network effectiveness, particularly regarding the opportunities for innovation and renewal. Therefore, the resources available to an actor will determine its value-generating capacity. Thus, the first important issue in this vector regards the control of central resources – either directly through ownership or indirectly through business relationships. The second issue deals with the combining of the various resources – internal as well as external – and their functionality in the larger resource constellation in which they are involved. The evolvement of action space in this vector can follow two patterns. First, actors may prefer to improve their internal control of critical resources. This process of *hierarchization* implies action spaces where the established network logic is strengthened. In other situations, actors perceive options for potential benefits by decoupling of established control patterns. Such action spaces, including generation of new connections, are identified as *extrication*.

The three network layers are connected and interdependent. This means that also the network vectors are interdependent and thus affected by changes in the network, in turn offering options for new action space. The long-term evolution of the network tends to increase the connections among network vectors. In this way such modifications contribute to the further strengthening of the network structure and the preserving of the established network logic, which may call for new arrangements. In a similar vein, minor modifications within the established network open for new types of connections and thus new action space. Therefore, the evolution of the network vectors functions "as a force that is changing the network in a certain direction" (Håkansson and Johanson, 1993, p. 24), by offering opportunities for new action space. This means that also the network dynamics and related transformations originate in the three network vectors. New conditions in either of the three vectors provide action spaces for major reorganizing of established network arrangements.

3.2 Generating action space

The main argument in this paper is that the network vectors represent appropriate analytical tools for understanding and generating network dynamics. Starting with the activity-resource vector we can conclude that improved resources for transportation and production will enable the development of alternative activity configurations, thus representing a potential space for action. Moreover, activities can become better linked and synchronized with positive impact on operational efficiency. Such arrangements also will fine-tune the utilization of resources. Standardization of activities through exploiting one and the same resource for several activities will improve economies of scale.

The actor-activity vector is focused on the division-of-work between the firms involved in the operations. By moving activities between the parties through outsourcing (and insourcing), substantial performance improvement may be gained regarding both efficiency and effectiveness. Such shifts will affect the level of specialization of the parties with impact on the scale and scope of the operations and in this way generate space for action. A crucial issue related to this vector is to identify appropriate linkages across the corporate boundaries regarding, for example, responsibilities and openness.

The main issue in the actor-resource vector concerns the combining of resources, internally and externally. Internal ownership provides an actor with direct resource control. Externally owned resources are controlled by suppliers and customers, thus imposing dependency on business partners. However, in truly interactive relationships the parties are interdependent, which provides both actors with some form of indirect control over the resources of the business partner. It is possible thus to claim that outsourcing of activities to a supplier might as well be recognized as insourcing of the supplier's resources and therefore be a source for new action space.

The above discussion illustrates in what dimensions action space may be generated. However, the main issue in the attempts to reorganize operations is to explore the aspects of the network's activities, resources and actors that are accessible in the strive for restructuring (Medlin and Törnroos, 2015). In this paper, we use "networking" for the conceptualization of these efforts.

3.3 Action space and networking

The above discussion is summarized in Table 1 illustrating potential sources for generation of new action space in networks through modifications of the three network vectors.

Generating a potential action space calls for managerial execution. Such activities are based on managers' understanding of the features of the own firm's position and role in the network, the corresponding features of other firms and what options for change that are available. Because of the inherent network complexity, a manager must in some way "make sense" of the business reality of which the firm is part. Sense-making has a long history in organizational research – see Weick (1995) for an overview. Within IMP, Johanson and Mattsson (1992) launched the concept "market theory" as a mechanism for sense-making. In this paper we apply "network pictures" as an analytical framing for understanding managerial action. The network pictures of managers "depend on their own experience, relationships and position in the network and will be affected by their problems, uncertainties and abilities" and are shaped through "interaction and participants experience in specific relationships and the corporate wisdom of each company" (Ford *et al.*, 2003, pp. 176-177). The view of network pictures has later been further elaborated on by, for example, Henneberg *et al.* (2006), Håkansson *et al.* (2009) and Henneberg *et al.* (2010).

A *network picture* is thus a mental map of the business setting in the mind of the manager. This map represents the manager's perception of the network configuration of which the company is part, including what actors are considered relevant, the actual and expected behavior of these actors, as well as the features and potential features of the network's resources and activities. Based on the network picture, managers act through what Ford *et al.* (2003) identify as *networking*. Networking involves all kinds of action; strategic, tactical or operational. In the terms applied by Langley (2007, p. 271) such actions "involve considerations of how and why things change, act and evolve."

The actions undertaken will result in various consequences, labelled *network outcome*. This outcome will include various effects: both expected and unexpected; both wanted and unwanted. Network outcome provides learning effects that impact both prevailing network pictures and future networking. Similar thoughts are expressed by Langley (2007, p. 273) in the claim that "actions to improve performance engender reaction that feed back into further action."

3.4 Research issues

The main objective of the paper is to explore network dynamics evolving from ambitions to transform established network configurations through exploiting new conditions. Such opportunities are identified as spaces for action and are generated through reorganizing of the three network vectors through networking. The exploitation of such action spaces will affect, and be affected by, the inherent features of the vectors and – most importantly – their interplay. Empirical analysis of the generation and exploitation of potential action spaces will call for research in terms of:

- identification of the underlying network pictures that impact managerial action;
- investigation of what networking actions that are undertaken; and
- analysis of the effects of networking in terms of network outcome.

4. Empirical setting

4.1 Methodological approach

To illustrate how action space can be generated and implemented through networking, we rely on a major industry transformation. This example, from the past decades of the 1900s, shows how car manufacturers in the western world in the 1980s responded to the increasing problems in their networks and the challenges from actors in the Japanese automotive industry. They responded through modification of the business context by adjusting to conditions featuring Japanese networks. We describe and discuss this transformation as reorganizing of the vectors of the network in which car manufacturers were involved.

This research set-up resembles what Langley (2007, pp. 273–274) describes as "tracing back," which builds on "investment in historical studies of organizations and the tracing of the processes by which they arrived at their favourable or unfavourable positions." As shown in the empirics below, western car manufacturers started from a highly unfavorable position. At the end of the process, however, they had managed to revise the position into a favorable one, through generating new action space.

We use this case as a highly relevant illustration of industry dynamics because it represents a major shift, not only for the

Table 1 Network vectors and sources of action space

Network vector	Potential sources for new action space
Activity-resource	"New" resources enable modification of activity links leading to improved synchronization of activity configurations
	Standardization of activities improves economies of scale in the utilization of resources
Actor-activity	Outsourcing and insourcing of activities change the division-of-work with substantial impact on performance
	Such shifts affect the specialization of actors and the need for coordination across the boundaries of firms
Actor-resource	Modification of resource constellations through recombining of resources is significant for effectiveness and innovation
	Adjusting and moving corporate boundaries have substantial impact on an actor's resource availability

Source: Authors' own work

car industry. The restructuring and the positive effects achieved made other industries follow in the same direction. The experience gained from the transformation had substantial effects on the general view of industry efficiency and effectiveness. In particular, the outcome in the car industry challenged prevailing perspectives in general on supply chains, efficiency in purchasing and the role of suppliers (for example, Gadde and Håkansson, 1991; Lamming, 1993). More recent publications confirm the significance of these findings: Martinelli *et al.* (2017) regarding supply chains; Gadde and Wynstra (2017) concerning efficient purchasing; and Araujo *et al.* (2017) with respect to the role of suppliers.

This paper is based on publications generated within two global research projects, coordinated by MIT in Boston, and then reported in Altshuler *et al.* (1984) and Womack *et al.* (1990). Both projects involved researchers and practitioners from all the car manufacturers at the time in Europe, the USA and Japan. During the projects, researchers and practitioners met at global seminars once or twice a year. One of the authors of this paper was involved in both projects, thus closely following the advent of the transformation for six years. These conditions provided considerable insight in the whole change process through the discussions and presentations at the global seminars and the access to all publications related to the projects. This paper thus builds on empirical information and analysis generated by the authors, as well as seminars and publications conducted by other researchers. The selection of which secondary data to rely on was quite unproblematic because the evolvement of the transformation followed quite distinct patterns, as is shown in Sections 5 and 6.

At first, it might seem a little problematic to mix the self-generated information with data from other researchers that sometimes relied on other theories, frameworks and methods. Such conditions could be an obstacle regarding analysis and interpretation. In this case we do not perceive this to be a problem. The main reason is the couplings to the overall MIT-projects. To be relevant in this context most of the sub-studies were oriented toward practical contributions which encouraged a research focus on issues in the business reality. First, studies tended to apply what Garud and Gehman (2012, p. 991) identify as a "relational perspective," implying that researchers start in "media res" – i.e. in the middle of reality. The relational perspective then encourages researchers to follow the studied phenomenon "in-the making." In this case, data collection then would be focused on following the actors in the car industry in their attempts to re-shape the network.

Second, in relation to presentation and analysis, researchers tended to follow what Waluszewski *et al.* (2017) categorize as an "image-based" approach. In image-based methodology, researchers rely on data in its original form – i.e. based on the real observations made. Data are thus presented in the "raw" form, rather than hidden in tables and equations. This seems also to have been a means to be perceived more practical, which in turn made interpretation of the secondary data easier in this study.

4.2 Starting point of the transformation

To describe the conditions in the industry in the beginning of the 1980s, we rely on the first of the worldwide research projects managed by MIT (Altshuler *et al.*, 1984). Around 1980, the car producing networks in the USA and Europe looked much the same as they did more than half a century earlier. Ford and General Motors dominated the scene in the USA with Chrysler as the third main actor. In Europe, Volkswagen, Fiat and the French and German manufacturers ruled the network together with GM's and Ford's overseas operations. In a similar vein, mass produced, standardized, cars, still represented the main output of the manufacturing operations. Collaboration between the various producers was almost non-existent – "the lonely one is strong" was the strategic mantra.

However, some of the basic conditions in the network had begun to change. One group of researchers expressed the development in the middle of the 1970s in the following way: "in the midst of the second energy shock we, like many other, began to wonder about the future of the automobile-based system of personal transportation" (Altshuler *et al.*, 1984, p. vii). Moreover, the same authors declared that the "world economy was entering the worst economic downturn since the Great Depression and the auto industry was among the hardest-hit sectors."

In addition, Japanese car producers, like Nissan and Toyota, had increased their presence in the western networks over time. In the beginning they succeeded to enter by offering low-priced vehicles. Shimokawa (1994) describes how the abovementioned conditions in the US auto network substantially reduced the competitiveness of domestic manufacturers after the second oil-crisis. He concludes that Japanese manufacturers "took advantage of this situation and proceeded to establish its superiority [. . .] both in cost and quality" (Shimokawa, 1994, p. ix). The appreciation of the Yen was a further factor favoring the competitiveness of Japanese producers. European manufacturers shared the problems appearing in the USA with regard to oil crises and overcapacity – but to a somewhat lower degree (Shimokawa, 1994). The Japanese challenge in the western auto network was pointed out in a multitude of publications, for example, Cole (1981), IISI (1982) and Anderson (1982). In the following sections, we describe the transformation of western car manufacturing in terms of network pictures, networking and network outcome.

5. Network pictures and potential action space

5.1 Network pictures

The notion of network pictures was launched in the beginning of the 2000s. For this reason, it has not been possible to identify the actual network pictures of the managers involved in the transformations some twenty years earlier. However, based on the secondary data at hand, and the changes which the data reflects, we claim that it is possible to derive the aspects of the networks that affected managers in their networking. There are lots of information describing the features of the car industries in the west and in Japan around 1980, which must have impacted on the managers' attempts to make sense of the reality, and thus their overall network pictures. Available documentation tends to highlight the main differential between the features of the Japanese system for automobile manufacturing and those established in the USA and Europe. Among these publications can be mentioned Abernathy and Clark (1982), Dodwell (1982), Hervey (1982),

Anderson (1983), Gadde and Grant (1984), Altshuler *et al.* (1984). There is consensus among these authors that western car manufacturers should be able to substantially improve performance through implementation of network configurations like those in Japan.

Based on the findings in the above publications (and in others) it is possible to identify three major differences between Japanese and Western systems for auto production. First, Japanese manufacturers relied on integrated production systems based on just-in-time deliveries from suppliers. Second, these delivery systems enabled Japanese manufacturers to reduce the degree of vertical integration and outsource production activities and rely on the resources of suppliers. Third, outsourcing of critical activities required closer supplier relationships, which in turn enabled technological collaboration. Because these approaches had shown favorable to efficiency and effectiveness, it is most likely that they represented something of an ideal structure, which obviously reflected a prosperous network picture with potential impact on coming managerial action.

These features differed substantially from conditions in the USA and Europe where car manufacturing strategy was based on three contrasting cornerstones. Instead of just-in-time deliveries, production systems were built around warehousing and buffering of components. Moreover, the primary focus was on internal operations rather than outsourcing of activities to suppliers. Finally, relations to suppliers featured market- based arm's-length conditions instead of close collaboration.

Table 2 summarizes the main differential between the principles for car manufacturing in Japan and the western world. There is a striking contrast between their features when they are described in relation to the three network vectors. Moreover, in terms of performance the Japanese approach had shown to be superior in comparison with the western. It was obvious from the publications at the time and the discussions of practitioners at the global seminars in the MIT project that managers in western car manufacturing corporations considered the Japanese approach as a means for solving their problems. The Western approach that once paid the way for American car producers was outdated and needed restructuring. In the attempts to generate new action space the Japanese approach was considered the most relevant network picture for restructuring through networking actions.

This view seemed so unanimous that it exemplifies what Ford *et al.* (2003, p.176) describe as situations where "a common view of the nature and dynamics of a network will be held by a number of participants in it." Such "collective network pictures" can be expected to lead to "joint action for or against change." Through reorganizing of the western networks, it should hopefully be possible to enjoy similar benefits as in Japan. Taking this direction would require substantial modifications of the network vectors. In the activity–resource vector, restructuring through heterogenization should replace previous ambitions for further structuring. The actor–activity vector needed to turn to a specialization path instead of the current focus on generalization to anonymous business partners. Finally, in the actor–resource vector, previous attention to hierarchization through ownership control of critical resources needed to be substituted by extrication allowing for exploitation of supplier resources.

5.2 Options for generating action space

Above we identified three significant aspects of auto manufacturing where conditions in the western hemisphere differed from those in Japan. As the three aspects had shown to be crucial for the performance of the Japanese firms, they obviously represented the main target for car producers in the USA and Europe. Here, we explore how the three aspects relate to the basic industrial network model and the network vectors.

The first one – integrated production system – involves the activity layer and the two vectors where activity is one of the components. On the one hand, just-in-time deliveries represents a focus on specialization in the activity-actor vector and heterogenizing in the activity–resource vector. Warehouse buffering on the other hand, constitutes a combination of generalization and structuring in the same vectors. By changing the focus from the second vector combination to the first one, huge inventories may be replaced by more seamless and coordinated operations. This modification of the activity linking leads to efficiency improvement and represents an interesting action space.

The second one – outsourcing and increasing reliance on suppliers – contains the resource layer and its two related vectors. When central resources are located in-house, firms gain superficial control – hierarchization in the actor–resource vector – and structuring in the activity–resource vector. On the other hand, this approach constrains the resource setting available. Outsourcing to suppliers represents extrication and heterogenizing in the two vector dimensions, thus extending the resource base and enabling enhanced combining of internal and external resources. This approach generates an action space where ties and interfaces between resources can be modified and improved.

Table 2 Network vector features in Japanese and Western car manufacturing

Network vector	*Japanese approach*	*Western approach*
Activity-resource	Integrated production systems and JIT- deliveries based on linked activities and adapted resources	Standardized activities and resources require warehousing and buffering to handle variability
Actor-activity	Outsourcing to suppliers provides economies of scale and scope. Activity links cross firm boundaries	Focus on internal operations and interchangeable business partners do not foster cooperative action
Actor-resource	Extensive use of supplier resources enables purchasing of customized systems. Suppliers involved in joint resource development	Focus on internal resources hinders engagement of suppliers in resource development and leads to buying of components rather than systems

Source: Authors' own work

The third one, finally – closer supplier relationships – deals with the actor layer and its two related vectors. In arm's-length relationships – focusing on generalization in the actor-activity vector and hierarchization in the actor-resource vector – integration of production systems through outsourcing to suppliers would not be achievable. Such arrangements build on stepwise specialization and extrication in the development of close cooperation over time. Moreover, once this mutual interaction evolves, new opportunity spaces for improvements will be discovered, because the two parties over time learn about their respective operations and how they can be improved.

The main options for generating new action space through changes in the vectors can thus be summarized in the following way:

- increased specialization in the actor–activity vector for improved synchronization through more fine-tuned linkages;
- increased heterogenizing in the activity–resource vector to improve resource combining through tighter interfaces; and
- increased extrication in the actor–resource vector to enhance collaboration and expand relationships with suppliers.

In Section 6, we describe what then happened in terms of networking and network outcome.

6. Networking and network outcome

This section begins with a clarification of the initiation of the transformation. In subsection 6.1, it is shown that increasing interaction and close collaboration with suppliers was at the top of the management agenda. Subsections 6.2–6.5 then discuss potential benefits of new relationships with suppliers in terms of outsourcing and supplier base reduction, integrated production systems, system sourcing and collaborative product development.

6.1 Point of departure

The first steps of the transformation initiated in the first half of the 1980s are illustrated by findings from research projects conducted within the auspices of a second global MIT-study – The International Motor and Vehicle Program (IMVP). Most of these changes are presented in working papers and seminars within the program. In the reference list these unpublished reports are identified by the acronym IMVP. The IMVP program was concluded with a book at the end of the decade (Womack *et al.*, 1990).

The primary driving force underlying the transformation was to make better use of suppliers and their resources, because this seemed to be the most significant factor behind the performance of Japanese auto firms. Observations of the Japanese system indicated an alternative action space – based on outsourcing – to reap potential gains in terms of reduced costs, as well as increasing benefits. However, obtaining these advantages would require considerable modification of the current features of the supplier relationships. As long as the western approach with a huge cadre of suppliers kept at arm's-length distance continued, the potential for improvements would not be possible to realize. Therefore, the main mission of the new approach was to increase interaction and collaboration with a reduced group of suppliers. This purchasing approach was described by, for example, Monteverde and Teece (1982), Wilson (1982) and Dirrheimer and Hübner (1983). In addition, a literature review (Gadde and Grant, 1984) identified three important improvements that would be available from closer supplier relationships:

- integrated production systems via just-in-time deliveries;
- supply of assembled systems instead of individual components; and
- increasing involvement of suppliers in product development.

The presentation of networking action and network outcome is structured along these four main ambitions.

6.2 Outsourcing and closer collaboration with fewer suppliers

Outsourcing and increasing collaboration with suppliers was expected to provide benefits regarding cost rationalization. Concentration of purchases to fewer suppliers was supposed to contribute more to economic performance than previous chasing for lowest price among many suppliers. The indirect costs associated with the latter approach were substantial in terms of supplier handling costs and various operational costs, such as transportation and goods handling. Moreover, through closer relations, benefits were expected through joint efforts in product development and fine-tuning of the supply chain with potential reduction of storage and production costs.

Early illustrations of the changing conditions regarding the relationships with suppliers were reported in, for example, Gadde and Grant (1984), Helper (1986) and Lamming (1987). One common finding in these papers was that such transformations are tricky. They are tricky because it takes time to commit suppliers to strategic collaboration when previous relations have been antagonistic. One significant example of the problematic point of departure is presented in Helper (1986, p. 17), where one supplier makes the following comment about the customers in the car industry: "They are nasty, abusive, and ugly. They would take a dime from a starving grandmother and steal our innovations." It is easy to understand that time is needed to convince suppliers with such perceptions about the potential benefits of new relationship arrangements. Building trust and commitment is a cumbersome process when it comes to changes from a negative relationship atmosphere toward a positive one.

Over time, however, the relationships between car producers and their suppliers improved as the mutual trust increased and evolved into commitment (Herrigel *et al.*, 1989; Lamming, 1993; Nishiguchi, 1994). Because of these changing conditions the level of outsourcing expanded considerably. This development is clearly illustrated by the transformation of Ford Motor Company. In 1980, Ford was relying to 70% on components and systems manufactured in-house, thus purchasing 30% of their input from suppliers. Two decades later, these figures were reversed – internal manufacturing accounted for only 30%, while suppliers contributed with 70% (Quinn, 1999). Also, the buyer–seller relationships improved considerably over time, illustrated, for example, by Ali *et al.* (1997) and Gadde and Håkansson (2001). This means that the

network outcome lived up to expectations. The positive effect followed primarily from modifications of the network vectors toward specialization and extrication.

6.3 Integrated production systems and just-in-time deliveries

The features of the flow of materials represented one of the main differentials between the supply systems in Japan and the western companies. A US research team "accustomed to the loading docks, the large storage areas and the large incoming inspection area" was taken aback by Japanese assembly lines where "trucks from suppliers back up through large bay doors right to the assembly line; supplier personnel unload a few hours of parts and depart." In this supply system, "there was no incoming inspection, no staging area, no expediting of material, just a seemingly continuous flow of material" (Abernathy and Clark, 1982, p. 8). It is obvious that car producers in the USA and in Europe could foresee substantial improvements in terms of both cost and quality if they were able to reconfigure the incoming flow of materials in this way. Moreover, a modified supply system would reduce tied-up capital substantially through reduced warehousing. The basic principles for JIT sourcing and its related consequences were discussed in, for example, Sei and Gakuin (1987).

The network outcome of the efforts to establish JIT-deliveries in the USA were positive. For example, Raia (1988) claimed that the extensive JIT-arrangement of Chrysler was one of the main factors contributing to the recovery of the company after the crisis of the early 1980s. Improvements of the material flow reduced the capital tied-up by more than $1bn. However, Raia (1988) also observed that the extended frequency of deliveries often came from increasing storage levels at suppliers, or from newly established warehouse businesses, one of which was named JIT-Warehousing. This first part of the transformation was thus merely a shift of location of buffers from one level in the supply chain to another. However, it should come as no surprise that full reconfiguring of supply chains is a time-consuming process. For Toyota it took 17 years to build a fully synchronized system to the first-tier suppliers, and a further 15 years before JIT had been established between first- and second-tier suppliers (Nishiguchi, 1987).

Early efforts to implement integrated supply systems clearly illustrated the benefits such arrangements could provide (Gilbert, 1990; Dion *et al.*, 1990). Moreover, technological development enabled reconfiguration of established activity structures. Manufacturing technologies evolved in directions where mass production no longer was a prerequisite for achievements related to economies of scale (Hayes and Pisano, 1994). Logistical developments improved delivery conditions regarding both speed and reliability (Bowersox and Closs, 1996), while communication systems enabled improvements of the information exchange between buyer and supplier (Gadde and Håkansson, 1991). Electronic data interchange systems were developed to enhance information flows. One example is the Odette system jointly established by European auto manufacturers for their communication with suppliers. At the end of the millennium, most car producers had developed synchronized delivery systems with their suppliers and in this way succeeded in the exploitation of a new action space (Collins *et al.*, 1997; White and Pearson, 2001). The outcome discussed above was generated mainly from network vector modifications related to restructuring through heterogenization.

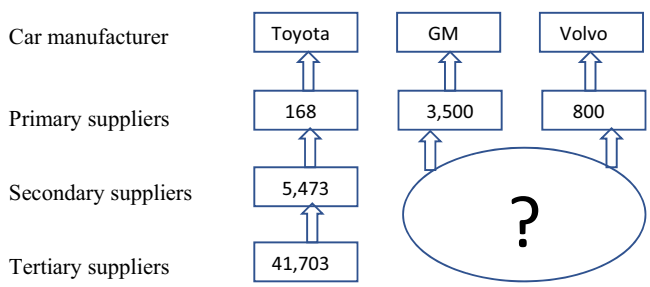
6.4 Supply of assembled systems instead of components

One of the highly significant differences between the Japanese and the western approaches was the number of suppliers that delivered directly to the assembly line of the car producer (see Figure 1).

In 1982, GM used 3,500 suppliers that delivered directly to its assembly facilities for a specific part of its procurement. The corresponding figure for Volvo cars was 800 (Gadde and Grant, 1984). The difference between the two can be explained by the number of cars produced and the number of factories. At the same time, Toyota relied on 168 direct delivering suppliers to all their assembly lines (Berry, 1982). Even though Toyota produced almost as many cars as GM they relied on less than a quarter of the number of suppliers used by Volvo. These figures occurred not because fewer components were required for the manufacturing of Toyota's cars. The reason was that Toyota had organized its supply systems differently. The 168 primary suppliers worked very closely with Toyota and were made responsible not only for just-in-time deliveries, but also for product development and deliveries of assembled systems rather than single components. Toyota also exerted some control over secondary and tertiary suppliers through their close relationships with the primary suppliers. The western manufacturers had very limited knowledge of what characterized the network "behind" their direct suppliers. The benefits obtainable from a shift toward close collaboration with a limited supplier base appeared obvious and substantial. Therefore, reducing the numbers of suppliers became a prioritized issue. The result of this effort was that GM in a 10-year period decreased the total supplier cadre from around 10,000 to 5,000 (Gadde and Håkansson, 2001).

Significant benefits were achieved from Toyota's outsourcing of sub-system assembly to the primary suppliers. Through this arrangement Toyota's supplier handling costs were substantially lower than their western competitors. Moreover, through this approach, the level of specialization in the entire network increased. The benefits obtainable through system sourcing in general are explained in Henderson and Clark (1990) and by Gadde and Håkansson (1991), with particular focus on the automotive industry. Von Hippel (1990) discussed

Figure 1 Supplier systems at Toyota, GM and Volvo Cars



Source: Authors' own work

the principles for partitioning of the total activities of a system into sub-tasks that can be delegated to business partners. This issue is what makes system sourcing highly complex, because the author shows that the partitioning of the total system can be made in so many ways. This fact is illustrated also in practice where one study found that General Motors and Honda applied quite contradictory approaches in their partitioning and sourcing of instrument panels (Raia, 1988).

Over time, the successful transformation toward system sourcing paved the way for new arrangements in relation to end-users. The ambitions of car manufacturers became increasingly directed toward customization and individualization of the car to apply to the diversity in consumer-demand. The integrated JIT-deliveries had decreased lead-times substantially, as well as reduced the benefits of mass production. Exploiting these conditions required increasing attention to platform solutions and modularization (Baldwin and Clark, 1987; Robertson and Ulrich, 1998). These approaches in sourcing showed to be significant tools in the efforts toward enhanced customization of cars (Alford *et al.*, 2000; Salerno, 2001). Living up to the requirements for ever shortened lead times was a challenge to suppliers. A common approach to handle this situation was that suppliers established module assembly plants close to the final assembly of the car manufacturer (Morris *et al.*, 2004; Fredriksson and Gadde, 2004). These supplier parks also improved the conditions for transportation of large modules and contributed to the beneficial network outcome. These effects resulted from network vector developments going in the specialization, heterogenizing and extrication directions.

6.5 Engaging suppliers in product development

Initial thoughts and illustrations of the potential benefits of increasing supplier involvement in product development were presented in, for example, Graves (1986) and Clark *et al.* (1987). Empirical evidence of the positive evolvement of buyer-supplier collaboration in design and development activities were provided by several authors (Clark and Fujimoto, 1992; Hines, 1995; von Corswant and Tunälv, 2002). The increasing supplier involvement affected, and was affected, by the evolvement of the three other changes discussed above, because of prevailing interdependencies. Collins *et al.* (1997) described how increased outsourcing of development activities are related to just-in-time deliveries and the occurrence of modular consortia. In a similar vein, Hsuan (1999) analyzed the consequences for new product development owing to modularization and increasing buyer-supplier cooperation. Such interdependencies make the processes increasingly complex.

Especially thorny situations will come to the fore in cases where design and development of products and systems are delegated to one supplier, while the manufacturing activities are outsourced to another one (Gadde and Jellbo, 2002). Similarly, Fujimoto (2001) claimed that the most appropriate strategy for development tasks may not coincide with strategic ambitions in the supply chain and in assembly operations. One way to handle such situations would be to delegate both development activities and manufacturing operations to one and the same supplier. Ali *et al.* (1997, p. 38) shows how Jaguar appointed Nippondenso as system supplier for one of its vehicle systems – an authorization that provided the supplier with full responsibility "for all the activities in design and development, the procurement and manufacture of sub-components, their final assembly and post-purchase quality assurance." However, such an approach is not only beneficial. The broad responsibility of the supplier constrains the specialization advantages that could be reached if the totality of activities were distributed to several suppliers. Moreover, the deepened engagement makes it necessary for the supplier to interact with a huge cadre of other system suppliers to secure the interfaces with these systems.

The importance of considering modularity, outsourcing and product development simultaneously is pointed out also by Sako (2003). If this is not the case, the buyer might risk expanding the level of outsourcing so much that it becomes problematic to maintain internal innovation capability (Lung, 2001; Gadde and Håkansson, 2001). Lack of this capability obstructs learning and makes it difficult to absorb external knowledge from suppliers.

This dimension of car manufacturers' ambitions to exploit new action space illustrates the complexity of networking decisions and the difficulties in foreseeing network outcome. As no action is isolated, each networking attempt will cause additional effects to those that were expected. In this final example the evolution of the network vectors went hand-in-hand toward specialization, heterogenizing and extrication. Any effort to generate and exploit action space must therefore be considered in its network context. Before decisions are taken it is important to analyze potential effects in other network layers and the likely impact on network vectors.

7. Transformation through reorganization of network vectors

The above presentation illustrates the substantial restructuring of the western car industry during the past decades of the 1900s. In this period the strategies of car manufacturers went through dramatic changes in each of the network layers. In the actor layer, arm's-length relationships with a multitude of suppliers were replaced by closer collaboration with fewer business partners. In the activity layer, vertical integration of operations was supplemented with outsourcing of activities and the development of synchronized activity links in relation to suppliers. In the resource layer, finally, the previous focus on ownership of critical resources was modified to enable utilization of the resources of suppliers, combined with the internal resources of the buyer.

The basic argument in this paper is that network vectors are significant for the understanding and management of transformations and network dynamics. The study shows how the reorganization of the car manufacturing system was impacted by modification of the features of network vectors. In the activity–resource vector, restructuring through heterogenization was important because evolving technological resources and improvements enabled new types of activity configurations. New techniques for information exchange enhanced the communication between the parties in the supply chain. Developments of manufacturing techniques and logistical facilities contributed to substantial reduction of lead times. Over time this synchronization of material flows was extended to include dealers and even car buyers. This approach

was highly significant for customization of car features to fit with individual consumer requirements. Moreover, new activity–resource configurations affected capacity utilization positively.

In the actor–activity vector, the turn to the specialization path resulted in outsourcing to suppliers and increasing integration of material flows. These changes required that synchronization of activities was extended to cross the boundaries of firms. Moving activities between firms changed the division-of-work with subsequent impact on performance in the undertaking of activities. In the transformation discussed in this paper, outsourcing provided benefits regarding both rationalization of costs, through increasing economies of scale and technological development through more specialized suppliers. However, it is important to note that in both previous and later transformations of the car industry such benefits have been realized through insourcing (Gadde, 2013).

In the actor–resource vector, the extrication path provided car manufacturers with substantial benefits through exploitation of the resources of suppliers for cost rationalization and technological development. The analysis also shows that increasing interaction between car manufacturers and their suppliers over time enabled a shift from previous antagonistic relationships toward collaborative arrangements Such effects occur through the common experience perceived by the parties with accompanying positive impact on trust and commitment. In these processes, learning plays an important role illustrated by the development of the offering of suppliers – from JIT-deliveries, via system sourcing, to the modular supply that enabled customization.

In the Introduction, we argued that attempts to modify network arrangements to create new action space might be met with resistance from those seeing the change as a threat. In this case, opposition was limited because most of the affected suppliers of the car manufacturers perceived the changes as opportunities to reach more favorable network positions. In other situations, the reactions might be quite different. The network features reflect the power of the strong players in the past, some of which may have an interest to oppose change and act as gatekeepers (Medlin and Törnroos, 2015).

In summary, substantial changes occurred in all three network vectors. In the activity–resource vector, there was a major shift away from the previous stepwise structuring of the collective of suppliers, toward intense heterogenizing, based on supplier reduction and increasing cooperation with those remaining. The supply network thus turned into a set of highly specialized relationships. This change provided the technological prerequisites for increasing supply chain synchronization. The accompanying adjustments and adaptations initiated through changes in the actor-activity vector through increased specialization facilitated effective resource utilization. Finally, modifications in the actor-resource vector toward extrication enabled improvements in terms of effective operations through closer integration with selected suppliers and recombining of resources.

As pointed out above, the key to successful exploitation of new action space was the intense interaction ongoing in business relationships. Interaction among business partners showed to be highly significant in the three examples of vector reorganizing discussed above. Interaction was the means for relationship improvement through the establishing of close collaboration with business partners. In turn, these conditions functioned as necessary prerequisites for the synchronization of activities in material flows and the extended combining of resources across corporate boundaries.

8. Interaction as means for generating action space

In this section, we explore the crucial role of interaction in the joint development of action spaces. In these processes, interaction can be seen as both simple and complex. It might seem quite simple if we look at two companies developing a business relationship. However, it appears much more complex if we try to include all potential effects in related relationships. These conditions will become obvious when we below discuss the single actor's interaction in individual relationships, in triadic constellations and in the overall network.

8.1 Action space and interaction with individual counterparts

Action space is generated and exploited through interaction in business relationships. Interaction is a means of establishing and handling interdependencies in and among activities, resources and actors. It is a means also for creating and changing interdependencies related to network vectors. Individuals and their understanding of the network are central for the relationship interaction aiming at reshaping of operations (Håkansson and Snehota, 2017; Medlin and Törnroos, 2015). Mutuality and longevity are central features in the development of the relationship for establishing a joint action space. Achieving this outcome requires the two parties to perceive each other to be important – economically and/or in other terms – now and/or in the future. The joint space can be generated in situations when the two interact regarding ambitions for efficiency improvements through rationalization efforts in the actor-activity vector. Another opportunity resides in interaction aiming at development and renewal in the actor-resource vector. By modifying these two vectors through interaction, action space can be generated in relation to the activity layer and/or the resource layer, particularly over time.

The transformation of the car producing network showed that manufacturers were able to generate new action space through interaction in some of their supplier relationships. However, owing to the previous relationship climate it was somewhat difficult to convince a supplier that the relationship from now on should be cooperative rather than confrontative. These conditions illustrate previous findings that relationship building is time consuming and that reaction is as important as action in networking efforts. Moreover, some suppliers lacked the capability to take on a wider role than the previous one as a typical subcontractor. Other suppliers having that capability now found that they were able to serve several manufacturers. This had not been possible before when the relationships were exclusive because of car manufacturers' fear of leaking information.

8.2 Action space and interaction in triadic settings

Relationships are not independent but connected to each other. Consequently, any interaction within a relationship between

two companies will affect some third parties. This outcome may be unintentional from the side of the acting company, but it may also be due to activation of a third party. The interaction between two parties must therefore be analyzed with regard to its impact on third parties because triadic constellations can be important for the generation of action space. One example appears when a third firm is connected to an ongoing relationship. A supplier may connect a second customer to a relationship with one of its customers, or the two customers can join forces against the supplier. In a similar vein, a buying firm may connect a second supplier to an ongoing relationship with a supplier. The opportunities for generating action space expand substantially when interaction between two parties is replaced by three directly connected interactions. Particularly, the connections to third parties may be instrumental in the efforts to reduce some specific lock-in effects in the established structure. In the transformation of the car industry, some suppliers became convinced about a new reality when two competing car manufacturers approached them with the same message.

The empirical examples above regarding interaction with individual counterparts need to be discussed further regarding the role of third parties. In the transformation of the flow of materials, interaction between manufacturer and supplier would not have been enough to change prevailing conditions. Establishing a triadic constellation with a logistical actor was required to develop the efficient materials flows that replaced warehousing and buffering. It was the same with the transformation of development responsibilities to suppliers. In many cases this change required that an independent development partner was engaged in a triadic setting. Also, the interaction with other manufacturers regarding system sourcing and joint platforms called for enhanced triadic interaction; both in relation to system suppliers and in relation to firms specializing in technical development.

8.3 Action space and interaction on network level

Interaction in one relationship might be observed, and reacted to, by more distant firms. These reactions may be expected or unexpected, as well as supportive or confrontative. Interaction can in this way be extended to involve several relationships and triads and thus regard broader network effects. In such arrangements the opportunities and potential action spaces become substantially enhanced. But the same conditions will also make it much more difficult to develop mutual joint spaces. The basic aim of these network efforts is to improve the activity–resource vector by connecting the "own" network with the larger setting of which the actor is part. This linkage should be collaborative by functioning as a complement to the larger setting. Such conditions to some extent support the maintaining of the current structure. Therefore, the connections also must include features that are perceived as confrontational. In this way, they will function also as facilitators for renewal and innovation by contributing to generate joint action spaces. However, the more to agree upon, the more likely it is that the interests of the actors differ and make it problematic to implement a joint action space.

Sometimes, actors adapt to the features of the resources and activities of other actors without explicit communication between the parties. The activity–resource vector is central in the creation of new configurations in the network through heterogenizing and extrication. When such changes are observed, actors can in certain cases adapt to these novel solutions without direct information exchange with others, identified as "silent" interaction (Håkansson *et al.*, 2009).

In the transformation of the auto industry, interaction on the network level was important for the establishing of the joint systems for exchange of information between manufacturers and suppliers. The greater the number of car assemblers that connected to these systems – the more efficient the systems became. But there is also a problem when more and more firms become interested in connecting. When trying to adapt to many various requirements, the system designer may find that the final solution will be perceived too standardized to be useful for various buyer-specific demands.

A further type of "new" interaction appeared in relation to the manufacturer's competitors. This interaction concerned, for example, the development of joint systems for information exchange with suppliers. But there was also more direct cooperation between car manufacturers to observe. Some of them joined forces and collaborated in the development of common product platforms to reduce costs. Such interaction was most unlikely to take place before the transformation.

In summary, the substantial transformation of the network vectors required massive interaction. The development of close relationships with some few business partners were significant for the generation of new action space. The evolving industrial structures featured strong interdependencies between companies, owing to the interaction required to establish cross-corporate connections among activities and resources. First, this change required new forms of broad and deep relationships with some few system suppliers featuring trust and cooperation. These conditions were quite far from previous arm's-length relationships. Second, in the new settings triads became significant. One of the illustrations regarded the increasing importance of logistic service providers in combination with system suppliers. Another example was the systematic connections between supplier and development partner in relation to the car manufacturer. Third, the enhanced organizing of suppliers and sub-suppliers illustrated in Figure 1 made network interaction necessary. Suppliers and sub- and sub-sub-suppliers had to adjust to the new business model. These changes occurred through interaction within ongoing relationships, but also through silent interaction.

9. Concluding discussion

The transformation of the western car industry involved a massive network reconfiguring – from arm's-length relationships with huge cadres of suppliers toward close collaboration with a limited number of business partners; from full reliance on internal resources toward utilization of the resources of suppliers; and from supply systems based on warehousing and buffers toward synchronized supply chains with minimum inventories. Altogether this development represents a remarkable transition where previous strategic standpoints were sacrificed and replaced by quite contradictory approaches. These modifications of prevailing recommendations for efficient and effective purchasing impacted not only the car industry. Similar reconsiderations affected also other industries with

subsequent effects for the role of supplier relationships, outsourcing and supply chain strategies (Håkansson *et al.*, 2009). These industries include, for example, biotechnology (Powell *et al.*, 1996), telecommunication (Marshall *et al.*, 2007), aerospace (Moll and Harrigan, 2018) and offshore wind-power (Johnsen *et al.*, 2019).

The framework applied in this study enabled analysis of the transformation in terms of the impact of reorganization of network vectors. Modification of the features of network vectors, and the interplay within and between the vectors, affected the opportunities for generation and exploitation of action space. The evolving action space contributed substantially to the performance enhancement achieved by car manufacturers in the western world. The framing of network dynamics by combining network vectors, interaction and action space thus constitutes the theoretical contribution of the study.

The changes of the business reality discussed in this paper feature two quite special conditions, potentially impacting on the implications of the study for today's industries. First, this transformation represents the combined reorganizing efforts of the firms in an entire industry, which is not the "normal" level for analysis of strategic change. Second, the restructuring started some forty years ago which might raise some doubts regarding the usefulness of the findings today. However, in our view, the framing applied in the paper should be of value also for individual firms and smaller groups of companies. If such firms consider their strategic ambitions in terms of networking and action space in their specific contexts, they would be able to improve the opportunities for successful reorganization. Moreover, we perceive the findings from the 1980s to be useful also in today's business reality. During the 40 years that passed, corporations have become increasingly "network-like" through outsourcing and enhanced reliance on business partners. This evolution has made networking and network vectors even more important in analysis and interpretation of strategic change. In conclusion, the findings arrived at in this study, summarized below, are most likely to be valid also in today's business reality and for strategic actions of individual firms.

First, it is not possible for individual actors to change complex network configurations without support from others. Interaction thus represents two opposite forces when it comes to the evolution of network vectors. It is through interaction that the interdependencies and lock-in effects in the established network are created. Moreover, it is only through interaction that a change agent may be able to generate new action space through active mobilization of business partners.

Second, mobilization for generating action space builds on two important prerequisites:

- a specific context; and
- interaction with specific counterparts.

The context can be represented either by problems (as in the case in this paper) or by potential opportunities. Such conditions may be related to expected benefits from exploitation of new technology or other changing situations. Furthermore, successful generation of new action space requires the active engagement of other actors that must be identified and motivated to become involved in interaction.

Third, it will always be possible to find candidates interested in generating new action space. In established networks there are tensions between actors with different perceptions of the features and the effects of the current structure. Such tensions tend to destabilize and weaken the setting and offer opportunities for development and renewal. Through careful analysis of the network conditions, a firm can discover new options for collaboration with current business partners, as well as identify new potential collaborators. The motivation of business partners can only be dealt with through interaction and joint discussions regarding what opportunities that can be identified, which of them to exploit and how this should be done.

Fourth, and finally, in the efforts to identify, mobilize and motivate partners, a potential outcome may be that some of the most important business relationships represent the strongest lock-in effect. This means that generation of new action space may require exit from a long-term business partner. This is a risky step to take as established relationships with business partners are the most valuable assets of a company. However, in some situations, it might be even more risky to stay with a long-term business partner with low propensity to change, than to actively try to generate new action space.

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