Interdependencies
blessings and curses
Freytag, Per Vagn; Gadde, Lars-Erik; Harrison, Debbie

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Chapter 12: Interdependencies – theoretical and methodological consequences

1.0 The importance of interdependencies

DAN-Technology (DANT) is an SME with about 150 employees and with customers mostly from Nordic countries. DANT designs and manufactures hydraulic, mechanical solutions and power packs mostly with electronic control systems. Typically, DANT develops solutions in collaboration with customers, although, the electronic control systems are developed in close collaboration with a supplier TT-Electronics (TTE). TTE is a somewhat smaller electronic company with about 80 employees. The collaboration with DANT has been successful; it has boosted it sales in other Nordic countries over the last 12-15 years. Both companies see their close collaboration as very fruitful as they have learned how to combine resources and link activities rapidly and smoothly. Overall, the collaboration has provided many opportunities to develop new competences, systems and solutions.

Due to TTE, DANT’s existing customer relationships can be developed more systematically and several opportunities for engaging in new relationships are in place. For both companies close to half of the sales is coming from mutual customers. Systems set up, handling of customers and perception of customers’ requirements are very similar in the two companies. The perception is that being interconnected has brought the companies far in their strategic development: co-evolving has also resulted in the creation of a number of dependencies.

For the past 4-5 years, DANT has started to build customer relationships in Germany. The sales to these relationships are growing. This has put pressure on the DANT-TTE collaboration. For example, a major German customer wants a new solution for handling waste from retailers. TTE has been reluctant to engage in the collaboration (and in Germany more generally) as somewhat
different technical solutions are required, which would also require services to be provided. Essentially, TTE wants to concentrate on the Nordic countries.

Interdependencies are getting increasingly important in real business life, due to outsourcing and increasing specialization, and how managers cope has implications (as the DANT-TTE illustration suggests). Interdependencies are one of the key empirical phenomena in IMP. The concept of ‘interdependency’ is core to explaining why the business landscape looks as it does. Such interdependencies can be exemplified by build-to-order production, just-in-time deliveries, collaborative research development and other types of adaptations across company boundaries.

The definition of ‘interdependence’ in Webster’s Dictionary is simply ‘reciprocal dependence’. Dependence is said to be about “mutual connection; a state of relying on another for support or existence; a state of being subject to the operation of any other cause”. The definitions in Oxford’s Advanced Dictionary are similar. They indicate dependence as “being supported by others; the state of being determined or conditioned; reliance” but also “confident trust”. Interdependence in turn is about depending on each other.

At the level of the individual firm, interdependence has been used frequently to characterize organizational conditions. For example, Pfeffer & Salancik (1978) concluded; “interdependence exists when one actor does not entirely control all of the conditions necessary for the achievement of an action or for obtaining the outcome desired from the action”. This hints at two diverging perceptions, illustrating the Janus faced features of interdependencies. On the one hand, “interdependence can create problems of uncertainty and predictability”. On the other hand, “how organizations to solve their problems of uncertainty regarding outcomes are likely to be led to increase their interdependence.”

The aim of this chapter is to analyze the double-sided features of interdependence and attempt to bring further the conceptualization of interdependency. The chapter proceeds as follows. In section two, we provide a brief historical overview of IMP research on interdependence. This is followed by three sections where interdependence is analyzed in relation to the activity, resource and actor layers of the ARA model (Håkansson and Snehota, 1995). Our problematization here is that, from our reading, interdependency looks different
in the three layers. For the discussion of interdependencies in the activity layer, we use the term ‘integration’. For the resource layer, the relevant term is ‘interfaces’, and for the actor layer, ‘involvement’. The final sections of the chapter integrate the separate ‘layer’ discussions into a coherent view of interdependencies in relationships and networks based on these ‘3Is’. We posit that the activity and resource layers are where we can see the consequences of how actors have involved themselves in creating interdependencies.

### 2.0 IMP and interdependencies

Interdependence is a central phenomenon in IMP research. Since the business landscape is full of interdependencies, studies of relationships and networks are always ingrained with the prerequisites and consequences of this phenomenon. Therefore, it is impossible to provide a comprehensive review of IMP research on interdependencies. In this section we trace the role of interdependence in three central IMP publications: Håkansson (1982); Håkansson and Snehota (1995); Håkansson et al. (2009). Since these publications cover a time-period of almost 30 years they illustrate the dynamics in the way in which the concept has been both understood and applied in IMP research.

In Håkansson (1982), there is no strong attention to interdependence. In the review of related literature, it was claimed that mainstream research tended to see an organization as dependent on its environment in “obtaining access to certain inputs” (p. 41). In the book, when interdependencies are discussed, they seem to represent some ‘general’ types of connections, e.g. between individuals. However, in the final paragraph of the book the authors conclude in the following way:

> One very important idea in our study is that interdependencies between companies are very common in terms of, for example, the development of long-lasting relationships. This interdependence is due to mutual adaptations in technical, organizational, or knowledge dimensions

(Håkansson, 1982, p. 394)

This conclusion is somewhat surprising since interdependence was not visible in the framing of the study and therefore also more or less unnoticed in the case presentations and discussions. Being outsiders, our interpretation is that interdependence appeared as a
significant empirical phenomenon in the first IMP project. It was not part of the conceptualization, but evolved from the experience gained in the collection of deep-probing case studies.

This results in a quite different starting point in the second IMP project. In one of the books reporting the study (Håkansson and Snehota, 1995), “interdependencies and connections in business relationships” constitute a key building block. Interdependence is used primarily as a means of representing ‘connectedness’ in networks. Connectedness becomes significant “when we consider the numerous interdependencies against the background of which business activity takes place” (p. 12). These interdependencies relate to technology, knowledge, social relations, administrative systems, and legal ties. Interdependencies can be exploited “in order to reach effective solutions in a certain relationship by connecting it to some other relationships” (p. 16).

Interdependencies are particularly evident in the chapter dealing with activities and activity links. Here they are discussed primarily in relation to economic performance. Through its business relationships, the activities of a company “are embedded in a broader activity pattern that lays the ground for what a company can do and how it can relate to others” (p. 51). The features of such relating are highly significant for the economic performance of the company. The authors conclude; “the impact of activity interdependencies on the economic outcome of a company can hardly be overrated” (p. 51).

In the third publication, Håkansson et al. (2009), the increasing significance of interdependencies is further reinforced. On the first page of the book it is claimed that “a basic feature of the business landscape is the intricate interdependence between the companies”. Again, interdependence is related mainly to the activity layer. The authors derive a model of interaction in networks involving two central features for each network layer. In this model interdependence is the concept applied for analysis of business interaction in the ‘space’ dimension of activity patterns. The authors conclude that interdependencies are unavoidable consequences of adaptations and business relationships featuring high involvement. They subscribe to the view of the double-faced nature of interdependencies by arguing that interdependencies simultaneously empower and constrain the individual firm. Therefore, it is claimed that building, exploiting and maintaining interdependencies are key managerial aspects.
The understanding of interdependencies as reflected in the three books clearly shows increasing consideration of the relevance of the empirical phenomenon. In these books the main attention has been paid to the prerequisites and consequences in relation to the activity layer. However, considering the ARA model and the interplay between its three layers, it is obvious that activity interdependencies also are reflected in the two other layers since activities are conducted by actors and undertaken through exploitation of resources. Below we discuss the role of interdependencies in each of the three network layers, starting with activities.

3.0 Interdependence and integration of activities

Interdependencies in the activity layer have their origin in the ways that activities are related. As discussed in the previous section this relatedness among activities is central with regard to operational efficiency and economic performance. Key issues in this relatedness regard the direct interdependence between two activities, as well as indirect interdependencies in relation to other activities in the entire pattern of activities. From a network perspective, the relevant unit for analysis of such interdependencies is an activity configuration (Håkansson et al., 2009). An activity configuration involves all activities undertaken in the creation of a particular product or service delivered to a customer. Any configuration is characterized by numerous activities featuring complex interdependencies. Efficient performance in such arrangements requires various forms of integration of the activities. They need to be integrated in the space dimension owing to interdependencies separated by organizational boundaries and geographical distance. Moreover, activities require integration in the time dimension since complex interdependencies may occur with regard to the various stages in a production process, where activities need to be conducted in predetermined order and sometimes adjusted in relation to one another.

Even before the first IMP project, these issues were central to researchers later recognized as belonging to the IMP community. One example is that Mattsson (1969) analyzed the relationship between integration and efficiency in marketing systems. The main attention was directed to distribution arrangements where he found “that interdependence between activities is the rule rather than the exception” (p. 26). Building on March and Simon (1958) he claimed that integration of activities is required owing to interdependencies related to (i)
the existence of common resources, and (ii) the attributes of technical processes. The first aspect obviously regards integration in space, while the second one – identified as chronological interdependence – relates to the time dimension.

Integration is a means of improving performance and efficiency in order to handle interdependencies in activity configurations. At the same time, however, activity integration is resource-demanding and costly and tends to lead to increasing interdependencies in other dimensions. A main conclusion in Mattsson (1969) is that the greater the interdependence is, the greater the need for integration.

The increasing attention to activity interdependence observed in Håkansson and Snehota (1995) seems clearly related to research presented in Dubois (1994). One of the cases in this dissertation was included in the book to illustrate activity interdependencies. The content of the dissertation was further developed and published in a book (Dubois, 1998). The aim of the underlying study was to develop a framework for analysis of activity structures and changes in the division of labour between a buying firm and its suppliers. This framework was based on the ARA model supplemented with two concepts provided by Richardson (1972). First, ‘complementary activities’ are those that have to be undertaken in a specific order because they are serially interdependent (or chronological in the terminology of Mattsson, 1969). Second, ‘similar activities’ are those that “require the same capability for their undertaking”. In other words, they rely on the same resource, which is defined as parallel interdependence.

Dubois (1998) used similarity and complementarity for analysis of the efficiency and effectiveness of various forms of division of labour. She concluded that the way in which interdependent activities are connected encompasses two related dimensions of significance for economic performance. The first one regards the connections among similar and parallel activities involved in a configuration resulting in a specific output, for example the manufacturing of a car, or the provision of a logistics service. The second dimension regards potential connections between activities involved in different configurations in the activity pattern.

The framing developed by Dubois was later extended by Hulthén (2002) and Hulthén and Gadde (2007). In these publications, dealing with distribution networks in the PC industry,
the transvection concept presented in Alderson (1957) was used for the conceptualization of the activity configuration behind a PC. A transvection involves the activities required to transform basic resources to an offering landed in the hands of an end-user. Transvections were applied in the description and analysis of serial interdependencies in alternative activity configurations for PCs. Parallel interdependencies were explored through the concept of ‘crossing-points’, defined as resources where several transvections intersect. In these sorting points, economies of scale can be generated through exploitation of similarities.

Interdependence is a significant feature also in other research streams, particularly within supply chain management (SCM). IMP researchers have made several contributions to this research area illustrated here by two examples. Dubois et al. (2003) explored interdependencies within and among supply chains. In order to strengthen the theoretical underpinning of supply chain management, the authors applied the three types of interdependence identified in Thompson (1967): sequential, pooled and reciprocal. The two first types are closely related to complementarity and similarity as defined in Richardson (1972). Analysis of reciprocal interdependence shifts the perspective from Thomson’s intran-organizational view to include inter-organizational conditions. The authors claim that the SCM-literature is focused on the interdependencies prevailing within a specific chain, “while interdependencies among supply chains has only been touched upon occasionally” (p. 8). By taking across-chain interdependencies into consideration the authors challenge some of the typical recommendations offered in the SCM literature.

In a similar vein, Håkansson and Persson (2004) argue that although the SCM-concept has created management attention around interorganizational issues related to serial interdependencies, little emphasis has been directed to other forms. Also these authors rely on Thompsons’ concepts in refining the SCM-view on interdependencies. The traditional SCM-approach encourages economies of integration through solutions supporting integration of serially related interdependencies. In addition, the authors show how economies of scale and scope can be pursued through arrangements promoting standardization, similarity and specialization when pooled interdependencies are to hand. Finally, economies of innovation may be exploited through collaboration and learning in situations where reciprocal interdependencies occur, because the output of one activity represents the input to the other, and vice versa.
As shown above, IMP’s main attention to interdependencies has been directed towards the activity layer. The research interest has focused on efficiency and effectiveness in various types of activity configurations and how integration and adjustments may impact on performance. From our perspective there seems to be two reasons why IMP researchers emphasized interdependencies in the activity layer. Firstly, interdependencies among activities are visible for direct observation. Such examples include production activities adapted to the requirements of individual business partners, as well as integration of logistics activities, often through joint investments in information technology. In this way, activity interdependencies are empirically visible and available for research.

Secondly, as shown above, theories and concepts appropriate for analysis of activity interdependencies had evolved within other streams of research. The models developed by Thompson (1967), Richardson, (1972) and Alderson (1957) could be applied for network analysis after minor adjustments. As will be shown below, the situation was different regarding the resource and actor layers. For analysis of interdependencies in these contexts, models and concepts had to be derived by IMP researchers.

**4.0 Interdependence and resource interfaces**

If “resources are at the heart of interdependence” (Ford and Håkansson, 2006, see also Mattson, 1975), we can also consider interdependencies from a resource perspective. Interdependencies in the resource layer are centred upon how resources are related. This relatedness centres upon the utilization of resources in order to generate value for both user and supplier (Håkansson and Snehota, 1995). In the discussion of resource interdependencies in this chapter, we will use the concept of *resource interfaces*. That is, the resource per se is not the source of interdependencies, but rather the interfaces of that resource with other resources (Penrose, 1959; Håkansson and Snehota, 1995; Håkansson and Waluszewski, 2002a, b). In other words, the value of a resource depends upon how it is combined with other resources via resource interfaces. Resource interfaces underpinning interdependencies are considered using a *resource interface analysis*.

The initial conceptualisation of interdependencies from a resource perspective mirrors the developments in the ‘activity layer’. The ARA model (Håkansson and Snehota, 1995) discusses resources as embedded in activities that are utilised by actors. Managers need to be
aware of the connections across resources within and across organisational boundaries. That is, the connections with the organisation’s resource collection, connections referred to as resource ties between resources owned by two organisations, and the whole set of resources, bundled together as a resource constellation, when considering resources at the network level.

One issue with the ARA model is that the analysis of the ‘resource layer’ becomes rather general and descriptive. The later so-called “4R” or “4 resource interaction” model (Wedin, 2001; Håkansson and Waluszewski, 2002a, b) provides a way to think more analytically about resources, or more specifically, resource interaction, at the network level. In this more fine-grained analysis it is resources that are central for considering interdependencies, not a dyad or relationship. Resource interdependencies can then be analysed in terms of networks of different types of resources, meshed together by the nature of the resource interfaces involved (Baraldi, Gressetvold and Harrison, 2012a, b). The model provides a structural mapping of how a resource is connected or perhaps interfaced with other resources of various types, and to what extent, and what the potential for change is. It therefore allows for the analysis of the dynamics of interdependencies (while activities are analysed more in static terms).

The starting point of an analysis, the focal resource, acts as the ‘centre’ of a representation or image of the direct interfaces (direct interdependencies) and indirect interfaces (indirect interdependencies) between that focal resource and other resources. In the 4R model, resources are classified as products, facilities (technical resources), organisational units and business relationships (social resources) (Håkansson and Waluszewski, 2002a, b). The choice of the focal resource, e.g. a focal facility such as a sea port, depends on the specific research issue of interest (see Jahre et al, 2006, for a detailed description of how to conduct an analysis).

This classification into resource types is only the first step; it is the interfaces across resources that are central. Resource interfaces are connections or linkages or couplings (Håkansson and Waluszewski, 2002a, Jahre et al, 2006; Dubois and Araujo, 2006). Therefore, they become ways of viewing interdependencies, but not between actors, but between and across resources. Resource interfaces can occur both across resources of the same ‘type’ and across resources of different ‘types’. Resource interfaces can be of two main types: pure (e.g. between two facilities) and mixed (e.g. between a facility and a business unit). Interfac-
es can be considered in terms of their depth and heaviness, which is an indication of the extent of resource interdependencies.

The identification of the resource types, the choice of a focal resource, and the analysis of the nature of the relevant interfaces, results in an image of resource interdependencies at a particular time period. Of course, multiple representations can be produced in order to try and compare what has changed and how (Jahre et al, 2006) or to gain an understanding of the dynamics involved.

Such representations facilitate attempts at managing existing resource interdependencies. It is a starting point in terms of considering the creation of new interdependencies, either by accident or design, in terms of altering resource interfaces. The change potential of resource interfaces (e.g. weakening, strengthening, creating or breaking interfaces) requires us to consider resource friction and variety (Håkansson and Waluszewski, 2002b). Attempts to change interdependencies in a particular way or create new interdependencies, can therefore present challenges. It is related to (i) images of potential connections or interdependency possibilities (the so-called ‘image layer’ of resources), (ii) repeated clashes between images of the activated structure and the reality of the activated structure (the so-called ‘activated layer’), and (iii) the nature of the existing interdependencies between directly (and indirectly) connected resources (Håkansson and Waluszewski, 2002a, 2013).

The 4R model is therefore not only an(other) classification of resource types (there are several of these in the management literature, e.g. resource based view). It also, unusually, provides a classification of resource interdependency types: the model allows for an analysis of resource bundles, constellations or networks, in terms of the interfaces connecting those multiple resources (Baraldi et al, 2012a, b). The resource interfaces are directed towards particular resources which are in turn embedded within particular relationships (Snehota, 2014). We can address both how resources do interact to form and replicate interdependencies both within and across organisational boundaries, and how resources could interact in terms of creating interdependencies. It is an analysis of resource heterogeneity in reality. Existing resource interfaces require adaptations in order to be maintained, be subject to day-to-day change and be the basis of attempts to create new interdependencies (Snehota, 2014; Alenius, Lind and Strömsten, 2015). The latter requires interplay between the image and activated layers.
5.0 Interdependencies and actor involvement

In the actor layer interdependencies have other features than in two other layers and appear for two reasons. Firstly, interdependencies in the activity and resource layers do not evolve spontaneously. Rather they result from the ambitions and efforts of actors to improve the efficiency of activities and the utilization of resources. In turn, these efforts impose other interdependencies. Secondly, the way these interdependencies are handled is contingent on the way actors are related which represents a second source of interdependence.

Actors relate through their interaction in business relationships. One significant feature of a business relationship is the level of involvement between the two actors (Gadde and Snehota, 2000). High involvement relationships feature massive connections between the two parties with regard to activity links, resource ties and actor bonds, while low involvement relationships lack some of these connections. Besides this direct involvement between the parties in the dyad, actors are affected also by indirect relatedness to other actors. This is because the individual relationship is embedded in other relationships in the web of actors. In this section, we begin by discussing significant features regarding involvement in a relationship and continue with aspects related to the ways individual relationships are embedded in the web of actors.

Within the ARA model, an actor is defined through its connections to other actors. The autonomy of the actor is limited as the actor is depending on other actors’ actions. The interdependencies in the actor layer arise from these conditions. As actors are not independent and self-contained, but are embedded and interdependent, relating with other actors become an issue of pivotal importance. Håkansson et al. (2009; 139) has described actors’ embeddedness and interdependencies as a matter of “how and to whom an actor becomes related have important consequences for how it is seen, how it can behave, what it can accomplish and how it can and will develop”. Coping with independencies at the actor level is a matter of understanding how the choices made impact on resources and activities.

Interaction is the basic process in the actor layer and the level of involvement is shaped in this process. Through interaction, resource ties and activity links are created, subsequently shaping bonds between the actors. Relationships are initiated when the actors have evaluated the attractiveness of the business partners. Attractiveness is evaluated in terms of (i) the
potential value residing in the other actor, and (ii) the expectations regarding the relationship that can be shaped. Potential value can be, for example, greater revenues, utilisation of capacity and technology, as well as new innovative ideas (Wilkinson & Young 2005). However, the opportunity to take advantage of the potential outcomes through a relationship depends on the possibility to build up a productive relationship with the potential partner. Both actors will make evaluations of the potential value and the other party’s ability to enhance performance through relationship building.

Decisions about relationship formation are not taken in isolation. The selection of a business partner is not a one-sided affair but builds on a double-choice of choosing and being chosen (Wilkinson et al. 2005). Suppliers search for customers and customers search for resource providers. Searching is an onerous action and an intriguing process where actors evaluate one another. The two potential partners may evaluate the attractiveness differently and on this basis perceive the potential outcome and relationship differently. Therefore actors may have different perceptions and interests in getting involved with each other and must thus be mobilised in one way or another.

The characteristics of the actor are pivotal elements in the interaction in which resource ties and activity links are formed. What an actor wants to achieve conditions what other actors get involved in the interaction processes. Knowledge about resources and their adaptations and activities and their adjustments determine what actors are employed and made use of in particular projects. The other actors involved enable and constrain what an individual actor can do. At the same time, what actors do forms the identity of the actor and its potential role as perceived by others. Relating to others in formal and informal agreements means that actors consent to some kind of mutual orientation and identification in connection to each other. Being in a relationship “entails interdependence, a more or less vague expectation of certain outcomes from reciprocal interaction” (Håkansson & Snehota 1995; 197). In order to be perceived an interesting partner, an actor must offer distinct possibilities in the eyes of others. Being perceived as a provider of distinctive possibilities will enable an actor to play a certain role in connection to those others. Depending on the specific context, different characteristics will be subscribed to the identity or role of the actor.

The interaction process between two actors is affected by the relationship atmosphere (Håkansson, 1982; Hallén and Sandström, 1991). This atmosphere involves various features.
Some of them can be identified as ‘collaborative’ and thus impacting positively on the interaction. Numerous studies have explored how trust and commitment affect the outcome of relationships. Other concepts are more focused on aspects related to potential confrontation between the parties. One of these concepts is power, which is directly related to one party’s dependence on the other. Power is supposed to provide the less dependent party with opportunities to direct the behaviour of the other. Another concept is conflict, which traditionally was seen as something that should be avoided. However, as will be shown in section 6, both these interpretations and the associated links to interdependence need to be revised in an interactive view of the business landscape.

This far we have dealt with the involvement and relatedness between two actors in a relationship and the interdependencies imposed. In turn, this relationship is embedded in other relationships. This multiplies the interdependencies since there are various kinds of connections to other relationships. Connections with suppliers, customers, public organizations, consulting agencies and several others are established, developed, exited and re-activated over time. In this way, actors attempt to handle the interdependencies in which they are involved. In these dynamic processes, the individual actor strives to improve the efficiency of activities and utilization of resources. The outcome of these ambitions is dependent on the actor’s abilities to handle prevailing interdependencies. These abilities in turn are to a large extent contingent on the involvement with other actors and the interaction with these business partners. The actor is shaped through its interaction and involvement with other actors and so are the possibilities of taking advantage of the opportunities residing in extended resources ties and activity links.

However, increasing the involvement in a relationship brings new interdependencies for actors. To assess the potential outcome of increasing resource ties and activity links will be difficult to envision upfront as relationships emerge over time. The effect for the counterparts will also be different and be seen as more or less advantageous by one party than by another. Applying meaning to constantly evolving resource combinations, activity links and actor bonds is an intriguing process that will imply that actors will modify their involvement over time. Therefore, actors may be highly involved in a relationship at one point in time and less involved at another point in time. Perceptions and interpretations of power balances, cooperative behaviours and what it means to be close, will therefore also differ accordingly. Actors engage in relationships to cope better, but this creates interdependencies and over time
inflicts on how they perceive themselves and their surroundings. In this sense, interdependencies are continuously enacted in the actor layer.

6.0 Discussion

In the three previous sections, we dealt with interdependencies in each of three network layers. Here we attempt to provide a view of the interplay among the three since in both the model world and in business reality they do not appear separately. We have identified the interfaces in terms of what we refer to as “three Is”: integration of activities, interfaces among resources and involvement between actors.

The interplay between the integration of activities and the interfaces among resources determines the efficiency in the activity layer and the utilization of resources. One aspect of this interplay is that increasing activity integration in terms of just-in-time systems puts more emphasis on well-functioning resource interfaces than do supply systems based on warehousing and storage. Another illustration is that enhanced similarity of activities improves the utilization of resources since this approach provides benefits in terms of economies of scale (although there is a tension here in terms of constraining the opportunities for customized activity configurations in specific relationships). This implies that managers who try to improve business conditions by changing interdependencies in the activity layer have to take the potential impact on the resource layer into consideration, and vice versa.

The interplay between interdependencies in the activity layer and the actor layer affects, and is affected by, the division of labour and the relationships in the network. For example, one actor may prefer to extend its integration of activities beyond its ownership boundary in order to handle interdependencies. Such ambitions may be achieved through insourcing of these activities, which affects the business partner previously involved in these activities negatively. Another option would be to extend the opportunities for integration through increasing involvement with this business partner, which also affects prevailing interdependencies. In a similar vein, by outsourcing activities an actor may be able to reduce internal interdependencies, but then be impacted by the increasing interdependencies in relation to the new business partner.
The interplay between interdependencies regarding resource interfaces and actor involvement put issues related to control to the fore. For example, a customer might see opportunities for improvements through modification of the resource interfaces in the input provided by a supplier. Depending on the involvement between the two actors, the supplier may be more or less willing to undertake these changes in the resource interface. If they are involved only to a low extent, the supplier might be reluctant to do this. On the other hand, in a high involvement relationship, the supplier normally has an indirect control of these resources accessed through the supplier. However, even when these conditions are to hand it might be difficult for the customer to affect the supplier to change the resource interfaces. The supplier is patterned also by interdependencies to other actors in the network. In this way, adaptation of resource interfaces to the requirements from a specific customer might constrain the opportunities for exchange with other business partners.

We stated earlier in the chapter that the integration of activities and interfaces among resources do not evolve spontaneously. The interdependencies generated in these layers are the outcome of actions performed by actors. However, these interdependencies do not arise because managers prefer integration of activities and connected interfaces among resources per se. These features are consequences of managerial ambitions to improve performance in one way or another. Such improvements may regard, for example, more efficient and sustainable supply chains, increasing economies of operations and enhanced innovation through collaborative product development. The exploration of the interplay among the “three Is” provide some implications related to these managerial ambitions. We discuss these implications in relation to the relationship atmosphere and the control ambitions of firms.

In the section dealing with the actor layer, we argued that the relationship atmosphere may be featured by both collaboration and confrontation owing to the prevailing interdependencies. Actors expressing strong control ambitions regarding integration of activities and interfaces of resources may find themselves involved in interaction in a relationship atmosphere primarily featuring confrontation. Tensions in relation to the business partner may escalate to dysfunctional conflict. These conditions typically pertain to situations where an actor exploits a powerful position attained through the business partner’s perceived dependency. It is unlikely that such relationships may be useful for handling interdependencies in the activity and resource layer.
In collaborative relationships, on the other hand, each firm avoids being too control oriented in relation to the business partner. In addition, the actors deliberately provide the other party with some control of their own operations, thus leading to increasing interdependence between the actors (Snehota, 2014). They do so because such relationship conditions provide opportunities for handling interdependencies in the activity and resource layers. In this relationship atmosphere, conflict cannot become dysfunctional since both parties have made considerable investments in the relationship. In such relationships, conflict may be a source of innovation when the two parties have to solve the issues underlying the tensions.

Complex interplays across the interdependencies in the network must be handled. Management need to decide how to relate to changing conditions resulting from the dynamics featuring the interactive business world. Numerous modifications occur simultaneously in terms of actors entering and exiting the network and changing the nature of their involvement. Technological development provides new opportunities for integration of activities and interfaces between resources. All the time actors need to be updated on the characteristics of these dynamics, anticipate their consequences and take actions accordingly. In these efforts, managers rely on their network pictures (Håkansson et al., 2009). Network pictures represent the individual manager’s perception of the features of the network in terms of its activity, resource and actor layers. Since network pictures are individually shaped, it is problematic for a firm to come to an agreement regarding the best way to deal with the complexities and interdependencies arising in the interactive business world. It goes (almost) without saying that these complexities multiply when inter-organizational conditions require interpretation.

Networks provide both the basis for competitive advantages and limitations for the individual company. Although, networks are more than the losses and gains of the individual companies as networks provide possibilities for combining resources and activities across a number of companies. Thus relationships and networks are crucial for a company’s performance as companies evolve with and through others. Much of the strategic thinking about what the strategic situation of a company is, what the company should aim for and how the company should achieve its aims holds an isolated understanding of the company as an island (Håkansson & Snehota 1989). Being in relationships and networks extends the possibilities for performing better for the individual company. In order to achieve better outcomes companies interconnects in a number of ways. Thus better performance of an individual firm
comes at a cost as interdependencies are created through adjustments and mutual
development of resources and activities and alignment of strategic thinking of the actors.
Strategic thinking about a company’s development and performance will therefore go beyond
a narrow focus of a focal company and its aims. Instead strategic thinking about achieving a
company aims encapsulates relationships and networks.

Relationships and networks create a starting point for coping with different challenges. A
network will have wider possibilities for handling complex and dynamic changes in the
environment than an individual company. Within the network different actors will hold
different competences and different actors will have specialized in handling particular tasks.
Although, the capabilities for handling different tasks will be based on earlier experiences
and the division of work among the actors in the network. Actors will attempt to envision
future developments, but earlier experiences and adjustments made will limit the actor’s
possibilities for coping with change. In this sense, path dependencies are a contingency for
coping as a company, within a relationship and as a network. Although a company may strive
for change in order to cope better in the future.

A company’s possibility to change depends on the position of the company within the
network. The different kind of dependencies that exists provides possibilities and limitations
for acting. However this also implies that strategic thinking about a company’s situation, its
aim and how aims should be achieved explicitly encompasses different relationships and
networks and its abilities to envision and cope with change.

In other words being embedded in a network constitutes interdependencies across the
network that in it self directs the networks possibility to evolve. Within the network different
actors will strive to influence other actors through their participation in different interactive
processes.

Interactive processes hold many facets as resource combinations and activity links can be
shaped in numerous ways. Individual companies will have learnt a certain repertoire in
handling resources and activities. Joining forces with other companies opens new possibilities
for resource recombination and activity configurations. Developing new solutions through
recombination of resources and activity configuration can lead to development of new and
competitive solutions. To create such new innovative solutions mutual adjustments and
specialization will often be necessary. The involved companies will allocate and adapt their
resources and activities accordingly. This may make perfectly sense in the given situation, as
it will not only provide potential for better solutions but eventually also improve the competitive performance of the individual company. Although choices made will also create new interdependencies and hamper possibilities to develop other solutions now or in the future. Interdependencies are created on an on-going basis as resources are recombined all the time, activities are re-configured and new understandings or pictures of networks emerge. Therefore interdependencies are inescapable as soon as companies start to act collaboratively.

Combining resources, crating activity links and accomplishing alignment among actors is undertaken to improvement performance of the involved companies. Interaction potentially also can create tension as aims and requirements for development of new solutions are not known up front. Different kinds of tensions can emerge as actors may have different aims or envision the situation of the network more or less differently. Although, tensions will relate to integration tasks such as combing, linking and aligning. These tasks are an essential part of an evolution process where actors co-evolve. Actors doesn’t necessarily agree how to develop within relationships and networks or as Håkansson et all (2009, p. 210) state it; “Aspirations for resources control and other strategic objectives of actors evolve”. Actions and outcomes will be interpreted differently depending on the position in the network. Although, the actors’ interests will be the driving force behind particular aims. Aims can be perceived as more or less about achieving self or collective interests. Therefor direct and indirect confrontations among actors can emerge. In particular when companies perceive other companies actions are driven by self-interests tension can be enhanced. When for example adjustments in relationships can be seen as one-sided and creating stronger interdependencies companies can through different means try to avoid to have to give in(Ritter & Ford 2004). Overall tensions in relationships and networks will often relate to existing and potential interdependencies. Handling of interdependencies includes confronting and conforming depending on network position and interests. Being very confrontational can be seen as a sign of a one-sided attempt to achieve self-interest. Understanding the nature of interdependencies is in this sense also is a part of process where companies are balancing interdependencies against collective and self interest.

In sum, managers have to cope with the ongoing interplay between the reality of existing interdependences and creating new interdependencies over time. This is the case for both the
A single dyadic relationship, and across multiple relationships, or the network level. A dynamic perspective in coping with interdependence suggest that the state of interdependencies at time period $x$ is the output of behaviours in relationships prior to this. For example, in more or less deliberate attempts to alter or change resource-activity connections on the part of the actors involved, this current state of interdependencies has consequences for creating new interdependencies or changing the current ones. It will of course be arduous to envision what interdependencies that will evolve within and across networks in advance. Managers will face challenges in reconciling and managing conflicts across attempts at changing interdependencies within existing relationships, and in embedding new interdependencies that result from new relationships. Lastly, as should be clear from the sections above, the interdependencies between two (or more) actors are not generic. Instead, they are specific, and the three ARA layers puts the content of this specificity centre stage.

7.0 Concluding discussion
Our exploration of interdependencies clearly indicates the existence of a complex network phenomenon. Interdependencies are in play within all three of the network layers. They are related to various prerequisites, occurrences and consequences throughout their interplay. Handling these interdependencies is a significant issue for management. This was clearly illustrated in the sections dealing with the interplay among the three Is, the subsequent need for coping and creating, and the double-sided features where interdependencies functions both as problems and opportunities.

The above findings provide particular conditions for theory development and research methodology. With regard to theory development the conclusion of our exposé is that interdependence is a highly significant phenomenon in the interactive business world. Historically, dependence on individual business partners was perceived a problem since such conditions were assumed to constrain the rational behavior of firms. Over time these perceptions have been modified since increasing specialization made it necessary for a firm to become dependent on the resources and capabilities of its business partners.

In a context of increased specialization, interdependence is the relevant feature to consider. This means that established principles for analysis of negative consequences of dependence need to be supplemented with analyses of positive consequences of interdependencies.
Although companies experience constraints through the existence of interdependencies, these same conditions provide substantial opportunities. For example, they underpin coping with change, joint learning and access to technology and other resources. In this chapter, we have discussed interdependencies related to the three network layers. Enhanced understanding of the consequences of interdependencies could be gained through research focusing on interdependencies between relationships and at the overall network level.

In relation to research methodology we subscribe to the conclusion by Håkansson and Waluszewski (2016): methodology needs to be an integrated part of the research handicraft by being a consequence of the “research problem and theoretical point of departure” (p.1).

Further examining of interdependencies thus needs to take the interplay between theory, method and phenomenon into account. Deep-probing and rich case studies are required for exploration of the phenomena featuring complex interdependencies. In order to come up with novel theories such studies should avoid being too strongly corroborated by mainstream conceptualizations.

A particular methodological requirement is imposed by the fact that interdependencies often cross the boundaries of firms. As discussed in section 6, the perceptions of representatives of one and the same firm may differ considerably with regard to their network pictures related to interdependencies. These conditions cascade in research on network interdependencies since the network pictures of various respondents are contingent on their specific network situations, their perceptions of this reality, and the logics they apply in their analyses of the interactive business world.
Bibliography


