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ABSTRACT

Interactive processes constitute a core notion in business exchange, leading to the concepts of relationships and networks. The constitution of process, comprising unfolding events, activities, and connected structures, relies on difference in space and time. While research has been devoted to time, the concept of space has thus far remained largely unexplored within business network research.

This conceptual paper focuses on spatial dimensions for conducting research according to the IMP business network approach. Business actors create connected relationships and networks that exist and change as continuous emerging spatial structures and as mental maps in the managerial mindset. These relational network processes and structures are located, distributed and experienced in and across space. Drawing on economic geography and conceptual frameworks from the business network approach, we propose new dimensions and conceptualizations of space for the study of these networks. The paper delivers proposals to extend our current understanding of business networks as emerging and changing spatio-temporal entities with implications for theory development, research and practice.

> *"A network approach requires identifying actors in networks, their ongoing relations and the structural outcome of these relations. Networks therefore become the foundational unit of analysis for the understanding of the global economy, rather than individuals, firms or nation states" (Dicken, Kelly, Olds, & Yeung, 2001).*

1. Introduction

Business relationships and networks constitute an avenue of research both within industrial marketing and in the current research on economic geography. Interaction between firms is a key process through which companies relate their activities and resources to each other, forming networks of interconnected business relationships. The Industrial Marketing & Purchasing Group (IMP) of researchers has been developing the interaction and network approach in business marketing since the late 1970s (Ford, 2001; Ford, Gadde, Håkansson, & Snehota, 2003; Håkansson, 1982; Håkansson, Ford, Gadde, Snehota, & Waluszewski, 2009; Håkansson & Snehota, 1995). In this tradition, network actors, their activities and joint resources, where time and process and the connected structure occupy an inbuilt and central position, play the key role.

Analyzing some key constructs of the IMP network approach reveals the important but predominantly implicit presence of both time and space in research constructs. A plethora of concepts related to time and process can be found in the central constructs of the tradition, including e.g. *interaction*, *relationships*, *activities*, *processes*, *stability and change*, *episodes*, *events*, *and path dependence* (e.g. Ford, 2001; Håkansson, 1982; Håkansson & Snehota, 1989, 1995; Håkansson et al., 2009). There are also many central concepts that include a spatial dimension, such as *network structure*, *resources*, *actors*, *position*, *links*, *ties*, *embeddedness*, *and network horizon.* All of these concepts exhibit to some degree an inherent temporal or spatial loading. Network links and ties as located and connected entities relate to existing structures in *geographic space*. Companies and their facilities are located in specific places, and resources are combined by various activities through their locations, physically and/or virtually. Social bonds, such as trust and commitment, relate on the other hand to socio-cognitive dimensions existing in the *mental space* between interacting actors.

While space has been identified as an area in need of research (Håkansson et al., 2009; Tidström & Hagberg-Andersson, 2012; Törnroos, 1991a), it has received scant attention as a key conceptual framework within the IMP network approach. Apart from a few recent contributions (e.g. Cantù, 2010; Eklinder-Frick, Eriksson, & Hallén, 2011; Nicholson, Tsagdis, & Brennan, 2013), the concept of space and geography has remained unexplored and is not taken explicitly into

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account within this domain. Yet the notion of space provides a core basis for e.g. resource heterogeneity, embeddedness and the overarching business network structure.

In economic geography, the dimensions of time and space differentiate a business network virtually and geographically as well as socially and culturally (Dicken, 2007; Dicken et al., 2001; Yeung & Coe, 2014). Overcoming spatial and other distances in exchange requires time, and the spatial positioning of actors occurs relative to time and the timing of business actions. To discuss space from this perspective without also considering time seems likely to be unproductive.

Therefore, we find it important in this study to clarify and deepen the concept of space in business network research. We posit that space, like time, should be seen as a multifaceted human dimension of social change (cf. Andersson & Mattsson, 2010b, 61), and that space cannot easily be captured with one or even a few chosen perspectives, concepts, or patterns of thought. This study differentiates between various spatial constructs, and adds to the extant literature by proposing a conceptual model of space pertinent to understanding the development of interactive business networks. The purpose of the model is to enhance and direct research on how space affects and is constructed in a business network.

We draw on conceptual developments and approaches within economic geography to shed light on how spatial concepts can be used as relevant frameworks and perspectives to study interactive networks in business marketing. Other network viewpoints of relevance, e.g. social networks (Granovetter, 1985; Parkhe, Wasserman, & Ralstron, 2006) and strategic networks (Gulati, Nohria, & Zaheer, 2000; Jarillo, 1988), deserve treatments of their own, although the proposed conceptual model might be applicable there, too.

Industrial networks in business markets and economic geography share common ground, though little exploited to date. Nicholson et al. (2013) argue that business network studies and economic geography "… often address similar (arguably identical) research problems, particularly those pertaining to the analysis of regional development networks, but with subtly distinct conceptual armories." However, cross-fertilization between the fields has been largely lacking, with only a few authors working in the overlapping area (see e.g. Cantù, 2010; Törnroos, 1991; Yeung, 1994, 2005). Based on the argued closeness and similarity, the development of a spatial perspective would appear to offer a promising opportunity to advance understanding of business networks.

The structure of the paper is as follows. First, we review the IMP network literature on how space is conceived and studied as part of business interaction and networks. Second, we introduce the viewpoints and conceptual contributions that economic geography can offer the IMP network approach. Third, based on both streams of research, we develop a conceptual model of network space comprising the key spatial dimensions of business networks. Fourth, we deepen the discussion by adding three geospatial concepts: place, location, and distance, and integrating them into the model. Finally, we sum up the conceptual development and discuss its implications for business network research as well as practice.

2. Spatial dimension in IMP business network studies

Business networks are defined as sets of connected exchange relationships where one relationship affects another (Cook & Emerson, 1978). The concept of connection implies the idea of business exchange occurring in and across space and in and through time. Here, the expression of 'in' concerns time and space as an arena or environment for business interaction, whereas 'across' and 'through' suggest the socially constructed forms of time and space, yet importantly including the substantive interactions.

In the IMP approach, networks connect business relationships comprising actor bonds, activity links and resource ties (Håkansson & Snehota, 1995). Business interaction and networks evolve in space, but the notion of space has only recently been proposed as a relevant dimension to be included in IMP network research (see e.g. Håkansson et al., 2009, pp. 38–45). Theoretically, in the IMP network approach space has been conceived through three focal elements: interdependency of activities, heterogeneity of resources, and jointness of business actors (Håkansson et al., 2009, pp. 38–45). Space has been seen as a context for interaction, or as a network structure that positions each actor and their interactions in its connected business landscape.

Space has therefore in some form been, at least implicitly, present in business network studies. In studying internationalization from a network perspective (Fletcher & Barrett, 2001; Fletcher, 2008; Johanson & Mattsson, 1988; Johanson & Vahlne, 2009; Törnroos, 1991), the spatial dimension is by necessity accounted for. In these studies, the spatial dimension is often closely related to country-level issues and recently also to global processes. Also, the concept of distance has played an important role, whether regarded as a physical, cultural, or psychic category (Törnroos, 1991a,b). Studies on regional networks take the proximity of companies and other actors in a specified geographical area as a focal point of departure in examining some focal aspect of business networks, e.g. industry decline (Nicholson et al., 2013), R&D operations (Johanson & Lundberg, 2007), knowledge transformation (Cantù, 2010), social capital (Eklinder-Frick et al., 2011). The central and peripheral locations of suppliers (Kamp, 2007) and local and global origins of investor relations (Chen & Chen, 1998) exemplify network type studies in relation to location. Finally, in strategy research in business networks, sensemaking by managers and the mental dimensions of network space have been pronounced (Henneberg, Naudé, & Mouzas, 2010; Tidström & Hagberg-Andersson, 2012). The concept of network horizon (Holmen & Pedersen, 2003), and the recent growing number of studies around 'network pictures' as cognitive maps, imply the idea of space, i.e. how human managers mentally experience their relational business webs around them (see e.g. Ford & Redwood, 2005; Henneberg, Mouzas, & Naudé, 2006; Laari-Salmela, Mainela, & Puhakka, 2015).

Thus, we conclude that space plays mostly an implicit role in IMP business network research. The topic has occasionally arisen in studies but has never been explicitly discussed or integrated into the development of IMP network theory. In the recent research, the mental–cognitive dimension of space has been strongly highlighted, but other spatial dimensions have barely been addressed. In some concepts (network structure, distance, location) or in some studied contexts (global business, regional networks), space is inherently involved indicating specific and relative positions in a spatial sense. We see these space dimensions as fruitful avenues for further inquiry.

3. Geographical perspectives on space in business networks

Studies of the firm in economic geography, where the focus lies on the spatial organization of business operations, offer an important source of ideas for the conceptualization of space in networks. As the economic geographer Yeung (1998, 109) states, "Network relationships in their *abstract* sense are placeless, although they produce 'networked space'. But the concrete realization of network relations must always be embedded in *place*", and "geography therefore plays a crucial role in influencing the formation of networks" (Yeung, 1998, 116). This idea is supported by economic geographers studying business networks within their field (see e.g. Dicken, 2007; Dicken et al., 2001; Yeung & Coe, 2014; Coe & Yeung, 2015). This is also taken as a point of departure for this study.

Economic geography has traditionally looked closely at how firms locate their activities and what drives and motivates them to seek favorable or 'optimal places'. The classical location theory of v. Thünen, Weber and their followers (see e.g. Isard, 1956; Lloyd & Dicken, 1979; Smith, 1981) employs mainly quantitative methods together with general economic theory where space "… and the world as well as people in it were treated as objects rather than subjects" (Cresswell, 2009, 3).

Research focused on restricted geographical environments and minimizing transport costs by looking at distance in simple production units through the eyes of 'economic man'. Space in these theories deals with physical–natural and relative notions of locations. In the 1970s, Post-Weberian theories began to study the locations of multinationals (Scott, 1988). Thereafter, the disintegration of MNCs and 'spatial division of labor' in conjunction with post-Fordist production systems and regional clusters emerged (Malecki, 1991). Agglomeration and location in cities, embedded ideas of activity and regional dimensions as well as networks of business relationships in spatially connected areas were also noted (Dicken, 2007; Markusen, 1996; Yeung, 1998). Space and location theory also deals with the notion of mentally experienced spaces of economic activity and locational investment (Malecki, 1991).

More recent theory and conceptual development in economic geography offers a relational perspective for spatial analysis (Bathelt & Glückler, 2003; Dicken et al., 2001; Malecki, 1991; Yeung, 1998). The idea of relational space came to the fore in the early 1970s (Harvey, 1973) and was later interpreted as 'the relational turn' in economic geography (see Bathelt & Glückler, 2003; Dicken & Thrift, 1992; Hess, 2004). The relational idea concerns the process of spatial development as an outcome of intra-firm and extra-firm interactive business relationships in the global economy. The foundation of space as a product of these social processes in relational economic geography is proposed to rest on the four so-called 'ions': organization, evolution, innovation, interaction (Storper, 1997; Bathelt & Glückler, 2003; Bathelt, Malmberg, & Maskell, 2004). Business interaction not only produces value, but also creates an organizing network structure that is connected and operates in space. Such a network is constantly emerging through evolution and revolution and often through new innovation processes. Space (in its network constellation) is relationally emerging in the sense that it is a result of decisions and interactions undertaken by human managerial actors.

A relational view on space is a good fit with the business network view of interactive relationships and networking as spatio-temporal emergent processes. From an IMP network approach you could however argue that the four 'ions' miss something essential: the role of strategizing by intentional actors and the need of adaptive mechanisms to deal with unexpected developments.

The idea of relational network space, as we use it here, approaches other network views drawn from economic geography and sociology. However, their perspective on networks may be quite different and their focal interest lies on somewhat other levels and issues. The Network Society view of Castells (1996) and the Global Shift viewpoint by Dicken (2007) take a spatial view of corporate network development, in conjunction with globalization. Economic geographers' Global Production Networks (GPN) approach (Coe & Hess, 2014; Yeung & Coe, 2014; Coe & Yeung, 2015) place their interest mainly on industrial production processes and global change in creating spatial production structures and organizing networking processes. Their approach focuses on three issues. First, the spatial fragmentation of production and consumption globally; second, the ongoing shift of global production networks including a new agency of global labor, and new institutional and territorial networks; and third, a stated need to move beyond traditional production networks and incorporate other actors and dimensions of place in order to account for change processes in global production. The inclusion of the local dimension in this global process is also significant. Both structure and a relational spatial process view prevail in the GPN approach (Coe & Yeung, 2015). The focus of GPN aims to explain the current drivers of global production and its spatial logic where the network organization and structure of leading firms is the primary force. Instead of business market and management research, the GPN approach mostly draws on the macroeconomic literature (for notable exceptions see e.g. Yeung, 2005 and Gress, 2010). GPN also uses the Actor Network Theory, deviating from the IMP network approach.

In sum, the economic geographic dimension of space has thus developed from classic studies on locations, physical dimensions, and distance, towards relational and mental constructs. A dynamic socio-spatial perspective has gained ground in economic geography since the late 1980s, including the idea of 'space being produced' (Harvey, 1973; Lefébvre, 1991). Just as networks are created and differentiated by managers through business relationships, interaction episodes and events, so too is network space produced and differentiated by actor managers. This notion implies that space is necessarily related to the social world and that producing space relates to interplay between the social and the spatial. As Yeung (1998) notes, space is related to social interactions and is "necessarily constructed and reproduced socially" (p. 110). Thus, the spatial element resides in reality, resulting from human interaction, and forms a building block for networking and for producing network(ed) spaces.

4. Space dimensions for the study of business networks

In this section, we propose four space dimensions that are either explicitly or implicitly present both in the IMP network approach and in economic geography. The first three describe different viewpoints for examining specific dimensions of space at a point in time. It is striking that separating out the first three dimensions is only possible when the dynamic sense of a process is removed, whereas the fourth dimension is only apparent within a dynamic perspective. The first three dimensions of space particularly relevant to business network research are:

- *A structural network dimension* that includes the nodes, links, ties and bonds forming a connected network configuration in geographical space.
- *A mental network dimension* that defines the cognitive space in the form of network maps or 'pictures' as perceived by human actors in the network, and
- *A relative network dimension* defined as the comparative and relative positions of corporate actors in the network space where they are embedded.

The inclusion of the fourth dynamic dimension is essentially new to IMP network theory:

- *A relational dimension* that comprises business interactions and strategizing that create new network spaces, altering the former nodes and links, positions and roles between actors over time, and constituting the three aforementioned dimensions of space.

The relational dimension denotes the emerging network creation process where the first three dimensions – structural, mental and relative – become enmeshed and undergo change. It provides a dynamic view on space as socially produced, reproduced and changing.

The concept of space we set out is essentially multidimensional. We are inclined to agree with the human geographer Harvey (1985, p. 228) on conceiving space in a contextualized and flexible way: "The concept of space is in itself multidimensional. … The lesson that should be learned is that there is no need to take a rigid view of the spatial concept itself either for philosophical purposes or for purposes of empirical investigation. … The concept itself may thus be regarded as flexible – to be defined in particular contexts, to be symbolized in particular ways, and to be formalized in a variety of spatial languages." This multidimensionality view calls for a framework that can contain and connect research ideas concerning space. Next, the four dimensions are defined and discussed in the light of the economic geography and IMP business network literatures.

4.1. Structural network space

We treat structural space here as the factual existence of phenomena in space. This type of absolute space, "which is fixed, asocial, and timeless" (Warf, 2010, 2403) depicts a structure in a 'frozen' state.

In the IMP network approach, the concept of space is mostly and implicitly used to refer to the structural configuration of a network at a specific point in time (Håkansson et al., 2009). This structural form enables the examination of the network as an institutional organizational form along with its physical elements (i.e. nodes, links and ties existing in space) at one point only, thus disregarding the dynamic element.

The change in the bonds, links and ties that form the structure occurs through interaction processes, between the actors who look to achieve their goals and respond to events of importance taking place within their networks. This idea of a changing network structure aligns also with a relational notion of time, where interacting parties simultaneously face both the past and future in the emerging present (Halinen & Törnroos, 1995; Dawson, 2013). The structure of the network needs to be analyzed in a frozen state in order to see its constituents existing spatially at different points in time, and in order to make sense of them as dynamic structures.

The notion of the structural network space emphasizes the physical–locational and structural–organizational aspects of spatial connections in networks existing at a specific point in time. In reality, companies strike business deals to exchange goods and services and information across space, and combine and employ various resources in continuous interaction. Companies, factories and offices represent an existing web of actors wherein these connections and flows are enacted between parties. Structural network space exists in the form of location nodes *in space* as well as in form of existing activity links, resource ties and actor bonds, which form the connections, interactions and diverse flows (e.g. information, economic, technological) needed *through space*. Thus, structural space at a specific point in time forms a *spatial network* connecting the nodes through specific interlinked threads.

4.2. Mental network space

The mental approach to network space adopts a humanistic perspective on the issue and describes the cognitive–spatial element of how individual business actors subjectively experience the connected set of relationships surrounding their organization. The focus lies on with how business people make sense of the network and its structure, connectedness, extension, and actors' positions therein. As the mental network space is subjective, the position of actors in the network can also carry the idea of actor power across space.

Cognition and mental mapping have been studied in the IMP network research in the form of schemas or mental models (Welch & Wilkinson, 2002), network horizons as mental network boundaries (Holmen & Pedersen, 2003), and as mental 'network pictures' (Ford & Redwood, 2005; Henneberg et al., 2006). This stream of literature is receiving considerable attention within the business network approach (Colville & Pye, 2010; Geiger & Finch, 2010; Laari-Salmela et al., 2015), but with an emphasis on cognitive aspects and sensemaking by managers. However, the explicit spatial dimensions of the concept, residing in the geographical literature, have largely been left unexplored.

Humanistic geographers have since the late 1960s studied the experiential role of space related to individuals as a distinct research area (Cresswell, 2009). This humanistic approach draws heavily on a phenomenological philosophy of science (Buttimer, 1976; Tuan, 1971, 1976). Humanistic geography relates to *place* as the key spatial concept, which can be seen as a central critique of humanistic geographers towards the quantitative geography dominating at the time (Cresswell, 2009). Sack (1993) notes that place draws together the natural, social and intellectual properties of space. "Integrating these diverse realms is another and combining effect of space and place - one that helps explain the capacious qualities of geography." (Sack, 1993, 328).

Humanistic geographers developed the idea of mental space early on (see Buttimer, 1976; Gould & White, 1986; Tuan, 1971, 1974, 1975), but their contributions have barely been referred to in business network studies. The network picture idea is closely related to mental space and maps, but the geographers focus on feelings and experiences in a humanistic and phenomenological sense. This differs from the more straightforward idea of network pictures as experientially based real life network structures with a specific theoretical content and operationalization (e.g. Henneberg et al., 2006; Ramos & Ford, 2011).

In sum, if we look at mental maps of business actors we are focusing on how they experience, feel and make sense of their network relationships and how they cognitively map the network space as if it were an existing structure of nodes and threads. As Tuan (1975, 209) posits, this is, however, an abstraction of reality and of the networks which in themselves are a human construction. "Mental maps…provide something to think with; they make it easier to focus and reorganize our thoughts. They cannot, however, be read off in the way that a real map can" (Tuan, 1975, 209). Tuan (1975) also tells us that mental maps are mnemonic devices to memorize events, people, and things, and also a means to structure and store knowledge. Thus, time in mental network space is likely to be highly differentiated across actors, with some individuals having highly fluid mental network space conceptualizations and others quite fixed.

4.3. Relative network space

In the economic geography literature, the relative notion of space has a locational aspect, which shows how one place or node in space is related to another. Space being relative, is therefore comprehensible in reference to specific frames of interpretation. Harvey (2006) notes that "Space is relative in the double sense: that there are multiple geometries from which to choose and that the spatial frame depends crucially upon what it is that is being relativized and by whom…" (cited from Warf, 2010, 2403). Thus, who is the actor and with whom and how do they relate to the network are critical issues regarding what is considered relevant in this sense.

Relative space leans conceptually on both structural as well as mental space, but adds the relative dimension and perspective to both. This relative dimension is created from a social sensemaking process between actors.

In a business network setting, relative space describes for instance how an actor is positioned in relation to other actors in the existing network structure (Johanson & Mattsson, 1985), or how a company acts in a role according to other actors' expectations (Anderson, Havila, Andersen, & Halinen, 1998). Embeddedness of business networks within global, regional, and local geographical layers, or different cultural settings (Fletcher & Barrett, 2001; Halinen & Törnroos, 1998), can also be seen as a notion of relative space. The location of a company in a network can be more or less favorable in relation to the company's customers or material suppliers. The relativeness further contains a mental cognitive dimension, i.e. how the position or location of an actor in the network structure is perceived relative to other actors in the network.

In sum, the relative dimension concerns a specific spatial quality of comparisons with other actors in the connected pattern of located nodes. Similarly, it refers to a mental quality of comparisons with other actors. At a specific point in time, the relative positions and links and connections between network actors can be mapped and analyzed. The relativeness lends firms the potential to strategize, to enhance their roles and create positions through their specific locations in the geospatial and mental landscape in a specific situation.

4.4. Relational network space

The concept of relational space notes the human construction composed of the preceding three space dimensions, also bringing in

continuing emergence, as the business network is dynamically evolving in time–space. The idea of relational space refers to social actors interacting in an ongoing emergent way with each other in time and space. Thus, the social and the spatial interact in a continuous *process* of emerging events and activities because there is "…. no such thing as purely spatial processes; there are only particular social processes operating over space" (Massey, 1985 cited in Bathelt & Glückler, 2003, 122).

In economic geography, the relational school of thought notes that "space can neither be used as an explanatory factor for economic action nor be treated as a separate research object in isolation from economic and social structures and relations" (Bathelt & Glückler, 2003, 123). Along these lines, we argue that business actors produce a network space by forming spatial patterns through their relational investments. This relational interactive process may concern e.g. supply activities, new foreign investments in specific locations, or the planning distribution and logistics between actors. These specific activities constitute spatial outcomes, i.e. connected network structures in space, between the actors.

In the IMP network approach, space – conceptualized as a network of relationships – leads to embedded positions of the actors, their resources and activities. The focus is on companies and their relationships (at the micro-level), yet stresses the central idea of connectedness. For firms, a "… consequence of their relative positions in space is that we cannot explain what happens in a single interaction process in isolation from those others with which it is connected" (Håkansson et al., 2009, 93; see also Andersson & Mattsson, 2010a,b). This implies that the key constituents of networks, i.e. actors, activities and resources, are configured as an outcome of social interactions forming a relational network space.

In sum, in business network research the relational spatial dimension has thus far not been brought to the fore. It comes into play when actors interact and relate to each other through their previous investments and in conjunction with the relative structural, geographical and strategic positions in the network. Each actor (individuals, departments, firms) has a structural position in relation to others, who in turn have relative positions connected to other actors. Interaction processes between these actors affect prospective others in the network, either directly or indirectly. Each actor also has a mental perspective on the network that has emerged through social processes and directs strategizing. Time and change are inherently present in relational network space, as compared to the structural, mental or relative network spaces, which show themselves in a specific way as an outcome of socio-spatial processes. The network notion connects the temporal processes (Medlin, 2004) and linkages with the spatial network (Ford & Håkansson, 2006a,b). Analyzing network change through the dimension of relational network space reveals the specific structure, mental perspective and relative notions of network space.

5. Building a model of Network Space

Fig. 1 integrates the proposed dimensions into a four-dimensional model of *network space*. We consider network space the overarching concept that comprises the four proposed spatial dimensions. Each dimension is qualitatively different, stressing a special angle of space, and thus enables specific research strands for inquiry. We contend, however, that these generic concepts are not mutually exclusive but highly related to each other. The relational dimension of space forms a dynamic process-based view of how interactions and events have a bearing on the spatial outcome of a business network. This central process approach to network space can be related to each of the dimensions displayed in the lower area of Fig. 1.

Network space exists as a specific, differentiated entity and is maintained by the connected network. In the upper part of Fig. 1, relational network space refers to the idea of networks as spatially existing and constantly emerging relational and processual phenomena. In networks, each interactive relationship and the activities involved therein

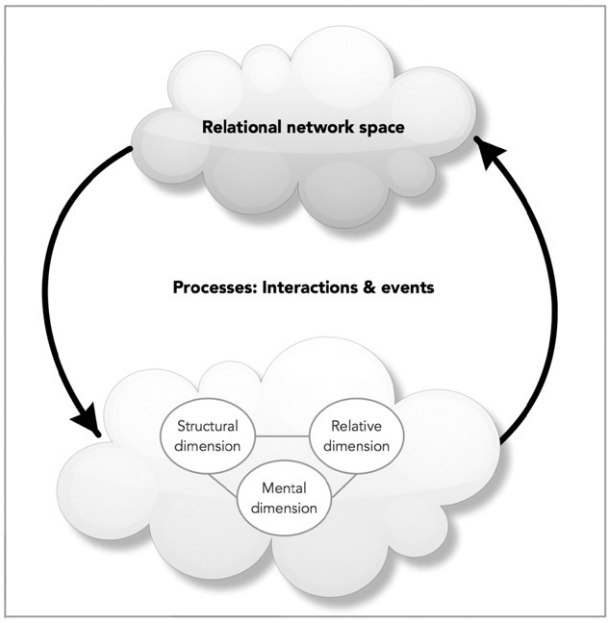

Fig. 1. Spatial model for network space.

only becomes clear in relation to other connected relationships (Håkansson et al., 2009, 93; Andersson & Mattsson, 2010a,b). Thus, interactive processes create a relationally constituted network space, thereby forming a constantly emerging and changing exchange structure. This relational notion of space also accounts for a human perspective on networks and aligns well with the IMP research on 'network pictures' (see e.g. Ford & Redwood, 2005; Henneberg et al., 2006).

Thus, in Fig. 1, interaction processes and events create network structures, mental perceptions and locations in space. The relational space dimension comprises the interplay of interactive social processes between business actors that creates the networks as well as being affected by them when networking and interaction proceed. Pre-existing network space left from past interactions also affects present interactive processes for an emerging future.

Rooted in the economic geography literature and its notions of space, the proposed model is also well aligned with the IMP network thinking. In Table 1, we list and evaluate a number of IMP studies that focus on some of the presented aspects of space. The concepts of the proposed model are used as analytical tools to assess how the spatial dimensions are, via our interpretation, present in the extant research.

In sum, the relational space dimension forms the multidimensional spatial context for change in networks, bringing together the structural, relative, and mental dimensions. The relational dimension rests on the schools of thought in the economic geography literature.

6. Developing spatial notions in business network research

Thus far we have argued that space forms an inherent multi-dimension category for understanding business networks, especially in the IMP network approach. To deepen this conceptual analysis, and to explicate it in more concrete terms, we will now draw on three spatial terms: place, location, and distance. Each of these can be examined from a structural, mental, and relative viewpoint, in accordance with the four-dimensional model of network space.

6.1. Place

The concept of place assists in specifying networks and actors in their structural space, but place is clearly also a relative concept that can be broadened geographically, as well as socially, culturally and mentally.

Table 1
Examples of business network studies with different spatial dimensions.

Study and focus	Method and network type	Spatial dimension(s)
Törnroos (1991a,b) Internationalization of Finnish firms in the late 1980s	- Case studies - Network internationalization of firms and industries (paper and construction companies)	*Network space, other than mental* Physical, relative and relational space
Fletcher and Barrett (2001); Fletcher (2008) Internationalization of an Australian white goods manufacturing company	- Single longitudinal case study - Network embeddedness in internationalization	*Structural network space* Spatial business expansion across national borders over time in developing network structures
Johanson and Lundberg (2007) Regional proximity in high-tech firms	- 37 firms, interviews - High-tech networks in Mälardalen, Sweden	*Relative network space* The role of geographical proximity and location/nearness of firms
Kamp (2007) Locational behavior in the Automobile industry in Europe	- 2 longitudinal case studies - Central-peripheral supplier networks, location and change	*Relational and structural network spaces* Locational change in network structures for automobile production, and relations, in Europe
Cantù (2010) Local proximity in space in developing spin offs of technological innovations	- Focused case study on different proximity dimensions in spatial relationships - Spin-off networks from the University of Milan in materials engineering	*Network space, other than mental* Developing local competencies, spatial relations and spin-offs from the local University Technology Park.
Eklinder-Frick et al. (2011) Bridging and bonding forms of social capital in a regional strategic network.	- Case study research on key actors in the network - Participant observation and interviews in 2004. New round of interviews in 2010 - Strategic regional network	*Structural and mental network spaces* Bridging and social bonding mechanisms in developing a strategic network
Tidström and Hagberg-Andersson (2012) Networking processes and change in SME relationships	- Comparative cases - SME networks changing from co-operation to competition	*Structural, relative and mental network spaces* Using inner (intra) and outer (extra) network spaces
Nicholson et al. (2013) Processes in declining regional competitiveness	- A case study in a declining peripheral region in the U.K. - Regional network	*Relational network space* Generative and degenerative processes causing industrial change and decline in a regional context

Note. The dimensions relate to the conceptualizations presented in this paper. The expressions of space are used as analysis tools to denote the spatial dimensions in these studies.

Place is defined as a "particular point in space" (Wilkes & Krebs, 1985), one that is usually singular because it is occupied by an actor or a thing. Place can also include a broadened point in space. Agnew (2011) treats place as characterized by a meaningful location with three key dimensions: i) Location, ii) Locale, and iii) Sense of place. All places are located in an absolute sense through more objective measures (e.g. latitude–longitude). Locales are material settings for social relations and "the way places look" (Cresswell, 2004, 1). This gives locales a social dimension for interactions and proximities in place, so creating social communities in specific local places. Sense of place relates to the human feel, or sense, of specific places such as cities, neighborhoods or e.g. local business environments or industrial sites (Gieryn, 2000). Cresswell (2004, 8) and Gieryn (2000, 465) also note that space is a more abstract term than place but the concepts need to be related to each other.

The concept of a *boundary* is an element of place, as a boundary delimits the point or locality in space. For place, the concept of boundary has interesting ramifications. Successive boundaries create places inside locales, and broader places outside locales, in a hierarchical manner. However, boundaries are also porous (Massey, 2008). The characteristics of broader place and more local place are linked by different network connections with somewhat similar as well as diverse social and cultural meanings (e.g. Barcelona, Catalonia and Spain). Boundaries are important in creating meaning and networks in relation to different mental maps of the network, but so too is the permeability of boundaries.

Business organizations have their offices and production units in specific places, in geographic locales, where key interaction takes place. Business resources are often fixed in space at specific places, at least to some degree. In particular, specific sources of raw materials, such as iron ore, are fixed in place. Even markets are often placed and often concentrated in specific localities in space. These specific spatially "fixed" places constitute the microenvironment in which business units are embedded. The place of a business enterprise and its local network always possesses particular characteristics. This specificity is an important basis for the resource heterogeneity premise in network research, a crucial factor that influences and shapes network development and change. Specific places, e.g. cities, around the actor companies form the basic spatial entity of the local network. However, other resources are more fluid and movable, for instance capital or logistic and transport systems. Places also create settings in which to pursue common (societal, regional) as well as actors' specific interests. Further, places create platforms for learning and sites for value creation through relational proximities in specific local environments.

In the IMP network approach, boundaries are an important topic for discussion. Network horizons and network pictures represent mental approaches to cognitively perceived network connections and boundaries (Holmen & Pedersen, 2003; Ford & Redwood, 2006; Henneberg et al., 2006). Similar ideas from economic geographic research are presented by Markusen (1996) in her article "Sticky places in slippery space", where certain locales have a specific attraction for investment and trade. Examples include Silicon Valley, the Johore Triangle around Singapore, the so-called 'Third Italy', southern Scandinavia, and global financial centers (Saxenian, 1994).

In the globalized business world, local existence and place play a role in creating a sense and feel for e.g. cities or other localities as business spaces. Thus, "being there" makes a difference for network actors (Gertler, 2003). Tradition and former decisions also play their part in attaching business activities to specific localities. The same is true of favorable locations in a logistical sense or specific innovative milieus and clusters (Castells, 1996; Dicken, 2007; Dunning, 1998; Porter, 1990, 1998).

The spatial dimension of place in a network constitutes the characteristics of an *actor's embedded local existence in a specific physical place or milieu.* Each of the network nodes has its local place as well as reasons for existing in specific places. The reasons can for example be a relative location and position in the network, former investments, spatial proximities and spillover effects on other firms, local history and attachment of the owners. Finally, the idea of place inside larger places and linked by networks leads to the key concept of location exerting influence on specific places in a fluid and extended global space.

6.2. Location

Location opens up the *relative* nature of places or locales. Location deals with where business organizations operate and economic investments are situated and made, relative to each other. Locations position places in a macro-environment, i.e. into the wider network (Yeung,

2005; Dicken, 2007; Dicken & Thrift, 1994). Thus, space is differentiated into places that are located relative to each other in space as well as time. Location therefore has both an absolute characteristic (a specific point or local place by latitude and longitude) *and* a relative characteristic, describing the proximity of one element in a structure to another.

The locational advantages derive from site characteristics i.e. the physical features that make up the immediate environment of a place's location. Such advantages may be based on proximity effects including spillover effects from learning and innovation processes (Brown & Duguid, 1996; Gertler, 2003; Torré, 2008; Cantú, 2010), as well as situational characteristics i.e. a place's relative location to other places and especially connected activities in the surrounding region (Owusu, 2014). Location must have important implications for network development, the actor's position in a network and the overall embeddedness of business companies. As a geographic concept it has not however been explicitly elaborated within the IMP network research.

The location dimension aids in defining the network as existing *relative to other actors in the emerging relational network space at a specific point(s) in time*. Location positions a company in a geographic network. The location has different scales from local to global, and also specifies network space structurally, forming the different locales and places on the map of a network's spatial nodes. Locations may also have strong mental connotations.

6.3. Distance

A third spatial concept related to business networks is the distance between the nodes of the located units of the network. Nodes are connected, and resource ties, activity links and actor bonds are formed and change through interaction that necessarily occurs across a distance. Information, goods and capital flows are handled between network actors to be managed over diverse distances. Distance is multifaceted and deals with how to overcome different spatial-based barriers. Distance barriers can be, for example, physical such as geographical barriers related to activity links between actors; socio-cultural such as communication and developing social bonds; or time-related as in how to interact and resolve economic and technological issues between actors combining resources and activities (Törnroos, 1991b). Distance and time create frictions in interaction between actors. In the global digital economy, some barriers are, at least potentially, more easily overcome than before. Also cultural distance affects how networks function in various contextual settings (Jansson, Johanson, & Ramström, 2007).

The concept of distance assists in analyzing the potential frictions in interaction that need to be overcome to implement business deals in time–space. These frictions may relate to geographical, temporal or socio-cultural aspects of business interaction. In the IMP business network research, the concept of distance has played a minor role, but has been employed in characterizing relationship development and in creating a relationship 'atmosphere' between industrial buyers and sellers (Ford, 1980; Håkansson, 1982; Hallén, Johanson, & Seyed-Mohamed, 1991).

In sum, the basic geospatial concepts of place, location and distance form spatial identifiers and specifiers to aid in differentiating the four dimensions presented in Fig. 1. In digging deeper into how networks develop over space, these three concepts are useful analytical devices with which to study emergence and change in business networks.

7. Discussion and implications

Space is besides time an inevitable but challenging dimension of interaction in business networks. In this paper, we have elaborated the concept of space by unwrapping its multidimensional meaning for the IMP business network research. Based on existing space-related research in this tradition and in the economic geography literature, we have built a conceptual model of network space. By further analyzing three basic geospatial concepts of place, location and distance in conjunction with the model, we have added depth to the conceptual treatment of space in business networks. The model is advanced to enhance our understanding of the spatial dimensions of interactive relationships and networks in the field of business marketing.

The presented model is helpful in various respects. First, it offers a perspective on how space can be defined conceptually in the IMP business network tradition. Second, it provides the means to examine network space in both static terms and from a dynamic perspective; it explains how space emerges based on structural, mental and relative dimensions in a social process of business interaction producing a relational network space. Third, the model provides an overarching meaning–structure to guide spatial research in industrial networks. While a specific study may focus on only one or two key concepts, the connections into a broader framework provided by the model can aid researchers in positioning and motivating their specific research problem.

Fig. 2 explicates the developed conceptualizations in the context of IMP network theory. The figure indicates how spatial concepts frequently used in the IMP network research refer to the structural, mental or relative dimension of network space. It also illustrates how the essentially dynamic referent of space – the relationally produced network space – emerges through these three temporally static descriptors in the social processes of business interaction. Interacting actors create activity links, resource ties and social bonds between each other; they build mental maps concerning other actors they are relating to in conjunction with mutual interactions and decisions made and they act, strategize and invest in order to position and locate themselves in relation to suppliers, customers and competitors as well as other actors. In short, through their networking, business actors produce the relational network space around them.

It is possible using the four spatial dimensions depicted in Fig. 2 to describe the state of the network in spatial terms, at a specific point in time. This view, as presented at the bottom of Fig. 2, presents the network as a locked structural entity at a specific moment generated through previous processes. This frozen network space is seen as an outcome of interactive processes between relevant actors over time. The concepts of place, location and distance can additionally be used to specify the prevailing geospatial configuration of network space. The concept of network space is in itself static and does not reveal the fluid picture of interactive elements gradually forming and changing the network structure in time–space. The dynamic aspect is noted in the process dimension of the model, in the continuously forming relational network space.

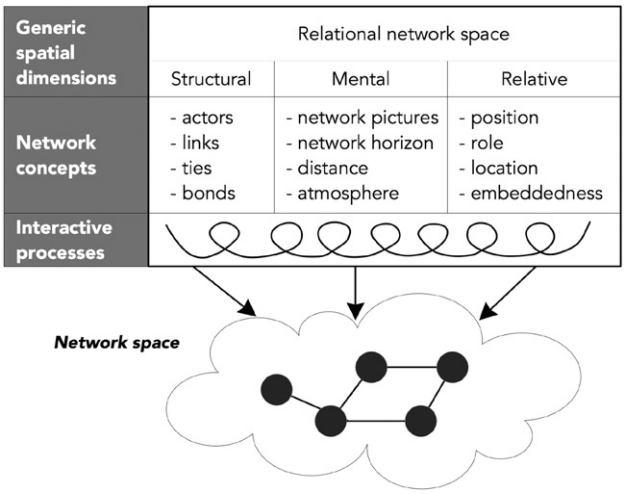

Fig. 2. Spatial concepts creating network space.

We argue that the dimensions of the model deliver conceptual tools to handle space in the IMP based business network research. Each dimension constitutes a specific research issue and can be used to develop spatial understanding of business networks. In research, these dimensions need to be related, however, to some specific spatial concepts and research contexts. Here we have analyzed place, location and distance as three relevant examples. We are aware that they do not take in all of the constructs that economic geography might offer for business network research. For instance, geographic inquiry on networks often concerns different levels from local to global or the interface thereof (see e.g. the GPN approach that deals with this issue Coe & Yeung, 2014, 2015, 67-74). In the business network research, these geographic scales have not been elaborated to any great extent even if they have important ramifications for the study of e.g. international and global business networks as emergent and changing spatial phenomena. It should be noted that scaling is a human construction to study space from a specific angle and focus. For example, place, location or intranet and extra-net perspectives allow a researcher to study business networks from the local to the global level or vice versa. Thus, these concepts enable researchers to pursue a specific spatial focus and perspective.

IMP network research has to date either explicitly or implicitly addressed some spatial perspectives (see Table 1). Those studies show how space exists through the dimensions presented in the research. Empirical research has to date been scarce and we therefore propose areas of research where a more varied and explicit use of spatial approaches and concepts would bring new insights.

7.1. Research implications

Spatial issues are clearly noted in the research on *international marketing and management in networks*, but mostly in an implicit fashion. Cultural or psychic distance between business actors in international trade and relational investments forms one line of inquiry closely connected to the mental dimension of network space. Developing international network structures and interdependencies between firms necessarily involves spatial aspects linked to the relative dimension of space. An explicit use of the embeddedness concept offers one opportunity (Fletcher, 2008; Fletcher & Barrett, 2001; Taylor & Leonard, 2002). We could in the future also expect to see more research on the local–global interface of international business networks, the role of regional networks in global business, simultaneously problematizing time and space in these studies (see e.g. Buckley & Ghauri, 2004; Buckley (2016)).

The spatial reality of networks is explicitly related to *strategy and strategizing in business networks*. Strategizing refers to how business actors perceive their network of connected actors and intentionally interact with others to relate to (or unrelate from) them. The continuous production of relational network space is thus essential for strategizing. The research on strategy in business networks is most explicitly drawn from the mental aspects of space, the analysis of network horizon (Holmen & Pedersen, 2003) and network pictures, both essentially rooted in managerial perception and sensemaking (Laari-Salmela et al., 2015). In addition, the relative dimension represented by the concepts of network position, location or embeddedness offers relevant spatial viewpoints. Strategic goals, such as getting close to customers or obtaining cost-efficient access to raw materials, closely relate to the proposed geospatial concepts of place, location and distance, providing a potential new angle for network research on strategizing. Dealing with both closeness and distance in global business forms an interesting line of inquiry on how to tackle space in strategy research.

Innovation and development in networks is another area of research where spatial aspects could add new insights. Locations in space concern e.g. proximity issues that imply learning, diverse potential spillover effects and the possibility of finding favorable milieus for companies to act jointly in production, trade, investments, and innovation. Proximity research can help in understanding the closeness and alignment of resources in particular locations and business milieus (e.g. Johanson & Lundberg, 2007; Cantú, 2010). Finding so-called 'sticky places' and enabling mutual interactions and gains in specific locations concerns the three static dimensions of network space as well as the location concept. In addition, the mental dimension of how specific locations, actors and business environments are considered potential alternatives is a promising avenue for research. The relative dimension of embeddedness when locating new business activities forms another relevant spatial angle for research into network development.

Research on traditional industries as well as virtual business can both benefit from the concept of network space. Space, in its physical meaning, often constrains the shaping and emergence of a business network. Raw materials and markets are often necessarily spatially fixed in one place. The result is that certain network actors are required to bridge these physical distances. This concerns industrial sectors in particular, but the mental dimensions of space may be equally important to other sectors, for instance banking and insurance, or even for "placeless" virtual business such as the games industry. It is suggested that the creation of bridging roles and positions between actors in the network space is a relevant area for research. Also locating business nearby other similar types of company, thinking in terms of both people and talent, may be an important driver in networking. The current trend for digitalization has a significant impact on companies' place, location and positioning decisions, which again constitute interesting topics for future research.

Furthermore, many *methodological* issues need to be considered to come to terms with tools needed to highlight the role of space in business networks. Process research together with empirical network–geographic studies is needed to better grasp networking processes and their spatial outcomes (Van de Ven & Poole, 1995; Halinen, Medlin, & Törnroos, 2012; Dawson, 2013).

7.2. Implications for business practice

The concept of network space also raises practical implications. It implies a typical view of business networks in the global economy as structures that create mutual interdependence and ongoing rapid change. Companies are advised to be alert to unpredictable change and to respond quickly in order to survive and enhance value creation and social and global demands. What we want to suggest here is that as an alternative to continuous change, it may be revealing to consider networking in terms of continuous production of space. Business success requires not only the management of change but also of space.

Managers deal with space especially in strategic management. This concerns for instance strategic location decisions (e.g. co-location), logistic solutions, make or buy decisions, and supply management. Strategizing in networks also relates to how companies act on and perceive their network boundaries and the overarching connected business landscape when coping with the firm's position and role in and across space (Mattsson & Johanson, 1992). In making strategic decisions, the four dimensions of space all indicate important spatial issues to address. For instance, being able to analyze the consequences of decisions when locating or starting to develop relationships in different parts of the world is strategically significant. How firms exploit the potentials of the multitude of locations connected to the network is another issue of importance for networking.

The international and global scale of business activities and investments stress the need to tackle the spatial aspects of business. How well are managers making sense of the places, regions and countries where they operate and do business? This issue concerns the structural, mental and relative dimensions and the underlying relational processes continuously producing the network in which firms are embedded and operate. In making investments by connecting with actors in new localities, regions and cultures across the globe deal with these "liabilities of foreignness" in networking (Johanson & Vahlne, 2009) need to be addressed.

7.3. Conclusion

By explicating the concept of space, we have aimed to demonstrate the central role of the concept in describing the change and emergence of networks. Interaction in business networks deals necessarily with both time and space. Space can be differentiated according to the proposed fundamental dimensions and these can furthermore be more closely aligned with the differentiation of time, to gain a deeper understanding of business network evolution and change. In this paper, we have provided a model of network space using a process-based ontology and epistemology on networks. We believe that the space model can provide researchers with useful conceptual tools for capturing network dynamics.

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