

Sensemaking in business networks: Introducing dottograms to analyse network changes

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ABSTRACT

The issue of how different actors in a network understand changes to their industry remains an under-researched but crucially important area. According to the industrial network approach, companies interact according to their perceptions of the relevant network environment and their subjective sensemaking of the network logic and exchange mechanisms relating to the activities, resources, and actor bonds. Using a case study of the Norwegian/Japanese seafood distribution system, we propose a methodology that allows us to better understand these perceptions. We develop an analytical method based on 'dottograms' which facilitates a more detailed understanding of change within networks. In particular, we show how the dimensions of time (past, present and future changes) and space (change at actor, dyad or network level) can be better understood, and also how the method facilitates our understanding by ascribing reasons for the change. As such, we provide a methodological contribution to research on business networks and change.

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1. Introduction

Managers often want to change distribution structures or their company's position in a network (Zaheer & Bell, 2005). At the same time there are those in the network who resist such changes (Håkansson & Ford, 2002). Management decision-making in this context is affected by managers' interpretations of the available information at a particular point in time (Ford, Gadde, Håkansson, & Snehota, 2003) also referred to as sensemaking (Weick, 1979, 1995). However, changes, and managers' perceptions of such changes, can vary across a business network as change perceptions are idiosyncratic to the individual actor. A systematic way of comparing and contrasting managers' perceptions of their surrounding network, will therefore aid our understanding of their decision-making behaviour.

This paper proposes an analytical framework to analyse how business networks change over time by limiting our focus to capturing and describing network change events. For this purpose, we use the industrial network approach, where networks are seen as interconnected relationships, as our theoretical and methodological framework. The paper looks at change from the perspective of how

managers or 'actors' describe and explain change, and the decision options they perceive. The actors' perceptions of change are investigated via their 'network pictures', i.e. how they make sense of what is happening around them. Such sensemaking may happen in a tacit way, in that it is not openly acknowledged by decision-makers. Reviewing recent research on business networks and network change, the paper addresses the existing shortcoming in the literature with regard to a systematic understanding of change perceptions (Halinen & Törnroos, 2005), and develops the concept of network change as well as an operationalization for the comparison of actor's perceptions. This allows for a detailed conceptualisation of the dimensions of *time* (past, present and future changes) and *space* (change at actor, dyad or network level). The concept of network pictures is used as a conceptual tool to operationalize these dimensions. We then introduce the 'dottogram' method which allows for a systematic comparison of different actor's understanding of network developments.

The dottogram method represents a contribution to our understanding of network change because it uses actors' perceptions of changes or their (implicit) network pictures to analyse the time and space specificity of network developments. Furthermore, it contributes to management research by introducing a new way to conceptualise the role of sensemaking. Our article progresses as follows: we provide a succinct overview of existing research on networks and change, and develop a framework for capturing elements of network change. This is followed by a discussion of network pictures as a way of understanding managers' perceptions. We then outline our research design, including the 'dottogram' method of capturing and

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analysing data. A specific distribution network is analysed via the use of dottograms, and we discuss findings as well as theoretical and managerial implications of our research.

2. Business networks and change

Recent research has stressed the importance of network structures in understanding business exchanges (Achrol, 1997; Möller & Rajala, 2007). These complex networks have been researched using different approaches. For example, strategic research has looked at strategic groups, either as defined by objective characteristics (McNamara, Deephouse, & Luce, 2003; Porter, 1985) or delineated by a shared understanding of different companies (Osborne, Stubbart, & Ramaprasad, 2001; Reger & Palmer, 1996). While this research tradition looks at structures of competition between related companies, the channel management or supply chain literature treats each individual business relationship as a separate entity, arguing that companies have to respond appropriately to changes in their business environment (Achrol, Reve, & Stern, 1983; Gultinan, 1974; Stern & Reve, 1980). Business networks have also been characterised in strategic marketing as value-creating systems (Parolini, 1999) where companies co-operate in order to develop value for customers and simultaneously compete to appropriate value (Möller & Svahn, 2006; Normann & Ramirez, 1993), and marketing alliances where firms co-operate based on formalised and collaborative agreements (Das, Sen, & Sengupta, 1998; Gulati, Nohria, & Zaheer, 2000).

While considerable research exists to explain business network structures in these different research traditions, the issue of *change within networks* is less well researched. Although there are several approaches to analysing relationships in terms of networks (see Araujo & Easton, 1996, for an overview), this article adopts the industrial network approach, underpinned by the interaction model, to understand different actors' behaviour (Ford et al., 2003; Ford, Gadde, Håkansson, & Snehota, 2006). As such, business networks are used as a metaphor for constellations of direct and indirect business relationships (Anderson, Håkansson, & Johanson, 1994) and are defined in terms of how *activities* are linked together, how *resources* are utilised in relationships, and the strength of bonds between the relevant actors (Håkansson & Snehota, 1995).

Companies are seen to interact based on their perceptions of the relevant network and their subjective sensemaking of the logic and exchange mechanisms relating to these activities, resources, and actors (Ford et al., 2003; Henneberg, Rohrmus, & Ramos, 2006). This causes webs of interconnections and interdependencies to form between companies, which make networking activities contingent on other actors and the interactions between them (Ford & Håkansson, 2006; Håkansson & Snehota, 1989). Network changes are thus seen as *manifested in* as well as *transmitted through* connected relationships with identifiable parties and unique counterparts (Ford et al., 2003), rather than in response to changes in a faceless exogenous environment (Håkansson & Snehota, 1995).

Network change is also discussed in relation to *network stability*, as stability and change are an inherent duality of networks (Håkansson & Snehota, 1995). On the one hand forces (such as new actors entering the network, or the activities of existing actors) will always try to change established actor bonds, resource ties and activity patterns. Havila and Salmi (2000) for instance found that mergers triggered a range of changes in connected relationships. Simultaneously, there are forces that will try to move towards stability. For instance, resource dependencies, high switching costs and risk-reducing strategies favour stability (Turnbull, Ford, & Cunningham, 1996). Thus, stability is a prerequisite for change (Lundgren, 1992) and an inherent feature of a network (Halinen, Salmi, & Havila, 1999). This duality has been defined as *coalescence* and *dissemination* of networks (Håkansson & Lundgren, 1992). Others use concepts such as *expansion* and *contraction* (Mattsson, 1987); *extension* and *consolidation*

(Cook, 1982) and *splitting* and *joining* (Hertz, 1996). Halinen et al. (1999) introduce the term *confined change* to characterise stability when change remains in the dyad, and is not acted upon by other actors in the relationship. However, due to the interdependencies of relationships, change in one relationship often spreads to others, subsequently affecting the whole network. This is defined as *connected change*; one which influences or is acted upon in other relationships in the network (Halinen et al., 1999).

Change may be seen as an evolutionary process, where revolution is possible but unusual (Easton, 1992), similar to a continuous process where stable periods are broken by radical changes (Halinen et al., 1999). Radical change here means that actor bonds, resource ties and activities are fundamentally altered or dissolved and new relationships established. Halinen et al. (1999) use the punctuated-equilibrium model to explain this, suggesting that changes occur by frame-breaking rather than incremental step. A number of reasons for such critical events have been suggested. Senior personnel changes in organisations; shifts in organisational structures; changes in strategy; as well as acquisitions, mergers and bankruptcies can all cause such change (Halinen et al., 1999; Oberg, Henneberg, & Mouzas, 2007).

Following the argument that managers act on the subjective interpretations of their environment (Borders, Johnston, & Rigdon, 2001; Ford et al., 2003), which can be related to managerial research by Weick (1979, 1995) (see also Möller, 2010) as well as socio-psychological theories of cognitive cycles (Neisser, 1967, 1976), network change must be seen in relation to how actors perceive their network. Thus, while events relate to change, the sensemaking of decision-makers drives their behaviour as well as the events, and thereby leads to change (Rachlin, 1994). The relationship between network changes and perceptions as well as sensemaking has been noted by several authors. For instance, Halinen et al. (1999, p. 786) conclude that "*the mental process of enactment can be regarded as a key explanation for stability and change in networks*"; and Hertz (1992, p. 121) states that "*...The perceptions of integration might cause greater effects that otherwise might be expected from the actual change*". Similar arguments are also found in other approaches, like the strategy and marketing channel literature. Gultinan (1974) emphasizes that it is not market forces in themselves that represent the change, but actor's perception of them. Similarly, Achrol et al. (1983) argue that organisations do not perceive the environment as such, but enact it. Following these arguments, the perceptions of events, rather than events themselves, lead to change in networks.

3. An analytical framework of network change

Whether or not change is perceived similarly by different actors in a specific network is of key interest, as differences or similarities in any firm's perspective can be used to understand strategic behaviour (Bogner & Thomas, 1993; Osborne et al., 2001). However, comparing the perceptions of multiple actors, specifically the time and space specificity of change, remains an under-researched area (Ford, Gadde, Håkansson, Snehota, & Waluszewski, 2008). Further, comparing different actors' ascriptions of the explanatory mechanisms is important because companies adapt to perceived changes through interactions based on their understanding or anticipation of the changing environment (Gronhaug & Falkenberg, 1989; Reger & Palmer, 1996).

Any such analysis should be based on the three aspects of time, space, and ascription (Ford et al., 2003; see Möller (2010) for alternative models). The time dimension ('when') relates to the subjective understanding of *past*, *present*, and *future* changes (Halinen & Törnroos, 2005), i.e. the nature of, reasons for, and impact of changes at different time periods. For the space dimension ('where') it is important to be able to systematically analyse these changes in order to compare differences between actors. Therefore, the *location of*

change needs to be analysed, depending on whether it occurs at the actor, dyad, or network level (Alajoutsijarvi, Möller, & Rosenbröijer, 1999; Halinen et al., 1999). Finally, the perceived *cause-and-effect*, the ascription dimension of change, needs to be understood. A systematic way to analyse and compare actors' perceptions of network changes along these three dimensions is called for. This article proposes a method based on an analytical framework which enables a more detailed conceptualisation of the dimensions of time (past, present and future changes), space (change at actor, dyad or network level) and cause-and-effect (why changes are occurring). In order to operationalize the analytical framework, the concept of network pictures is introduced as a conceptual tool. We subsequently develop a method ('dottograms') which uses the conceptual framework, together with network pictures as input and facilitates the explanation of change in networks. We exemplify our methodology based on a case study of the Norwegian/Japanese seafood distribution system.

Our analytical framework is shown in Fig. 1. *What* refers to the specific event (what happens) and *where* to the level at which the change manifests itself. From the perspective of a focal company, change can affect an individual actor (either in the focal company, or another actor in the system), or it can affect a specific business relationship at the dyadic level. However, the level of change could also reside in the network itself, affecting the whole business system (Gadde & Mattsson, 1987; Havila & Salmi, 2000).

The left-hand side (boxes A and B) we label the "*what*"-column, which describes the change in the network. An example could be the incremental change of introducing an updated SAP system. This could be seen as resulting in change in the company itself (single actor level), or it could mean that suppliers to the company need to adapt their own JIT and EDI systems to the new standards (dyadic level change). In an extreme case, all (or most) companies in the system would need to adapt their processes, with the resulting change activities permeating the network (network level change).

Networks change over time (Halinen & Törnroos, 2005). Current change is embedded in past events, and the current situation shapes future development by activating assumptions and expectations (Gronhaug & Falkenberg, 1989; Håkansson & Waluszewski, 2002).

Thus, to understand changes, it is important to capture not only the space but also the time dimension (Ford et al., 2003; Halinen & Törnroos, 2005). The time-specificity of change (when it happens) refers to the aspects of past, present, and future changes, and how actors perceive these changes to be interconnected over time. The vertical axis in our analytical framework indicates this dimension in terms of the network characteristics in the past, present and future. Each of the three aspects of the level of change, i.e. actor, dyad, and network, are shown. In the previous example, the introduction of a new SAP system in one company is a change from past to present at actor level (box A). As a result, current suppliers will need to adopt these standards (a change from the present to the future at dyad level, box B), thus affecting the whole network (change from present to future at network level, box B).

By integrating both time- and space-specificity, our framework can be developed further to include explanatory ascriptions of change. On the horizontal axis another column indicates the "*why*", the reasons given as to why change is happening (boxes C and D). This can again be linked to the actor, dyad, or network levels. This framework thus describes what kind of change happens and the perceived reasons for it. For instance, one actor may attribute the introduction a new version of SAP (what is happening) to action taken by an individual company, e.g. because a new CEO is keen to introduce updated technologies (why it is happening). But the same change could also be explained because a key customer is forcing it onto a (dyadic) relationship, or because of a network effect requiring conformity to a certain software standard in the overall system due to wide-ranging process integration in a supply chain. However, it is also possible that some actors will have no explanation of why a change is happening, therefore, boxes C and D could remain empty.

According to this framework, changes occur along the *what*-column at actor, dyad and network levels, from past to present (box A), and from present to future (box B). Understanding the drivers of change is a distinct sensemaking process, described in the *why*-column (boxes C, and D). A progression dynamic therefore exists within the analytical framework: the transformation and change from a past state to the current state (box A) is explained by the

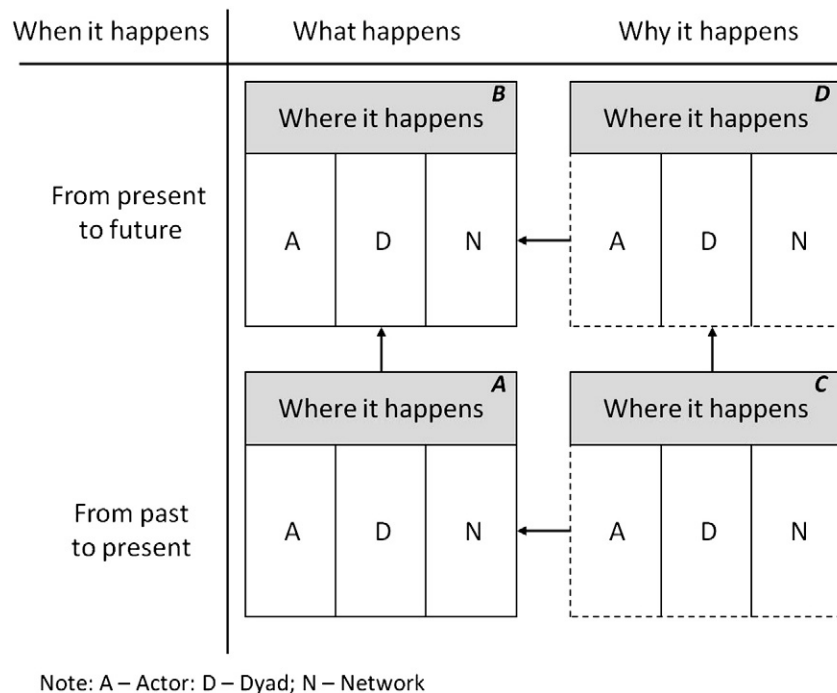


Fig. 1. Analytical framework linking pictorial descriptions of change (network pictures) with textual descriptions of changes (what) and ascriptions for these changes (why).

specific reasons for change (box C). The same is true for the expected developments regarding changes from the present to the future, (box B) which are made sense of using the explanation captured in box D.

4. Network pictures

Following this discussion of an integrated framework which will be used to conceptually underpin our empirical study, the concept of *network pictures* is introduced as a way of capturing the perceptions of actors regarding the time-, space-, and ascription-specific aspect of change. Network pictures are well suited to this purpose as they represent the subjective sensemaking of managers, due to the fact that “a concrete market is the result of operations of disentanglement, framing, internalization and externalization” (Callon, 1999, p. 192), many of which have no ‘objective’ properties but are dependent on participants’ beliefs and interpretations (Henneberg et al., 2006). As such, network pictures share some characteristics of concepts developed in the strategy literature on companies’ shared understanding of market phenomena, i.e. ‘cognitive strategic groups’ (Fiegenbaum & Thomas, 1993; Osborne et al., 2001). Recent research shows increasing interest in the concept of network pictures (Henneberg, Mouzas, & Naudé, 2009; Henneberg, Naudé, & Mouzas, 2010; Leek & Mason, 2010; Tonge, 2010). They provide understanding of how managers react to changing environments (Halinen & Törnroos, 1998; Oberg et al., 2007) and help to explain strategic decision-making behaviour (Borders et al., 2001). As such, the concept of network pictures is influenced by, and related to, the research themes of cognitive strategic groups (Osborne et al., 2001; Porac, Thomas, & Baden-Fuller, 1989) cognitive scripts and cognitive mapping (Fiol & Huff, 1992; Johnson, Daniels, & Asch, 1998), and managerial cognition/sensemaking in organisations (Colville & Pye, 2010; Daft & Weick, 1984; Weick, 1995).

Network pictures are managers’ network theories (Mattsson, 1987), representing what they subjectively perceive to be important and what the pertaining logic for actions and consequences of managerial activities are. As such, they are the ‘theories-in-use’ helping managers not only to make sense of their complex environment, but also to guide their decision-making and influence their managerial behaviour (Welch & Wilkinson, 2002). Conceptually, our understanding of network pictures is grounded in the theories of cognitive cycles (Neisser, 1967, 1976). Network pictures may or may not be explicit; however, they represent an individual’s solution to the ‘framing problem’, i.e. knowing what knowledge or inferences may be relevant or irrelevant to a specific issue (Zaheer, McEvily, & Perrone, 1998). They are therefore posited to guide networking activities, but they are also used to ascribe meaning to events in the network, such as activities instigated by other actors (Ford et al., 2003; Smircich & Stubbart, 1985). The individual decision-maker is thus provided with a bounded field of decision possibilities within the limits of expectations shaped by the framework of his network picture.

Recent research proposes that network pictures exist on two levels: narrow or broad (Henneberg et al., 2010). Henneberg et al. (2006) suggest that network pictures collected from managers can provide an insight into the individual actor’s frame of mind (i.e. narrow network pictures), thereby provide an understanding of what they believe to be relevant and important. Thus, they are defined as managers’ “subjective, idiosyncratic sensemaking with regard to the main constituting characteristics of the network in which their company is operating” (Henneberg et al., 2006, p. 409). Mouzas, Henneberg, and Naudé (2008) argue that these individual network pictures represent not merely managers’ or companies’ views, but rather the interactions between managers, i.e. it is the clash of different network pictures that guides managerial actions. Interactions therefore cause a shared and inter-subjective understanding of the environment (Daft & Weick, 1984; Weick & Roberts, 1993).

Conversely, Ford et al. (2003) and Ramos (2008) suggest that network pictures, although based on individual managers’ sensemaking,

can be integrated by researchers to form a *broad* picture. From this perspective, Ford, Naudé, and Ramos (2005, p. 3) define network pictures as “a conceptualisation by the observer of the network views of the participants. It is a representational technique that aims to capture or illustrate views that specific actors have of the networked environment within which they operate”. This approach can be used to make the network itself the unit of analysis, by providing a research lens which abstracts from the specific managerial network pictures to create a network-based perspective (which is nevertheless determined by individual beliefs which are shared, e.g. about the relevant network horizon) (Holmen & Pedersen, 2003). Defined in this *broad* sense, network pictures can, for example, be used to trace the development of a whole network longitudinally (Ford & Redwood, 2005). However, in this paper we use network pictures as snapshots in time, and adopt a narrow perspective because we are interested in managers’ sensemaking, i.e., how they explain changes. We are aware that this cross-sectional and comparative-static research design may pose a limitation to our study, as a longitudinal research design may have given us a dynamic understanding how managers see network change over time. Nevertheless, we believe that collecting managers’ network pictures of the past, current and future events of change adds to our initial understanding of how they perceive change.

5. Research design

5.1. Explaining network change through network pictures

In our study, the unit of analysis was focal companies within a distribution network, with our empirical data focussing on the network pictures of key decision-makers, representing the sensemaking shared by top management within the company (Ford et al., 2003; Halinen et al., 1999). This subjective and narrow approach overlaps with Mintzberg’s (1979) notion of ‘strategy as perspective’, and provides a representation of actor-network embeddedness (Halinen & Törnroos, 1998). The network pictures used are framed so as to relate particularly to issues of change within the different levels of the network.

The network pictures collected cover the specific aspects of space and time specificity, as well as issues of ascription. Collecting this multi-layered information was possible due to the fact that the process consists of a pictorial ‘image’ as well as an interpreting ‘text’. The text provides additional information about the image (e.g. reasons for changes occurring, ascribed intentions, specific information about the content of a change occurring). As such, network pictures are akin to metaphors: they are rich sensemaking devices in their own right (Draaisma, 2000). They provide information about the intensity of the perceived change by respondents identifying and emphasizing the importance of a particular change event, or the importance of the effect of the change. Furthermore, network pictures encompass information about the level of change, for example by identifying the source (actor, relationship, or the network itself). By allowing respondents to think about changes retrospectively but also prospectively, network pictures can compare the different time layers of characteristics held by the respondents (Halinen & Törnroos, 2005). We specifically asked the respondents to describe their network pictures along three time dimensions, using *five years ago*, *today* and *five years from now* as the basis for the interviews (the time markers of ‘five years’ to denote ‘past’ and ‘future’ were derived from the initial case study discussed below which showed that most respondents in the network thought about change in roughly 5 year periods).

To operationalize the data collected, template analysis was used to relate empirical findings to the analytical framework. It is used as part of a contextual constructionist epistemology where multiple interpretations of any phenomena may be arrived at, depending on the perspective the researcher takes and “the richness of the description produced” (King, 2004: 257). Template analysis enables the researcher to look at the source data from various angles, all depending on

1. Passage from text	2. N	3. What is happening?	4. Where is it happening? (AA, AD, AN BA, BD, BN)	5. Why is it happening?	6. Where is 'why' happening? (CA, CD, CN DA, DD, DN)
"Things are slow in Japan. But the underlying change is accelerating due to more direct contact between suppliers and end users."	1	Here he describes the general change towards direct distribution	Change at network level (BN): General change towards direct distribution (1)		
"The reason behind this that in Japan the retailers wish to adopt purchase strategies and management practices that have been introduced by international retail chains such as Carrefour and Wal-Mart. They are inspired by this and they see that if they are to survive they have to get closer to the origin of the products that they source. This is to a great part driven by the retail level. "	2			This change is happening because retailers are adopting new purchasing practices	Sensemaking at actor level (DA): Retailers are adopting new purchasing strategies (2)

Fig. 2. Example of initial template analysis.

conceptual templates and categories (in our case, the integrated analytical framework of network change). Such an analysis provides a flexible and continuous process of altering categories and finding increasingly suitable interpretations as the material is analysed (King, 2004; Piekkari, Plakoyiannaki, & Welch, 2010).

A simple template relating to the dimensions of the framework allows the empirical data to be systematized. This is shown in Fig. 2: initially, textual statements (column 1) are classified with regard to whether the respondent describes the change itself (column 3 – *what*), and where it is happening (column 4 – *where*) or *why* the changes happened (column 5 – *why*) and which level the respondent refers to in order to explain the changes (column 6 – *where/why*). Each change identified was given a unique code (column 2). In a second step, the changes were mapped onto the analytical framework of Fig. 1. Changes can then be analysed to see whether they represent a change from “past” to “present” (box A), or from “present” to “future” (box B). Corresponding changes at actor, dyad, and network level are logged by integrating the initial textual analysis by means of adding the perceived changes plus the explanations to the pictures: box C indicates the reasons for the changes described in box A, and box D indicates the reasons for the changes described in box B. Consequently, different changes can be attributed to different reasons. Each of these aspects can be represented in a schematic overview template (the initial dottogram), or a more detailed content description by themes (revised dottogram). Both dottograms are introduced below.

5.2. Introducing the dottogram

In order to understand structures of change, reduce the complexity of the data, and to compare perceptions of change between actors, the “dottogram” was introduced (see Fig. 3). Dottograms represent both a novel research methodology and a conceptual framework for analysis. In the *initial dottogram*, each dot represents a change referred to by the respondent. The number of dots indicates change intensity in the particular area (past or present; what or why; and actor, dyad or

network). For example, in making sense of why things will change in the future, the respondent in Fig. 3 clearly sees the importance of actors rather than dyadic or network changes (represented by the number of dots in box D). Empty boxes indicate that there are no changes discussed. This initial dottogram therefore provides information about the predominant level on which change occurs, and the levels that drive change. Furthermore, differences in the assessments of the past, current, and future network developments come into clearer focus (differences in change density between boxes).

While the initial dottogram facilitates an analysis of the structures of change, we also use another revised template (the *detailed dottogram*) to capture ‘thick’ descriptions of the changes occurring and the reasons for them. The same template structure is used as in the initial dottogram analysis to facilitate cross-referencing. Using *insertion*,

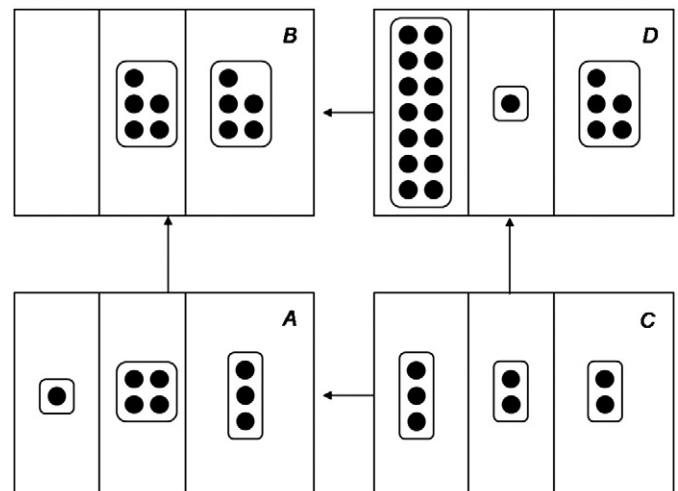


Fig. 3. Initial dottogram for Norway Salmon respondent.

deletion, changing scope or changing higher-order classification (King, 2004), more specific details regarding the changes, especially their level of relating to actors, dyads, or the network were added. The revised template uses higher-order classifications. The dottogram structure can therefore be enriched by substituting each dot with the specific change description, 'opening up' the dots (see Fig. 4 for a partial view of a detailed dottogram, discussed further below). It provides in-depth understanding of the specific network changes important to an individual actor, and how these changes are linked through sensemaking mechanisms and through a progression in time. Based on these two analytical lenses (initial dottogram and detailed

dottogram), a case study of change in a network can be constructed, using information from all relevant network actors.

5.3. Case study setting

In order to demonstrate the dottogram methodology, we show its application to a network facing great change. This is the salmon distribution network from Norwegian farmers and exporters to Japanese distributors and retailers. An initial study of five exporters and seven importers was undertaken in 2006 (Appendix A lists the companies involved) as part of a larger study (Abrahamsen, 2011). The Norwegian

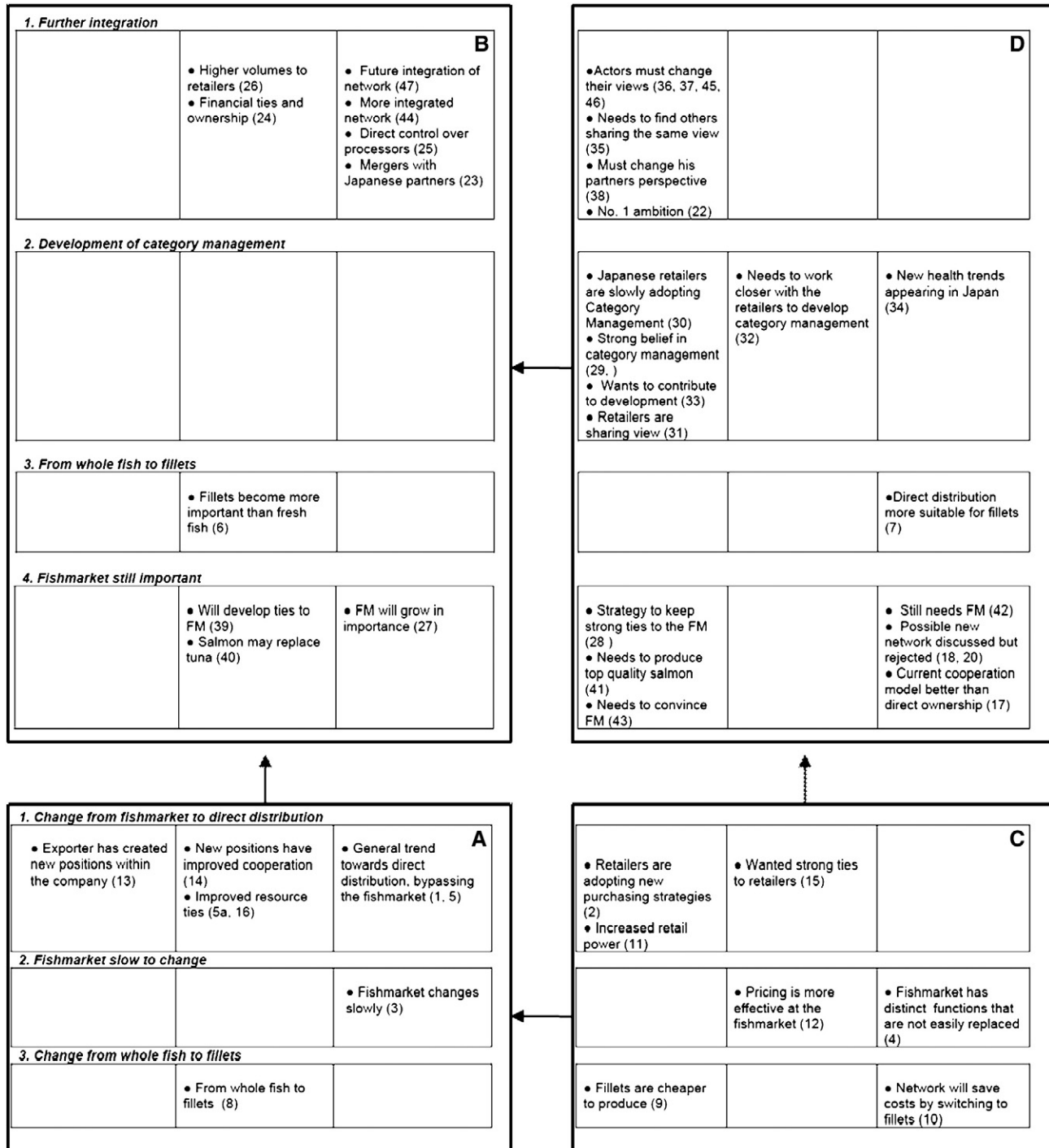


Fig. 4. Detailed dottogram for Norway Salmon respondent.

sample was identified by cross-checking information from preliminary discussions with key actors in the seafood industry coupled with official Norwegian export statistics. Subsequent data analysis indicates that 69% of salmon exports to Japan were covered by the respondents. The Japanese sample was identified by the Norwegian suppliers, with a focus on seven companies out of approximately twenty key actors.

The initial study confirmed the network to be an appropriate case setting (Halinen & Törnroos, 2005), due to the traditional distribution system being replaced by direct distribution, with large importers and retailers starting to bypass network layers such as the traditional fish markets. It also identified initial differences in the actors' perceptions regarding the network. Norwegian exporters perceive the Japanese traditional distribution system to be inefficient and long-winded, whereas the Japanese importers believe the system works well. However, these perceptions held by the Norwegian exporters have encouraged them to look for new customers in other countries. Similarly, Japanese importers' frustration with their Norwegian suppliers' lack of attention and continued efforts to bypass the traditional distribution systems has resulted in new ties to partners in Chile and Canada. As Håkansson and Snehota (1995) argue, "*the different and contrasting perceptions of the [activity links] are at the origin of some changes*," thus such bypassing activities indicate structural changes in the network. Given the different perceptions held by the actors in the initial study, it was concluded that a detailed case analysis of the Norwegian/Japanese salmon distribution system with specific focus on network changes was appropriate.

A detailed follow-up case study was conducted in 2007. Multiple interviews were held with Norwegian exporters, Japanese importers, wholesalers, distributors, processors, retailers, and government agencies (Appendix B lists those involved). Interviews traced the salmon distribution through the two different systems: the traditional fish-market, and the direct distribution systems. Interviews were held with different actors in several companies, enquiring about their understanding of the network and changes they perceived. To increase validity and reliability, all interviewees were given the same set of questions, being asked to draw and explain what their network looked like five years ago, including the main actors and key relationships as they saw it. Then, they were asked to repeat the exercise for the present network, and finally to envisage what it would look like in the future. These collected network pictures were then used as a starting point for an interview about how they perceived changes in their network, i.e. the transformation from one network picture to the other. The decision to use five year intervals was made to increase validity and reliability as all the respondents would relate to the same time frame, as suggested by the findings from the initial case study.

6. Analysis and findings

In order to show the application of our methodology, we present the analysis completed for one company, Norway Salmon (specifically their Asia key account director), utilising their initial as well as their detailed dottogram. We then progress to a comparative representation of the different change perceptions of a wider variety of actors.

6.1. Initial dottogram Norway Salmon

Norway Salmon is one of Norway's largest seafood producers and exporters. An integrated producer, it has its own seafood farms and processing plants, and has been selling salmon to Japan for over 20 years. It has a wide product range, but fresh salmon remains one of the key products. The Japanese market represents 10% of its exports, equating to about 20% market share of fresh Norwegian salmon in Japan. It handles most Japanese relationships from its Norwegian head office, with seven dedicated staff. Fig. 3 showed the initial dottogram of this company.

Using the dottogram to analyse the perceived network changes perceived, it appears that more of the changes were in the future

network (box B) compared to the current situation. Most prominent are future changes at network and dyadic level (i.e. confined as well as connected changes; Halinen et al., 1999), and not at the actor level. Explaining these future changes, the respondent attributed these changes to developments especially on the actor level, and only to a small extent on the network level (with almost no change explanation at the dyadic level; box D). He perceives future changes (which will mainly affect their relationships as well as the general network) to be driven by decisions and actions taken by Norway Salmon itself (and other individual actors). Compared to these wide-ranging changes in the future, the current change density is rather low (box A): some changes are happening (especially at the dyad level), driven by events in all three areas of network characteristics, dyadic relationships, and individual actor activities (box C).

6.2. Detailed dottogram Norway Salmon

Developing the analysis of change perceptions from the initial to the detailed dottogram, the specific change events and attributions behind the dots are shown in Fig. 4. Each of the dots of Fig. 3 has now been detailed as a change description or a change ascription, i.e. the dots have been 'opened up'. These are grouped thematically for an integrated analysis (previously, this was referred to as 'higher order classifications'). For example, the ten dots in box B of Fig. 3 are grouped into four themes in Fig. 4. This allows us to see which reasons are used by the respondent to make sense of what kind of change in the network. As an example, the theme of *Further Integration* shows that having to change one's view by incorporating interaction partners' perspectives is seen as an important actor level change reason (in fact the one with the highest change intensity, incorporating four dots of the initial dottogram: 36, 37, 45 and 46). This is expected to result in future dyadic changes (i.e. retailer interactions will gain higher volume shares; new concept development with retailers will be intensified; and financial co-ownership structures will develop). We return to this level of interpretation below.

6.3. Interpreting the detailed dottogram to analyse Norway Salmon

We can now use the detailed dottogram to understand the thematic changes and the reasons for those changes in greater detail. We confine ourselves here to explaining just the 'here and now' of boxes A and C, excluding a detailed discussion of the future based upon boxes B and D. Looking first at box A (what change is currently happening?) and then C (why is it happening?), three main themes can be distinguished, which we exemplify by quotes from the respondent.

6.3.1. General change from fishmarket to direct distribution

In box A, the respondent describes the changes from the fishmarket to a more direct system: "*Things are slow in Japan. But the underlying change is accelerating due to more direct contact between suppliers and end users.*" The general trend is bypassing the fishmarket: "*Now you have a Norwegian exporter selling to a Japanese importer or to an importer owned by them such as Global Seafood. This importer has direct contact with retail chains or restaurant chains. This model has grown in magnitude the last 5 years.*" Another example of change at network level is closer ties to importers, processors and retailers: "*The main difference in resource ties is that we develop concepts together in the direct system. These concepts can be regarding packaging, logistics, special product quality, feed mix at the fish farm, category management together with the supermarkets, and menu development with the restaurants.*" As a result, Norway Salmon has created new positions within the company (change at actor level): "*We share knowledge with our customers. We have recently hired a product development manager and a brand manager. These are resources that we draw upon together with the importers and retailers in Japan. We have not created them specifically for Japan, but for our company.*" This has improved cooperation with their partners: "*We are now in*

a much better position to negotiate with the retailers than previously, and these skills are important to us, and we use them to get in closer cooperation with our customers.” Furthermore, the increased ties and integration of the network have led to greater commitment between the actors: “We have three companies in Japan that we define as strategic partners. With these three partners we draw on various types of resources. So here we position ourselves much closer than we do in the traditional system.”

The way Norway Salmon explains these changes (box C) relates to the role of the retailers who are perceived to be increasingly powerful: “The purchase function in the direct system is more professional than in the traditional system. And the retail power is greater in the direct system.” Further, retailers are adopting new purchasing strategies (i.e. sensemaking at actor level): “The reason behind this is that in Japan the retailers wish to adopt purchase strategies and management practices that have been introduced by international retail chains such as Carrefour and Wal-Mart. They are inspired by this and they see that if they are to survive they have to get closer to the origin of the products that they source. This is to a great part driven by the retail level.”

6.3.2. The fishmarket is slow to change

The respondent also discusses change at network level as the fishmarket system is changing, although at a slow pace: “despite all predictions that we will see a less fragmented retail level in Japan, this development is extremely slow. As long as we have the fragmented retail level, the fishmarket fulfils an important role.” Looking to box C to find the reason behind this, at the network level the company perceives that the fishmarket has some distinct functions that are not easily replaced: “What I think is easy to overlook when we talk about Japan is the real importance the fishmarket has, and which will remain. It is wrong to suggest that the fishmarket will lose its importance. It is an effective way of distributing large volumes of fresh fish. In a fragmented market like ours, it is very effective.” Further, on the dyad level the fishmarket is an effective way to determine prices between the actors: “You may regard it as a gigantic cash and carry wholesale outlet where small retailer, supermarkets, shops and restaurants meet and get what they need at the time that they need it. With guaranteed freshness. This role is important as long as the retail level is as fragmented as it is.”

6.3.3. Change from whole fish to fillets

Thirdly, Norway Salmon sees a change in product form from whole fish to fillets on the dyad level (box A). “The growth in Japan is larger regarding fresh fillets rather than whole fish. Whole fish products are mainly found in the traditional system. Fresh fillets very rarely find their way to the traditional system because the market is not suitable for this kind of distribution. One of the problems is perishability, challenges regarding freshness, which means that you need to have a shorter distribution. You have less flexibility. The filleted fish is only suitable for some purposes, whereas whole fish has more options, greater variation. And this flexibility you find in the fishmarket. You don't need this kind of flexibility in direct distribution.” Driving this change (box C) is a belief among the actors that fillets are cheaper to produce: “The increasing production of fillets is all about money. We pay on average 12 NOK per kilo in airfreight to Japan. If you have a gutted salmon of 4.5 kg times 12, this represents 54 NOK. Out of 4.5 kg whole salmon you get 3 kg fillets. Times 12 this is 36 NOK. These two volumes (4.5 and 3) represent the same amount of end product. If you are making sashimi out of this (4.5 kg fresh fish) you get the same amount of sashimi as this (3 kg fillet). But you have saved 12 NOK in freight. Literally, you don't ship the bones and the head, and this saves you money.” Hence, this transition is beneficial to the whole network as other actors also will save costs (sensemaking at network level): “You never see a Japanese sushi-chef, or a retailer, filleting the fish himself. In the most expensive restaurants the sushi chefs do it, but in the kaiten [belt] sushi restaurant, which are the majority and is the largest segment for salmon, they buy ready sliced products. This is sliced in Japan or South-East Asia for frozen products. For companies doing this slicing, normally

processors with own or outsourced production, it is more profitable for them to buy fillets than whole fish.”

Although not discussed here in any detail, we can see that the themes in boxes B and D identify and then explain four different thematic changes: further integration, the development of category management, the change from whole fish to fillets, and the on-going importance of the fishmarket. The methodology used to identify these change themes was entirely similar to that undertaken above.

6.4. Comparative analysis of the salmon distribution network: initial dottograms

Dottograms can be used in a second step to systematically compare the different perceptions of change by multiple actors. Our analysis now changes from a focal company to comparing multiple companies. We present the findings for a comparison of four actors in the Norwegian/Japanese salmon distribution network: in addition to Norway Salmon (a producer/exporter), these are Bluewater Trading (a large Japanese importer), Shoitachi (a large processor) and Asahi Retail (a large retail chain in the Kyoto/Osaka area). Fig. 5 shows the initial dottograms for these actors.

Norway Salmon's initial template has already been analysed above. In comparison, Bluewater has a limited view about changes in the future. The most striking feature of Bluewater's template is that the majority of changes are concerned with boxes A and C, i.e. changes that have taken place currently (A), and why they have happened (C). In box A, the majority of changes are occurring at the dyad level, most notably in the relationship between himself and his exporter. Bluewater makes sense of these changes by referring to the actor level and the network level in box C, i.e. changes appear due to something happening (sensemaking) at the actor level and network level.

The template of Shoitachi, a processor, is characterised by a limited number of connections and dots compared to Bluewater and Norway Salmon. In Shoitachi's case, the majority of changes occur at the dyad level in box A. Sensemaking devices used to explain these changes are found especially at the actor level in box C, indicating that changes in Shoitachi's relationships are due to actions taken at the actor level. As such, the Bluewater and Shoitachi templates are similar. Both emphasise changes at the relationship level. But whereas Bluewater focuses on both the network and the actor level to explain the changes, Shoitachi focuses more on current actors as a reason for change.

Asahi's template is similar to Bluewater and Shoitachi in its description of changes mainly at the relationship level (box A) and the use of sensemaking mostly at actor level to explain them (box C). Where Asahi differs is in the descriptions of future directions of changes in box B: Asahi sees more changes appearing in the future than the importer or the processor company. However, not many explanations are offered as to why these changes are likely to appear (box D, with only three changes).

7. Discussion

Norway Salmon's dottogram demonstrates knowledge of the Japanese market with a clear view about future changes. These ‘thick’ expectations about network change contrast with the rather ‘thin’ views of the Japanese companies. While Norway Salmon perceives the main drivers of change to relate to the actor level, the other companies do not share this view. Norway Salmon has in general a broader perspective, referring to changes and change reasons along all three dimensions (network, dyad and actor level). Bluewater on the contrary seems to be more engaged in the ‘here and now’ changes which seem overpowering (at least if viewed through the perspective of their initial dottogram). This actor is continuously adjusting to the changes taking place at the dyad level such as changes in Bluewater's relationship to their new supplier (Norway Salmon), to their new customer (Asahi Retail), to their old customer (the fishmarket), and

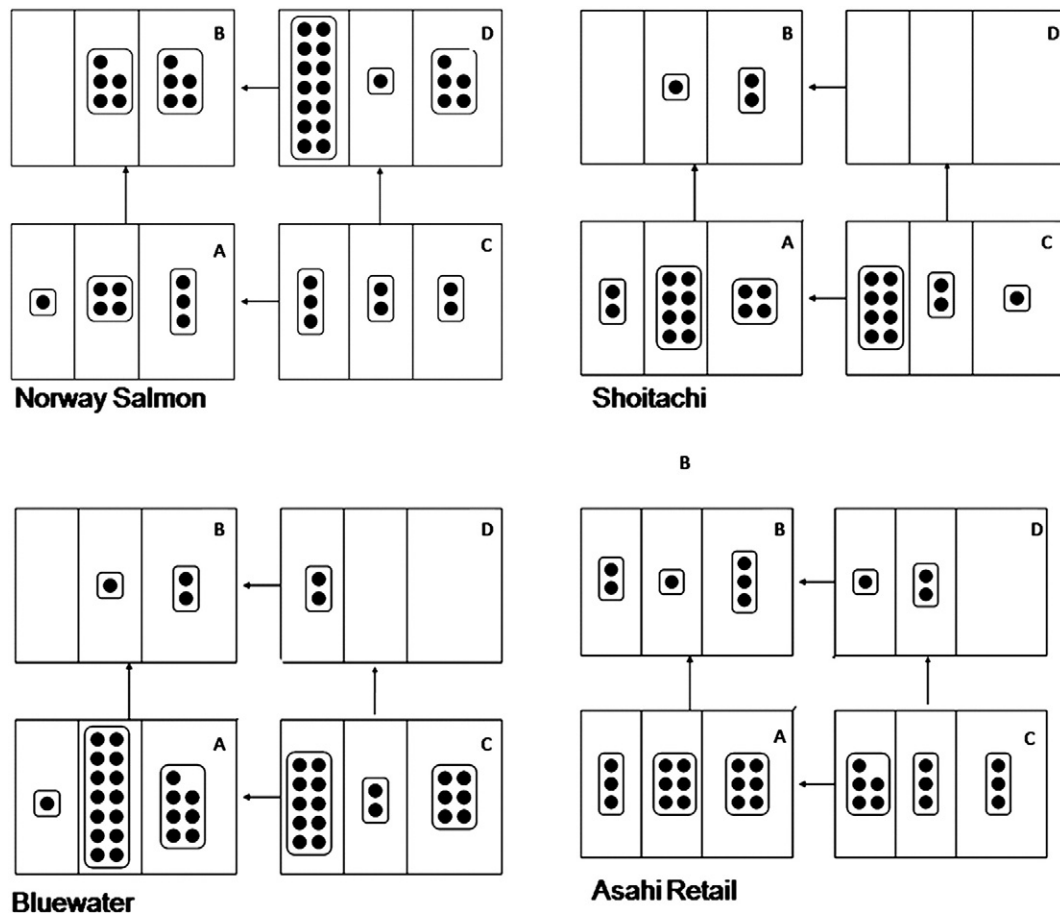


Fig. 5. Initial dottograms for four key actors in the Norwegian/Japanese salmon distribution network.

to the processor which is also a new actor in Bluewater's network. Explaining the dyadic changes, Bluewater has a broad scope as it refers to sensemaking at both network and actor levels (box C). This is also evident in Shoitachi's case, albeit on a much more parsimonious level. Shoitachi seems to be mostly concerned with the current state of the network, although they perceive change to be much less intense than Bluewater. Shoitachi does not seem to have any expectations regarding change in the future. Their focus is on their current dyads, and use sensemaking mainly on the actor level to explain these changes, seemingly adjusting and manoeuvring with regard to changes taking place in their distribution relationships. Their concern is to make things work in their closest relationships.

Norway Salmon and Asahi Retail are at 'opposite' ends of the distribution network (i.e. exporter/producer of raw material, and retailer with access to end-customers, respectively). Their initial dottograms indicate that they are facilitating changes, not merely responding to them: both have more detailed perspectives about the future of the network. From the interviews it appears that both Norway Salmon and Asahi are very 'action oriented,' wanting things to change in the network with regard to future developments. They have (complementary) visions of where they want to go; Norway Salmon wants closer ties to the retailers, and Asahi wants closer ties to the producers. They have both initiated actions based on these change-related network pictures. Thus the templates of Norway Salmon and Asahi Retail are similar in their focus on the future. Shoitachi and Bluewater may understand these concerns, but their challenge is to respond to them without a clear future-oriented network picture. Thus, Shoitachi and Bluewater also share similar templates, particularly concerning boxes A and C.

8. Conclusions and implications

This study has presented two main themes, and therefore represents a twofold contribution. First, it has developed an analytical framework illustrating how actors describe and explain network change. Secondly, this framework has then been used to propose a method based on network pictures and dottograms to analyse data for both individual actors and between actors. The framework represents a systematic way to analyse actor perceptions of change, and herein lies its main methodological contribution. Network pictures have so far mainly been discussed as a theoretical construct and only a few studies exist using them as a research tool (Kragh & Andersen, 2009; Oberg et al., 2007). An important methodological contribution of the study relates to the conceptual link between network pictures and their use to understand network dynamics and change in terms of *space*, *time* and *ascription*.

Concerning *space specificity* (Ford et al., 2008), using the dottograms means that change can be studied according to whether it happens within a company, in the relationship between companies, and/or in a network of further connected relationships. It provides a way of comparing subjective interpretations of several actors, a key issue in understanding interaction: "...subjective interpretation means that the actions of actors will be based on their individual interpretations of the actions of others and of the world around them. One of the important consequences for the researcher is that subjective interpretations separate the reasons for actions from their effects ... Interpretation means that the subjective dimension becomes important, as there will be variation between the interpretations of different actors" (Ford & Håkansson, 2006, p. 15). The dottogram addresses these issues as it allows the variation in interpretations between different actors to be compared systematically.

The framework also incorporates the *time* dimension as change is seen as something that was (past), to something that is (present), and to something that will be (future) (Halinen & Törnroos, 2005). It provides a starting point for analysing interaction in time, as “*history matters in interaction and so do future expectations. In fact, interaction is difficult to delimit in time. It has no easily identifiable beginning or end*” (Ford & Håkansson, 2006:7). The dottogram method offers a way to understand how actors explain change, as the attribution of causes of change may be studied as to whether they appear at the actor, dyad or network level, both at present and in the future. Thus the dottograms are an exemplification of what Ford et al. (2008, p. 23) describe as “*The ability to analyse and cope with changes in relation to space dimensions becomes a key issue for actors.*”

Finally, the dottogram further provides an answer to what Ford and Håkansson (2006, p. 7) define as a key problem of understanding interaction in that it is “...*difficult to make sense of these alternative possible outcomes [of interaction].... Similarly researchers will find that the multiplicity of simultaneous interactions, both between and outside of any dyad, makes it effectively impossible to construct distinct causal links between particular episodes and outcomes of interaction.*” Dottograms provide a way of *linking causes* (the why-column) and *effects* (the what-column), not in the positivist sense, but using subjective interpretations of the respondents to understand these links in terms of the sensemaking attempts of relevant actors. In this way the dottogram addresses another problem of interaction: “...*researchers seeking to explain interaction over time will have to be more interested in the evolving views of the actors, rather than attempting to model the sequence of cause and effect in a supposedly objective way*” (Ford & Håkansson, 2006, p. 9). The dottogram offers one solution to this problem as it incorporates *ascription* of changes.

Furthermore, by developing dottograms, this study shows how network pictures can be collected and analysed, which facilitates a range of comparisons between respondents. In case study research, although there are “*probably as many approaches as researchers suggesting ways to make collected data fit for analysis*”, write-ups are often purely descriptive (Eisenhardt, 1989, p. 540). The application of dottograms represents ‘innovative practice’ (Piekkari et al., 2010) as they enable systematic within-case and cross-case analyses, an integral part of the case study research process. They enable us to understand change in several dimensions, for instance comparing of the attributions (the reasons for change): actors may describe similar changes, but attribute them to different causes (or for that matter have similar explanations for different events). Another option is to structure the analysis in terms of cultural background (Norwegian/Japanese). Furthermore, the issue of the network position of different actors, as well as their network roles, and the changes with regard to these constructs over time, would also provide additional insights into framing dimensions of network changes (Möller, 2010).

The study described here is a cross-sectional study of actor perceptions in a network. Although the study analyses different time dimensions (past/present/future), the data were collected at a given point in time. However, it is possible to use the method for a longitudinal study. In the present study actors were asked to describe their network at three points in time. Changes from the past to the present are discussed in terms of how the network today differs from what it used to look like, and future changes are discussed in terms of what will change from today's situation. If a similar study is conducted in five years' time, this will give unique insight and comparisons in terms of what the actors believed would happen and what actually happened.

Considering limitations of the study, we encounter the general concerns that have been raised about doing case study research. Dubois and Gadde (2002) for instance discuss a number of limitations: first, case studies are seen to provide little basis for scientific generalization (Weick, 1979; Yin, 1994). Second, case studies are often rich descriptions of events without clear analytical framing;

they at best only partially support quasi-deductive theories, and they suggest some notion of statistical generalization where multiple case studies are used (Easton, 1995). Dubois and Gadde (2002) introduce the *abductive approach* to case study research, also referred to as “*systematic combining*”, where “*theoretical framework, empirical fieldwork and case analysis evolve simultaneously*” (p. 554). This has also been our experience in developing the analytical framework and the dottogram method. A second limitation of our study concerns the framework. It presents an account of how actors perceive changes affecting different aspect of the network. As such, this is not a representation of ‘reality’, but represents perceived reality, i.e. a socially constructed view of the world. It bases its foundations on the concept of network pictures and sensemaking, where reality is an idiosyncratic construct. When studying changes, we actually study the outcomes of change, i.e. the product, while not explaining the process of change. Changes can only be understood in retrospect. It therefore makes sense to describe changes in terms of the actor's perception of them, because it is these perceived changes which serve as basis for their actions (Ford et al., 2003). A third limitation concerns the dimensions of the analytical framework, in that it is concerned with several network picture characteristics, but it does not take into account other dimensions such as company performance, and as such we have developed a descriptive rather than a normative approach.

In doing so, we have developed a framework of network change that encompasses change description as well as change ascription at different points in time, thereby introducing an innovative way of understanding differences in change perceptions by different actors within the same business network. Dottograms of different granularity (initial and detailed) have been developed to condense and aggregate the data captured as network pictures. These dottograms have been used to understand change in the empirical example of a Norwegian/Japanese salmon distribution network. As such, the paper suggests that managers' sensemaking is best understood by taking into account the three dimensions of space (actor, dyad and network level), time (past, present and future) and cause-and-effect (what and why). We propose that the use of dottograms as a basis of the analysis may be one way to capture these dimensions in a managerially meaningful way.

Appendix A. Company/respondent description for initial study (names have been altered)

Company	Type of business	Key respondent
<i>Norwegian sample</i>		
Global Seafood	Farmer, processor, exporter	Sales director + key account manager, Japan
Rocky Coast	Farmer, processor, exporter	Trade and development manager + KAM
Norway Salmon	Farmer, processor, exporter	Team manager, Asia
Viking Seafood	Farmer, processor, exporter	Sales unit manager, fresh dept. Asia
Ocean Salmon	Trader, processor, exporter	Sales manager frozen dept. + sales manager
<i>Japanese sample</i>		
Karatsu Co. Ltd.	Importer, wholesaler, trader	General manager, int. trade and marketing dept.
GMC Inc.	Importer, trader (<i>sogo susha</i>)	Manager, seafood dept.
Japan Corporation	Importer, trader (<i>sogo susha</i>)	Manager of marine products
Tokyo Fisheries Corp.	Importer, wholesaler, trader	Deputy general manager, overseas department
Nippon Trading	Importer, trader	President
Kato Marine Products	Importer, trader, processor	President
Global Seafood Japan	Importer, trader, sales subsidiary	Managing director

Appendix B. Company/respondent description for follow-up study (names have been altered)

Company	Type	Key respondent
<i>Norwegian sample</i>		
Global Seafood	Farmer, processor, exporter	Sales director, managing director
Norway Salmon	Farmer, processor, exporter	Team manager, Asia
Viking Seafood	Farmer, processor, exporter	Sales unit manager, fresh dept. Asia
Ocean Salmon	Trader, processor, exporter	Asia manager
<i>Japanese sample</i>		
Karatsu Co. Ltd	Primary wholesaler	General manager, int. trade and marketing dept.
Akimoto Ltd.	Primary wholesaler	General manager
Tokyo Fisheries Corp.	Importer/secondary wholesaler	Deputy general manager, overseas department
Rocky Coast Japan	Importer	General manager
Kato Marine Products	Importer	President
Bluewater Trading	Importer	Vice president
Asahi Retail	Retailer	Head buyer
BCC	Retailer	Head buyer
Sensei Transport	Distributor	General manager
Narita Distributors	Distributor	General manager
Shoitachi	Processor	President
Norwegian Seafood Council	Gov agency	Counsellor, fisheries section
Tokyo Metro. Government	Gov administration, Tsukiji	Director general
+ various other actors		

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