

Netquakes

– Describing Effects of Ending Business Relationships on Business Networks

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Abstract

Business network dynamics and change in business networks are most often discussed from the perspective of a focal business relationship and business relationships, for example customers and/or suppliers, connected to the focal dyad. This type of studies focus on how one relationship influences another directly connected relationship. Most often the indirectly connected business relationships, such as customers' customers, are not considered. This means that we still know very little about how change spreads further in business networks.

The purpose of this paper is to elaborate further on the spread of change in business networks by focusing on the process following the ending of a business relationship. For understanding this process of change in business networks we propose a framework that is inspired from the study of earthquakes in seismology, here called "netquakes" (Dahlin, Havila & Thilenius, 2004). When enough "stress" is involved in the relationship it needs to be released. In some situations this "stress" leads to termination of the business relationship. This, in turn, could start a netquake process in the surrounding business network.

The strength of the netquake process can be observed through the effects of the ending business relationship in the connected relationships. The higher the effect in the business network the stronger the netquake. The ending of the business relationship, in turn, "releases energy" into the business network causing uncertainty that can be observed by the effects in the business network. The ending of some business relationships "shake the ground" far away from the ending business relationship, whereas some business relationships end without any effect on the surrounding business network. We illustrate our discussion on the different types of netquake processes by three empirical examples.

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Introduction

In an earthquake the ground starts to shake, you hear a rumbling from the ground, things around you start to sway back and forth, and some of them may fall on the ground. After a while it is over leaving behind the more or less severe effects. The ending of a business relationship can be compared to an earthquake. For the involved parties it can be a shaking experience, sometimes involving a lot of “rumbling”. This can be the case also for the surrounding business network. The earth is constantly creating earthquakes. Some of them are severe, some are not even noticed. If we compare this to business relationships that end the situation is similar; the ending of some business relationships “shake the ground” far away from the ending business relationship, whereas some business relationships end without any effect on the surrounding business network.

Business network dynamics and change in business networks are most often discussed from the perspective of a focal business relationship and business relationships, for example customers and/or suppliers, connected to the focal dyad. This type of studies focus on how one relationship influences another directly connected relationship. Most often the indirectly connected business relationships, such as customers’ customers, are not considered. This means that we still know very little about how change spreads further in business networks and how the structure of business networks change.

The purpose of this paper is to elaborate further on the spread of change in business networks. The special focus here is on how to describe effects of business relationship ending on the surrounding business network. For understanding the spread of change in business networks we propose a framework that is inspired from the study of earthquakes in seismology, here called “netquakes”.

The structure of the paper is as follows. First, we briefly discuss relationship dissolution and network effects. Next, we focus on earthquakes and how this metaphor can be used when describing network effects. Thereafter, we illustrate the discussion by three examples where ending of a business relationship influences the connected business relationships and the structure of the business network in different ways.

Relationship Dissolution and Network Effects

As earlier research shows, business-to-business relationships change continuously in content, strength and nature through the interaction between the involved parties (see e.g. Anderson, Håkansson & Johanson, 1994; Håkansson & Snehota, 1995). For example, the two business parties may agree on changes in the ordering or delivery procedures. That is an example of a change that is handled through adaptation within the business relationship. The relationship is thus rather stable as the change is incremental and manageable. However, if a situation occurs that cannot be handled through the flexibility and adaptability of the relationship, there is a risk that the relationship ends. Radical change and dissolution of business relationships has attracted some research attention so far and is seen as an important aspect in understanding business relationships and networks (Tähtinen & Halinen, 2002).

If the change remains within the business relationship dyad and does not affect or is affected by other relationships in the network, it can be characterised as a “confined change” (Halinen, Salmi & Havila, 1999). However, business-to-business relationships are not isolated islands, and thus, what happens in one business relationship most often influences what happens in other connected relationship (see e.g. Håkansson & Snehota, 1989). This means that there can be a kind of “connected change” (Halinen, Salmi & Havila, 1999) that causes a type of “*domino effect*” in the business network (Hertz, 1998). Håkansson & Snehota (1995) call this the “network function” of business relationships. The idea here is that change in one focal business relationship may influence other business relationships both directly and indirectly as they are connected to each other. Thus, due to the various network interdependencies, indirect relationships relatively distant from the focal dyad may be affected. The effect on a connected relationship from connected change may however vary. Less serious change may be handled by adaptation of the relationship, while more severe changes might ultimately lead to dissolution of existing relationships or establishment of new (Halinen, Salmi & Havila, 1999).

Business networks are usually seen to change in an incremental way, which means that the overall pattern of business relationships seem to be more or less stable over time even though changes take

place within the business relationships. Network researchers have thus emphasised the existence of both stability and change in business networks (Easton, 1992; Gadde & Mattsson, 1987; Håkansson & Snehota, 1995). The establishment and ending of business relationships is in the network seen as changes of the network structure.

Even though the idea of incremental change of business networks might be a useful assumption, networks may sometimes change in a radical way (e.g. Halinen, Salmi & Havila, 1999; Havila & Salmi, 2000). Networks evolve in response to specific events (Madhavan, Koka & Prescott, 1998), and the recent waves of acquisitions, mergers and bankruptcies can be seen as periods with many radical events that may trigger radical change in a business network and changes initiated by a merger or an acquisition may spread far in the business network (Halinen, Salmi & Havila, 1999; Havila & Salmi, 2000). Halinen et al (1999, p.786) sees the critical event as “the impulse that allows tensions to be released and the network to reconfigure” in the meaning that some relationships may be terminated or new relationships established. Whether this will happen depends on how the parties perceive and react on the event. It also depends on the specific character of the relationship, as well as the context in which it is embedded (Gidhagen, 2002). Change in business networks is however a topic on which more needs to be known (Madhavan, Koka & Prescott, 1998).

The ending of a business relationship can be seen as a critical event that changes the overall business network structure. In some situations this leads to incremental network change and in other situations to radical network change. The effects in the business network will next be described in resemblance to earthquakes, and will therefore be called “netquakes”.

Business Netquakes

Before discussing “business network earthquakes”, we need to understand what an earthquake is. The aim here is to use earthquake as a metaphor and as a starting-point to discuss effects of business relationship dissolution on the surrounding business network.

***What is an earthquake?*²**

The earth is separated into different layers. The topmost layer is the lithosphere, which is comprised of the crust and solid portion of the upper mantle. The crust is ranging from about 5 to 70 km in thickness worldwide, and the mantle (upper and lower) is about 2900 kilometres thick. The lithosphere is divided into many plates that are constantly moving in relation to each other. (<http://scign.jpl.nasa.gov/learn/plate1.htm>, 2004-07-28) Earthquakes occur when the plates, for example, dive under another, press towards each other or pull away from each other.

An earthquake is “the vibration, sometimes violent, of the Earth’s surface that follows a release of energy in the Earth’s crust” (<http://pubs.usgs.gov/gip/earthq1/how.html>, 2004-07-27). One way to describe earthquake is as follows:

“When the Earth’s plates move against each other, stress is put on the lithosphere. When this stress is great enough, the lithosphere breaks or shifts. Imagine holding a pencil horizontally. If you were to apply a force to both ends of the pencil by pushing down on them, you would see the pencil bend. After enough force was applied, the pencil would break in the middle, releasing the stress you have put on it. The Earth’s crust acts in the same way. As the plates move they put forces on themselves and each other. When the force is large enough, the crust is forced to break. When the break occurs, the stress is released as energy which moves through the Earth in the form of waves, which we feel and call an earthquake.” (<http://scign.nasa.gov/learn/eq1.htm>, 2004-07-27)

There are three different types of waves: P waves, S waves and surface waves. The P waves are the fastest of the three waves, whereas the S waves are more dangerous as they are larger and produce

² We would like to thank Björn Lund, Geophysics Department, Uppsala University for the constructive comments on an earlier draft of this paper.

vertical and horizontal motion in the ground surface. The surface waves are the slowest ones and move close to or on the surface of the ground. (<http://scign.jpl.nasa.gov/learn/eq6.htm>, 2004-07-27)

Epicenter is the point on the earth's surface vertically above the point of origin of an earthquake. (<http://scign.jpl.nasa.gov/learn/glossary.htm>, 2004-07-28)

To Measure Earthquakes

The size of an earthquake can be measured in a number of different ways. One way is to describe the effect of an earthquake on the earth's surface in terms of *intensity*. One example of an intensity scale is the Modified Mercalli Intensity Scale, which is based on observed effects (see Table 1). The lower numbers on the intensity scale express how the earthquake is felt by people and the higher numbers express the observed damage. (<http://neic.usgs.gov/neis/general/mercalli.html>, 2005-04-10)

Table 1. Modified Mercalli Intensity Scale to measure the intensity of an earthquake

I.	Not felt except by a very few under especially favourable conditions.
II.	Felt only by few persons at rest, especially on upper floors of buildings.
III.	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck.
IV.	Felt indoors by many, outdoors by few during the day. At the night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V.	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI.	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII.	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII.	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX.	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundation.
X.	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI.	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII.	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

(<http://neic.usgs.gov/neis/general/mercalli.html>, 2005-04-10)

Another type of measurement is the *magnitude* of the earthquake. Magnitude is determined by using mathematical formulae and information from seismograms. One way to express magnitude is by using the Richter scale. The scale is logarithmic and, for example, number 7 on the scale means that the

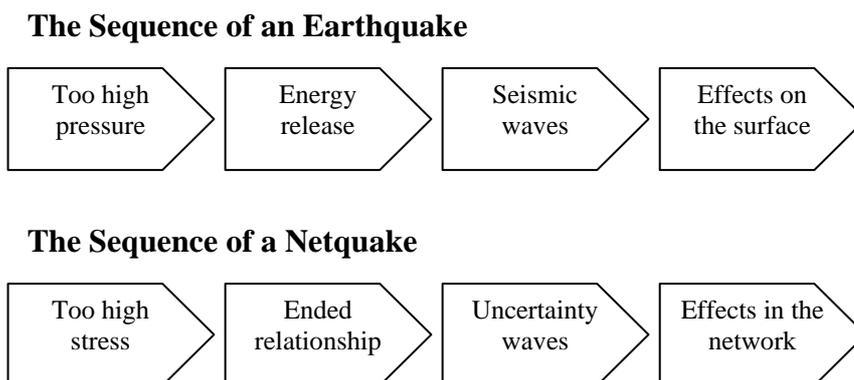
ground motion is 10 times as large as number 6 on the scale. (<http://pubs.usgs.gov/gip/earthq1/measure.html>, 2004-07-27)

Earthquakes of large magnitude do not necessarily cause the most intense surface effects. The surface effects depend also on local surface and subsurface geological conditions. For example, if two areas are equally distant from an earthquake's epicentre it is more likely with severe effects if the ground is unstable consisting of sand or clay, than if the ground consists of granite. Besides the magnitude and the geological conditions an earthquake's destructiveness depends also on the distance from the epicenter and the design and construction of buildings. (<http://pubs.usgs.gov/gip/earthq1/measure.html>, 2004-07-27)

To Describe Business Netquakes

The plates could be seen as companies and the relation between the plates as business relationships between the companies. When two plates move against each other they put forces on themselves and on each other. When the force is large enough the crust breaks. This is the case also regarding the two business parties: when enough "stress" is involved in the relationship it needs to be released. In some situations this "stress" leads to termination of the business relationship. This, in turn, could cause a "netquake" in the surrounding business network. In an earthquake seismic waves spread while in a netquake the waves can be seen as grave information leading to increased uncertainty spreading through the network of connected relationships (see Figure 1).

Figure 1. The Sequences of Earthquakes and Netquakes



The strength of an earthquake can range from a slight tremble only detected by the seismologist instrument to a devastating catastrophe causing mayhem and complete destruction. The netquake can similarly be anything from just another ending relationship between two parties unnoticed by the rest of the network to a complete dismantling of the network surrounding the terminated relationship.

The effects of an earthquake can be described by using the Modified Mercalli Intensity Scale, a scale mirroring the effects of the earthquake on the earth's surface. The effects of a netquake, its intensity, can in a similar way be observed through the effects of the ending business relationship in the connected relationships. This effect appears in the connected relationships as the waves of uncertainty spreads from the ended business relationship that forms the epicentre of the netquake. The higher the effects on the business network the higher intensity of the netquake.

In an earthquake the effects on the surface of the seismic waves are not always the same. This has to do with the varying geological configuration of the earth's outermost layer and also the design and construction of buildings. With some types of ground the effects become more serious and with others less. Similarly, in the case of a netquake different types of "ground" and "construction of buildings" lead to more or less serious effects. What type of effects the netquake causes depends on the type and strength of the connected business relationships. In some business relationships the waves of uncertainty will lead to increased commitment when the parties try to adapt to the new situation while in others de-commitment forms the start of the end of the relationships.

In a network the effects of a netquake can basically take the form of 1) change in interaction between actors within the existing structure of connected ongoing business relationships and 2) change in the network structure of connected relationship in the form of ending of existing business relationships or initiation of new business relationships. We propose that the intensity of a netquake can be identified using these basic forms of change in the network. The more changes in the network structure of connected relationships in relation to adaptation in the ongoing connected relationships due to the ending of a business relationship the higher the intensity of the netquake. Based on this we propose a scale for discussing the intensity of a netquake (see Table 2). This is followed by three empirical illustrations of swaying, shaking and breaking netquakes.

Table 2. Netquake Intensity

	Effect on the Business Network	Observable effects
0 – Trembling	The ending of a business relationship in the network is observed by others in the network but does not lead to any change.	- Increased flows of information
1 – Swaying	The ending of a business relationship in the network leads to some changes mostly in the form of adaptations in the ongoing business relationships.	- No connected relationships break. - Some connected relationships are affected. - All connected relationships can adapt to the new situation within the existing network structure.
2 – Shaking	The ending of a business relationship in the network leads to changes in the network both through adaptations in the ongoing business relationships and through changes in the network structure.	- Most connected relationships are affected. - Some of the connected relationships break. - Some of the connected relationships adapt to the new situation within the existing network structure.
3 – Breaking	The ending of a business relationship in the network leads to changes mostly through changes in the network structure.	- All connected relationships are affected. - Many of the connected relationships break. - Few of the connected relationships adapt to the new situation within the existing network structure.

Empirical illustrations of Netquakes

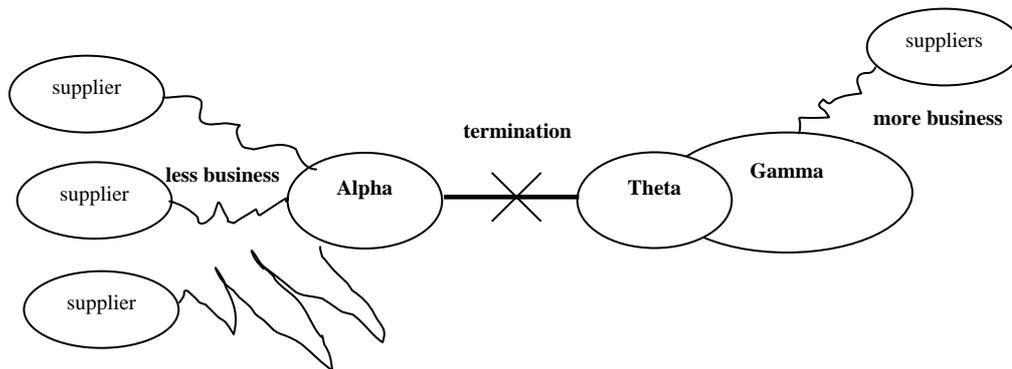
A netquake (i.e. effects of the ending of a business relationship) can influence the connected business relationships more or less severe. In this section we illustrate our discussion on swaying, shaking and breaking effects by three cases. In each of them a business relationship ends causing different types of effects on the surrounding business network.

Swaying effects

Swaying effects, i.e. a situation in a business network where the ending of a relationship leads to changes in the network through adaptation within the existing network structure, can be illustrated with an example from Havila & Salmi (2002).

The Swedish company Alpha has been a supplier to Theta, also located in Sweden, during several decades (see Figure 2). Alpha was an important supplier to Theta who had outsourced all of its production. Theta, in turn, was also an important customer to Alpha as it represented about 1/3 of the sales of Alpha. Then, more or less “over a night” this long-lasting and close business relationship was terminated. This happened directly after Theta was acquired by a Finnish company, Gamma, which produced products rather similar to the products of Theta. Gamma had free production capacity and decided to move all the Swedish production to its own production facilities in Finland. As a result, Alpha lost a very important customer representing a large part of Alphas business. This also influenced Alpha’s suppliers in Sweden, who lost parts of their business with Alpha. Especially one of the suppliers lost almost all of its business with Alpha. Gamma’s suppliers in Finland, in turn, got more orders as the Finnish company had the tradition to buy from Finnish suppliers at that time.

Figure 2. Illustration of Swaying Effects in a Business Network



The example above illustrates how the effects of the ending of one business relationship lead to “swaying” in many of the connected business relationships in the business network. One of the business relationships (one supplier to Alpha) is swaying so much that it is near to be terminated. However, the overall network structure is unchanged and remains to appear as prior to the ending of the business relationship.

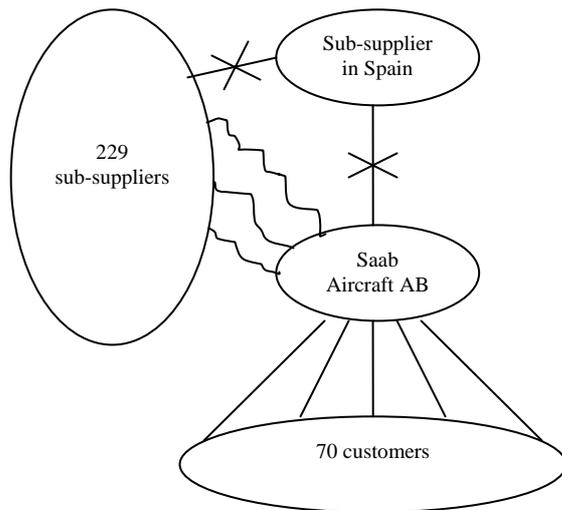
Shaking effects

Shaking effects, i.e. a situation in a business network where the ending of a relationship leads to changes in the network both through adaptations within the ongoing business relationships as well as in the network structure, can be illustrated with an example from a case dealing with changes that started when the Swedish company, Saab Aircraft AB, ceased the production of its commercial aircrafts Saab 340 and Saab 2000 in 1999.

Saab Aircraft AB had a total of around 230 sub-suppliers, and it was important that the sub-suppliers would continue to supply maintenance and spare parts also after the production cessation as each aircraft has a lifetime of 25-30 years. At that time Saab Aircraft AB had about 70 customers (see Figure 3).

Saab Aircraft AB and one of its sub-suppliers in Spain came to the agreement that Saab Aircraft AB was to take over the production of possible spare parts that could be needed in the future. This was a suggestion from the sub-supplier, who was not interested to continue with the production, as it would not be able to sell especially many spare parts. The parties agreed that the best solution was to move the production to a smaller workshop like that of Saab Aircraft AB. All the jigs and other tooling were moved over from the sub-supplier to Saab Aircraft AB and the relationship was terminated. Accordingly, the contact and technological cooperation between the Spanish sub-supplier and the other sub-suppliers was terminated and Saab Aircraft AB’s role vis-à-vis these sub-suppliers changed.

Figure 3. Illustration of Shaking Effects in a Business Network



This case is an illustration of a situation where the ending of one business relationship led to adaptations within some relationships (Saab Aircraft AB and some of its sub-suppliers) as well as changed the network structure, as the Spanish sub-supplier was replaced with a relationship directly between Saab Aircraft AB and the technological partners in the network. This was a slight restructuring of the network that deals with maintenance and production of spare parts to the two aircraft during the 25-30 years after the end of the aircraft production.

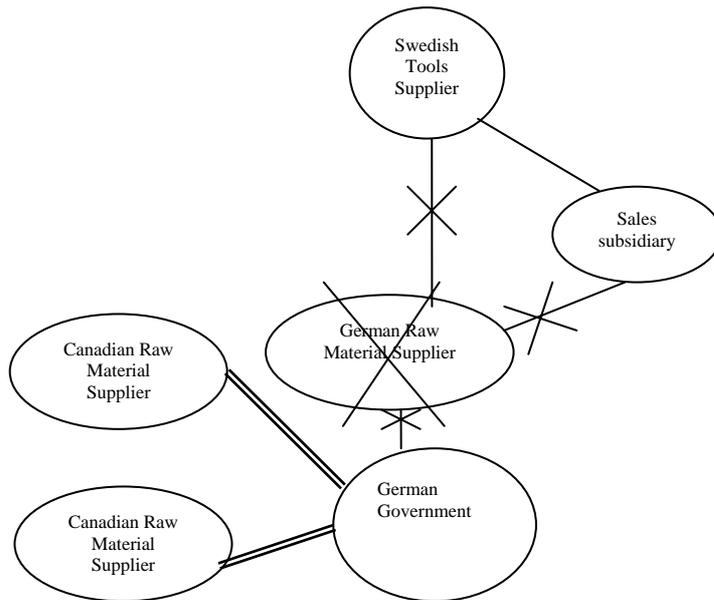
Breaking effects

Breaking effects, i.e. a situation in a business network where ending of a relationship leads to change of the network structure, can be illustrated with an example from Havila (1996).

The Swedish Tools Supplier has for several decades been manufacturing tools which are found in many different appearances, and which can be used in several types of industries. The first delivery from the Swedish Tools Supplier to the German Raw Material Supplier company was made in 1965. Since 1989 the Swedish Tools Supplier's sales subsidiary has been directly involved in the contacts with the German Raw Material Supplier. For example, a new product was developed in collaboration between these three parties. At that time the German Raw Material Supplier bought large volumes of the tools manufactured in Sweden. Further, the Swedish Tools Supplier regarded it as being very unlikely that the customer would stop buying from them.

However, the business relationship ended in 1992 when the German government, which owned the German Raw Material Supplier, decided to close it down (see Figure 4). One reason for the closure was the high production costs in Germany. In 1994 the product was mainly bought from companies situated in other countries, for example in Canada. When the German Raw Material Supplier company was closed down in 1992 the Swedish Tools Supplier bought the license to manufacture the new product, which it had developed together with the German Raw Material Supplier.

Figure 3. Illustration of Breaking Effects in a Business Network



The example above illustrates effects of the ending of a business relationship on the existing business network structure. In this case the ending business relationship involves three parties; the Swedish Tools Supplier, its sales subsidiary and the German Raw Material Supplier. After the closure of the German Raw Material Supplier, the German Government is not connected to the Swedish Tools Supplier as it started to buy the raw material from abroad instead of manufacturing it in-house. The result was a complete restructuring of the network.

Concluding Remarks

The fundamental idea of business network is the connectedness of relationships within it. In reality it is most often difficult to study spread of change in business networks as several events causing change take place at the same time or almost the same time all over the network. However, in a situation when a relationship is terminated it is often possible to follow the effects or non-effects of the termination on other connected relationships.

Inspired by the effects of earthquakes, we propose a framework, "Netquake Intensity" to describe the effects of the ending of a business relationship on the business network. The effect on the network varies in extent and type. From a non-spreading *tremble*, the effects increases into *swaying* as some surrounding relationships are affected and adapted to the new conditions. As the severity increases, more and more relationships change and some might even end as a result of the *shaking* situation in the network. The most extreme is when the ending of a relationship causes the *breaking* of the network in the sense that the network is completely restructured. All together, the framework offers a possibility to increase our understanding of how change can spread in business networks.

The framework also raises a number of questions to be considered in the future. For example, what is the role of the characteristics of the connected relationships? How does the type of activities performed influence the netquake intensity? How does the network structure influence the netquake intensity? How to deal with "aftershocks" in the business network? This leads to the question if it is possible to study netquakes, i.e. is it possible to isolate one type of change taking place in business networks?

References

- Anderson, James, Håkansson, Håkan and Johanson, Jan (1994), "Dyadic Business Relationships Within a Business Network Context." *Journal of Marketing*, 58, 1–15.
- Dahlin, Peter, Havila, Virpi and Thilenius, Peter (2004), "Netquakes – Effects of Ending Business Relationships", paper presented at the 3rd Nordic Workshop on Relationship Dissolution, September 17-19, Kukkolaforsen, Sweden.
- Easton, Geoff (1992), "Industrial Networks: a Review." in *Industrial Networks – A New View of Reality*, Björn Axelsson and Geoff Easton eds. London: Routledge, 3–27.
- Gadde, Lars-Erik and Mattsson, Lars-Gunnar (1987), "Stability and Change in Network Relationships." *International Journal of Research in Marketing*, 12, 29-41.
- Gidhagen, Mikael (2002), Critical Business Episodes: the criticality of damage adjustment processes in insurance relationships. Doctoral Thesis, Uppsala University, Department of Business Studies.
- Halinen, Aino, Salmi, Asta and Havila, Virpi (1999), "From Dyadic Change to Changing Business Networks. An Analytical Framework." *Journal of Management Studies*, 36, 779-794.
- Havila, V. (1996) International Business-Relationship Triads: A Study of the Changing Role of the Intermediating Actor, Doctoral Thesis, Uppsala University, Department of Business Studies.
- Havila, Virpi and Salmi, Asta (2000), "Spread of change in business networks: an empirical study of mergers and acquisitions in the graphic industry." *Journal of Strategic Marketing*, 8, 105-119.
- Havila, Virpi and Salmi, Asta (2002), "Network Perspective on International Mergers and Acquisitions: What More Do We See?" in *Critical Perspectives on Internationalisation*, Virpi Havila, Mats Forsgren and Håkan Håkansson, eds. Oxford: Elsevier Science Ltd, 457-472.
- Hertz, Susanne (1998), "Domino effects in international networks." *Journal of Business to Business Marketing*, 5, 3-31.
- Håkansson, Håkan, and Snehota, Ivan (1989), "No Business is an Island: The Network Concept of Business Strategy." *Scandinavian Journal of Management*, 5, 187-200.
- Håkansson, Håkan and Snehota, Ivan, eds., (1995), *Developing Relationships in Business Networks*. London: Routledge.
- Madhavan, R., Koka, B.R. and Prescott, J.E. (1998), "Networks in Transition: How Industry Events (Re)shape Interfirm Relationships." *Strategic Management Journal*, 19, 439-459.
- Tähtinen, Jaana and Halinen, Aino (2002), "Research on ending exchange relationships: A categorization, assessment and outlook." *Marketing Theory*, 2, 165-188.