Exploring and exploiting network relationships to commercialize technology: A biofuel case

By

Christopher John Medlin	Jan-Åke Törnroos
University of Adelaide	Åbo Akademi University
AUSTRALIA	FINLAND
chris.medlin@adelaide.edu.au	jtornroo@abo.fi

Abstract

We contribute to the literature with an understanding of how managers can explore and exploit the business network to commercialize a breakthrough technology. The innovator firm must (1) explore the current business network to find partners and gain access to resources, (2) arrange business relationships for exploiting the business network, and (3) explore and find a network-technology fit inside a future business network. The final requirement is essential to innovation commercialization, and further the quality of the network-technology fit will affect the speed and success of the first two processes.

Academic literature has questioned how to balance between exploring and exploiting; however the usual focus was from a single firm's perspective and capability. We contribute to current research by elaborating exploring and exploiting as processes occurring between actors in a dynamic business network. The paper addresses past research on firm exploration and exploitation of the environment and then develops a framework for assessing current and future exploring and exploiting of a business network. An in-depth longitudinal case study of a biofuel development and commercialization exemplifies the conceptual issues in practice. Final sections address managerial implications and future research.

Keywords: adaptation, interaction, processes, network, innovation, technology development

1. INTRODUCTION

New technologies find a place and develop in the business network if they supplant and/or complement an existing technology. In either case other actors invite technology owners into a network position and role. Firms involved in developing a new technology need to build managerial understanding of opportunities and how their innovation fits within the business network (Håkansson 1987; La Rocca and Snehota 2014). Seeking a network position relies on exploring to find appropriate relationships with partners at each phase of the technology development (Araujo and Easton 2005; Johanson and Mattsson 1992) Developing a network position relies on understanding the network and working with partners to access and exploit the required resources. However, an important and often more difficult task is exploring the network to find a future for an innovation.

Exploring the current network for a future is an early task in making sense of the opportunities for value creation in positioning a new technology. By contrast, exploring for resource access and solutions to current development issues is focused in the present business network. This distinction notes the dynamic sense of the business network, as present and future and in relation to the past. This dynamic perspective of the business network is an area of research that is presently hardly studied.

March (1991) introduced the concepts of exploration and exploitation with reference to how an organization learns and adapts. He postulated that firms might fall into either of two traps. Firms effective at exploitation of a technology would become increasingly better in this capability and so fail to adapt to their environment. Firms effective at exploration of new technologies would bring new products to market, but would never fully exploit an old set of technologies to build substantial profit. Considerable literature has discussed this paradox and whether firms are capable of ambidextrous exploration and exploitation (O'Reilly and Tushman 2008). However, this literature mainly focuses on the internal capabilities of the firm, rather than on the organization processes between firms in a network setting.

Ritala, Hurmelinna-Laukkanen, and Nätti (2012), in studying network coordination, note that the exploring and exploiting processes are dynamically bound. These authors suggest that there are likely multiple and over lapping phases of exploring and exploiting. In this paper we develop exploring and exploiting as not only firm learning processes, but also as processes relying on interaction between actors in the context of the network[1]. Our research question is: How are processes and phases of exploring and exploiting interlinked in a network of actors developing and commercializing a new technology?

In this paper we extend the innovation literature by applying a dynamic network perspective, in which individuals and their understandings play a strong role in re-shaping the business network. Exploring and exploiting processes are based on learning and knowledge development that occurs inside business relationships, and so actors are seen as firms whose activities are mediated by human managers[2]. Following a constructivist epistemology (Järvensivu and Törnroos 2010), we develop a process understanding of how a specific set of actors over time explores a future network to find other actors who will position and invite future entry to the network or exit from it.

The paper is presented in the following manner. First, we discuss the literature on firm exploitation and exploration. Next we elaborate a dynamic network perspective, as a framework for understanding of innovation processes. We apply an outside-in perspective (Håkansson 1987), where firms act inside a network; as well as an inside-out (Medlin and Törnroos 2007) perspective of the firm, where the actors are individuals whose goals are that of their firms. Third, we explore this framework by undertaking a longitudinal case study of technology development to support fuel distillation from algae. The phases of network exploration, both future and present, are elaborated; along with the phases of technology development to display how the firm and partners are engaged in commercializing a breakthrough technology. Finally, we complete the paper by discussing managerial implications and future research.

---

[1] The process distinction with exploration and exploitation is created by the network interaction context.
[2] Managers together coordinate and organize business activities.

2. EXPLORING AND EXPLOITING IN A BUSINESS NETWORK

2.1. Literature review

The issue of whether a firm should develop a capability to explore or exploit the environment has vexed researchers since March (1991) indicated that these abilities relied on different resource uses. Schumpeter (1934) first noted that adaptation requires exploring for new possibilities and exploiting what is known. Richardson (1972, 892) also noted that a firm has to *"adapt itself to the need for co-ordination … between the development of technology and its exploitation."* But March (1991, 71) saw a particular problem, where success in exploration or exploitation would lead a firm to specialize and so lose the ability to adapt for the other purpose. For March (1991) firms strong in exploring would not have a resources for exploiting an innovation, and so would have sub-optimal profit. On the other hand, firms with resources adapted to exploiting, would stop exploring for new opportunities and so would go into decline (March 1991). This seeming paradox has generated considerable research.

One solution to the paradox is that firms develop an ambidextrous capability where the firm is successful at exploration and exploitation (O'Reilly and Tushman 2008; 2004). An empirical study by Li and Huang (2012) supports this ambidexterity concept. In a quantitative empirical setting these authors model exploration and exploitation as an interaction variable, which mediates marketing/technological proficiency and new product performance. Balancing exploration and exploitation capabilities leads to greater levels of product innovation. But how does a firm achieve such a nuanced set of capabilities?

Gibson and Birkinshaw (2004) differentiated between structural and contextual ambidexterity. The structural meaning is concerned with systems and processes, and so there is a degree of contradiction between exploration and exploitation. But contextual ambidexterity focuses on the behavioral characteristics of managers within the firm. According to Gibson and Birkinshaw (2004) contextual ambidexterity means managers are able to stretch, display discipline, and support and trust other managers while pursuing multiple goals. Gibson and Birkinshaw's (2004) quantitative empirical evidence supports this thesis. The role of managers in balancing exploration and exploitation capability is a key.

Similarly, ambidextrous behavior is possible by differentiation and integration within a firm, with for example different business units or departments responsible for exploration or exploitation (Gupta et al. 2006; Raisch et al. 2009). Jansen, et al's. (2009) empirical study supports both integration and differentiation, with evidence that informal manager teams and cross-functional formal processes mediate the association between structural differentiation and ambidexterity. Managing both exploration and exploitation is possible in a larger and differentiated firm. However, many R&D firms are small and not well resourced.

Other researchers have elaborated a deeper understandings of the context for exploration and exploitation (Gupta et al. 2006; Raisch et al. 2009). Gupta, et al. (2006) questions the dimensionality of the two concepts, and asks whether exploration and exploitation might be orthogonal. In the case of a single dimension the paradox is evident; but the second conceptualization opens the way to ambidextrous firm behavior. However, when resources are limited the issue of whether to spend energy on exploration or exploitation will arise.

While calling for studies with a multi-level and longitudinal perspective, Raisch et al. (2009) asks whether the processes of exploring and exploiting might be partially external to the firm. Thus, these authors suggest that the key areas to research are a firm's absorptive capacity for knowledge and access to external knowledge through social networks. Supporting this assertion is Im and Rai's (2008) evidence that combined explorative and exploitative knowledge sharing affects relationship performance in long-term supplier-customer exchanges. Also, Capaldo's (2007) empirical data based on social network analysis shows that firms with many heterogeneous weak ties into peripheral parts of the network as well as strong ties in their local core network, are the most successful. The data is longitudinal and archival; based on the number of years in which the firms collaborated on a venture, the number of relationship years, and the number of collaborations signed over the relationship years. However, none of the research noted investigates the learning processes of exploring and exploiting in a business network. But evident for success of innovating firms is the question of how they and their partners mutually undertake successful exploration and exploitation.

Interestingly March (1991) highlights that choosing between firm exploration and exploitation is complicated because judgments and risk preferences *"embody intertemporal, interinstitutional, and interpersonal comparisons"* (ibid, 71). But rarely have researchers studied the temporal, network and individual actor perspectives of activity allocation between exploring and exploiting the firm environment. March (1991) also characterized exploration and exploitation as nouns, with exploration including *"search, variation, risk taking, experimentation, play, flexibility, discovery,* [and] *innovation."* But exploring and exploiting are learning processes and are better associated with activities. Exploring includes the activities of searching, seeking, risking, experimenting, playing, being flexible, discovering and innovating; while exploiting includes the activities of refining, choosing, selecting, implementing and executing and so producing efficiently. We consider therefore an activity focus as more suitable for studying the inter-temporal nature of exploring and exploiting.

Gupta, et al. (2006) and Raisch, et al. (2009) note an underlying time dimension; where exploration and exploitation occur iteratively in a punctuated equilibria context or ambidextrous behavior is synchronously undertaken. The concept of a punctuated equilibrium has been conceptualized as a way to apprehend change in a network (Halinen et al. 1999). Recently, Halinen, et al. (2012) have elaborated a more complex understanding of time as dynamic periods, sequenced periods, and flowing time. This more dynamic characterization of constructed times can provide researchers with tools to understand inter-firm exploring and exploiting processes within the dynamics of the business network.

In the next section we elaborate the dynamic network and follow that by a framework of how exploring and exploiting is undertaken by actors. Following the temporal, network and individual actor perspective issues alluded to by March (1991), we address the exploring and exploiting processes in a research framework of individual managers together managing activities in a temporally emerging innovative business network.

2.2. Dynamic network framework

Firm learning through innovation and relational processes occur through and inside time. This suggests an elongated conceptualization of the business environment is required as a framework

for understanding change and technology development. In this section we develop the concept of an elongated network.

Consider the bounded and subjective view of the network drawn by managers under research conditions (Henneberg et al. 2006). No two managers have the same mental understanding of the network, and each has different network horizons (Holmen and Pedersen 2003). These divergent human-based network pictures are simple representations. Managers know and appreciate that the network is forever changing, and that their representation is a simplification of the continuously dynamic activities within and between firms. Theoretically, around the manager are all of the resource ties, activity links and actor bonds that comprise the business network at that point in time. Also extending into the past are those ties, links and bonds as well as changing actor forms as firms are sold, merged, bought and closed. Viewed from the present the activities connecting resources in the past display a perspective of the network flowing into the present, along with the associated technological trajectories (Dosi 1982) and path dependencies (Araujo and Harrison 2002). This perspective is composed firstly, by a temporal place of view – the present; secondly by a direction of view – to the past; and finally by a statement about the nature of time – forward flowing to the future. Spread before the theoretician is a dynamic presentation of the coming into being of the business network. The concept of a business network is created by such a rearward perspective.

However, firms are in business for their future, and so the theoretician must turn and face the future. This is an impossible task in the short and nervous change characterizing present reality in business. One can only imagine elements of the network projected into the future; and then with different degrees of likelihood. A theoretician, however, would see the network extending forward in time into many possible futures, each with different path dependencies based on business relationships and technical trajectories. The resource ties, activity links and actor bonds of the past would extend in changing ways into the future. The forward and asymmetric flow of time (Adam 2000) would extend the possible cause and effect associations in unending lines of activity into the distant future. The many futures would appear already in the present (Luhmann 1979), as the bifurcation of the endless chains of cause and effect, so that the possible networks extend in multiple views into the future. At this point the theoretician grasps the past network

and partially projects the many network futures – but really the future is more complex, and more surprising, than any theoretician can elaborate.

However, managers do not see the theoretical and time elongated network. The manager's view of the network horizon is limited (Holmen and Pedersen 2003). Managers, in the face of complexity and a chaotic environment, can only manage according to 'simple rules' (Eisenhardt and Sull 2001), or intuitively within a strong understanding of dynamics (Sjöstrand 1997). As indicated, to a manager, the concept of the network is a mental implement (Geiger and Finch 2010), a means to influence and be influenced (Holmen and Pedersen 2003) and so a means to achieve economic outcomes. Also however, the business network is a way to spread risk and secure safety in numbers. Firms spread risk by undertaking complementary activities based on different resource sets, different skill sets and their associated activities. The business network grows stronger, as do the firms, by allocating dependencies between other actors. In this way the network of firm secures the future by degrees in the form of "leaps" or more continuous incremental progress.

Still managers must make decisions about resource and activity deployments into business relationships, which are extending into the future. At this point social construction is the only way forward. Decision-making in a networked business environment is always risky; with trust, commitment and partner choice being the main issues under-pinning financial investments. Noteworthy is that the industrial and business network is not formed and reformed immediately as is the case with social structures (Giddens 1979; Giddens 1984). Rather investment and social construction of the business network occurs over longer time periods. Network change is fore-shadowed and considered for long periods of time before taken in a piece-meal and punctuated manner. Even in circumstances requiring immediate action, such as the 2008 Global Financial Crisis (GFC), the changes reverberate for extended time periods in cascading network change. But contrarily the managerial thinking for re-construction occurs in the present (Mead 1932), where past and future 'load' into each other (Hedaa and Törnroos 2008) to provide a basis for individual and collective action based on an apprehended situation for decision-making.

As a consequence we apply the concept of relational time involving the existing past, present and future notions (Halinen and Törnroos 1995). We also take in the asymmetric time concept (Adam 2000), where time is flowing into the future (Halinen et al. 2012). The final time concept is that of sequenced time periods (Ancona et al. 2001; Capaldo 2007). The three time concepts are connected to each other in an innovation commercialization context: (1) asymmetric time flow takes the network from one period to another, (2) the sequenced periods are constructed according to commercialization phases, which are socially recognized, and (3) managerial decisions occur in the forever moving present of relational time, which is passing along the flow of time.

2.3. Exploring and exploiting in a time elongated network

Bringing an innovation to commercialization means undertaking a number of processes and phases of technological development. The task requires the interactive assistance and complementary fit of technologies and managerial alignments together with many other actors (Rohrbeck and Gemünden 2011). The processes and phases of technological development are reasonably elaborated in the current literature (Ritala et al. 2012).

To envisage a commercialization strategy, managers need to explore the times of future change in the network. Information from other actors concerning the future business network is a key to understanding a commercialization path: defined as the required objectives and committed resources from actors and value connections spread out in time. The source of this interacted and connected understanding is from individuals who are connected by business and social relationships. The business relations are *representational* as actors act on behalf of their business organizations. The basic forms of the information in a future network perspective are evident as (1) the rights and placement of resources and the resource ties between firms, (2) the activities and the activity links between firms, and (3) the changing roles, positions and ownership of firms and the changing relational connections between actors. Information in each of these areas signals the cues of the actors how and with whom, and how to partner and these interacted business relationships open and/or close access to resources and information.

Proposed framework of exploring and exploiting in a commercialization project

A technology development strategy is built on three processes within each period: (1) an exploiting of the current network to achieve the technology development objective/s of that phase, (2) an exploring of the next phase for required actors and resource access and activities to achieve technology development objective/s that are still being settled, and (3) an exploring of the end phase of commercialization, the future network. These processes are repeated in each subsequent phase as displayed in Figure 1. Further, an additional process of exploring and exploiting is required within phase 1 to find a suitable starting objective and actors to aid in developing the technology (not shown in Figure 1). This first process is an aggregation of process 2 with 1, but focused on exploring the present network, since there is no prior phase for preparing the network. Once the commercialization strategy is in place, the rounds of exploring and exploiting find and feed resources into developing and commercializing the technology.

We see that each proposed phase is based on objectives for achievement by a specific group of actors, supported by a network configuration. However, the proposed phases are not certain, but as in any development process one must begin. The strategy emerges with an exploring/exploiting phase where the network of period 1 is developed. The first objective is to elaborate the emerging technology development and the commercialization strategies. The actors exploit and explore their present network, extending their network horizon (Holmen and Pedersen 2003), identifying actors and who has useful information and access to resources. The 'exploring of the end process' (i.e. Figure 1, arrow 3) is the most important, because this builds ideas on how the developed technology might fit in a future network: what is termed here the network-technology fit. The ability of managers to communicate the network-technology fit is essential to gaining resources and partners for success in all the prior development periods.

Figure 1: Proposed framework - Exploring and exploiting phases for technological development by period

3 Exploring the end phase: to find network-technology fit.
Begins in phase one and is repeated each phase.
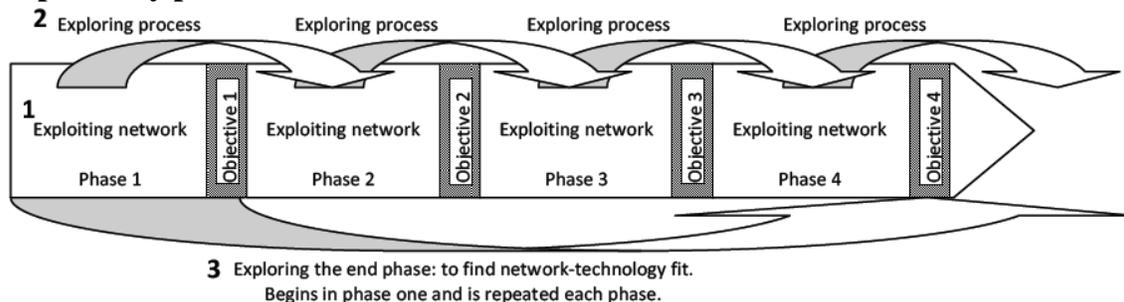
Each new exploring process is future directed (Figure 1, arrows 2). The actors explore and seek to understand the connections between parties in the current business network and what is possible and needed for resources and activities in the immediate future. The parties seek alignment of their interests and resources. Where the actors find mutuality of interests they look to adapting their resources to align and allow enactment of their value processes and purpose. Attractions will be based on the potential of the resources and ideas of the actors, their business or societal interests and needs and the possibility to position the actor in a novel way for future gains. The exploring process involves interaction in attracting and being accessible to being chosen or choosing so as to open a developing process between parties.

In the exploiting process managers rely on resource and activity commitments. The exploitation becomes urgent, stronger and explicit when the goals become clearer and are jointly detected and evident. The actors re-configure their relations, dissolve some relations, re-structure their resources, tie their resources together in new configurations and so exploit their immediate network to achieve the objective of the current period in the technology development process. The exploiting process involves intensified and purposeful interaction between the actors, with each actor specializing and coordinating resources and activities to achieve their own goals while spreading risk.

As a consequence, the exploring and exploiting processes are directed and intentional, although some chance events are involved, but the direction of exploration and exploitation strengthens as managers learn and understand how the innovation will fit into the business network. This understanding emerges from the very beginning, when managers explore the future network and find future suitors. Each suitor is also engaged in an exploring process in the interests of their immediate actors. Thus the exploring and also the exploiting processes are composed as interactions between firms in the business network, each seeking a network-technology fit, to enhance customer value and their own competitive advantage. However, at issue is where and how an actor develops an understanding of a future network, along with detail and information about being attractive to another actor. To understand the exploring and exploiting processes that

enhance network-technology fit in a future network we undertake a case study of an emerging break-through technology: biofuel from algae.

3. METHOD

The issue of dynamics in our research question suggests a longitudinal case study of an innovation development (Yin 2010). In this specific case the researchers have been able to track the innovation process as it started and has developed from 2007 to 2014. The study is constructivist in nature and conforms closely to the "naturalistic inquiry" postulated by Lincoln & Guba (1985). The goal is to present this unique case as it unfolds, in order to make sense of the key events from the actors' perspectives. Data collection is from key *individual actors* and the focus of the data is of *individual perspectives* concerning their actions and those of other actors. These individual actors along the way have been decisive and key informants who have been regularly interviewed. Issues concerning access to relevant and rich data have been secured in this way. This perspective needs to be elaborated more strongly in business network research (see however Halinen and Mainela 2013; Medlin and Törnroos 2007). In this individual perspective the sensemaking, cognition and awareness of what takes place in the business environment is found in the narrative stories and plots told by the key informants.

Sensemaking is seen as a waypoint for action and a tool for managers to react to stimuli in the environment (Weick 1993; Weick 1995; Weick et al. 2005). Sensemaking is always at a point in unfolding time and is based on social understandings of the environment. Thus, unfolding the case requires consideration of the meaning of time. Based on the foregoing notion about time and process a multitude of meanings arise. In this paper the focus is on the following conceptualizations form a methodological angle. First, the *human time* concept is placed in the forefront, i.e. how individual actors experience time and events as the process unfolds in its contextual setting (Bluedorn 2002; Halinen et al. 2012). Second, human time is related to managerial sensemaking, i.e. sensing cues from the network as a guide for managerial action, and decision-making in situations that evolve along the way. Third, the presented relational notion of time frames the sensemaking of the actors as they experience a situation and events at a point in time. The 'present' defined as a constant state of becoming is situated between a 'past'

and an upcoming 'future' with the potential to move forward (Halinen and Törnroos 1995). Forth, the method also uses chronological time in framing the events and sensemaking processes. As the process moves forward events are mapped an interpreted by the researchers (Halinen et al. 2012).

The detected mapped events and processes form specific *event trajectories* (Hedaa and Törnroos 2008). These event trajectories represents a contextualized longitudinal 'story' with connected events, plots and processes framing the development of meaning through sensemaking (Weick 1993). The researchers' analysis of transcriptions, reduced narratives (Makkonen et al. 2012) and contextual elements surround the research process (Lincoln and Guba 1985). The interview data is transcribed and analyzed from the perspective of the paper and its objectives and focal perspective.

The concepts of exploring and exploiting have not been used as direct questions to the informants. The researchers have, however, been able to analyze these processes through the collected data because it is thick and rich enough to allow a trustworthy interpretation. The specific technique for data collection is named 'point-mapping', where researches plunge into the process regularly over time (see Halinen et al. 2012). The data collection started with a short replication and reconstruction from 2007 up until early 2014. Annual interviews have been conducted in order to plunge in at intervals that contain a relevant narrative. Point-mapping minimizes potential memory loss. The researchers had good access with the key actors and also when new actors and people representing involved organizations arrived in the process studied.

The study aims to conform to the criteria for qualitative research. Trustworthiness in conjunction with relevance is the key for evaluating qualitative data and research. The basic concepts of validity and reliability have been replaced by other quality criteria here (Miles and Huberman 1994; Yin 2004). Attaining high levels of trustworthiness in what has been labeled as naturalistic inquiry Lincoln and Guba (1985) claim that qualitative research should be able to show:
Credibility (that findings are found to be close to reality). Securing good access to key informants responsible of the events taking place has enabled this criterion to apply. Interviewing more than on informant telling the same story enhances credibility in this case as well.

Transferability (being able to show that results are applicable in other similar type of situations). The results of the case study can easily be applicable and used in other similar contexts when related to innovation processes and how these processes unfolded. The concepts and the findings can be transferred and compared as well quite easily to our mind.

Dependability (the consistency of the findings and its "thickness"). The results are 'thick' in this case along two key dimensions. The first is the time framework of almost seven years where longitudinal narrative descriptions give rich data for analysis. Second, the data focuses on the processes developing at a specific point in relational time. This view gives both the past developments and future prospects room for analysis and presentation. This gives richness and thickness to our data.

Confirmability (to show that results are not biased on behalf of the researchers and that the language of informants is accurately presented). This is a difficult issue and handled here by opening the issues through very open questions where informants tell the story at every interview situation in relation to the past. The researchers requested for more details and potential clarifications needed during interviews. At the analysis stage the authors present the final reduced narratives. Of course the specific viewpoints raised in the researchers own sphere of interests is a focal point in presenting the results.

The conceptual ideas and the model are used in order to analyze and construct the process as it has unfolded through the narratives of the key informants and deconstructed again by the researchers interpreting the stories told. The empirical presentation of the case is read through by the informants in order to secure that it has been interpreted in a correct manner. Even this "corrective measure" does not secure that all relevant issues and events have been taken to the fore. Some stories always stay hidden for different reasons.

4. BIOFUEL FROM ALGAE CASE STUDY

Biofuel is an Australian R&D firm seeking to commercialize the manufacturing process for producing crude oil from algae. The case is presented according to the time periods of the major objectives as they have emerged and been understood by the main actors. Here we present the

exploring and exploiting processes in each of the five periods to date. The final commercialization period, period 6, is still some five years away. The objectives, as they emerged, for each of the periods are shown in Table 1.

Table 1: Biofuel's emerging objectives by period

Period	Objective	Timeline
1	Application for funding from the Asian Pacific APP scheme (not successful).	2007
2	Second application for Asian Pacific APP scheme (successful)	2008
3	Test a pilot plant in an outdoor, open-air environment.	2009 – late 2013
4	Prepare a grant application for the Australian Renewable Energy Agency in conjunction with AOC Pty Ltd.	2012 – February 2013 (Periods 3 and 4 overlap)
5	Test a demonstration plant at Coppermannia. Not fully integrated.	2013 – 2014 **Current period**
6	Build a commercial size and fully integrated plant.	2019 (?)

The individual and organizational actors are presented in Table 2.

Table 2: Individual and organizational actors

Individuals *	Their organization *	Interviews
SG	Professor, Energy Research Center, University of Australis	6 September 2011
DL (PhD civil engineering)	Professor, University of Australis Also employed by Biofuel Pty Ltd	12 December 2012 20 February 2012 29 January 2013 12 February 2013 11 March 2014
MP An internationally known algae expert.	Professor of Marine Phycology and Director of an Algae R&D Center at Western University.	8 August 2012
GR	CEO of Biofuel Pty. Ltd. Joint Venture CEO of AOC Pty Ltd (a major shareholder of Biofuel)	20 February 2012 12 February 2013
PA (PhD energy applications)	Professor, University of Australis	10 May 2012
OC	Board Chairman, AOC Pty Ltd	13 February 2013
	BAN, major shareholder of AOC Pty Ltd	
Mr Smith (Mayor)	Coppermania City Council (CCC)	
	Coppermania City Economic Development Department (CCEDD)	
	Australian Renewable Energy Agency	
	Northern Australia mining firm with power plant (WAP)	
	Global Centrifuge company	
	Local Catalytic company	
* Fictitious names		

The continuing rise in oil and gas prices and the uncertainty of secure supply means alternate energy sources are required. Strategically liquid fuels are of *"greatest value because they are used for road and defense transport and also liquids can be transported within the present distribution systems" (SG, Interview 6 September 2011).* Growing algae for biofuel has a lower environmental footprint, an overall lower greenhouse gas emission and as a fuel is energy positive. In addition, algae do not compete for agricultural land or inputs. There are five steps in the manufacturing process from algae to fuel: (1) production of algae, including growing in salt water and recycling of waste, (2) concentration of algae, including removing the algae from the water, (3) conversion of algae into kerogen, the precursor to crude, by cavitation where the cell wall is broken, (4) extraction of crude, and (5) fractionation into fuel products such as jet fuel, petrol, diesel, bunker fuel, kerosenes, etc.

4.1. Period 1

The development of algae biofuel at Australis University began with a triggering signal between two researchers DL, with an interest in algae production, and PA who had an interest in energy production. At that time there was scientific and engineering press reports regarding the development of algae production on a larger scale. The two researchers began by exploring and exploiting their surrounding network. An existing energy cluster at the university formed the site of the project and some research funding was given to the project.

> *"We were just picking up what other people were doing and we were quite happy to get on the bandwagon with everybody else." (PA interview 10 May 2012)*

In the exploring process the researchers were busy scanning funding possibilities for their research. This beginning exploring process involved both exploiting the researchers surrounding network in the university and exploring the wider national grants schemes and exploring international conferences that would open research avenues. Both researchers saw the need for developing a biofuel technology and the resulting future research opportunities and funding potential. The researchers decided on their first objective, to write an application for funding from the Asian Pacific APP scheme. The application was unsuccessful, but it had alerted other actors to the researchers' interests.

4.2. Period 2

Phase of exploring for future network-technology fit: DL attended relevant conferences. Other attendees included algae and engineering researchers, bio-technicians, gene researchers, oil company representatives, energy firms, and refinery representative. *"Yeah so it's funny how everything happens. Simultaneously to this there was a group in America also set up to look at CO_2 reduction, ... a workshop at Berkeley, invitation only and fortunately I was invited. ... it was really to get this group of experts to consider whether or not we should pursue algal biofuels, ... we all came to the conclusion, huge challenge but yes we should do it, and it needed funding for pilot plants, it needed industry engagement." (DL, 12 December 2011)* The conference delegates also noted that the gate price of algal-biofuel would need to be less than US\$1 per liter to compete with fossil crude, which was selling at US\$0.60 per liter. But there were other issues concerning technology fit. *" ... with algae you might get 30 percent of that as oil and 70 percent of protein and carbohydrate biomass left, that's a lot, ... you have produced that much of agricultural feedstock, you have flooded the market, it's too simplistic. ... Now talking to farmers in Australia, they're very concerned about this new industry because it's going to put pressure on the nutrient and fertilizer base, so they're worried the cost of fertilizer will go up. Well it would. So we said we want to recycle our nutrients, so we see more value in recycling then selling them." (DL, 12 December 2011)* And so the decision was taken to always concentrate on energy manufacture.

Exploring phase for period 3 and 4: The researchers realized they needed expertise in algae cultivation and they found MP, a Professor of Marine Phycology and Director of an Algae R&D Center at Western University. DL was also talking with AOC, a private firm that had been researching biofuel for some years.

Exploiting phase in period 2: DL was exploiting his university network. His students were testing the feasibility of producing fuel from algae: *"I said to my students "I want you to work on the processing area and you have got to consider all of the solutions possible, but relate them to the value of the product" and that was basically we said a dollar a liter that's our product value, so all the options to process, unless you can do it for a dollar a liter, forget it. So we quickly went through all the technologies that we needed to address and realized we had to develop our*

own technology, it didn't exist off the shelf. (DL, 12 December 2011)

Also in this period the three main researchers wrote a new grant application, and "… *this time we were successful, got our funding which was about two million dollars cash in 2008, and it was fantastic because we knew we had the money to build a pilot plant, but being the type of funding it was we had very challenging milestones to achieve over the three and a half years of funding. (DL, 12 December 2011)*

4.3. Period 3 and 4

Periods 3 and 4 overlap, but are differentiated with two objectives: for period 3 the objective is to test a pilot plan in the open air in northern Australia; while period 4 has the objective of preparing a grant to win funds for a plant to demonstrate commercial viability.

Exploiting phase in period 3-4:   The know-how and expertise in algal growth from Western university is put in use. MP engages WAP, who brings many resources. WAP *"… will give … accommodation in the workers' camps in northern Australia". So that was great, land for free, accommodation and also they had a brand new gasfired power station being built and they said we can use CO2 from the stack, so there were all these extras they could give us, without giving us cash and that was great." (DL, 12 December 2011)* Also DL now brings AOC into the project. *"AOC joined and they said "we will put half a million dollars cash into the project on the proviso we form a company".   So that's how really it happened.   AOC, University of Australis and Western University, we sat down and negotiated the company, so how was this company going to look, because AOC have been studying the space for algal biofuels and realized that it has the opportunity to become commercially viable." (DL, 12 December 2011)* Biofuel is formed as a company with shareholding by AOC, Western University and Australis University. The pilot plant is operated successfully in northern Australia.

Phase of exploring for future network-technology fit: This type of exploring process continues incessantly. The researchers continuously scan the environment and talk with possible future actors. *"we are more interested in jet fuel.   Interestingly two weeks ago Virgin Australia announced that by 2020 they want five percent of their fuel to be from sustainable sources, which*

is great, because they use 1.1 gigalitres per year so five percent of that is actually realistic with algae. So the market is developing and we're saying to the end users, we need you in to invest in infrastructure to convert the oil to your fuel needs and to supply the feedstocks. So at the moment we are looking for off-take agreements, sort of a long way to go." (DL, 12 December 2011)

Exploring phase for period 5: Even as the main actors build and operate the pilot plant to test growing large quantities of algae in the open air, their minds are turning to the next phase. Processing the algae requires separation of large water quantities. *"To concentrate the algae, remove the water, we've been looking at the technology from Global Centrifuge - that company is at about the same stage of development as people like us so their proven technology is the right scale for our demonstration plant. (DL, 11 March 2014)* The location of the plant to test commercialization is also on their minds. *"we believe a good place for our plants would be in Coppermania, it's an industrialized area, everything is there - labor, rail, trucking, CO2, saltwater, so we're definitely looking there." (DL, 12 December 2011)* But the idea is not pursued until the pilot plant is showing success and the grant writing for funds to build and run the commercialization feasibility plant is underway. *"we went over there, met the council, scoped Coppermania basically and realized it was a definite place to go. It was a region where they are wanting to grow, they want new industry, they want innovation, it's in the Coppermania City Council's vision, renewables are part of their plan." (DL, 11 March 2014)*

4.5. Period 5

Phase of exploring for future network-technology fit: This process is on-going and pervades every step of the technology development. *"We have been talking to potential and end-users of biofuels and the message is we will not pay a cent more for biofuel than fossil and it has to be energy-positive and it has to have a lower carbon footprint. … I've learnt that the airline industries, to be honest, are less interested in biofuel and more interested in stable prices so they see that biofuelers could provide them with a fixed price so they may be able to sign, for example, a five-year agreement." (DL, 11 March 2014)*

Also now other firms interested in applying the technology are being attracted. *"We've had*

several visits from … multi-billion dollar companies that … have the capability to check everybody up and … fortunately for us we've been informed that they were most impressed by Biofuel because of our commercial focus, much less on R&D, and understood that our technology is quite advanced." (DL, 11 March 2014) These potential customers of the technology are important to Biofuel's future. *"I maintain contact with them by email and these companies, because of who they are, are in no rush to do anything so they will come and visit in the next few months to see our operation. They have seen all the data, they have seen the plans, but they need to see it for real, so we maintain those links." (DL, 11 March 2014)*

But the involvement in the original scientific forums still continues. *"Yeah, it remains very important for us to attend these meetings and because in 10 years experiencing these meetings I know which ones we should be at and which ones we don't waste our time with, but those relationships are extremely important because they're still majority academic meetings but, like us, our international collaborators have their own links to industry in their own countries so it is very important to maintain that communication. … I am going to a meeting in New Orleans. It's arranged by industry to start talking about how are these biofuels going to end up in oil refineries, so it's topical so I am going there deliberately to find out what is going on, but we will go through the program to say, "Okay, I might pull in this guy," and that's - we definitely plan ahead with these meetings now to get the information we need." (DL, 11 March 2014)*

Exploiting phase in period 5: The commercialization feasibility plant is opened at Coppermania. The plant comprises technologies from a number of other firms, new capital equipment installed by local firms under contract an also equipment re-cycled from the northern Australia pilot plant. The plant is not fully integrated, but is set up in such a manner that a full feasibility study is undertaken. Other actors are important in providing complementary technologies. Global Centrifuge, who operate in mixed water biomass applications, develop and install a centrifuge able to manage a throughput of 200,000 liters per day. Local Catalytic, an R&D firm, jointly develop with AOC their catalytic technology for continuous conversion of algae to kerogen. AOC and Local Catalytic have separate and joined patents on different parts of the technology. The next 12 months will see the completion of the feasibility study stage.

Exploring phase for period 6: AOC is now exploring funding for their first commercial plant, even though they need to gain 12 months of information from the feasibility plant to provide investors with a secure, but not risk free, investment. *"They* [BAN] *own the shares so they have a choice: they can either say, "We can invest in" - and they have the ability, ... or they will change their shareholding agreement so a new party can step in." (DL, 11 March 2014)*

Building a fully automated and continuous processing commercial plant will take a lot of planning. Even beginning now to plan will take many years to gain the land. *"We are sounding out people we should talk to, to access large tracts of non-agricultural land. We are sounding out investors: what is driving them to be interested in what we are doing. We are obviously working closely with government to say, "Okay, what hoops do we have to jump through?" It's one thing building a demonstration plant and it's another thing covering 1000 hectares in ponds. That has lots of implications. So we are always thinking about working on those aspects into the future." (DL, 11 March 2014)*

5. ANALYSIS AND DISCUSSION

The exploring phase for network-technology fit is an important element of the case presented. From the very beginning, as in figure 1, sustainable algae as a complementary fuel source is approached in a commercial sense. The solution was always to improve the network-technology fit by minimizing competition with other actors, while also maximizing fit with specific cooperating actors. Regarding competitors the researchers avoided issues with fossil fuel producers by targeting the jet fuel segment that is willing to pay more for a sustainable fuel able to be delivered regardless of business and political shocks. Additionally as an agricultural product algae represented competition to farm inputs, such as land and fertilizer, and farm outputs, such as stock feed. The researchers resolved this potential negative network-technology fit issue by re-cycling algae biomass as an input to the growing process, as well as re-cycling water and using salt-water algae so that there is no competition for inputs. These ideas were understood early in periods 1 and 2 of the case in discussion with other researchers and from presentations at the annual conferences. The exploring process for network-technology fit was

very much a social sensemaking one.

The case displays how the exploring of network-technology fit was refined in every successive period. Each round of exploitation and exploration within each case period provided new information about the technology, which attracted other actors that were interested in purchasing the technology, or that could provide complementary technologies so that the researchers did not have to re-invent technology. Thus, the exploring phase for market-technology fit is composed as bridging time in two parts, first by considering the beginning and the end, the time of final commercialization to an end customer, to look for possible fit. Second, as the technology emerges, a new set of processes emerges where other actors join the commercialization process either as potential buyers or potential suppliers.

Meanwhile the exploiting process occurs in the present network setting, where actors combine resources and activities to achieve their objectives. In each period the case actors undertook activities with others to exploit the network and achieve their own objective. For example, Biofuel and WAP exploit their own and each other's resources in an interactive manner to achieve their own and mutual objectives. The adaptive alignment of resource-fit processes is a key factor in exploiting the value potential of the connected actors. Exploiting creates mutual and specific value but creates also a new situation that needs an exploring process to be made with new objectives to be found to be "exploitable" and hence new actors, activities and resources to be formed to reach this new objective. In the case (in 2014) the present commercial plant has the actors web, spatial location and the technology but lacks still a final commercial phase, which is at an early explorative stage.

Finally, there is the exploring of the next phase, which occurs in the present network concerning the actors and resources required to be a yet settled objective. In this exploring process the next set of actors align themselves to create and enact the new relationships, which from a single actor perspective is an exploring phase of preparation. This period is more vague and open for ideas to be explored and new connections and actors that can add value to the actors. This forms a sensemaking exploration process where relevant cues can be detected form the environment for future action and more visible objectives for individual firms and common goals.

Also the case study highlights the important role of individual actors, as researchers and then as managers within firms, but all pursuing in a type of joint manner the commercialization of a technology. The individual perspective was important at all periods of the commercialization process to date. Also evident is the growing embeddedness of the individuals and firms in a more complex network and changing network of actors, where specialization and interdependence is growing so that risk is spread and security of the future is enhanced. At each period of development the roles of actors are changed according to with whom they interact in each new network structure. However, also evident is the passing nature of these roles as each network structure allows the actors to gain resources to take on the next objective, and so prepare for the next network structure. Ahead of each period is the sunshine of the future (Huemer 2014) drawing in investors, grant providers, customers and suppliers without whom the funds exploiting the network would stall. The delay of an objective places uncertainty on returns and new sources of funding must be found.

Regarding ambidexterity of exploring and exploiting, we see a more complex configuration of exploring the next phase and also the future network, as well as a need to exploit the present network to develop the technology and undertake the exploring. The issue of ambidexterity only arises when a single firm is the focus. More than ambidexterity is required by the firm developing a technology. Also required are skills at attracting other innovating firms so that the risks are spread across a network of specializing firms. These firms are also exploring and exploiting, so that in effect the actors collectively develop technologies and move towards commercialization. In effect the issue of ambidexterity is not real in a dynamic perspective as the temporal spread of exploring and exploiting processes across a network of firms, means that the real issue is one of how to coordinate the interests and goals of many firms.

An important point to note in the case study is how humans construct phases and periods in ever-flowing time. Reality and temporal change are apprehended in the present when we construct phases or periods, or are deconstructed when thinking again. On the other hand, flow, surprises and past constructions are also matters we deal with when apprehending reality and temporal change. The construction of less clear phases and more definite periods is undertaken socially to

create order and "capture" time. Periods with definite ends and beginnings were applied for a researcher perspective, while phases were constructed for the managers' perspectives. Thus, we note the way researchers' and respondents' perspectives are differently crafted in time. Finally, we should note that the Western cultural way to "manage" reality is likely different from other cultural perspectives of capturing time, and importantly including past and future Western ways of managing reality.

Ritala, Hurmelinna-Laukkanen, and Nätti (2012) present three phases of networked technology development: early ideation, technology development and pilot commercialization. In many ways these three phases are found in the Biofuel case study but because commercializing algae biofuel production involves many related technologies we see continuing rounds of technology ideation, development and piloting and also ever increasing levels of capitalization. The sequences of ideation, development and piloting occur for each technology in new ways, as new technologies are integrated into the production system. This is evident in the case with Global Centrifuge already working on the next technology to integrate with Biofuel's still forming plans to achieve a first integrated commercial plant within the next five years. Once can also see that such a plant will then be duplicated, with new technologies, around the world in specific locations according to interest from fuel supplier. Thus, the development and commercialization process is feed resources from ever new interested parties who are all exploring for network-technology-fit and to find ways to re-configure the network to undertake their next moves.

6. MANAGERIAL IMPLICATIONS

The need for managers to think and conceptualize firm activities in dynamic terms is increasingly apparent in a global and interdependent business environment. Managers and firms cannot choose between exploring and exploiting technology, both are essential processes for surviving in a changing technological environment. March (1991) already noted the intertemporal, interinstitutional and interpersonal issues involved in a firm choosing when and how to explore and/or exploit technology, but settled on a relatively static representation of the firm adapted into only one of these required capabilities. The need for managers to think in

dynamic terms is evident in the research which points to the use of temporal and different firm structures (Gupta et al. 2006; Raisch et al. 2009) to manage both exploring and exploiting technologies. Conversely, the argument of whether firms can or cannot be ambidextrous ignores the flexibility available to managers when a dynamic perspective is embraced. Finally, Raisch, et al. (2009) point to the idea that exploring and exploiting is not a firm only capability, and we extend this idea further by noting that a network of actors is involved in exploring and exploiting to develop and commercialize a technology.

By taking a dynamic and network perspective of the ways firms explore and exploit together the research presented here shows that managers need to be adept at working with and shaping the understanding of other firms to commercialize a new technology. Success in commercialization requires at least three capabilities around exploring and exploiting in a dynamic network perspective. First, managers need a comprehensive story of how a new technology will fit into a future business network, and without displacing other powerful actors. To develop such a story managers should explore different future network-technology fits to see how their firm and other firms can be involved in commercializing new technology. Without a comprehensive story a firm can neither explore ways to gain access to resources to develop and commercialize a technology, nor exploit the knowledge and resources of current network partners.

But also required are the capabilities to exploit with partners in the current network, to (1) gain and align the resources to develop the technology, and (2) to explore and prepare for the next phase of technology development and also to continue exploring for network-technology fit in future possible network configurations. Each of these three process capabilities is noted or implied by DL (11th March 2014): *"I'm always planning the next part of this development. Where is our next plant going to be built? Who is going to build it? How much money do we need? And I think you need to think like that with industry partners: Where do they want to be? And often you can steer them; often they don't know. So you need to be a bit of a visionary."*

7. FUTURE RESEARCH

The future research from this paper concerns each of the processes identified and how to conduct research concerning managing reality in time flow. We see these three areas of research contributing to the literature on strategizing in networks (Gadde et al. 2003; Mouzas et al. 2008; Whittington 2006). First, with regard to network-technology fit the role of the academic and business community in foreseeing and exploring future technologies and options is a growing field. But this research needs augmentation from a network perspective, so that multiple connected actors are considered and not only from a firm view research (Andriopoulos and Gotsi 2006; Rohrbeck and Gemünden 2011). The actors-mix in developing innovation into business is one factor to consider. Actors being human and representing firms and organizations is one issue. Another issue is how these individual actors need to adapt to new roles and enact in new positions in the network when it develops (e.g. from a researcher acting on behalf of the University into a businessperson acting for the firm). Multiple roles might also prevail, which needs specific skills. Aligning interests of university, industry, financial actors and local communities and potential customers forms a complex setting. Gaining a common future outlook for these diverse actors is a key managerial matter. Creating a collective vision is a key issue.

Second, with regard to the exploring process for re-structuring the network to support a future technological development phase, there is continuing research required which takes an 'intentional' view of business networks, and not only a view of the network as given. This research should seek to understand how firms managers and influence each other so that more than a 'reactive' approach is taken to business partners (see e.g. Ford and Mouzas 2010; Håkansson and Ford 2002). Instead research might focus on how managers and firms are proactive in developing their network, how firms' different objectives and interests are applied to re-structure, create and dissolve business relationships in a network. The investment concept is an issue to consider. What relationships are relevant actors prepared to go into and invest resources and adapt and align into? Relational investment also needs a long term commitment and further investments over time. The potential gains and the needed sacrifices have to be made.

These matters needs proactive actors that set the train into motion and initiate and develop the value potential and find and attract needed resource-parters into the network.

Third, while the area of exploiting the current network has been a focus of considerable IMP research (Ford and Mouzas 2013; Håkansson and Snehota 1995), we see a need for future research on how the social and collective exploring process is undertaken inside the dynamic business network. The structure and firm relations of the present network reflect the power of the players in the past, some of whom will act as gatekeepers, but how to create the future is not only in the interests of the past technology owners. For example, humans and their firms in parts of the network can fall into the trap of being institutionalized and lose their creative potential.

Finally, we see considerable research is required on research methods to capture the concepts of a dynamic network. There are many ways to conceptualize and problematize time (Halinen et al. 2012), with each offering new tools and insights into managing and strategizing in a network context. There is a move to consider time conceptualization in research methods (Halinen and Mainela 2013; Halinen et al. 2012; Hassett and Paavilainen-Mäntymäki 2013). We see that theory development and research methods must account for time and accord with how time is conceptualized respectively.

References:

Adam, Barbara (2000), "The temporal gaze: the challenge for social theory in the context of GM food," The British Journal of Sociology, 51 (1), 125-42.

Ancona, D.G., G.A. Okhuysen, and L.A. Perlow (2001), "Taking Time to Integrate Temporal Research," Academy of Management Review, 26 (4), 512-29.

Andriopoulos, Constantine and Manto Gotsi (2006), "Probing the future: Mobilising foresight in multiple-product innovation firms," Futures, 38 (1), 50-66.

Araujo, L. and G. Easton (2005), "Investments, Positions and Strategy from a Network Perspective," in Perspectives on Market Networks – Boundaries and New Connection, P. Andersson and S. Hertz and S. Sweet, Eds. Stockholm: Economic Research Institute.

Araujo, Luis and Debbie Harrison (2002), "Path Dependence, Agency and Technological Evolution," Technical Analysis and Strategic Management, 14 (1), 5-19.

Bluedorn, AC (2002), The human organization of time: Temporal realities and experience. Stanford, California: Stanford Business Books.

Capaldo, A. (2007), "Network structure and innovation: the leveraging of a dual network as a distinctive relational capability," Strategic Management Journal, 28 (6), 585-608.

Dosi, Giovanni (1982), "Technological Paradigms and Technological Trajectories: A Suggested Interpretation of the Determinants and Directions of Technological Change," Research Policy, 11 (3), 147-62.

Eisenhardt, Kathleen, M. and Donald Sull, N. (2001), "Strategy as Simple Rules," Harvard Business Review, 79 (1), 106-16.

Ford, D. and S. Mouzas (2010), "Networking under uncertainty: Concepts and research agenda," Industrial Marketing Management, 39 (6), 956–62.

Ford, David and Stefanos Mouzas (2013), "The theory and practice of business networking," Industrial Marketing Management, 42 (3), 433-42.

Gadde, Lars-Erik, Lars Huemer, and Håkan Håkansson (2003), "Strategizing in Industrial Networks," Industrial Marketing Management, 32 (5), 357-64.

Geiger, Susi and John Finch (2010), "Networks of Mind and Networks of Organizations: The Map Metaphor in Business Network Research," Industrial Marketing Management, 39 (3), 381-89.

Gibson, Cristina B and Julian Birkinshaw (2004), "The antecedents, consequences, and mediating role of organizational ambidexterity," Academy of Management Journal, 47 (2), 209-26.

Giddens, Anthony (1979), Central Problems in Social Theory: Action, Structure and Contradiction in Social Analysis. Berkley, CA: University of California Press.

---- (1984), The Constitution of Society: Outline of the Theory of Structuration. Cambridge: Polity Press.

Gupta, Anil K, Ken G Smith, and Christina E Shalley (2006), "The interplay between exploration and exploitation," Academy of Management Journal, 49 (4), 693-706.

Håkansson, H and D Ford (2002), "How should companies interact in business networks?," Journal of Business Research, 55 (2), 133-39.

Håkansson, Håkan (1987), Industrial Technological Development: A Network Approach. London: Croom Helm.

Håkansson, Håkan and Ivan Snehota (1995), Developing Relationships in Business Networks. London: International Thomson Business Press.

Halinen, Ainao, Asti Salmi, and Virpi Havila (1999), "From Dyadic Change to Changing Business Networks," Journal of Management Studies, 36 (6), 779-95.

Halinen, Aino and Tuija Mainela (2013), "Challenges of longitudinal field research in process studies on business networks," in Handbook of Longitudinal Research Methods in Organisation and Business Studies, Melanie E. Hassett and Eriikka Paavilainen-Mäntymäki, Eds. Cheltnam, UK: Edward Elgar Publishing.

Halinen, Aino, Christopher J. Medlin, and Jan-Åke Törnroos (2012), "Time and process in business network research," Industrial Marketing Management, 41 (2), 215-23.

Halinen, Aino and Jan-Åke Törnroos (1995), "The Meaning of Time in the Study of Industrial Buyer-Seller Relationships," in Business Marketing: An Interaction and Network Perspective, Kristian Möller and David Wilson, Eds. Boston, Dordrecht and London: Kluwer Academic Publishers.

Hassett, Melanie E and Eriikka Paavilainen-Mäntymäki (2013), "Longitudinal research in organizations: An introduction," in Handbook of Longitudinal Research Methods in Organisation and Business Studies, Melanie E. Hassett and Eriikka Paavilainen-Mäntymäki, Eds. Cheltnam, UK: Edward Elgar Publishing.

Hedaa, Laurids and Jan-Åke Törnroos (2008), "Understanding Event-based Business Networks," Time and Society, 17 (2/3), 319-48.

Henneberg, Stephan C., Stefanos Mouzas, and Pete Naudé (2006), "Network Pictures: Concepts and Representations," European Journal of Marketing, 40 (3/4), 408-29.

Holmen, Elsebeth and Ann-Charlott Pedersen (2003), "Strategizing Through Analyzing and Influencing the Network Horizon," Industrial Marketing Management, 32 (5), 409-18.

Huemer, Lars (2014), "Creating cooperative advantage: The roles of identification, trust, and time," Industrial Marketing Management.

Im, Ghiyoung and Arun Rai (2008), "Knowledge sharing ambidexterity in long-term interorganizational relationships," Management Science, 54 (7), 1281-96.

Jansen, Justin JP, Michiel P Tempelaar, Frans AJ Van den Bosch, and Henk W Volberda (2009), "Structural differentiation and ambidexterity: The mediating role of integration mechanisms," Organization Science, 20 (4), 797-811.

Järvensivu, T. and J.Å. Törnroos (2010), "Case study research with moderate constructionism: Conceptualization and practical illustration," Industrial Marketing Management, 39 (1), 100-08.

Johanson, Jan and Lars-Gunnar Mattsson (1992), "Network positions and strategic action: An analytical framework," in Industrial Networks: A new view of reality, Björn Axelsson and Geoffery Easton, Eds. London: Routledge.

La Rocca, Antonella and Ivan Snehota (2014), "Relating in business networks: Innovation in practice," Industrial Marketing Management.

Li, Yong-Hui and Jing-Wen Huang (2012), "Ambidexterity's mediating impact on product development proficiency and new product performance," Industrial Marketing Management, 41 (7), 1125-32.

Lincoln, Y.S. and E.G. Guba (1985), Naturalistic inquiry. Newbury Park: Sage Publications, Inc.

Luhmann, Niklas (1979), Trust and Power. New York: John Wiley.

Makkonen, Hannu, Leena Aarikka-Stenroos, and Rami Olkkonen (2012), "Narrative approach in business network process research: Implications for theory and methodology," Industrial Marketing Management, 41 (2), 287–99.

March, James G (1991), "Exploration and exploitation in organizational learning," Organization Science, 2 (1), 71-87.

Mead, George Herbert (1932), The Philosophy of the Present. Chicago: University of Chicago Press.

Medlin, Christopher J. and Jan-Åke Törnroos (2007), "Inter-firm Interaction from a Human Perspective," Finanza Marketing & Produzione, 25 (1), 41-56.

Miles, M.B. and A.M. Huberman (1994), Qualitative Data Analysis: An Expanded Sourcebook (2nd Ed. ed.). Thousand Oaks, CA: Sage.

Mouzas, Stefanos, Stephan Henneberg, and Peter Naudé (2008), "Developing Network Insight," Industrial Marketing Management, 37 (2), 167-80.

O'Reilly, Charles A and Michael L Tushman (2008), "Ambidexterity as a dynamic capability: Resolving the innovator's dilemma," Research in organizational behavior: An Annual Series of Analytical Essays and Critical Reviews, 28, 185-206.

---- (2004), "The Ambidextrous Organization," Harvard Business Review, 82 (4), 74-81.

Raisch, Sebastian, Julian Birkinshaw, Gilbert Probst, and Michael L Tushman (2009), "Organizational ambidexterity: Balancing exploitation and exploration for sustained performance," Organization Science, 20 (4), 685-95.

Richardson, G.B. (1972), "The Organisation of Industry," Economic Journal, 82 (327), 883-96.

Ritala, P., P. Hurmelinna-Laukkanen, and S. Nätti (2012), "Coordination in innovation-generating business networks-the case of Finnish mobile TV development," Journal of Business & Industrial Marketing, 27 (4), 6-6.

Rohrbeck, René and Hans Georg Gemünden (2011), "Corporate foresight: its three roles in enhancing the innovation capacity of a firm," Technological Forecasting and Social Change, 78 (2), 231-43.

Schumpeter, Joseph A. (1934), The theory of economic development: An inquiry into profits, capital, credit, interest and the business (R. Opie, Trans.). Cambridge, Mass.: Harvard University Press.

Sjöstrand, Sven-Erik (1997), The two faces of management. The Janus factor. . London: International Thomson Business Press.

Weick, Karl E. (1993), "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster," Administrative Science Quarterly, 38 (4), 628-52.

---- (1995), "What Theory is Not, Theorizing Is," Administrative Science Quarterly, 40 (3), 385-90.

Weick, Karl E., Kathleen M. Sutcliffe, and David Obstfeld (2005), "Organizing and the Process of Sensemaking.," Organization Science, 16 (4), 409-21.

Whittington, Richard (2006), "Completing the practice turn in strategy research," Organization Studies, 27 (5), 613-34.

Yin, Robert K (2010), Qualitative research from start to finish: Guilford Press.

Yin, Robert K. (2004), Case Study Research: SAGE Publications.