EVOLVING NETWORK CAPABILITY IN THE ENTREPRENEURIAL FIRM

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ABSTRACT

This paper examines how entrepreneurial firms evolve their network capability. Network capability of the entrepreneur paces through time through the combination of deliberate time-based interventions by the entrepreneur and business partners, and events that impact how the momentum for further capability enhancement evolves. The results reported in the paper are from a longitudinal, 9 month, case study of an entrepreneurial firm in the telecommunications industry providing antenna solutions for mobile communications. Short-term business goals and time pressure on the founders were found to limit the value and resources placed into developing network capability. Event-based pacing would seem to be a greater spur for network capability development than conventional time pacing as it forces change in the entrepreneur's cognitive patterns to begin to engage in a more interdependent way of thinking and acting. This paper shows how network capability evolves in a punctuated way as the entrepreneur makes sense of the business network overtime and through key events. The examination of the evolution of entrepreneurial network capability helps understand why some firms become embedded quickly and other do not. The dynamics of the pace at which capability emerges can be used to plan interventions to enable firms to become more active in networks or as a trial and error process for the firm itself to develop its experience in networks.

Competitive paper

Key words: network capability; entrepreneurial firm evolution; relationship development; network dynamics and change.

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INTRODUCTION

Using a temporal lens, the aim of this paper is to examine how entrepreneurial firms evolve their network capability. Network capability can be viewed as the ability to initiate, use, develop and maintain multiple relationships to enhance the business (Walter, Auer and Ritter, 2006; Chen, Zou and Wang, 2009). Entrepreneurial firms are recognised as being important engines driving economic stability and growth yet their size insinuates that they are particularly vulnerable to resource constraints. Networks and inter-firm cooperation and interaction are important for the nascent firm to overcome resource constraints (Dubini and Aldrich, 1991; Hanna and Walsh, 2008) with network ties acting as an important avenue for bringing opportunities and resources into the firm (Hite, 2005). However, network benefits are not inherent, rather network capability must be developed by the entrepreneurial firm (Möller and Svahn, 2003). A vast literature suggests that being embedded in a network of relationships is seen as a core mechanism in the growth of the entrepreneurial firm (Jack, 2005; Lechnera, Dowling and Welpe, 2006; Hanna and Walsh, 2008) with the development of relationships viewed as essential to enter into networks (Hoang and Antoncic, 2003; Hite, 2005). However, how the entrepreneur evolves into network capability is not featured in the literature. Therefore, the contribution of this paper is to examine how entrepreneurial firms evolve their network capability using a temporal lens that is, putting "time and timing front and centre" (Ancona, Goodman, Lawrence and Tushman, 2001:645). This is an important gap and responds to the call for more research on both time and space in industrial marketing (Andersson and Mattsson, 2010; Hedaa and Törnroos, 2002; 2008). In addition, existing research tends to consider time as strengthening business relationships and increasing levels of cooperation (Ford, Gadde, Håkansson, and Snehota, 2003) and as an agent enabling change (Gersick, 1994; Andersson and Mattsson, 2010; Tidström and Andersson, 2012) as opposed to a tool for examining capability development.

Awareness of the need to incorporate time and space into network research is not new (Hedaa and Törnroos, 2002; Ford and Håkansson, 2006). This is due to the fact that interaction within a business relationship, which is at the heart of network research and a primary observation within the IMP group, is strongly connected with time and space (Håkansson, Ford, Gadde, Snehota, and Waluszewski, 2009). This is based on the premise that it is not what is going on within a company, but between firms that constitutes the doing of business (Ford, Gadde, Håkansson, Snehota, and Waluszewski, 2008) with the marketing and purchasing of industrial goods viewed as an interaction process between two parties within a certain environment (Håkansson, 1982: 22). This implies that in order to understand business relationships, it is important to consider how and why they develop and change over time (Tidström and Andersson, 2012). The same logic holds true for the development of entrepreneurial network capability. Given that capabilities need to be built by the entrepreneur, are context dependent and experientially based, to fully understand how it network capability evolves, it is important to look at the process through a time and space lens.

This paper is structured in the following manner. First, we elaborate on network capability and temporal pacing in a literature review linking the two theoretical concepts. The methodology for the qualitative, longitudinal case study is then presented. Findings from the case study are presented based on qualitative semi-structured interviews and secondary data of an entrepreneurial firm in the telecommunications industry providing antenna solutions for mobile communications based in Ireland but producing overseas. Conclusions and discussions on how network capability evolved in the case company are drawn and the

section also incorporates suggestions for future academic research and implications for entrepreneurs.

LITERATURE REVIEW

Network Capability

The entrepreneurship literature recognises that firms are becoming increasingly dependent on external resources and capabilities as they pursue their goals and the ability to engage in effective cooperation is becoming a core skill of successful entrepreneurs to mitigate the specific contextual challenges that they face. Challenges which permeate the entrepreneurial literature include the fragility associated with small size (Hanna and Walsh, 2008), resource constraints due to both liabilities of newness and smallness (Baum, 1996; Stinchcombe, 1965), dependency on a small market and lack of specialist expertise (Carson, 1985) can be overcome through external network interactions and relationships (Hite, 2005; Lechnera, Dowling and Welpe, 2006). Internal capabilities such as social and communication skills, product knowledge (Hill, 2001), innovation, responsiveness to change (Wynarczyk, Watson, Storey, Short, and Keasey, 1993), and flexibility (Van Gils, 2000) are useful for network action. Yet the scale of the entrepreneurial firm and its often independent, internally orientated established means of doing business (Nooteboom, 1994) tend to mitigate participation in networks. Given that entrepreneurs have much to gain from network action it is important to uncover how they engage in the network capability building process overtime. As entrepreneurial owner/managed businesses differ considerably from their larger counterparts, and account for a considerable portion of firms, it seems sensible to address aspects of the network capability process gap. This paper identifies and examines the temporal issues associated with network capability development as "networks do not emerge without considerable endeavour" (Birley, Cromie, and Myers, 1991: 58). This is important given the fact that neither time nor process have been particularly strongly discussed or developed within IMP research (Medlin, 2004; Ford and Håkansson, 2006; Quintens and Matthyssens, 2010).

Network capability comprises a firm's ability to initiate, maintain, and utilise inter-organisational relationships to gain access to various resources held by other actors (Walter, Auer, and Ritter, 2006). As a process, it enables the access to and sharing of expertise and more tangible assets (Adamides and Voutsina, 2006). This promise of fruitful exchanges and combinations of resources has led to an infusion of network research in the entrepreneurship literature. As firms must build rather than buy capabilities (Teece, Pisano, and Shuen, 1997), network capability is not inherent but rather is evolutionary in nature. Firms build these capabilities by sharing and/or jointly integrating their resources in a network setting to create identifiable advantage. Yet, the exact content or process of network capability building remains largely under explored (Gulati, 1998; Kale, Dyer and Singh 2002; Walter, Auer, and Ritter, 2006). While similar constructs exist such as relational capability (Lorenzo and Lipparini, 1999), and network competence (Ritter and Gemünden, 2003) the literature has paid little attention to understanding the pacing of its evolution.

Temporal Research

While research has advanced our understanding of entrepreneurial networks, few studies have focused on process issues, in particular the network capability building process. Process research deals with how events come into being and unfold over time in a context (Halinen, Medlin and Törnross, 2012). Process involves "a sequence of individual and collective events, actions, and activities unfolding over time in a context" (Pettigrew, 1997: 338). Process research is useful for this study as it is concerned with understanding how things evolve over time and why they evolve in this way (Langley, 1999: 692). Using the temporal lens, this paper will examine capability processes and the cycles that they align with (Ancona, Okhuysen and Perlow, 2001; Gersick, 1994), actor's perceptions of *time* and temporal *events*

within a particular context or space. Time is a subjective phenomen; Andersson and Mattsson (2010) note that the difficulty in achieving a deeper understanding of process in empirical studies is the ambiguity associated with time and events in research. For example, according to Tidström and Andersson (2012) time can be conceived as chronological, ranging from past to present and through to future or understood and analysed in light of its suitability, that is time that is either right or wrong. Ancona, Okhuysen and Perlow (2001) highlight the multi-faceted nature of time describing five categories of time and events. They conceptualise clock time as being linear, objective, precise and measurable quantifiable units. With cyclical time, they note that events repeat over and over such as the seasons repeat year on year in the same sequential manner. They note that time can be associated with lifecycle, such as the lifespan of individuals and the phases that they progress through. In a network setting this would relate to the stages of relationship development put forward by Ford (1980) and Dwyer, Schurr and Oh (1987). Using the example of an earthquake they describe unpredictable event-based time as we do not know when an earthquake will erupt in addition to the fact that people use the event as a reference point for things that happen before and after whereas Christmas would describe a predictable event in time. This has parallels with what Ford and Håkansson, (2006: 7) describes as 'lumps' in the interaction process and Hedda and Tornroos (2008) term 'surprises' meaning non-expected events which are often the engines for change in business-to-business networks.

Although business network researchers argue that "time is the first and probably most important issue when analysing interaction" (Ford and Håkansson, 2006: 7) they also argue that both time and events are always related to space and therefore both should be considered simultaneously (Andersson and Mattsson, 2010; Hedaa and Törnroos, 2001, 2002; Tidström and Andersson, 2012). Events in time cannot be analysed in a vacuum with space representing the context within which an event occurs. For example Håkansson, Ford, Gadde, Snehota, and Waluszewski, (2009: 38) argue that space "…positions each single interaction in relation to others and provides the focal interaction with an extended context". Clearly, networks and relationships are not without context. Each network context is ''heavy'' with resources, knowledge and understanding in many different forms as a result of complex interactions, adaptations and investments within and between the companies overtime (Håkansson and Ford, 2002). Transactions are not isolated, rather relate to each other overtime in a particular context or space.

The Link

Entrepreneurial relationships and networks evolve overtime and are dependent on the founders' context (Ostgaard and Birley, 1994). Taking the view of entrepreneurship and entrepreneurial capabilities as a process (Gartner, 1985; Jack and Anderson, 2002), process research clearly fits our research question to address the impact of temporal pacing on the emergence of network capability in an entrepreneurial context. Network capability is embedded in and seasoned with the entrepreneur, suiting process research which is concerned with understanding how things evolve over time and why they evolve in this way (Langley, 1999: 692). Context or space is fundamental to process research, both the inner mosaic of the firm and the outer economic, social, and political environment within which the firm operates (Pettigrew, 1997). As "… relationships only emerge, evolve, grow and dissolve overtime as a consequence of individual activities" (Ring and Van de Ven, 1994: 95) both time and events are vital to the emergence of network capability. Through employing process research, scope exists to demonstrate empirically how context can be mobilised by key actors as they seek strategic outcomes important to them (Pettigrew, 1997), hence allowing us to discover how the entrepreneur, driven by outer and inner contextual challenges can engage in network activity. Within this paper, the inner space is represented by the individual focal firm or entrepreneur as agent of the firm. The inner space reflects how actors perceive their network

space including who comprises their network and the capabilities present within the firm in addition to their orientations towards time. The outer space represents other actors, such as customers, and the nature of the market, which are external to the focal business relationship. For this research two types of temporal pacing are related to the evolving of network capability; pacing related to *time* and *events* (Gersick, 1994).

Time

Temporal orientation refers to perceptions and interpretations of time (Andersson and Mattsson, 2010). At an actor level, the degree to which the entrepreneurs operate through a short-term versus long-term lens may impact on the development of network capability. Entrepreneurs, traditionally time starved may not prioritise the maintenance of relationships, rather lean towards a short-term approach in their interactions. That is, characterised by a 'survival mentality' (Hankinson, Bartlett and Ducheneaut, 1997) and constant 'firefighting' in their day-to-day activities (O'Donnell, 2004) may lead to a lack of long-term relationship and network planning. An actors' time orientation may also impact on the development of network capability. That is, when looking at their relationships do they do so from a position in the past, in the present or in the future and do they look towards the past, the present or the future? Their orientations in how they conceive time as linear versus cyclical can also impact the pacing of their network capability development. Are meetings with networks members pegged to events or temporally paced in a cyclical manner, for example, do they meet with suppliers on a problem basis or every six months regardless of activity patterns within the time frame?

It has also been noted that the construction of actors' temporal orientation to an important extent is based on how they perceive and make sense of the network space and context in which they are embedded, how they see the network. In this way network horizon is important as it depicts networks at its broadest level, encompassing all connections within an entrepreneur's view. Network horizon is a useful concept as it depicts the extendedness of the entrepreneur's network view irrespective of its relevance hence providing a boundary from which the entrepreneur can deduce their network context (Håkansson and Johanson, 1993; Anderson, Håkansson and Johanson 1994; Holmen and Pederson 2003). Context refers to the part of the network within the horizon that the actor considers relevant (Håkansson and Snehota, 1989; Anderson, Håkansson and Johanson 1994; Holmen and Pederson 2003; Gadde et al. 2003) or that is present within their cognition. For example, for the entrepreneur networks may not be understood in the IMP markets-as-networks approach but realised only in the context of personal contact networks. Network participation may also be resisted by the entrepreneur for fear of loss of control over the business and a desire and belief in self-reliance hindering information sharing and joint problem solving.

Events

How entrepreneurs evolve in network capability can also be explained through mapping events to time. Actions and events have temporal profiles, such as timing, duration, speed and sequencing (Andersson and Mattsson, 2010). Network experience can be built up through the repeated sequencing of events such as scheduled monthly meetings with customers or distributors, scheduled deliveries or payments. Hedda and Tornroos (2008) term such events synchronic or diachronic meaning they happen, exist or arise at precisely the same time, or recurring or operating at exactly the same periods. These events are continuous and represent norms and routines in the relationship that play an important role in providing a basic structure to business activity (Ford and Håkansson, 2006). Although it may seem like each event is an isolated transaction, it is likely if the event is similar to earlier events, it reinforces and confirms customers' perceptions and attitudes towards the supplier (Hedda and Tornroos, 2008). In such cases parties usually have a shared understandings and expectations of these events and trust and commitment can increase overtime.

However, as mentioned earlier, according to Ford and Håkansson (2006) interaction and events within relationships and networks are likely to be "lumpy" so that there are periods of more intense episodes of interaction than others. They note that one way for analysis to cope with "lumpy" interaction is to identify "significant events" or "critical incidents" or "surprises" (Hedda and Tornroos, 2008). This helps to separate out events which are norm based such as the routines that play an important role in providing a basic structure to business activity with unexpected events or events linked to the network. For example, a company's approach to product development may represent a critical event if it involves network actors in any real way. Similarly events characterised by knowledge sharing or joint problem solving would show that an entrepreneur was evolving in network capability. Joint problem solving refers to events where the entrepreneur engages with their network of contacts to jointly solve problems saving time and effort in decision making, conserving their limited time and cognitive resources (March and Simon, 1958). Joint problem solving events are critical for network capability to evolve as they represent a mechanism for early stage collaboration enabling entrepreneurs to experiment with working with network actors both in their own interest and, overtime, in the interest of other network actors. Such arrangements provide managers with valuable external learning opportunities to draw on during capability acquisition (Larson, 1992; McEvily and Marcus, 2005).

RESEARCH METHODOLOGY AND DESIGN

Research Approach

Using a temporal lens, the aim of this paper is to examine how entrepreneurial firms evolve their network capability. This study adopts a case study approach as the primary research method, following the view of Easton et al. (1997) who argued that case research methodology is particularly appropriate in industrial networks research where complexity and dynamism of relationships limit the applicability of positivist research based on inferential methods. Case study research is also in keeping with recent entrepreneurship literature which supports the need for longitudinal, qualitative studies to be conducted in the area of networks (Jack and Anderson, 2002; Hoang and Antonic, 2003; Hanna and Walsh, 2008; Chen and Tan, 2009). The method of research took the form of semi-structured in-depth interviews with the case company complemented with secondary sources.

Participant Selection and Data Collection

For this study we analysed an entrepreneurial firm in the telecommunications industry providing antenna solutions for mobile communications. The firm is based in Ireland but outsources its production to Taiwan. As can be seen in Table 1, the company founders met in Taiwan at a trade conference in 2003 and initially set up the company in November 2004. The business was launched in January 2005 and had just started making a profit in 2007 when they agreed to participate in this study. Both business partners were between 30-35 years old when they initially set-up the venture and for both, it was their first business. They had diverse skills which facilitated the partnership. Partner A, who participated in the study was a skilled salesperson whereas Partner B was an engineer living in Taiwan with fluent Chinese.

We initially conducted preliminary interviews with eight Irish entrepreneurs that met the following key criteria: less than 10 employees, past participants in a university's entrepreneurship program, in operation for more than 1 year with the entrepreneur acting as leader of the business. However, the ICT firm agreed to participate in the study for a period of 10 months allowing for close observation and providing access to all materials pertinent to their business including business plans and financial statements. This was important given the widely cited difficulty of observing pacing effects (Gersick, 1994). Data was collected at monthly intervals from September 2007 to May 2008 with one of the two founding partners in the business. This was deemed important by the authors as, due to the nature of the

exercise, they were the actors who could make immediate decisions within the company and were fully responsible for the firm's network activity. Over 15 hours of interview data was collected and analysed over the ten month period. All of the interviews were taped and transcribed immediately following the interviews. Similar to work by Gersick (1994) a summary of the interviews was prepared to lead the following interview. We felt this was important for temporal research to determine how plans and events had played out during the periods between interviews. Documentation in the form of company and product brochures, presentation materials, business plans, newspaper articles and company information on websites were also analysed for this study. The diversity of sources facilitated the validity of the emerging process through triangulation (Yin, 2003).

Data Analysis

The interviews and subsequent analysis for this study focused on the role that time played in developing network capability reflected in how the entrepreneur regulated his involvement in networks. Codes were developed based on themes relating to network capability development. The data was analysed by organising it chronologically, month by month, and reduced by focusing on key decision points and milestones as anchoring time points (Schurr et al., 2008; Aaboen, Dubois and Lind, 2011). Key events, decisions and plans were listed by the authors in addition to how they impacted on the development of network capability overtime. Initially, the entrepreneur was asked questions in relation to the history of the company and the capabilities present within the firm at the early stages of development which could impact on the development of network capability. Business imperatives and cycles were examined in relation to network capability development. Key indicators centred on whether relationship and network development and maintenance were prioritised by the entrepreneur. How business imperatives were paced was analysed in addition to key events that occurred that may have impacted on network capability development. For example, were sales and financial targets set to time scales? Did this impact on relationship building with customers? In relation to product development we analysed whether it was driven by key events and the extent to which other network members were involved which would facilitate the development of network capability. The means through which a firm generates customers and business can also indicate whether it is evolving in network capability development. Interactions with customers and distributors viewed as single events would show if the entrepreneurs had a preference towards operating in a transactional as opposed to a relational manner which would inhibit the development of network capability. Such exchanges would be primarily discrete exchanges characterised by very limited communications and narrow content (Dwyer, Schurr and Oh, 1987). Conversely, the entrepreneur may describe events characterised by information sharing and joint problem solving which would be indicative of a more relational approach to their business favouring network capability development. The authors also sought to uncover the role that time and events played in triggering change and relationships development in addition to changes in network cognition. We were interested to know whether the entrepreneur paid attention to time and deadlines in their operations and whether this further impacted on their interactions with other actors. For example, overtime did they develop stronger relationships with customers, distributors and partners to develop their business?

As we are focusing on how the entrepreneur evolves in network capability, our analysis looks at the network of an actor, a relatively broad level of analysis encompassing all the interconnected relationships of the entrepreneurial firm. We argue that within an entrepreneurial context, the individual and the organisational levels are similar hence we are examining the temporal pacing of network capability development from the actor or entrepreneur's perspective. NVivo, a software tool, was used to facilitate the organisation and analysis of documentation and interview data. Given that process and qualitative data has

been described as "messy" (Langley, 1999: 691), NVivo acted as a support system to assist in managing and analysing the large volume of complex data and rearranging the data into smaller coded groupings to facilitate insight, comparison, and theory development (Strauss and Corbin, 1990).

FINDINGS

The start-up network resources of the business

Table 1 gives an overview of the history of the firm depicting the important events that Founder A described during the ten month interview period. As was noted, the history of the firm is significant as what a company is born with will impact how its network capability is shaped or how it shapes it. To assess the pattern presented in this findings it is necessary to know the technical and managerial capabilities present at the founding of the business. The two founders of the business met at a trade conference in Taiwan in 2003 and by November 2004 had formed their new business. Their first contract was established through a speculative project design for a Japanese company who audited their contract manufacturing in Taiwan providing it with certain legitimacy. One of the founders had spent 8 years working in Taiwan, has fluent Chinese and significant knowledge of electronics manufacturing and design and acts as the technical director of the company, while the other founder has the sales experience and is the overall managing and sales partner. The technical network provided by one of the founders is significant as it was possible to contract the first design job to an English engineer. In addition, in 2005, two equity partners were brought into the business based on the technical partner's contact network. The business did not pay any full-time salaries until 2007 and these were small salaries to both the founders. They did tie into a network of engineers whom they could use part-time on a project basis. This kept costs low as they did not have the money to pay full-time salaries. The use of antenna in a variety of machine-to-machine applications meant that the market was growing rapidly, and for a niche player outside the mobile telephone industry, the potential for business growth was attractive. The business model was lean, not by choice, but was responsive to customer demand and innovative where, even in the initial phases, they could achieve high antenna performance (low noise), and were competitive on costs (manufacturing in Taiwan and China), and could deliver quickly. The company had an initial advantage over their competitors which they could use to generate new sales. Although armed with this technical competence and experience, the founders did not have access to customers or distributors and therefore had to find a route-way into customer markets. Their initial proposition was to do custom design products without charge and without major customer involvement as a way of becoming a supplier. The sales founder had major drive and ambition and did appear to be able to build social capital with customers which would seem to provide a basis on which to build a network of relations albeit starting from scratch. The two founders did not have previous new venture experience and had little experience in interaction. Whilst aware of relationships in a social sense, and did research on the major players in their business, they did not have a deep understanding on how the various actors connected to each other and were in business to sell products rather than to develop relationships. Indeed, they saw the life-cycle of their product being fairly short, maximum two years, and felt they were under major pressure to continue to generate new sales leads. Therefore, the founders' network cognition was low but they had the capability to learn from others in interaction and develop network capability. The pace of this development and its cycle is what the authors are trying to analyse in these findings.

Date	***Event***
2003	Business founders met at a trade conference in Taiwan.
November 2004	Business started with project for a Japanese Tier 1 supplier which

	became their first sale. Both founders invested €20,000 in the business.
January 2005	Business launched with one founder based in Ireland and the other in Taiwan. The business is managed from Ireland and production and development based in Taiwan close to main supplier.
June 2005	Investor - €7,500 - PhD Materials Engineer for 2.19% of the business. This investor is also an employee with specialist ceramics knowledge.
August 2005	Investor - €50,000 - 12.5%, an ex-banker.
August 2005	Started working more directly on projects for customers
Summer 2005	They had meetings with their competitors - invaluable learning curve as it showed them where we want to be. They did not know at the time that they would be their competitors.
September 2005	Joined SEEPP (a university run spin-out programme of 1 year duration which was supported by Enterprise Agencies). Received a competitive state financed employment grant as they were identified as a high potential firm.
December 2005	Market analysis report prepared for the spin-out programme that they were on.
Year 2005	Achieved sales of €35,000 in 2005, loss €14,000.
December 2005-March 2005	Beginning to hone skills as problem solver for antenna problems in external devices, for example, in logistics tracking.
2006	Connection with a university radio antenna research centre – unsuccessful as the antennas were for larger applications – from an investor perspective handy to have a connection with them.
March 2006	Business plan drafted for investor readiness and for spin-out programme.
May 2006	Business plan finalised – entered competition (finalist).
	Mentor from the spin-out programme provides important contact and enterprise agencies involved in spin-out programme provides European sales contact which translates into major sale.
End of 2006	Financials 2006 – sales 208k – profit 2k.
January 2007	Started making a profit.
May 2007	Business plan revised (Winner of Business plan competition).
	Finance from Ulster Bank (due to competition).
April 2007	First quarter sales of €200,000.
Feb-June 2007	Appointed an engineering manager in the US to work on-site with US customers tuning and customising antennas. Appointed second engineer in the US – both are paid on a job basis.
May 2007	Decided to focus on two main product ranges – internal antenna's and external antennas. This would move the company away from becoming a designer of other related products.
June 2007	Environmental opportunities for product development not identified from customers, for example, antenna for child safety in the wake of the disappearance of Madeleine McCann in May 2007 while on holiday.
September 2007	They started marketing a new ceramic antenna product for satellite radio in the US (SDARS), which was co-developed with their partner factory in Taiwan.
October 2007	Begins to get referrals to major clients through existing customers. For example, got an introduction to a French company that he had been trying to get into for 2 years through another French client. Products

	launched on a specialised catalogue sales website.
November 2007	Approached a local enterprise agency looking for office space and were rejected. Approached national enterprise agencies looking for matched investment which was rejected.
Jan 2008	Hired two employees in Taiwan - €1200 per month, one with a masters in design but these are not as creative as European employees according to founder.
Feb 2008	Distributor visits to the UK – distributor brought them to new and current customers (distributor visits took place every six months).
March 2008	Meeting with business partner in Taiwan (annual review), and visited manufacturer.
April 2008	Started new catalogue sales relationships.
May 2008	Commenced talks with a distributor and customer in South Africa.
December 2008	Year revenue €1.3m.
Jan 2013	25% growth per year to date; 56 employees; managing founder now based in the US; customer pays for design; many of the early stage relationships still there; company's expansion funded by internal resources; established reputation in the network.

Table 1 - Chronology of key business events 2004-2008

Business imperatives and cycles

Building network capability was not a conscious business objective for the founders. Other business priorities were driving the business even in its third and fourth years of operation. The managing founder did not prioritise the maintenance of relationships or consider the access through relationship to other nodes in the network. Not actively networking was probably due to lack of time rather than interest or use. Other priorities dominated to such an extent that unless a network actor was of immediate use they quickly became dormant. The three main imperatives driving the business and appeared in all of the interviews were – sales; financing the business; and, new product development. These occupied the time of the managing founder and were critical to remaining in business. Given that the owners spent the first two years of the business on no pay it is understandable why the focus on these business objectives was so acute. Ultimately, these factors may not drive the business but were the constant preoccupations during the period under study. Business imperatives drive a certain view of the business reflected in the business plan, approaches for funding and personal objective of the entrepreneurs. Specific actions were taken on a weekly, monthly and six monthly cycle to assess progress on these three objectives. Nothing transformational happened through this review cycle that would change the business network progression or its relationships to its customers in the period under study. Perhaps this is because it did not succeed in its financial objective to bring in investment (including equity) of €500,000. This investment would have been used to add a significant product development facility and in-house engineering rather than relying on its part-time/job product design network. The founders identified a range of investors including distributors but were really focused on trying to get a government agency to invest in the business which did not happen probably due to the company's manufacturing being off-shore. Financial objectives of this type are linked to quarterly and year-end financial targets and almost appear out of sync with the aspirations of the founders to develop world-beating products and grow the business. The sales imperative was also linked to a constant need for survival and to attain the financial objective of doubling the business every year. One cycle of note that linked to the possible development of network capability was a distributor visit programme which happened in a six month cycle. This would facilitate the build-up of relationships and referrals from this

network over time. Towards the end of our interview period, the business was beginning to really see how important distributor relationships were to their initial business model generating 50% of referred customers. Even though the managing founder saw relationships as primarily short-term and transactional and there for what you could get out of them, some realisation of the importance of partnering was beginning to develop. However, at the same time, the business was considering adding telesales to focus on cold calling and diversifying into related components to grow the business. The third business imperative, new product development parallels the focus of the other two objectives as a short-term route to market rather than a relational building. Their strategy of product development for customers at low cost was developing them market reputation and sales but without using it to build relationships and get customers to pay for it the investment in it would not be worth it. Some of the product it developed would cost its customers €20,000 to get done. Even though it did not cost the company this much money to do it, it is easy for an outsider to see that this type of product development cost absorption isn't sustainable for a company of the size of the start-up. Currently, they were able to use their Taiwanese manufacturing relationships to do things cheaply which made it possible to keep their costs low but how long this would last is open to question. At the end of our study, they were moving some of the manufacturing of the lower value products to China. The time span for the product life cycle was two years. The company's products were under constant obsolescence threat and this concept of time weighed heavily on their thinking to the extent it influenced their view of needing a major pipeline of new customers to fill the void left by ending product lifecycles. Our analysis led us to believe that the business cycles mitigated network capability development. Their product development approach is presented in exhibit 1. This approach is linear and controlled by the company and perhaps does not foresee what they are actually doing which is more process based and interactive. However, it does represent their 2007, just pre-study, method and mode of thinking. It may be just trying to conceptualise something that they thought investors would like to hear.

How do we decide what products to offer?
1. We find a customer with a specific need. This happens by us either approaching the prospect with our unique offering… or they have contacted us through the website or referral.
2. We thoroughly research the chosen niche market (e.g. automotive GPS antennas). Identify distributor pricing, end user pricing, key players, volumes, manufacturing costs.
3. Identify the top selling products now, and what will be the up and coming 'hot products'.
4. We search for existing products in the current manufacturing base. If we can find it we test, approve, re-brand, and commence immediate sales. This keeps NRE, tooling costs, and the risks to a minimum.
5. If not found, we will attempt to modify an existing antenna product. If not we develop a new unique product offering such as Hercules.
6. Customer design-in. Most products are custom designed for the end user, delivering high performance for them. This provides a readymade channel and lessens risk of product failure. The custom antennas can also be sold to other players in the market – we now have an extra part we can hopefully just modify by tuning for other devices. Each time the customer feels that the product is specific to them. Our design is protected as the customer knows this.
7. 2007 step. On our new website, which is currently in development – a Web 2.0 style forum will be launched encourage antenna users to share their experiences and develop stronger attachment to the company's products.

Exhibit 1 – Company's approach to product development

Opportunistic customer generation and referral

The pattern of developing customer relationships up to and during the period of the study was opportunistic or as a result of referrals. The notion of developing business through partners and relationships was only beginning to take hold towards the end of our period of study which was into the 4th year of the company's operation. However, the initial project that the company undertook was beginning to define its area of expertise in antenna design and manufacture solutions and this was reflected in its written business plan in mid-2007.

The sales imperative was driving a shorter term approach to relationship development. The company used three channels of distribution but did not feel any major channel loyalty even though it had up to 50% of its sales through referrals, primarily through distributors. These distributor relationships got the nascent company in touch directly with customers when they had a problem that required antenna expertise. The company appeared not to trust any of its partners but did realise the need to maintain relationships with them and visited distributors on a six monthly basis in the period of our study. The founders knew that they were dependent on distributors for sales and, unlike their competitors, paid the distributors a percentage if they gave them a referral for an antenna custom design solution. This was a good, if unplanned, way of building some loyalty but, more importantly, of building reputation as a technical problem solver which appeared key to the sales building process. It would be difficult for a new company to get to the customers directly as they had no reputation and some of these entities were large, for example, car companies or major module vendors to same. Therefore, they were reliant on distributors to refer them or on people in their contact network to open the door. The mentor appointed to the company when they were on the university spin-out programme in 2005-2006 also provided an entry into a specific industry sector which became one of their major sources of revenue. Nevertheless the company continued to rely on the need to cold call and widen its network of customers rather than use the resource of its existing network, for example, in 2008, following a 6 monthly patterned review of their sales figures, a quote from the managing partner shows this: "*I have gotten slack re looking for new contacts/customers/leads. I feel that I am reactive in dealing with customer relationships which is a negative thing. I make lots of conference calls. I am going to start telesales – chasing contacts for an hour every day for a while because I have noticed that his customer base hasn't expanded in a while*." The managing partner's sales background may be impacting his focus on sales as he continued to use trade magazines and newspapers to generate leads in 2008. The gradual change to more relationship building and long-term systems was happening due to a natural maturing process through reputation building as described and by problem solving for customers. The process of problem solving and customising solutions was repeating with many customers and was beginning to contact in a more triadic way through, in one case, a customer in France recommending the company to one of its suppliers (Table 1). Two examples of their problem solving, see, Table 2, from 2005 and 2006 describe a consistent approach to get things done for customers which is readily transferable into a network capability if used as a part of longer term relationship building which the company was not able to focus on due to its business imperatives.

Transport navigation example 1: A customer contacted the company frustrated as the tracking devises installed on trucks were causing problems for the drivers and as a result he was dealing with numerous and frequent complaints from truck drivers and from installers. Problems included: antenna-noise problems, where they were placed was causing leaks in the truck in bad weather; and they were too big. The entrepreneurial firm started working with the truck drivers and installers to design a new product to eliminate current problems. The drivers and installers were pleased to be involved in the design process and their knowledge input resulted in an end product that met their need without the previous problems. The customer was content as he no longer had to spend time dealing with issues and complaints.

Machine-to-Machine communication example 2: They are not traditional wireless device makers, so they used an off-the-shelf module and a well know antenna brand – a Tyco electronics part. Unfortunately for them Tyco sold them an off-the-shelf antenna that did not even meet the basic requirements for operation, and offered no customisation service to solve the problem, their attitude like the other American and European antenna companies is take it or leave it, if you're not Motorola or Nokia we're not going to spend money to solve your problem. So IPS contacted Taoglas, we took the whole parking meter, which included a 1950s style battered steel stand, as only the "heads" on these machines need changing! Our antenna designers came out with a custom antenna within 2 weeks, fully tested inside their "head" in a state of the art 3D radiation chamber. This service would cost up to USD 20,000 in the US and Europe. We offered this free to the customer, this way we are guaranteed to lock them in at the design stage, we have minimal costs to do this in Taiwan (probably USD 500), and any costs can be amortised into the unit price as production rolls forward.

Table 2 - Problem Solving approach to customers and lead generation

The role of events in triggering change

Up to the time of the study or in the first two and a half years of the business the key events were the chance meeting of the founders and the unique resources this partnership brought to the business. The second major event was the winning of the business plan competition in mid-2007 which enabled them to get a bank loan without which the business may not have been able to grow/survive. From a network perspective the founders brought a technical resource which included a network of designers and manufacturers that enabled a business offering in interaction. This problem solving capability was unique in competitive terms and was enough to build a business. They were able to manufacture and supply to the highest quality and quickly and they possessed a high level of engineering talent to solve technical problems with antennas. The founders also had a sales ability and determination coupled with financial understanding from around their personal contact network. The business, like most small business, struggles for acceptance especially when it is designed for an international market, and needs finance to develop at this level. The company was unsuccessful in getting this and the winning of the business plan competition, at least, gave them access to loan facilities which could finance the business.

During the study period, the events that most triggered development (or where going to) were similar to the earlier phase – finance; enhancing their technical capability; and, building on their problem solving ability. The inability to get venture equity/investment was the constant business problem. This imperative heightened during the study period as many capital raising avenues trailed off and seemed to be closing. Whilst this hadn't triggered a change in growth strategy by the time our study finished it was obvious that they were going to have to use internal resources to grow. Planning was still very short-term and related to survival. They had hoped in the 2007 business plan to add significantly to their technical ability by adding personnel to their Taiwanese and Irish product development team to be able to sell the notion of higher level technical competence to their customers. This competence was also going to be added to with a technical sales capability. Lack of finance made this practically impossible. An alternative lower cost strategy to deal with this in 2008 was to add 2 engineers to their Taiwanese base to continue to work with engineers in other countries on a project basis. This was going to give them a slower return but was their only option. The European and US engineering resource was more problem oriented and suited their needs but the costs of a full time resource was prohibitive. Over the time period from start-up to the end of the study period, the network entry and positioning capability of problem solving continued and the company's learning from customers became more of a unique trading network resource. This perfecting of their offering takes a long time and can only be

measured through the company gaining more and more direct interactions with customers who use them as a trusted source.

Relationships development – time and capability

The market, according to the company's records, is fast growing which means that market actors will be able to grow their business if they have the technical competence to complete the job. The company has been able to get into a relatively complex network where they represent a component in a large produce module without forming any deep customer relationships. The relationships with customers from the company's perspective do not involve customer resource ties into the company's business. The company appears to view each transaction as complete even though they could be selling antennas to that customer for years afterwards. Even into the company's fourth year of operations, it hasn't solidified its partnerships with customers. This may be a resourcing issue and one of its small size comparatively to its larger customer – its resource dependency is making it keep its distance. As a small company it is being flexible to respond to any customer rather than develop a relationship with a few. Its need for sales is driving its activity wider into as many resource networks as possible. Its evolution is been carved by trial and error within the miniature specialised antenna market rather than through any particular plan. One side of relationship building it has to do to get to customers is via distributors where it appears to be increasing its commitment and vice versa with the distributors. As mentioned, the company incentivises distributors for referrals and receives 50% of its business through their recommendation. While it does not profess loyalty to them, it does appear to be gaining a strong foothold and client recommendation through them. Some of its distributors have been changed due to lack of performance but others now have a four year history with them and are one platform to grow where the customer is less accessible. However, distributors sell more non-customised solutions so will need to be bypassed over time.

Whilst on a structural level it may appear that the company is slow to develop relationships or is going to use more of an outsider position to evolve, when the company's efforts in evolving interaction capability are considered, a stronger relational perspective emerges. The company was unknown in its network yet is consistently building a reputation as a specialised problem solver. It is honing this relationship competence to enhance trust and become a player in the network. It appears a matter of time before this happens but the difficulty for the small firm is holding on until this happens. This experience in interaction is the essential force going on below the surface of the network which is the route-way into the network for the company in this situation. The company doesn't place a value on this competence as it enjoys solving problems for its customers and wants to be the best at this but it is bridging it into the network.

Changes in network cognition

Over the period of the study the firm's managing founder altered his view regarding who comprised his network. As can be seen in Figure 1, on commencement of the study although the entrepreneur acknowledged that they operate within relationships, networks were viewed primarily through a social lens comprising informal discussions with friends, family members and business people in a social setting. Initially, relational value was perceived by the firm in terms of the support, encouragement and appreciation of their efforts that they received through social ties. Network expansion was facilitated through "*introductions*" to fellow business people and valued as the core impetus of networks, as, according to the founder, "*networks are all about getting yourself out there*".

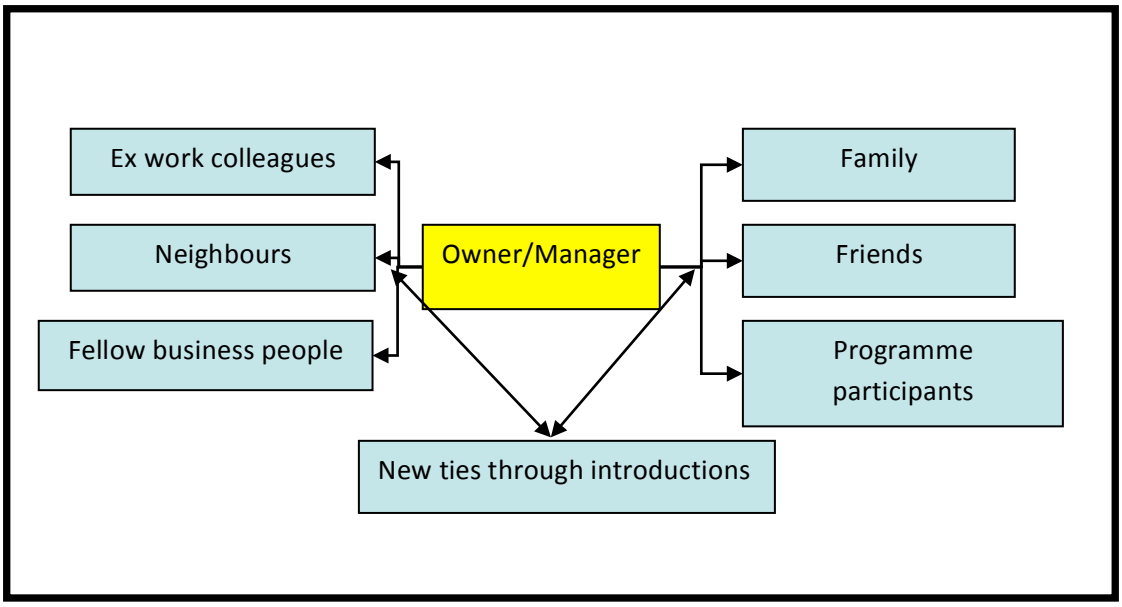

Figure 1 - Initial perception of networks as a social phenomenon

By the end of the study period (Figure 2), the founder's network context seemed to have changed to mirror that of the interactive perspective showing that they were evolving in network capability. The entrepreneur set up six monthly meetings with foreign distributors based on past events where valuable knowledge had been gleaned and started to look at their value beyond that of a logistics service, as was noted: "*They know the lay of the land. They know the local key players, including customers, competitors and suppliers. They keep me informed of changes in the market and introduce me to new customers on each visit*". He noted meeting customers through distributors or otherwise was vital for their business as "*customers share information in face-to-face meetings that you would never hear through other communication mediums … If you are not meeting them all the time you will really miss out*." Government sponsored events and funding opportunities ensured regular meetings with formal bodies and mentors, who were intimately familiar with the running of operations and the industry, were important for advice deemed dependable as they were perceived as having no "*hidden agenda*". The initiation of the relationship with the US employees was a significant milestone for the company and showed that the entrepreneur was evolving in network capability. Employing US engineers on a contract based "*changed our strategy completely and helped us to develop an understanding of what was necessary for the US market. They told us the pricing of the other competitors and helped us to develop customer and partner relationships*".

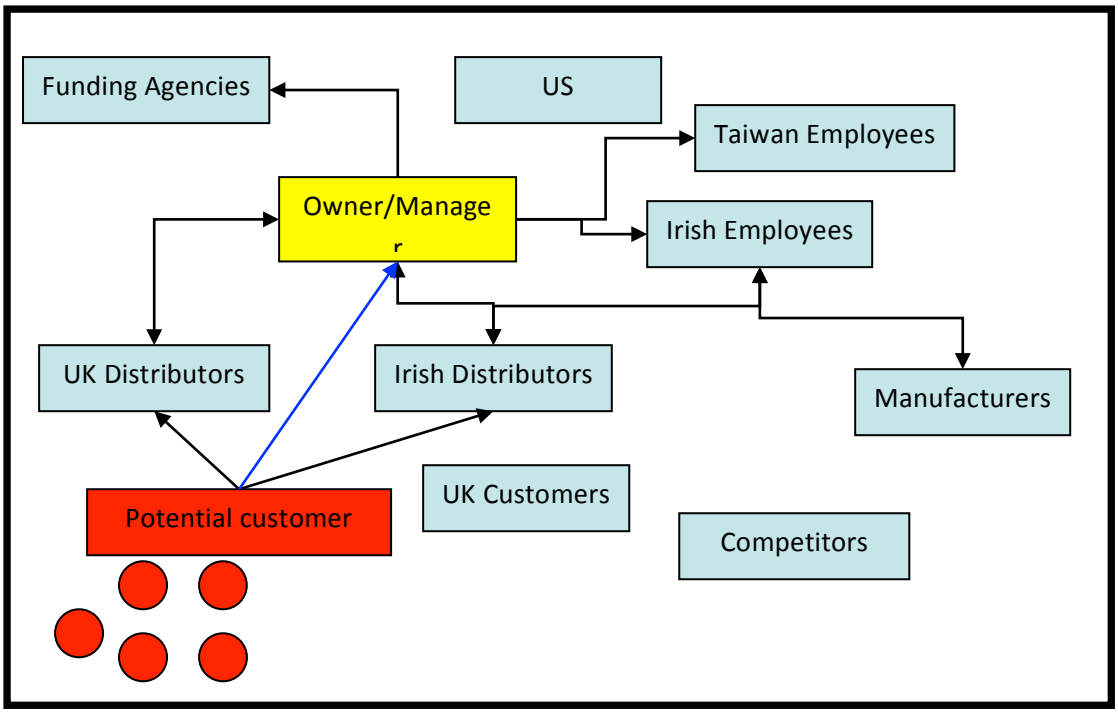

Figure 2 - Perception of networks from an interaction perspective

However, the word-view of the firm's managing founder did not appear to change. A general cautiousness and mistrust prevailed his attitude particularly to competitors. His approach to relationships remained one of transaction-focus rather than relationship building. The major assets and resources the firm relied on were internal and in the very strong partnership between the founders. The sense-making of the managing founder was one of practical survival and any long-term commitments that did not generate immediate sales were not actively considered. It was a matter of getting the product out into as wide a customer base as was feasible to finance enhancements to their technical capability. Given the firm had little experience in the network, it did, by the period of the study, know who its competitors, suppliers and major customers could be. Its view of its horizon was much broader than at the start (Figure 1 versus Figure 2). However, given the business imperatives described, it didn't understand the need to embed itself in particular industry sectors, or may have been driven by a preference for not becoming too dependent on any one sector and narrowing its options. Indeed, in late 2007, it saw itself as diversifying into two new business areas which it saw as major opportunities as new divisions. These divisions, one in solar energy, would have taken resources away from its antenna business and the partners' focus on it.

The managing founders may have had fixed views on developing and controlling the business but his and the business's experience in interaction was beginning to force a change in the ideas of how the business might grow and succeed through other firms. The indicators of a change in cognition were its experience in problem solving for customers, its emerging reputation for technical excellence and delivery, distributor trust in the founders based on competence but also social trust on their willingness to get things done and not let partners down (evidenced in customer quotes used to recommend the business to others), in referrals by unknowns which means that they were being talked about in a wider network, in their ability to attract talented engineers in the US to work for them on a contract basis. The company needed to attract talented people with specific qualification as the business is specialised. The company had not yet developed a shared set of ideas within a network of actors, yet the doors were opening and they were reciprocating the goodwill shown to them through their delivery of high quality products. This sense of shared cognition and a more

relational worldview was taking a long time as the business was now in its fourth year and, in practice, individual world-views may be the last thing to change. In the follow up interview conducted in 2013, the business was positioned as a module supplier fully integrated into its customers' businesses and still using its reputation of problem solving and peer-leading technical competence. The business was highly trusted and saw itself as a player within the industry rather than the outsider trying to get in. It appears that this change in cognition was gradual in the businesses now ninth year of operation.

DISCUSSION AND CONCLUSION

Using a temporal lens, the purpose of this study centred on examining how entrepreneurial firms evolve their network capability. While much research has been conducted in the area of networks, using a temporal framework to examine network capability development provided a fresh perspective for empirical enquiry. Prior empirical work does not focus on evolving capability through a temporal lens but findings have many parallels in literature that supports the results in this study. This study therefore addresses a need for more temporal based research in networks (Medlin, 2004; Ford and Håkansson, 2006; Quintens and Matthyssens, 2010). In addition, it has been noted that despite significant interest in entrepreneurial networks few process orientated studies have been conducted in the area of network capability development (Hoang and Antoncic, 2003). Process research was deemed appropriated for this study as it is "concerned with understanding how things evolve over time and why they evolve in this way" (Langley, 1999: 692). According to Pettigrew (1997: 340) "processes are embedded in contexts and can only be studied as such". Hence this paper, in discussing how entrepreneurial firms evolve their network, has shown the complex, sometimes fortuitous path they can take to becoming embedded in a network. Their evolution depends on resource access but this study shows how events and temporal pacing influence its network horizon and through this impact its perceived business development pathways. In our case study the firm eventually developed network capability and became a part of the network but this process was not smooth, it took a long time, and involved a temporal-based experience in interaction; change to one of the founder's cognition that business can indeed succeed through networks rather than gain the necessary resources alone.

The findings highlight the importance of context to temporal research; what Van de Ven (1992) term the outer and inner mosaic of the firm impacted the development of network capability. The outer context of the entrepreneurial firm, in particular the nature of the industry, impacted on the temporal development of network capability. This was due to the fact that the environment within which the firm operated influenced the events that shaped the development of network capability (Tidström and Andersson, 2012). For example, being characterised by a highly competitive landscape eliminated the formation of co-opetition networks and relationships (Bengtsson and Kock, 2000; Lechner and Dowling 2003). Even with short product life-cycles no collaboration or joint problem solving was evident between the entrepreneur and their main competitors showing a lack of trust and information sharing (McEvily and Marcus, 2005). As was noted by the entrepreneur; "*It is a very competitive industry. If one of our competitors had a problem we would aim to make it worse for them*".

The inner context of the firm also had a clear impact on how network capability evolved. In keeping with Ergazakis, Ergazakis, Flamos and Charalabidis (2009), life within the entrepreneurial firm was based on day-to-day survival and fire-fighting activities and as such had a short-term as opposed to long-term orientation with their business. Initially a 'fortress enterprise' mentality prevailed (Huggins and Johnston, 2008), resisting external intervention with an extreme reluctance to engage in any behaviour that might lead to a dependence on others (Chell and Baines, 2000; Izushi, 2003). This was particularly evident in their approach to attaining funding which they primarily aimed to achieve through public bodies. When this approach was unsuccessful they drove the business forward on their own showing that a

belief in self-reliance and independence was stronger than the desire to build network capability beyond that demanded by immediate trading needs. This is similar to findings by Hanna and Walsh (2008) that should a firm have both the time and finance available to develop the required capability, they would generally prefer to remain operating independently**.** In line with the entrepreneurship and small business literature the case firm suffered from the liability of newness and smallness (Baum, 1996; Stinchcombe, 1965), with both time and resource pressures hindering the development of network capability. The focus of their business model was on implementing lean business operations as opposed to spending time developing and maintaining embedded, interconnected relationships. This further highlights the importance of existing contacts for the entrepreneurial firm and the fact that "time and history are at the centre of any process analysis" (Pettigrew, 1997: 339).

Regarding time, network capability development was built through in cycles with timing norms emerging as the study progressed (Ancona, Goodman, Lawrence, Tushman, 2001). Meetings with distributors and larger customers were paced as they took place at specific times throughout the year, usually at six monthly intervals. All parties had a shared understanding and expectation regarding these meetings (ibid: 649) which could be categorised as scheduled as opposed to emerging norms. This is similar to what Ancona, Okhuysen and Perlow (2001) describe as repeated activity mapping which facilitates the development of network capability through information sharing. However, the firms' problem solving capability seemed to act as a major entry ticket to relationships facilitating the development of network capability. That is 'critical events' seemed to be more important than scheduled visits in terms of network capability development. Problems, similar to "surprises" or "critical events" (Hedda and Tornroos, 2008) created "lumps" (Ford and Håkansson, 2006: 7) in interaction and helped to further develop relationships. When customers approached the firm with a specific problem, more intense periods of interaction ensued and joint problem solving helped to build trust and commitment as the firms were working together (McEvily and Marcus, 2005). This also helped to build their reputational network as a problem solver, an important point given that the managing partner is a sales person as opposed to an engineer by trade and as such may have been outside of the core industry personal contact network.

The findings suggest that the evolution of network capability development was tempered by both critical events and time, network capability being defined as the ability to initiate, use, develop and maintain multiple relationships to enhance the business (Walter et al., 2006; Chen et al., 2009). Findings suggest that the initiation and use of relationships seemed to be primarily driven by problems or events whereby the customer approached the focal firm with a particular wireless based issue. This event triggered momentum in interaction in the early phases of product development as both companies were in constant communication to design a product to solve the issue. Joint problem solving necessitates the mutual trust to be built and information sharing within a relationship (Uzzi, 1997; McEvily and Marcus, 2005) facilitating the development of network capability. While events triggered relationship initiation and use, it would seem that the relationships with core customers and distributors were maintained and developed through temporal rhythms in the form of scheduled visits.

Often the advice given to the small firm is getting sales as quickly as possible in a transactional manner. However, this study highlights the value of initial relationship experience and being known within a network as a route way to gaining long-term repeat customers. To start with, the managing entrepreneur, as a salesperson as opposed to an engineer, did not start the business with embedded relationships. This study highlights that it can take considerable time to become a part of value chain networks which may be underestimated for the new firm. Clearly networks and the development of network capability is essential for information acquisition and sharing, joint problem solving in the

form of product adaptation and innovation and the sharing of expertise and more tangible assets. This is particularly important for the nascent, entrepreneurial firm in which such activities are often restrained because of a lack of resources such as funding and/or expertise. For example, within this case the growth of the business was tempered by and occurred in parallel with their evolving in network capability. Their real business was developed in interaction and growth would not have ensued without the development of network capability. Initially the managing entrepreneur viewed each event, both problem based and scheduled meetings, as a transactional activity, not linked in any way to other transactions. This is similar what Ancona, Okhuysen and Perlow (2001) term single activity mapping where each event or interaction is analysed in isolation and has a defined start and end point. However, overtime they started to see the benefits in examining the connections between interactions within the network and viewing them in relation to other transactions as opposed to stand alone events. This showed that they evolved in network capability and simultaneously grew their business.

As with all studies, the present study has certain limitations. This paper was developed using a single longitudinal case study. During the period of the study the firm's future was not secure yet it did ultimately succeed and represents a case of success in evolving network capability. Much would also be gained from studying the opposite. In addition, adding some further cases would be useful step in advancing knowledge in this under researched area. Additionally, because of the small country context within which the process was explored, it may be interesting to conduct a similar study in a larger country context or within a different industry. The case company's sales founder eventually moved to be closer to his customers, to the US, which may illustrate a difficulty in becoming embedded into a global network from a peripheral base.

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