

THE ROLE OF LEARNING NETWORKS IN BUILDING CAPABILITIES IN SMALL AND MEDIUM SIZED FIRMS

George Tsekouras

CENTRIM, The Freeman Centre, University of Brighton, UK

Phil McGovern

Institute of Technology Tallaght, Ireland

Tim Brady

CENTRIM, The Freeman Centre, University of Brighton, UK

Submitted to

OLKC 2006 Conference at the University of Warwick, Coventry

20th – 22nd March 2006

THE ROLE OF LEARNING NETWORKS IN BUILDING CAPABILITIES IN SMALL AND MEDIUM SIZED FIRMS

1. Introduction

There has been a lot of writings for the capabilities and the way they can be developed and renewed within an organisation. Most of this literature refers to large corporations and the way they build up their capabilities. Much less is known about the way smaller firms build their capabilities; however the situation that small firms face is drastically different at least because they have much less resources to rely upon.

One of the most successful ways for smaller firms to advance their competitive success is through participating in alliances of development together with other firms, the local government and other local institutions. A particular form of collective action among small firms and other local stakeholders is learning networks, which focus exclusively on organisational learning and knowledge sharing among different firms.

This paper draws on a wider research project undertaken in Ireland examining the impact of participation to a learning network for the capability building process in small and medium sized enterprises (SMEs). More specifically, the paper focuses on the process of absorption of knowledge 'spawn' within learning network by the participating firms and the factors that influence this process.

Building on previous work on absorptive capacity, the paper distinguishes two types of absorptive capacity, the de facto and the de jure one. Special attention is paid to the latter as the explaining factor for the variations of network contributions to different firms' capability building process. The conditions under which this can deliver a significant contribution to the capability-building process of a small firm and the factors that can influence this de jure absorptive capacity are also discussed.

2. Literature Review

2.1 Firm's Capabilities and Organisational Learning

Penrose's (1959) resource-based theory of firm growth has been described as a 'learning theory of the firm' (Best 1990: 127). Penrose argued that firms create a 'strong base' of specialised resources and knowledge in the use of certain types of technology and the exploitation of different markets (Penrose 1959: 137-138). Because resources alone do not create value, a firm must draw upon the knowledge and experience – or 'organisational capabilities' (Chandler 1990; Grant 2002) – of people working together in an organisation to leverage the pool of resources and perform activities that create competitive advantage.

An organisation's capability is distinctive or core when it provides a unique source of competitive advantage, which is not widely available to other firms in an industry (Kay, 1993; Hamel and Prahalad, 1994; Iansiti and Clark, 1994; Leonard, 1995). A core capability is difficult to imitate and uses scarce resources that cannot simultaneously be implemented by large numbers of firms (Barney, 1991).

Firms move into new basic positions along 'paths' of learning set by their inherited knowledge and experience (Teece and Pisano 1994). Nelson and Winter (1982) discuss the difference between routine and innovative behaviour. Routines refer to repetitive and predictable patterns of activity involved in producing products and services that are 'visibly "the same" over extended periods' (Nelson and Winter 1982: 97; March and Simon 1958: 13). Innovation refers to the changes in a firm's routines required to develop new technologies or explore new markets (Nelson and Winter 1982: 128). Teece and Pisano (1994) and Teece et al. (1997) argue that new forms of competitive advantage stem from dynamic capabilities, i.e. the ability to adapt, reconfigure and renew capabilities and to create innovative responses to a changing technology or market environment.

The underlying assumption of all these studies is that the foundation of capabilities is the knowledge gained from learning either internally or from external sources (Nonaka and Takeuchi, 1995; Leonard-Barrton, 1995). However all these studies have a serious limitation: most of them address the issues faced by large corporations with abundant resources in their hands and access to pools of expertise all over the world. The small firms face tougher choices due to the limitation of their resources. To respond to this challenge, a number of collective schemes have developed termed as clusters, industrial districts etc.

2.2 Learning Networks

The importance of these schemes lies on the ability of small firms to join their small-scale resources in order to develop a critical mass of resources that can be useful to all of them (Schmitz, 1995; Sengenberger and Pyke, 1992; Semlinger, 1995). However the organic growth of inter-firm networks such as clusters and industrial districts have serious limitations in terms of requiring a certain number of cultural and economic conditions to be in place (Hobday, 1994).

To help with these problems, a new initiative was introduced the last ten years, which is usually co-funded by public authorities or industry associations. The so-called Learning Networks are inter-organisational networks where structures have been established with the primary purpose of increasing the participants' knowledge (Bessant and Francis, 1999; Dyer and Nobeoka, 2000; Bessant and Tsekouras, 2001; Bessant et al, 2003). Learning through networking gives the opportunity not only to share expenses and resources but also to listen to new ideas, challenge ones' own inherent assumptions and embrace new perspectives. These networks:

- involve representatives of different organisations, mainly firms
- are formally established with clear and defined boundaries for participation,
- have a explicit structure for operation with regular processes that can be mapped to the learning cycle,
- have a primary learning target –specific learning which the network is going to enable
- can assess the learning outcomes which feed back to the operation of the network.

The formal character of the network provides a permanent structure for identifying knowledge gaps and satisfying knowledge needs, allowing evaluation and accumulating experience regarding the support required by learners. More significantly, the lasting character of membership in learning networks facilitates the development of trust relationships among participants.

Learning networks range from networks focusing on (Bessant and Tsekouras, 2001):

- single issues (e.g. the British Quality Foundation),
- particular sectors (e.g. Industry Forum by the Society of Motor Manufacturers and Traders, CIRIA for the construction industry in UK),

- specific regions and particular sectors (e.g. AC Styria for the automotive sector in the Austrian region of Styria)
- specific regions without any sector or topic focus (e.g. Plato network in Ireland)

Although it is known that learning networks can help to upgrade regional industries (Bessant, Kaplinsky, Morris, 2003), the process of how a learning network helps individual firms to develop and renew its capabilities is less clear. The absorptive capacity of a firm-member of such a learning network is expected to play a significant role in regulating this process.

2.3 Organisational Learning and Absorptive Capacity

The term absorptive capacity was first introduced by Cohen and Levinthal (1990) who argued that “the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities” (p. 128). To their opinion, the absorptive capacity “is largely a function of the firm’s level of prior related knowledge” (p. 128) and depends primarily on the firm’s own R&D.

Zahra and George (2002) provide a very thorough review of the concept and point out that

“Despite growing use of the construct, the study of absorptive capacity remains difficult because of its definitions, components, antecedents and outcomes. These issues highlight a need for greater clarity about the domain and operationalization of this construct” (p. 185)

Zahra and George (2002) define absorptive capacity “as a set of organisational routines and processes by which firms acquire, assimilate, transform and exploit knowledge to produce a dynamic organisational capability” (p. 186). Critical for their analysis is the distinction between the potential absorptive capacity (PACAP) and the realised absorptive capacity (RACAP). The PACAP “comprises knowledge acquisition and assimilation capabilities” while RACAP “centers on knowledge transformation and exploitation” (p. 185).

Although the two components of absorptive capacity “build on each other” (Zahra and George, 2002, p. 188) in an iterative way, they remain focused on different things. For

instance, PACAP is rather “an outward-looking absorptive capacity” (Cohen and Levinthal, 1990) while RACAP has a rather “inward-looking” (ibid.) orientation. According to Zahra and George (2002), “potential capacity allows firms to sustain a competitive advantage” (p. 185) but unfortunately “the potential capacity component ... has received disproportionately less empirical scrutiny when compared with realised capacity” (p. 185).

Furthermore, the absorptive capacity has received very limited attention in inter-organisational context. Lane and Lubatkin (1998) referred to the concept of relative absorptive capacity. However this analysis is again relevant to the conditions of large corporations rather than SMEs. For instance according to this analysis the relative absorptive capacity depends on, among other things, the similarity of the organisational structures and compensation policies of the two interacting organisations – conditions more relevant to the large corporations rather than small size organisations. This omission is critical, given the increasing significance of inter-organisational initiatives for SMEs. In fact since the PACAP has an outward-looking orientation, it is even more vital to analyse it in the context of interaction between different firms.

The lack of literature in this field may also be responsible for another oversight. Cohen and Levinthal (1990) in their original paper consider absorptive capacity as referring primarily on the knowledge that the firm can take in from spillovers from competitors or knowledge from outside the industry. Other authors (e.g. Lane and Lubatkin, 1990; Larsson et al, 1998) place inter-organisational learning in the context of two organisations interacting with each other as part of a ‘rightful arrangement’ such as a strategic alliance. In fact belonging to a learning network or a cluster is also a rightful arrangement; for instance a learning network is a network with formal boundaries where it is clear who is in and who is not.

It is important to distinguish between these two different kinds of absorptive capacity, because the antecedents, the conditions and the operational aspects are significantly different. For instance, reverse engineering activities are primarily affected by the behaviour of the ‘learner’ and the appropriability regime while the absorptive capacity in the context of two rightfully interacting organisations is an outcome of the interaction between them (Larsson et al, 1998). This is especially the case for the potential absorptive capacity which is clearly focused on outward-looking activities.



Figure 1: Different Kinds of Potential Absorptive Capacity

Following these deliberations, two different kinds of potential absorptive capacity can be introduced:

- The *de facto potential absorptive capacity*, referring to the knowledge acquired and assimilated in actual fact whether by right or not
- The *de jure potential absorptive capacity*, referring to knowledge accessed and acquired as part of a rightful entitlement.

The de fact potential capacity mediates between the knowledge that is ‘out there’ and the knowledge that the company can assimilate from this; a typical example of de facto absorptive capacity is the reverse engineering activities. On the other hand, typical examples of de jure absorptive capacity are the behaviours and activities that a firm develops as a part of a strategic alliance, a joint venture or a learning network or a cluster (Figure 1).

This paper looks into two fully developed learning networks in Ireland to explore the de jure absorptive capacity developed by their members, all of them SMEs. The main interest is to *investigate the factors that influence the de jure absorptive capacity*. Although the main focus is on the potential absorptive capacity, elements of realised capacity will be also discussed.

3. Methodology

To understand the way the networks operated multiple semi-structured interviews were carried out with key personnel in each of the two networks including the CEO of Skillnet, the network promoters and network managers in each of the two networks, specialist trainers and network participants. The data collection was carried out between March 2003 and April 2005 (Table 1).

FPN & RTN Networks	Number of Subjects	Data Collection Method
Skillnet CEO	1	Semi-structured interview
Network Promoters	2	Semi-structured interview
Network Participants (Firms)	21	Survey
Network Managers	2	Semi-structured interview
Specialist Trainers	8	Semi-structured interview
Participating Firms (in-depth investigation)	6	Multiple semi-structured interviews (Case Studies)

Table 1: Data Collection Schedule

The CEO of Skillnets was interviewed for the purpose of agreeing terms of reference in undertaking the research. One promoter from each group was interviewed between July 2003 and November 2003 and between November 2004 and December 2004. Each semi-structured interview lasted approximately forty-five minutes. The interviews offered insights into the motivation and rationale for group participation and provided information on capability outcomes from participation in the network. One network manager from each group was interviewed between July 2003 and August 2003, between February 2004 and March 2004 and at the end of the process i.e. between November 2004 and December 2004. Each semi-structured interview lasted approximately forty five minutes. They provided knowledge of the capability gaps, the facilitation process, the learning process and an insight into the capability outcomes.

Four specialist trainers from each group who were contracted to deliver specific inputs to the network group against identified knowledge gaps were interviewed when they were working with the groups between November 2003 and December 2003, between February 2004 and March 2004 and at the end of the process between November 2004 and April 2005.

Each group consisting of ten/eleven participants (seven/eight core and three non-core) were interviewed during the facilitation process to obtain their initial views/motivations for joining the network and their assessment of progress to date. They were subsequently interviewed during their involvement in the process (after six months) and at the end of the process (i.e. between November 2004 and December 2004). From these interactions, an assessment of the capability gaps in their respective firms at the beginning, during the process and a rich picture of their candid views about the capabilities acquired was obtained. Each semi-structured interview lasted approximately forty-five minutes.

Three firms were selected from each network group for in-depth case study analysis. The main interviewee in each firm was the key participating executive in the network. In some cases this was the owner manager, in others a departmental executive. The interview duration for the initial interview was between one and two hours. Two further interviews were conducted with two other executives in each case-study firm to provide a cross-reference on the main interview agenda. At the later interviews, this served as a measure on how knowledge is filtered into the firm as a result of participating in the learning network.

The case study firms were tracked over the entire process (approximately forty-eight months). By doing this, it was possible to gather information on the identification of capability gaps and on the effectiveness or otherwise of the learning mechanisms chosen to overcome these gaps. The case analysis allowed general conclusions to be drawn from the process. Next sections present a brief description of the Skillnets approach, the two focal networks as well as four case studies of core members.

4. The Skillnets Networks

The Skillnets concept emanated from the White Paper on Human Resource Development:

Primary responsibility for human resource development at the level of enterprise rests with the private sector. Effective investment in human resource development will yield a good commercial return in the context of a sound business plan (Department of Enterprise, Trade and Employment, 1997, p. 113).

The approach developed by Skillnets was regarded as a departure from previous support models in a number of ways. Central to the approach was that a network model would become the basis for support and address imperfections in training markets. Skillnets proposed an enterprise-led approach. This concept accepts that firms (rather than agencies or support bodies) would be best placed to identify key needs and devise effective training responses to those needs.

The governance of the networks lies in the hands of participating firms that decide on management and decision-making processes, training needs, methodologies, training providers and delivery systems. By focusing on this process, it proposed to help overcome the isolation faced by owner-managers through sharing of ideas and experiences, learning from one another and developing improved ways of managing a business.

Skillnets provide a framework i.e. technical support, advisory services, linkages and guidance to networks. Skillnets also facilitate transparency, accountability and appropriate monitoring and control systems to ensure proper management of public funds. The cost for each firm in the network would be greatly reduced by the combination of partial state aid and the efficiencies brought by group buying power.

Following the first pilot programme (1999-2001), a new three year mandate was set by Skillnets in which fifty five networks were established, incorporating a multitude of industrial and commercial sectors. The Minister for Enterprise, Trade and Employment has granted a further five year mandate to Skillnets to provide increased funding and support for enterprises for the period 2005-2010.

A typical Skillnets network model includes:

- the network promoter
- the network manager
- the core and the non-core members (primarily firms)

The promoter is the key driver, who signs the contracts on behalf of the network and his/her role may be summarised as follows:

- Provide a structure and promote collaboration - generate interest and enthusiasm for the network
- Recruit participants and explain benefits to prospective participants
- Negotiate funding and design policy for network programmes and assist the network to obtain support and funding from public and private groups
- Set priorities and facilitate the network in reaching common goals - add value to the network by addressing market, technical, managerial and environmental competencies

The network manager is the key coordinator, responsible for:

- Operations management of the network
- Recruitment of the right people so that there is long-term network support
- Organisation of specific training programmes/ selection of appropriate trainers
- Responsibility for good practice
- Provision of a link with Skillnets Board

In order to focus their efforts and reduce the cost of promotion, Refrigeration Technology Network and First Polymer Network took a decision to require participants to register as 'core-participants'. This required that interested participant firms submit some base line data on their existing continuous development policies and their capability priorities for the period. In return, they would be guaranteed that the training programme would reflect their needs and they would receive information on all upcoming network events. Thus the learning needs are defined on the basis of the requirements of core participants. Non-core participants are defined as those who could qualify but decide not to commit and do not register. They are kept informed from time to time with a view to persuading them of the benefits of participation.

5. The First Polymer Network (FPN)

5.1 The Industry and the Network Formation

The plastics industry has become increasingly important in Ireland's industrial structure, employing 11,000 people and exporting an estimated €500 million to Britain and mainland

Europe. Eighty per cent of the firms are Irish-owned firms, which accounts for an estimated 60% of employment, while the rest of the industry is largely made up of German, UK and USA firms. The sector is under competitive pressure from low-cost economies including Eastern European countries - some of them new EU entrants. As the industry supplies other sectors such as electrical, electronics and medical devices, it could be vulnerable to their peculiar market downturns; in 2003 about twelve plastics firms went out of business.

Prior to the establishment of First Polymer Network (FPN), the industry in Ireland had no structured training arrangements. Skill development initiatives were undertaken in an ad hoc manner, where individual firms engaged the services of trainers from the British Plastics Industry Association.

FPN originated as a sub-group of a pre-existing trade body (Plastics Industry Association (PIA)). Arising from discussions with this body, a number of key firm representatives began discussing capability gaps in the industry. There was also a perception that the bodies whose function it was to bridge these gaps (FAS - The Employment and Training Authority and third level educational institutions) were not responsive to the 'real' needs of the sector. This led to the idea that, while the PIA was fulfilling its mandate as a representative body, there was a need to deal with capability and skill development.

The FPN was formed in 1999 to address training needs by providing both in-house and classroom-based development programmes. It now consists of sixty-seven member firms in material supply, polymer processing and research and development processes throughout the country. Since April 2000, FPN has delivered a number of programmes in core technologies.

5.2 The Case Studies

Three core members were selected from the FPN: MAC Plastics, Mould-Tech and Tiber Technologies¹. All three firms had a relatively strong innovation record (Table 1). MAC Plastics had developed products for several 'demanding' sectors, supplying large multinational enterprises with strict quality requirements. Mould-Tech had been very strong

¹ Pseudonyms are used for the actual participating firms to protect their anonymity.

in supplying parts to mobile telephony companies. Tiber Technologies had supplied parts to high-tech industries such as the computers and the telecoms industries.

Nevertheless, all three of them faced significant challenges. MAC Plastics needed to balance the tensions created by serving several industries at the same time. Their priority was to build an organisation which is able to switch from one more to another relatively quickly and without too much overhead cost; these were the areas that they expected the FPN to help.

Mould-Tech was desperate to distance itself from the bad fortune of the telecoms industry. It wanted desperately to diversify to customers in other industries, which however had much stricter requirements in terms of Quality Assurance (QA) and hygienic conditions. To enable this shift, Mould-Tech needed to up-skill significantly its organisation and also find a network of reliable suppliers which can help to produce in line with the strict requirements.

Tiber Technologies, the largest of all three, had been selling to industries which were coming to a recession and therefore they needed to enter new markets where they could exploit their innovation potential. However, Tiber Technologies were not very clear regarding the markets they have to target or the way they had to follow in order to entry these markets. In few words they found themselves in a strategic cross-road where they needed ideas which could help them to get over the forthcoming crisis in the computer and telecoms sectors.

All three of the cases had expectations for the FPN and this why they decided to become core members of the network. The underlying hope was that the time and effort they would spend to the network would pay them back in terms of ideas, knowledge or identifying reliable suppliers. However the strategies they chose to interface with the network were rather different. MAC Plastics appointed one of its managers to play the role of the link with the network. In fact they have been very active in the pilot phase of the network but their participation became much lower later on. In complete contrast, Mould-Tech adopted a much more active –and therefore resources intensive- strategy: the Director of the company became the Promoter of the emerging network. From this position he had much more responsibilities and time commitments but at the same time much more leverage to influence the network activities and the resources dedicated to it. Tiber Technologies adopted a middle-way strategy, although somehow closer to the Mould-Tech one: the company appointed its

Director to represent it to the network who remained quite active throughout, without however undertaking any management responsibilities from the network.

All three firms were quite active in developing new products and new processes during the focal period (1999-2005). Prior to 1999, MAC had developed a number of process innovations (Table 3). To fully exploit their significant automation, they came up with a plan to reduce substantially the set-up time, minimise the problems appear in the production (regular cleaning-up time etc.). At the same time, the knowledge accumulated in product design specifications, was enhanced by industrial design skills and an management system for maximising the interface with the customer supported by a database including all the customers' unique needs. This enabled the company to carry out complex product designs and mould requirements. The firm also took action in safeguarding ISO certificates and became more environmental friendly (Table 3). From all these actions lines, the company benefited substantially from FPN only in the area of production optimisation (Table 3).

Mould-Tech appears as a different story (Table 4). During 1999-2005, the company actualised a change of focus from a production line concentrating on multi-assembling and smooth flow of materials and products to a production process seeking continuous improvement and attaining strict quality requirements. A new system of cassettes for rapid mould making was introduced ensuring, among other things, that repeated orders of parts was produced exactly to the same specifications -something important for the medical devices sector which require very high precision. Co-ordinate Measuring Machines were also introduced to reduce the variance of produced parts with special training given to technicians.

To ensure smooth production process, the techniques of Single Minute Exchange of Die and Design Of Experiments were also implemented. Furthermore a number of QA initiatives were undertaken, such as the SPC technique and the cause-effect analysis. As for the human resources policy, a new system of operators levels was introduced with training for each level – the aim being to bring all the operators at least on level 2 (Table 4). Mould-Tech also introduced a new medical team responsible -from concept to finished products- for the medical devices sector, including designated front-line managers and a new reward system based on performance. The interaction with other network members and the sharing of their experience with running teams was instrumental for Mould-Tech action in this respect.

FPN was also very helpful in the other innovation areas. The FETAC (Further Education Training Awards Council) modules on injection modules supported the acquisition of related machines, the In-Mould Decoration initiative gave Mould-Tech the opportunity to access knowledge on cassettes moulding, the Gage repeatability & reproducibility study gave knowledge on process variation, the 'train the trainer' programme and on-site demonstration gave know-how to the company for SPC and troubleshooting etc. (Table 4). All together Mould-Tech seemed to enjoyed a tremendous level of support from the network with contributions in several of its deploying innovation projects.

By the time Tiber Technologies joined the network, it has already installed injection moulding, multiple cavity tools and a clean room. A considerable part of its production process had been automated while an innovative matrix organisation has been established with an advanced management system in place to ensure the participation of all required competencies in project teams. Despite these advances, the firm had still to sort out its strategic choices –whether it would like to see itself in another segment of customers or another market all together (Table 5).

Despite the lack of a concrete strategic plan, the firm followed the network activities picking up pieces of knowledge 'in the way'. For instance Tiber Tehcnologies has followed all the network training activities on the troubleshooting techniques, , reduction of process variation, SPC, Pck and ASQ standards, Gage repeatability and reproducibility etc. (Table 5). As a result the quality of the production process was substantially enhanced, the number of correct set-ups increased and the precision of produced parts improved. This set the foundation for the next FPN activity on processes and skills for validation, which was then deployed in the company to validate the manufacturing of medical devices. Following this, the firm followed the FPN training on ISO EN 13485 and started to put processes in place for applying for the ISO 13488 -a standard certifying QA for medical devices. After a number of implemented changes and developed processes, the firm has acquired the ISO 13488. This enabled the firm to bid for supplying medical devices firms.

	MAC Plastics (est. 1980, 47 staff)	Mould-Tech (est. 1991, 70 staff)	Tiber Technologies (est. 1981, 130 staff)
<i>Firm's Background</i>	<p>Taken over by a UK Group in 1998</p> <p>Differentiated portfolio of products - food (40-50% of turnover), pharmaceutical, medical, petrochemical, leisure markets</p> <p>Need to align internal processes with customised customer requirements - enhance flexibility quicker to respond</p> <p>Need to make more systemic the on-going innovation activities of the firm</p>	<p>Strong in telecoms, but down with sector downfall</p> <p>Strong reputation for innovation</p> <p>Need to diversify to medical devices but...</p> <p>...Federal Drugs Agency approval is needed</p> <p>...much stricter Quality Assurance is required</p> <p>No structured training – training ad hoc and imported</p>	<p>Supplies to telecoms and computer industries</p> <p>Very strong capabilities but... facing crossroads!</p> <p>Uncertainty - Little strategic clarity for future</p>
<i>Strategic Intent To Join FPN</i>	<p>Should minimise human contact with product production as a result of customer requirements (food processing firms)</p> <p>Become more co-ordinated to manage the diverse mixture of products – align structure with technology</p> <p>Ensure the existence of reliable suppliers</p>	<p>Sharing the cost of up-skilling in order to qualify for supplying to medical devices</p> <p>Develop structured training for the company</p> <p>Qualified suppliers required to produce medical devices – FPN to upgrade local suppliers in order to enable production for medical devices</p>	<p>To become more informed in order to be better able to anticipate forthcoming market changes</p> <p>Assure structured training and certification by accredited organisations but in a reduced cost</p> <p>Get ideas to help reflection on strategic options open in the plastics industry and the firm</p>
<i>Power position</i>	<p>Core and founding member</p> <p>Manager</p> <p>Carry out the pilot programme, then lower their engagement</p>	<p>Core and founding member</p> <p>Director</p> <p>Promoter of the Network</p>	<p>Core and founding member</p> <p>Director</p>

Table 2: Contextual Factors of The Case Studies in the First Polymer Network

<i>Prior Knowledge</i>	<i>Innovations (1999-2005)</i>	<i>Contribution of the network</i>
A close working relationship with machine and mould suppliers in Switzerland, Germany, America, LA, and Canada Hot melt sealing and ultrasonic welding	Introduce significant automation - Reduce people from 83 to 47 ISO 9001 certification ISO 14001	
Basic injection moulding 12-16 cavity tooling system	Overall Equipment Effectiveness (equipment availability, production rate, quality rate) – reduce tooling set-up time	
Prevention of potential errors, minimise production downtime through high-performance downstream equipment	Optimise processing conditions, troubleshooting problems areas, new clean-down techniques Reduce average time for clean-down to 60 mins - saved time to <ul style="list-style-type: none"> • perform additional colour checks to reduce start-up waste level • to take more orders 	FETAC module on injection moulding Specialist seminar on Single Minute Exchange of Die (SMED) and Design Of Experiments (DOE) Training expertise certified by FETAC (Further Education Training Awards Council)
Clean room environment – in-line labelling	Environmental management system Repak award winner – temperature controlled laboratory	
Product Design Specification (PDS) – 3D models, CAD, assembly modelling, animation 3D Mechanical engineering –consultant hired Logistics management for multi-location customers	Complex product design and mould requirements Enhance industrial design Introduce a database of each customer’s unique needs Maximise interface with customers – contacts at different levels	Team leader module

Table 3: MAC Plastics Prior Knowledge, Innovations and Network Contribution

<i>Prior Knowledge</i>	<i>Innovations (1999-2005)</i>	<i>Contribution of the network</i>
Multi-station assembly lines – additional processes to assembling like ultra-sonic welding, heat staking, degreasing electric testing etc. Fully integrated MRP system – minimise raw materials and smoothing work-in-process	Thirteen injection moulding machines acquired / clean room - moulding specialist hired	
Rapid mould making system for fast prototyping – short lead time, flexibility, facilitate de-bugging, quality assurance Three different processes to decorate mobile phones lenses depending on requirements Extensive automation, clean feeding system	Cassettes for rapid mould making system for producing a wide range of products - 100 cassettes for high-tech healthcare firms Reducing lead-time of new quality parts from 12 weeks to 3 weeks – much quicker response to customers and much lower tooling cost Measurement variation identified and reduced – use of CMM Improve the execution of automated production operations	Gage repeatability & reproducibility study – use of Coordinate Measuring Machines (CMM) On-site programme for multi-tasking, set-up of payload schedules, set-up and use of touch sensing In-Mould Decoration initiative – get in touch with Nissha and Kurz, training on cassettes moulding FETAC modules on injection moulding
	SMED and DOE implemented, reducing cost and delivery time	Specialist seminar on Single Minute Exchange of Die (SMED) and Design Of Experiments (DOE)
	Train technicians to apply Statistical Process Control (SPC) and troubleshooting techniques – moulding inconsistency reduced by understanding causes and effects	Train the trainer programme and on-site demonstration from Arburg, Krauss-Maffei, Fanuc on mould changing, monitoring, setting-up and basic troubleshooting
	Assessment of training needs based on performance – operators set to level 1 (no supervision, basic skills), 2 (limited responsibility for quality and troubleshooting, basic supervisory), 3 (lead operator) or shift supervisors Enhance marketing campaign through the FETAC certification	Training expertise certified by FETAC (Further Education Training Awards Council) 12 FETAC modules
	Medical team, responsible from concept to finished product – develop new products for medical devices sector Designated front line management programme – new reward system based on performance Training by Irish Management Institute in supervisory management	Interaction with other network members exposed weakness in team-working in the firm’s cell structure FETAC module on team leader

Table 4: Mould-Tech Prior Knowledge, Innovations and Network Contribution

<i>Prior Knowledge</i>	<i>Innovations (1999-2005)</i>	<i>Contribution of the network</i>
<p>Clean room Move from 4 to 8 cavity moulds Injection moulding – extensive robotics Training on robotics expertise provided by specialist technology manufacturers (Demag, Bespak, Wittman)</p> <p>Matrix organisation Advanced management system – working in teams including all required competencies</p> <p>ISO 9001 acquired (1993)</p>	<p>Quality increased and faults decreased substantially Increase substantially number of correct set-ups</p> <p>Validation for the manufacture of medical devices ISO 13488 acquired – medical device standard (2003) Tendering and quotations for medical devices firms</p> <p>ISO 16949 acquired – automotive standard (2004) Tendering for car manufacturers’ contracts</p>	<p>Introduction to the moulding cycle, plastic materials, troubleshooting, processing errors Improve process variation, SPC, Process capability analysis (Pck), sampling techniques, ASQ standards Gage repeatability & reproducibility study</p> <p>Tuition responsibilities within the validation project team; qualification vs. validation; worst case scenario; implementation stages Tuition on regulatory requirements ISO EN 13485</p> <p>Training expertise certified by FETAC (Further Education Training Awards Council)</p>
	Strategic alliances with training and higher educational institutions	FPN brings on board training and third level educational institutions – opportunity to make connections
Complex requirements assembly lines		
Just-in-time warehouse		

Table 5: Tiber Technologies Prior Knowledge, Innovations and Network Contribution

5.3 The FPN Impact

It is probably no surprise that while the satisfaction from the FPN of both Mould-Tech and Tiber Technologies is very high, the satisfaction of MAC Plastics is only average. Mould-Tech had a relatively clear strategic agenda, namely to move away from the slowing-down telecoms sector towards a more vibrant and dynamic medical devices sector. Its top management saw the FPN as a golden opportunity to enable this transition by transferring to the network the cost of this transition.

The Managing Director of Mould-Tech has quickly moved to 'snatch' the position of the network promoter, despite the significant spending of time and effort that this job was associated with. Apparently his judgement was that the benefit that his firm could get could surpass the cost associated with the job of the network promoter. In any case, it seems that his opinion was that leveraging resources from the network was probably the only way for its small company to make the transition from a sector with low quality requirements to a market which allows more value-added but also requires much more knowledge-intensive activities.

His judgement was proved true since Mould-Tech has developed the capability for developing new products in a knowledge-intensive sector, has developed the capability to manufacture in extremely demanding conditions as well as the capability of shifting flexibly from one batch to another in a relatively short time with a low cost. Most of all, by leveraging the network resources, Mould-Tech has managed to develop its dynamic capabilities (Teece et al, 1997) i.e. the capability to reconfigure its knowledge base, its organisational processes and eventually its unique assets, opening up new paths for development for the company.

Tiber Technologies expressed a satisfaction of similar level with Mould Tech. The firm has come to join FPN with a less clear strategic plan. The top man, who represented the firm to the network, had no clear vision for the future of his company. The company had come to similar conclusions as Mould-Tech that serving the telecoms and computers industries was a rather insecure option; however in contrast with Mould Tech, Tiber Technologies had made no decisions regarding the markets it would like to address. As a result the company used the network as a 'brainstorming forum' in the hope of forming better ideas for its future

development. The strategy adopted was to follow the network activities in the hope that top management will be able to construct new avenues of development.

Through participating to these network activities, the company managed to build up gradually new capabilities which led to new avenues of growth. More specifically, through absorbing quickly the knowledge offered by the network and disseminating it throughout its organisational, the company managed to realise a number of changes which laid the foundation for the developing capabilities. In fact the company has gone through a steep learning curve, facilitated by the network, the first time it applied for the ISO 13488, a certification required for bidding for medical device contracts. This learning was re-deployed a year later to acquire the ISO required for bidding for contracts in the automotive industry:

we are working on two standards, we have managed to get one this year, which was ISO16949 – medical devices standard, we have achieved that and the learning process that goes on in here around achieving that is unbelievable... We are going through exactly the same experience now with the new ISO standard, TS 9000, - the standard automotive system (Interview with Tiber Tech Manager, 11/12/2003)

In similar vein, the acquired skills and the implemented changes deliver a capability to produce in very demanding hygienic conditions which were later exploited in securing contracts from the food-processing industry.

As a result Tiber Technologies, by simply ‘following the steps’ of the network, found itself present in three new markets which did offer the so painfully sought avenues of development. This was a strategy of the new capabilities emerging from the ground activities of the network without any clear strategic vision from the company either in terms of its development or in terms of its participation in FPN. However there were two critical conditions without which the company would not have managed to pick up the gains.

Firstly, although there was no strategic clarity regarding the company’s requests from the network, there was a strategic commitment to follow closely the network activities. This commitment was expressed through the representation of the company by the Managing Director and the very active participation of firms’ employees to the network activities. This strategic commitment has given the implicit permission to managers not only to spend time

on following the network activities but also to be willing to try the acquired knowledge without the fear of risking their carriers over an unsatisfactory outcome.

Secondly, the organic style of their management and organisational structure enabled the company to disseminate the incoming knowledge to the wider organisation. The matrix organisation, the 'all competencies system' of their management as well as the flexibility ensured by the project teams enabled Tiber Technologies to thoroughly integrate the incoming knowledge with ongoing activities:

What happens is you have one person who has a relatively high level of knowledge to start the process. That person is ... not so much a trainer as a tutor and a champion, but at every meeting she has others learn from her (Interview with Tiber Tech Manager, 11/12/2003)

The participation to FPN combined with these conditions offered the opportunity to Tiber Technologies to build up its dynamic capabilities out of following the steps of the network:

Other firms in the industry – yes - but we are learning more in this area than we would have in the past and it's partly because I have more exposure to them through First Polymer Training than the rest of the people (Interview with Tiber Tech Manager, 11/12/2003)

The story was completely different in the third case MAC Plastics. MAC Plastics is a learning organisation with several lines of innovative activity pursued (Table 3). This was complemented by a huge investment in automation equipment to bring the firm up to standards for hygienic conditions of production – required by food processing manufacturers. Nevertheless, FPN has not been able to assist substantially in this process. With the exception of one line of innovative activity the firm does not seem to benefit substantially from the network activities. This is reflected to the firm's satisfaction level from FPN which is medium. MAC Plastics was lacking the kind of strategic commitment to the network that was obvious in the other two cases. For instance, the firm's representative to the network was one manager, rather a Director. To make things worse, the firm's participation to the network has been reduced after a pilot period. The managers in MAC Plastics might have played the safe

card, relying more on controllable internal efforts rather than the activities of a group of firms whose the outcome depended on other less controllable factors like the other firms priorities.

	Mould-Tech (70 staff)	Tiber Technologies (130 staff)
<i>Satisfaction level</i>	Very high	Very high
<i>New capabilities</i>	Capability of developing new products Flexible manufacturing capability – short lead times, low cost Manufacturing capability in extreme hygienic conditions and with high precision requirements Dynamic capabilities emerging – shifting from assembly-dominated markets (telecoms) to knowledge-based development and manufacturing activities (medical device)	Capability to understand and implement various (ISO) standards Diversify to medical devices market – tendering for contracts in 2002 Diversify to automotive sector – tendering for contracts in 2004 Proctor & Gamble contract awarded - detergent market

Table 6: First Polymer Network Impact on SMEs

The firm’s sophisticated management and organisational structures enabled the transfer of know-how acquired in the medical devices market to flow into another potential market: the automotives one. Encouraged by the successes in the medical device sector, the firm started to put in place processes for applying for the ISO 16949; FPN came in help with a number of FETAC modules organised around the same period of time. A year later, the ISO 16949 was acquired, allowing the firm to quote competitively for jobs in the automotive sector. To further enhance the newly acquired capabilities, the firm has started to establish strategic alliances with a number of training and higher educational institutions which it could meet after the FPN brought on board for a number of seminars and workshops.

6. The Refrigeration Technology Network (RTN)

6.1 The Industry and the Network Formation

The refrigeration industry has become increasingly important in Ireland’s industrial structure, employing 1,300 people and generating estimated €200m sales annually. The refrigeration sector in Ireland principally comprises SMEs - only two of the firms employ over 50 people. The sector is under competitive pressure from low-cost economies including Eastern European countries - some of them new EU entrants.

The refrigeration industry today is a lot different from that of twenty years ago. The primary driving force behind these changes continues to be environmental, with the greatest impact on replacement of CFCs (Chlorofluorocarbons), which were found to be depleting the ozone layer. New technologies and new regulations surrounding the sector require training for employees to keep up with internationally and environmentally driven changes.

Ireland had no representative trade association or professional institute for the sector to deal with the myriad of issues associated with the import, wholesale, installation, contracting, maintenance and repair issues of a complex service. The Refrigeration Technology Network (RTN) was formed by a group of firms committed to improving training in the refrigeration-engineering sector in Ireland. A preliminary meeting was held including the Skillnets CEO and seven companies and in October 1999, RTN became a reality.

6.2 The Case Study

ICS started as a sole trader but has grown organically to an employment of 25. The market place changed greatly for ICS since its formation in 1980. This was partly as a result of the firm expanding from a small segment of engineering services to a firm that offered all aspects of engineering and building services in the commercial, industrial and semi-state sectors.

The firm sought to widen its customer base. ICS continued to source new lines of business where it could align its skill-set. The champion of this process is the owner's son who is a qualified mechanical engineer. He devotes a lot of time to holding monthly management meetings and backing up managers in order to advance the new business project.

However there were significant barriers in the way. To date there had been very little opportunity for technicians in ICS to advance beyond the level of apprenticeship. The firm sought more knowledge intensive training addressing higher value-added activities. To this end, it saw an opportunity in RTN to fulfil this objective. ICS was one of the founding members of RTN with the owner's son becoming its representative to the network. He did not spend a lot of time in network management and decision-making meetings but he was very active in sending firm's staff to RTN training sessions.

His fascination with RTN training was paid off through a number of improvements that took place within ICS (Table 7). Following an RTN workshop, the company changed the process of documentation site reporting. This combined with an RTN workshop on advanced troubleshooting for electrical systems produced big improvements in terms of the average time on service calls. A much better compliance with environmental protection was put in place reflected in certifications such as the gas handling and recovery, as a response to the network training initiatives on these topics and as a result of interaction and knowledge sharing with other network members. After another RTN programme, ICS also put in place a new advanced system of staff appraisal which produces the competencies and skills that each person needs for improving the quality of the process and for fulfilling the company's targets. The new system of staff appraisal and the identification of the relevant training needs helped the company to respond quicker to competencies requirements and build a more flexible organisation. These advances enabled the company to deliver turnkey projects:

We ... would have had the technical in-house knowledge and expertise to take a company from cradle to grave (Interview with ICS owner, 25/01/2005)

In few words, the knowledge the firm picked up from the network combined with knowledge accumulated in the company prior to RTN have laid the foundation for developing a new critical capability the capability of delivering integrated projects, a capability quite unique in Ireland. The contribution of the network to this capability building process has been critical, at least according to the one of the two owners of ICS:

It would make us more cost effective and it would make us more competitive and generally speaking it wouldn't turn us down a new road that we wouldn't have been thinking of going because we would probably consider ourselves to be market leaders or to be cutting edge in business anyway. So we would imagine that we are striving down that road and Skillnets has given us the armour or the confidence or... the know-how or the fine tuning to help us on our way! (Interview, 25/01/2005)

<i>Prior Knowledge</i>	<i>Innovations (1999-2005)</i>	<i>Contribution of the network</i>	<i>New Capabilities</i>
Temperature/humidity measurement MVD (Machine Vision Direct)			Turnkey integrated projects including the building arrangements Commissioning facilities management – selecting, buying, installing technology
	Documentation site reporting improved	Workshop on documentation site reporting	
Engineering/fabrication maintenance skills Programmable Logical Controllers (PLCs)	Cut average time on service call by over 30%	2-days workshop on Advanced Troubleshooting for Electrical Systems	
	Certification in gas handling and recovery	Global warming and energy consumption seminar in collaboration with INEOS EN378 Safety and Environmental workshop	
Enter new markets such as the food industry (cold rooms, deep-freezes and shop-chilling equipment part of the ICS package)	Compliance with Kyoto treaty	Commercial programme for operation efficiency and apply requirements of European legislation Interaction with network members - awareness of the need for these topics	
	New advanced staff appraisal methods and procedures	Staff Appraisal and Performance Review training programme	
Develop building services Maintenance, Energy, Environmental Technical Association on refrigeration skills Irish Management Institute (IMI) on high specifications for air conditioning systems	Deliver turnkey projects	RTN programme for project management	

Table 7: ICS Prior Knowledge, Innovations and Network Contribution

7. Render New Capabilities For SMEs: The Power of De Jure PACAP

The case studies have clearly demonstrated that leveraging resources from the external environment can be a very fruitful strategy for building up a small firm's capabilities. Despite the cost associated with this strategy (e.g. the effort towards the network management and its decision-making process), it could be eventually less costly than a strategy of building up most of your resources internally – as shown by the rather expensive policy of MAC Plastics which required heavy investment in automation equipment. Nevertheless certain conditions that need to be fulfilled for an SME to benefit from participating in a knowledge-sharing network like Skillnet.

Firstly, in order to benefit from any external knowledge as well as to convert it to new capabilities an SME needs to build a realised absorptive capacity, i.e. a capacity to transform the incoming knowledge into new products and services. For this to happen sophisticated mechanisms should be established to allow the firm's own innovative activities to be integrated with the incoming knowledge (Iansiti and Clark, 1994; Tsekouras, 2005).

Secondly, developing new capabilities in an SME does require the flow of knowledge from outside; the price of developing everything internally is almost unbearable for a small firm. However to identify, evaluate and assimilate this incoming knowledge requires the development of a special capacity – the potential absorptive capacity. The de facto version of this absorptive capacity of a small firm has been well examined especially in the context of innovation studies. What has been less examined is the de jure absorption capacity of a small firm. The underlying assumption has been that although a small firm can benefit from knowledge 'spillover' in the economy, its small size is prohibitive for spending efforts and resources on organising initiatives to access external knowledge. A small firm, this approach seems to go, must take advantage of the existing knowledge 'out there' but it can not afford to organise initiatives to identify and access external knowledge, at least in an active way.

Several of the reported cases have shown that this is clearly not the case in the modern economy. In fact there are two reasons making the de jure absorptive capacity very important for a small firm. First, as shown by the case studies, unlike the similar initiatives between large firms (e.g. strategic alliances), collaboration among small firms for joint knowledge development is not a project amenable to highly "asymmetric learning strategies" (Larsson et

al, 1998); probably this is because the “dynamics of power” and “the learning stakes” (Larsson et al, 1998) are not that high among SMEs. Second, SMEs are less path-dependent than their large counterparts due to their inherent flexibility -a point well illustrated in the reviewed cases. As a result the de jure absorptive capacity and the correlated prospect of influencing the direction of these organised initiatives may hold more value for an SME. The last years have seen a number of organised initiatives which require the active participation of the small firms and aim exclusively to diffuse knowledge among SMEs.

Although this is definitely of assistance to small firms which suffer from limited resources, it poses new requirements on them in terms of developing the required competencies to deal with this relatively new de jure potential absorptive capacity. In fact this outward-looking absorptive capacity affect critically the extent to which the knowledge incoming from these organised forums can be translated into new capabilities for a firm.

8. Developing The De Jure Potential Absorptive Capacity

The de jure absorptive capacity should be analysed because it can have profound effects on small firms strategy, the way they develop knowledge and capabilities and eventually the way they create value. To give a better account of these implications, the way the focal firms source their capabilities is worth examining (Table 8). The pattern of knowledge sourcing has changed drastically in the three, out of the four, cases. Mould-Tech exploited its unique position within the FPN to leverage resources from the network; the process of knowledge development –which lays the foundation for the capability-building process- changed from being driven primarily by internal activities to become externally-focused.

Tiber Technologies has always an external orientation but the main source of knowledge traditionally was the mechanical equipment suppliers –probably a hybrid between a de jure and de facto potential absorptive capacity. The development of FPN made the firm to shift its main attention and energy to the network where a more clear competence of de jure absorptive capacity was required. As a result, the company had more sway to influence this external process –at least compared to the previous situation of absorbing knowledge from specialised suppliers representing already developed products. This change of focus led to a gradual ‘tweaking’ of the knowledge development process towards more combined forms (i.e. outsourced knowledge combined with internal skills and competencies).

ICS also witnessed a change of priorities as a result of the participation to the network. More specifically, although ICS was primarily looking into its own organisation for ideas and improvements, the participation to RTN changed this priority towards a model where the outsourced knowledge occupy the most significant position with activities combining the incoming with the internal knowledge as the second most important priority.

<i>Innovation Activities</i>	MAC Plastics	Mould-Tech	Tiber Technologies	ICS
<i>prior to join</i>	Primarily inward-looking	Primarily inward looking Secondly outward looking	Primarily outward-looking through suppliers Secondly inward looking	Primarily inward-looking Secondly outward-looking
<i>4-5 years after joining</i>	Primarily inward looking More combined knowledge	Primarily outward looking Secondly internal and combined	Combined (inward with outward looking)	Primarily outward-looking Secondly combined (inward with outward-looking)

Table 8: Innovation Activities and Absorptive Capacity

In other words in three of the four reviewed cases the opportunity to participate in a learning network gave the firms the chance to develop their de jure potential absorptive capacity. This capacity comes only as a result of practice i.e. real conditions of participating in inter-firm collaboration for accessing new knowledge. Once developed, this de jure capacity can be redeployed to leverage more resources from other similar initiatives. This is probably what can explain the lasting success of industrial districts in several countries –once the firms have developed the relevant capacity they have the drive to keep similar initiatives going.

9. Factors Affecting The De Jure Potential Absorptive Capacity

The de jure absorptive capacity is a capability of its own. A whole range of decisions get involved such as how much of time the firm needs to invest on this capacity, what level of management is appropriate to deal with this activity etc. This absorptive activity and the variety of intervening variables affecting it needs to be understood for the small firms to deal with this new reality in an effective and efficient way.

Four factors were found to affect this new type of absorptive capacity, out of the analysis of the cases (Figure 2). The position of the individual in the interface between the firm and the network seems to be very important; one of the drawbacks of MAC Plastics participation to FPN was that it was represented to the network by a manager compared to the two other cases in FPN which were represented by a Director. In fact previous literature has confirmed the significance for the absorptive capacity of the individuals in the interface between the firm and the environment (Cohen and Levinthal, 1990).

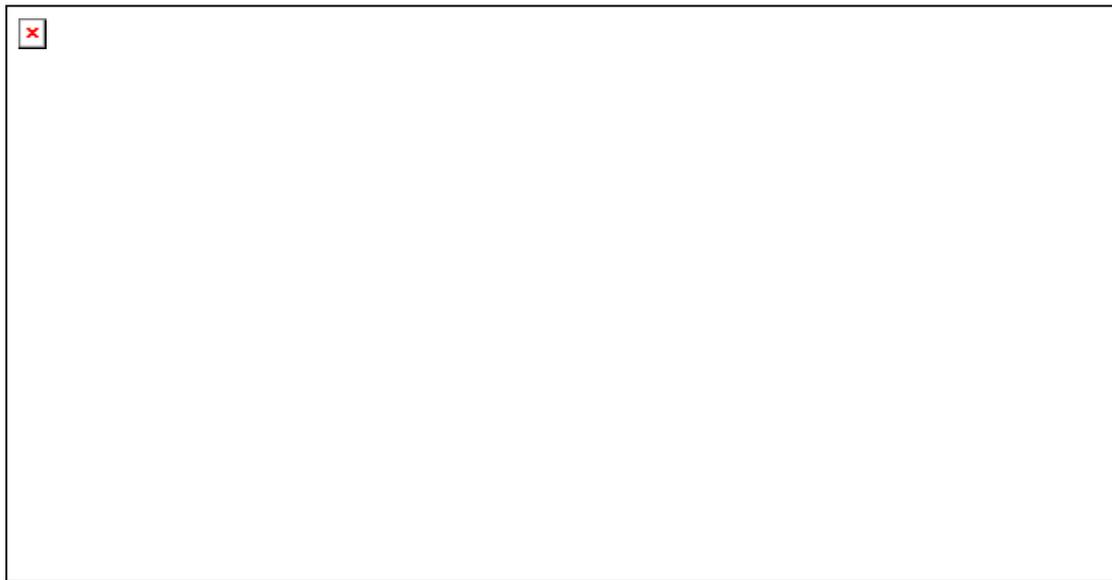


Figure 2: Factors Affecting De Jure Potential Absorptive Capacity

Secondly, the degree of alignment with the network resources allocation process will inevitably affect the potential absorptive capacity since it has implications regarding how much the network knowledge agenda become tailored to the firm's specific needs and requirements. The actions of the Mould-Tech's Managing Director to become the network promoter and the benefits that his company has got out of it, illustrates very clearly this point. However a firm can also influence the network's resources allocation through an alliance with the network's "dominant logic" (Lane and Lubatkin, 1998). This has been demonstrated by the Tiber Technologies story, which, without undertaking any major management responsibility within the FPN, simply allied with the dominant player, namely Mould-Tech and got a substantial benefit out of it.

Thirdly, apart from influencing the strategic agenda of the network, it is equally important to participate to the ground activities of the network. Both cases of ICS and Tiber Technologies story which were very conscientious in following the network sessions show the significance of this factor. Even without a concrete attempt to influence the network agenda and therefore the focus of the network activities, observing closely these activities opens up new ways of reflection and action for a firm. For example one members of the RTN admitted that:

“The soft skills of selling and staff appraisals has been very useful for us - we would tend to ignore it normally! If training wasn't provided [in RTN] we wouldn't do it.”
(RTN core member, 20/01/2005)

Finally, it is known that learning takes place through successive rounds of reflection and action (Kolb and Fry, 1975; Edmondson, 2002). In other words what the firm takes up from the network sessions depends a lot on what the firm tries from these ideas back in its organisation. The case of Tiber Technologies is a clear testimony to this: the firm encouraged an “open doors policy” with its employees encouraged actively to try ideas and techniques picked up from the network. This policy created a climate of “low fear to make mistakes” (Edmondson, 2002) and more specifically a low fear to make mistakes through trying ideas which come from the network.

10. Conclusions

This paper has looked into the way that learning networks contribute to the capability-building process of small and medium sized enterprises. To get an insight into this rather complex process, a qualitative approach was adopted with case studies being the primary methodological instrument. Inevitably a handful of case studies provide only a limited picture of this complex process. More studies and larger sample surveys might be useful to this end.

Nevertheless, a number of significant conclusions have been drawn from these qualitative enquiries. More specifically, the concept of absorptive capacity needs to be elaborated to relate to the circumstances it is deployed. Two different kinds of absorptive capacity are defined the de facto one which is associated with the knowledge leakages from competitors and other institutions and the de jure one which comes as an outcome of rightful arrangements between participating companies.

Participation to a learning network is associated primarily with the potential absorptive capacity of a firm i.e. the assimilation of knowledge by the organisation. However this learning serves as a catalyst for building up the realised absorptive capacity i.e. the exploitation of this knowledge and provides the foundation on which new capabilities are developed. In this sense, participation to a learning network can guide the capability building process within a small firm.

There is a major intervening variable which comes between the networks activities and the ability of a participating firm to renew its capabilities. This intervening variable is the de jure potential absorptive capacity. This absorptive capacity is affected by the individual in the interface between the network and the participating firm, the network resources allocation process, the participation to network ground activities and the freedom to try network outcomes within the firm without the fear of consequences from potential failure.

All together academic and practitioners communities alike need to understand better this de jure absorptive capacity which has major implications in the modern economy for the way small firms develop their knowledge, build up their capabilities and eventually create value.

References

Barney, JB 1991. "Firm Resources and Sustained Competitive Advantage" *Journal of Management* 17: 99-120.

Bessant, J. and Francis, D., 1999, "Implementing learning networks." *Technovation* 19, 6/7: 373-383.

Bessant, J. and Tsekouras G., 2001, "Developing Learning Networks", *A.I. & Society*, Special Issue on Networking, Vol. 15, pp. 82-98

Bessant, J., Kaplinsky, R., and Lamming, R., (2003), "Put Supply Chain Learning into Practice", *International Journal of Operations & Production*, 23(2), 167-184

Best, M. 1990 *The new competition*, Cambridge MA: Harvard University Press

Chandler A.D. 1990 *Scale and Scope: The Dynamics of Industrial Capitalism*, Cambridge MA: Harvard University Press.

Cohen, W.M and Levinthal, D.A. 1990 Absorptive capacity: A new perspective on learning and innovation." *Administrative Science Quarterly*, 35: 28-152.

Department of Enterprise Trade and Employment, 1997, *White Paper on Human Resource Development*, Government Publications, Dublin

Dyer, J. H. and Nobeoka, K., 2000, Creating and Managing a High-Performance Knowledge-Sharing Network: The Toyota Case. *Strategic Management Journal*, 21, 345-367.

Edmondson, A., C., 2002, "The Local and Variegated Nature of Learning in Organizations: A Group-Level Perspective", *Organization Science*, Vol. 13, No 2, pp. 128-146

Grant, R.M. 2002 *Contemporary strategic analysis: concepts, techniques, applications*, Malden MA: Blackwell

Hamel, G., and Prahalad, CK, 1994. *Competing for the Future*. Boston MA Harvard Business School Press and McGraw Hill.

Hobday, M. (1994). "The limits of Silicon Valley: A critique of network theory." *Technology Analysis and Strategic Management* 6(2): 231-244.

Iansiti, M. and Clark, K.B., 1994, "Integration and Dynamic Capability: Evidence From Product Development in Automobiles and Mainframe Computers", *Industrial and Corporate Change* 3(3) 557-605

Kay, 1993, *Foundations of Corporate Success*, Oxford University Press

Kolb, D. and Fry, R., 1975, "Towards a theory of applied experiential learning", in Cooper, C. (ed.), *Theories of Group Processes*, Chichester, John Wiley

Lane, P. J., and Lubatkin, M., 1998, "Relative Absorptive Capacity and Interorganisational Learning", *Strategic Management Journal*, 19; 461-477

Larsson, R., Bengtsoon, L., Henriksson, K., Sparks, J., 1998, "The Interorganizational Learning Dilemma: Collective Knowledge Development in Strategic Alliances", *Organization Science*, 9/3

Leonard, D. 1995 *Wellsprings of knowledge: building and sustaining the sources of innovation*, Boston, MA: Harvard Business School Press

March, J.G., 1991, 'Exploration and exploitation in organisational learning', *Organization Science* 2/1: 71-87

March J.G. and H.A. Simon 1958 *Organizations*, New York: Wiley

Nelson, R. R. and Winter S.G., 1982, *An evolutionary theory of economic change*, Cambridge, MA: Belknap Press.

Nonaka, I. and Takeuchi, H., 1995, *The knowledge creating company*, Oxford University Press, New York

Penrose, E., 1959, *The theory of the growth of the firm*, Oxford: Oxford University Press.

Schmitz, H., 1995, "Collective Efficiency: Growth Path for Small-Scale Industry", *Journal of Development Studies*, Vol 31, No 4, pp. 529-566

Semlinger, K., 1995, "Public support for firm networking in Baden-Wurttemberg" in R. Kaplinsky, B. Coriat, F. den Hertog and L. Andreason. *Europe's next step*. London, Frank Cass

Sengenberger, W. and Pyke, F., 1992, "Industrial Districts and local economic regeneration: Research and policy issues" in Pyke, F. and Sengenberger, W., (eds.), *Industrial Districts and Local Economic Regeneration*, International Institute for Labour Studies, Geneva, pp.1-30

Teece, D. and G. Pisano 1994 'The dynamic capabilities of firms: an introduction'. *Industrial and Corporate Change*, 3/3: 537-556.

Teece, D., Pisano, G. and Shuen, A. . (1997) 'Dynamic capabilities and strategic management' *Strategic Management Journal* 18(7) 509-533

Tsekouras, G., (2005), "Gaining Competitive Advantage Through Knowledge Integration in an European Industrialising Economy" in *International Journal of Technology Management*, Special Issue on Strategies for Learning and Innovative Capability-building Within Firms in Emerging Economies

Zahra, S. A. and George G., 2002, "Absorptive Capacity: A Review, Reconceptualization, and Extension", *Academy of Management Review*, 27/2, 185-203