



## **The Impact of Information and Communication Technologies on Inter-organisational Routines and Activities of Learning Networks**

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**Abstract:** This paper uses the conceptual tools of technology-in-practice and the enacted structures to examine the impact of Information and Communication Technologies on the activities of learning networks, that is inter-firm networks specifically formed to enable their members to share and increase their knowledge. The basic assumption is that the measurement of the real impact of Information and Communication Technologies on organisational forms and functions require the identification of the routines and everyday practices deployed before and after the implementation of a new system. Therefore the paper starts with identifying the inter-organisational routines deployed by learning networks and discusses the implementation of a technological platform in three learning networks in Austria, France and Ireland. The emerging technologies-in-practice are identified and the way that these technologies-in-practice fail or succeed to enhance the relevant routines is analysed. A survey among the learning networks members gives further insights into the actual aspects of the network routines that were affected by the introduced technology and its situated usages.

The paper argues that, in the context of a network, only the alignment of transparent with receptive technologies-in-practice instigated by different stakeholders can produce a real impact on the inter-organisational routines and structures. In fact the alignment of technologies-in-practice within the network can influence critically several repertoires of inter-organisational routines such as the communication and informal knowledge sharing routines, with critical implications for the improvement of the whole network.

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## 1. Introduction

The interaction between technology and organisational structures has been for long the focus of both academic research and writing; contingency theories (Woodward 1965; Lawrence and Lorsch, 1967; Khandwalla, 1974; Galbraith, 1977), strategic studies (Buchanan and Boddy, 1983; Andreau and Ciborra, 1996; Ciborra, 2000) and structurational models (Barley, 1986; Orlikowski, 1992; DeSanctis and Poole, 1994) being just a few of them. However the vast majority of these studies take individual organisations as the primary unit of analysis. Even when those who adopted a network perspective, they did it in the context of a single organisation (Barley, 1990; Burkhardt and Brass, 1990).

Meanwhile one of the most drastic changes in the nature of the innovation process is the open character of innovating and learning (Owen-Smith and Powell, 2004; Chesbrough, 2003). Because knowledge today cuts across disciplines, professions and industries (Gibbons, 1994) it is only through networking that organisations can bring together the required knowledge to develop new products, processes or services<sup>2</sup>. An increasing number of firms turn to networks of users (Von Hippel, 2005), experts, other companies (Nooteboom, 2004) or event rivals (von Hippel, 1987). In fact the interaction between different organisations facilitates more than the transfer of existing knowledge: it induces the creation of new knowledge (Gulati, 1999).

The large literature on alliances (Zollo et al, 2002), joint ventures (Inkpen and Beamish, 1997; Tsang, 2002) etc. is a clear evidence of this trend. Inter-firm networks have been considered from different perspectives including negotiation and collaborative relationships (Ring and Van de Ven, 1994), trust (Newell and Swan, 2000), governance and decision-making structures (Von Tunzelman, 2004; Jones et al, 1997; Elg & Johansson, 1997) and finally from learning and knowledge transfer (Inkpen, 1996; Khanna et al, 1998; Larsson et al, 1998; Lubatkin et al, 2001; Owen-Smith and Powell, 2004). Nevertheless most of these studies adopt either a dyadic point of view, where the one-to-one interactions become the primary focus of analysis (e.g. Larsson et al, 1998) or alternatively the form and the structure of relationships are examined to explain the benefits and the behaviour of participating firms (Baum et al. 2000; Burt, 1992; Powell et al., 1996; Tidd, 1997).

This paper falls in line with the few studies which adopt the network as the main unit of analysis (e.g. Dyer and Nobeoka, 2000). More specifically the paper treats the network as a integrated organisation with its own everyday practices and routines. Following the research tradition of organisation routines (Nelson and Winter, 1982; Winter, 1964; Becker, 2004) and everyday practices (Orlikowski, 2002), this paper defines the network in terms of inter-organisational routines and centralised or distributed practices. Furthermore the paper investigates how the identified routines and practices interact with the introduced information and communication technologies (ICT) in order to select the technology uses and 'construct' the new network.

This research took place in a rather discouraging background, where emerging evidence shows that the latest wave of ICT find difficult to break into networks of firms (Bessant, 1999) even if these networks are organisationally well established with a long history of trust and collaboration (Gottardi, 2003; Belussi, 2002; Chiarvesio et al, 2004). Furthermore a growing body of evidence points at the limited

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<sup>2</sup> According to an OECD report, 90% of innovative activity requires networks of independent firms (OECD, 1999).

value of ICT for knowledge management despite the latest wave of software applications using these terms (Cohendet and Steinmuller, 2000; D'Adderio, 2001, 2004).

The paper reports on the introduction of latest information and communication systems into learning networks, i.e. networks purposely formed to share knowledge between firms. The paper analyses the effect that these technologies have on the inter-organisational routines and the very nature of the networks themselves. Different types of emerged technologies-in-practice are identified together with the enactment of new routines. In this way the paper aspires to contribute to the missing discussion on the role of ICT on inter-firm networks and the role that ICT can play for transforming these networks.

## **2. Inter-organisational Routines and ICT Practices**

Contingency studies correlated successfully specific attributes of technology with certain organisational aspects but they contributed little in explaining the process through which the relations between them arise and establish (Barley, 1990). The 'processual question' was proved to be more complicated, requiring a more dynamic vision. A number of studies attempted to approach this issue (Jasperson et al, 2002).

A first group of authors has looked into this relationship from the technological perspective, where technology is a critical factor which "determines or strongly constrains the behaviour of individuals and organisations" (Markus and Robey, 1988, p. 585). In similar vein, DeSanctis and Poole (1994) distinguish between "faithful and unfaithful appropriations of technology" implying that there are "embodied structures" (Orlikowski, 2000) designed-in the implemented technologies which are appropriated by organisations in different degrees.

Another set of studies emphasise that organisations "choose how and when to apply IT to accomplish work" (Jasperson et al, 2002, p. 406). According to these studies, the technological solutions become the dependent variable with the organisations information needs and the managers' choices become the independent variables.

However both approaches have great "difficulty explaining why similar technologies are often associated with different structures and why identical structures frequently surround widely divergent technologies" (Barley, 1990, p.62). According to Orlikowski "this insufficiency is particularly acute in the context of internet-worked and reconfigurable technology (such as groupware and the Web), the use of which is becoming increasingly prevalent" (2000, p. 405). A more adequate understanding was offered by the emergent studies which focus on (Orlikowski, 2000, p. 407):

what structures emerge as people interact recurrently with whatever properties of the technology are at hand ... Through this regularised engagement with a particular technology (and some or all of its inscribed properties) in particular ways and particular conditions, users repeatedly enact a set of rules and resources which structures their ongoing interactions with that technology... in their recurrent practices, users shape the technology structure that shapes their use.

According to this approach, the IT and organisation are both independent and dependent variables. As put by Markus and Robey (1988, p. 588), "the uses and consequences of information technology emerge unpredictably from complex social interactions". The introduction of IT into an organisation is nothing else than a catalyst "initiating a series of reciprocal causes and effects from which the use of

technology and the organizational outcomes arise” (Jaspersen et al, 2002, p. 406).

On-going activities and inter-organisational routines provide the best lens to look into the situated action as well as the consequences of ICT on a network. For instance, Feldman and Pentland (2003, p. 107) refer to the understanding of organizational change and argue that “the explanatory factors may be at the level of the routine rather than at the level of the organization. The conditions for stability and for change may exist in the same organization and may manifest themselves differently from one routine to another”. Identifying the emergence of new organisational structures through technology requires a good identification of the established routines and on-going activities before the introduction of the technology at hand, as a base line which the technology will strengthen, modify or drastically alter<sup>3</sup>. In other words *measuring the real innovation potential of ICT requires a thorough understanding of the organisational routines either pre-existing to or enacted after the introduction of the technology*.

Routines have been defined as “patterns of behaviour that is followed repeatedly” (Winter, 1964) or as “repetitive, recognizable patterns of interdependent actions, carried out by multiple actors” (Feldman and Pentland, 2003, p. 94). The notion of routines has been adopted because “they provide a window to the drivers underlying change, enabling us to observe change in more detail” (Becker, 2004, p. 649). However Becker admits (p.662-663):

Attempts at actually specifying how routines are varied, selected, and retained, are very few still ... research on how routines changed (variation), and how they are selected, has been much thinner on the ground

Feldman and Pentland (2003) deliberate the dual character of routines distinguishing between *the ostensive and the performative aspects* (p. 100):

The ostensive aspect of the routine is the idea; the performative aspect, the enactment ... in terms of music, the ostensive part is like the musical score, while the performative part is the actual performance of music

Becker (2004) emphasises the *collective nature of routines* in the sense that they are interplay of individual rules, interests and activities. However he points out that a fine balance between individual habits and organisational routines is needed in order to keep the organisational coordination. He argues that “routines can be disrupted when participants in a routine start acting in a manner that is more individual than collective” (p.674). He admits that routines can be spread in different locations or organizational units<sup>4</sup>.

Few authors referred directly to *inter-organisational routines*. Although authors refer to inter-organisational routines, they do not analyse the content of the actual routines but other issues like previous experience of the partner, knowledge of the focal technology (Zollo et al, 2002). Grandori and Soda (1995) refer to nine network mechanisms which are deployed to enable networking between participants: communication, decision, negotiation; social co-ordination and control; integration and linking-pin roles and units; common staff; hierarchy and authority relations; planning/control systems; incentive systems; selection systems; information systems. Orlikowski (2002) adopts a more analytical approach, referring to the “deep competence of distributed organizing - the capability of operating effectively across

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<sup>3</sup> The capability of software to reconfigure organisational routines has been central in the discussion of the interaction between the two (D’Adderio, 2003).

<sup>4</sup> Interestingly neither Becker nor the wide range of literature he reviews consider routines across organisational boundaries.

the temporal, geographic, political and cultural boundaries routinely encountered” (p. 249)<sup>5</sup>. Investigating “how knowledge that is distributed among individuals and embedded in their work practices can be integrated and shared with others” (p. 269) she focuses on the everyday practices i.e. “what people *do* every day to get their work done” (p. 249). She identifies five repertoires of practices: sharing identity, interacting face-to-face, aligning effort, learning by doing and supporting participation.

The interest of this paper is on a particular form of inter-organisational networks, the so called learning networks, which are networks set up with the primary objective of establishing systematic knowledge exchanges between different firms in order to increase the firms’ knowledge and innovation potential<sup>6</sup>. A distinguishing element of learning networks is the existence of a distinct organisation which plays the role of the network broker<sup>7</sup>. The broker has its own personnel including a Director, its managers and administration staff. Learning networks have been deployed in a variety of contexts: from supply chains of large manufacturers, to boost regional development, help individual sectors and assist the diffusion of particular techniques such as the quality management (Dyer and Nobeoka, 2000; Nooteboom, 2004; Anghern et al, 2003; Bessant and Kaplinsky, 2003; Bessant et al., 2003)<sup>8</sup>.

Of course knowledge interactions between different firms is not a new phenomenon (Nonaka and Takeuchi 1995, Von Hippel 1988). Larsson et al (1998) criticize both fallacies of “good partner” (p. 287) and “learning race” (p. 288) arguing that inter-organisational learning outcomes result from the interaction of how receptive and how transparent the participating partners are. They argue that “few have attempted to extend organizational learning theory to an interorganizational level” and point out that “collaboration among more or less autonomous organizations is likely to require different management skills than those typically developed in traditional hierarchical firms” (p. 287).

Network creation	How the membership of the network is defined and created
Decision-making	How (where, when, who, etc.) decisions get taken
Conflict resolution	How (and if) conflicts are resolved
Information processing	How information flows and is managed
Knowledge capture	How knowledge is captured and articulated to be available for the whole network
Motivation/commitment	How members are motivated to join and remain in the network – e.g. through active facilitation
Risk/benefit sharing	How the risks and benefits are shared
Integration	How relationships are built and maintained

<sup>5</sup> Her analysis takes place in the context of a single but geographically dispersed organisation.

<sup>6</sup> Although the term learning network has been used in the literature, the term learning is rather misleading. These networks target more the knowledge sharing among firms and the emerging knowledge creation rather than learning in the form of formal training like the training of technicians.

<sup>7</sup> Spencer (2003) argues that the presence of global knowledge brokers (i.e. firms emerging through the economic process) in knowledge-diffusion networks contribute to the competitiveness of industries. In learning networks the broker is usually an independent organization with the exclusive mission of organising and developing the network and the knowledge exchanges between its members.

<sup>8</sup> Appleyard (1996) revealed that public mechanisms for interfirm knowledge sharing are favored in Japanese companies while private channels are preferred in the US. Most of the learning networks fit somewhere in between, involving public authorities, private firms and probably academics. Of course there are learning networks which are completely private owned and managed (Dyer and Nobeoka, 2000). For a full review of the various kinds of learning networks see Bessant and Tsekouras, 2001.

	between individual representatives in the network
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**Table 1: Activities of a learning network (Bessant & Tsekouras, 2001, p. 95)**

The is exactly the challenge presented to learning networks, i.e. to develop the organisational forms and the managerial capabilities for sustaining and improvising the knowledge sharing activities on a long-term basis<sup>9</sup>. This puts emphasis on the “patterns of behaviour that is followed repeatedly” (Winter, 1964), namely the inter-organisational and interdependent routines of a learning network. Bessant and Tsekouras (2001) discuss eight networking processes of a learning network (Table 1)<sup>10</sup>.

Despite these contributions, very little is known today about the potential impact of ICT on the organisational forms and functions of learning networks, leaving a number of questions unanswered. Given the increasing significance of open innovation today and that institutions like inter-organisational learning networks are becoming more important, this is an omission that needs to be addressed. To assess the innovation potential of technology for learning networks, the ‘base line’ in terms of learning networks routines need to be defined with an emphasis on those inter-organisational routines that are ‘inclined’ to ICT support. These routines need to be detailed at the level of everyday practices to give a comprehensive and thorough account of the ‘base line’ which the ICT will potentially reinforce or change. The first question that this paper is set to address is

- *Which inter-organisational routines within learning networks are ‘susceptible’ to ICT support?*

Orlikowski (2000) attempted to capture the dynamics initiated by introducing ICT in an organisation by developing the concept of *technology-in-practice*. The technology-in-practice is the set of rules (e.g. voting procedures) and resources (e.g. stored data and public display screens) “that are (re)constituted in people’s recurrent engagement with the technologies at hand” (ibid., p. 407). A clear distinction is made between the technological artifact “which appears in our lives as a specific machine, technique, appliance, device or gadget” and the technology-in-practice which refers “to the specific structure routinely enacted as we use the specific machine, technique, appliance, device, or gadget in recurrent ways in our everyday situated activities” (ibid. p. 408). This analysis puts emphasis on the enactment of new organisational structures as a result of the unique use experience (ibid. p.408):

Use of the technology involves a repeatedly experienced, personally ordered and edited version of the technological artifact, being experienced differently by different individuals and differently by the same individuals depending on the time or circumstance

Changes are not predetermined or even predictable since “there can be no single, invariant, or final technology-in-practice, ... in such possibilities ... lies the potential for innovation, learning and change” (Orlikowski, 2000, p. 412).

Three dimensions of technologies-in-practice are identified: the conditions of use, the situated action and the consequences in terms of enactment new structures. One important condition of use is the actual hardware and software available to users and more specifically the *knowledge embeddedness* which “refers to the extent to

<sup>9</sup> Sustaining these activities in the long-term allow the building-up of trust among the network members which provides the basis for knowledge sharing (Vangen and Huxham, 2003).

<sup>10</sup> Harland et al (2004), considering networking activities in the context of supply chains, adopt the same networking activities adding the partner selection and resource integration.

which relevant organisational knowledge has been codified and stored within” (Purvis et al, 2001, p.122). The expectation is that (Purvis et al, 2001, p. 122):

Higher levels of knowledge embeddedness ... would enhance potential users’ perception about the usefulness of [the platform] and its value as a source of knowledge

To ‘measure’ the impact that ICT can have on the organisational forms and functions of learning networks, the paper will explore the enactment of specific technologies-in-practice that were routinely enacted as a result of particular technological properties in real networks. The focus here is on the performative aspect of the enacted routines in learning networks. The second question that this paper is set to address is:

- *What technologies-in-practice can emerge in the context of learning networks? What inter-organisational routines can be enhanced as a result of these technologies-in-practice?*

The processual character of the routines has been emphasised in literature (Becker, 2004). Characteristics like the speed of changing routines or their content, time of impact and the extent of change -in leaps or incrementally are emphasised. Tranfield and Smith (1998) refer to *meta-routines* as routines for changing routines. The interesting question is whether the instigation of specific usages of technology (i.e. technology-in-practice) can also ‘generate’ meta-routines in the context of a network. To assess the full impact of ICT on the organisational forms and functions of learning networks, how these meta-routines change the nature of a learning network needs to be explored:

- *Can the emergence of technologies-in-practice in learning networks give rise to meta-routines? Can these meta-routines lead to a substantial improvement of the network?*

### **3. Research Setting and Methods**

This paper reports on a 2 year research project which investigated the inter-organisational routines and practices of well-established learning networks and the innovation potential of recent ICT for these networks. Research has followed three stages.

The first round used inductive qualitative techniques to identify the clusters of inter-organisational routines deployed by learning network to become operational. The unit of analysis was the whole network which extends beyond the core business of knowledge sharing among its members including activities like decision-making. Semi-structured interviews were carried out with the network brokers in the following networks: AC Styria in Austria, Ecole De Paris in France, SkillNet, Clé Book Publishers-Skillnet and Plato-North Dublin in Ireland. The data from the semi-structured interviews were complemented by ethnographic research<sup>11</sup> in four of the reviewed cases<sup>12</sup>; a team of six researchers carry out participatory observation<sup>13</sup> in sessions of the focal networks over a period of six months including data like

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<sup>11</sup> Ethnographic research “has been described by some authors as being ideally placed” to capture the “actual contents of routines” (D’ Adderio, 2003, p. 323).

<sup>12</sup> Skillnet is an umbrella organisation, “a network of networks”, which funds and oversees a number of specific learning networks such as the Clé Book Publishing network. However it does not perform direct knowledge exchange sessions among firms; for this reason it was excluded from the sample of participatory observation.

<sup>13</sup> Two extremes exist in ethnographic research: the role of full participant, “observatory participation”, or a spectator completely uninvolved, “participatory observation”, (D’ Adderio, 2004, p.65).

members network activity log-ins from between the network sessions. At this point research was geared towards identifying those learning network routines that are more ‘fertile’ for ICT support. Four focus groups with network members and other influential stakeholders<sup>14</sup> were held in the four focal learning networks with participation ranging from 4 to 8 people. Finally a special two-day workshop was organised with the participation of learning network brokers from the three networks to define specific ways through which ICT can support the functions of learning networks. At the end of this phase the learning network routines that are inclined to ICT support as well as the potential benefits from ICT functionalities became clear.

The next phase dealt with the introduction of a portal in three learning networks (AC Styria, Ecole De Paris and Plato-North Dublin). The three portals were introduced in the three networks and some network groups were asked to use the portal as part of their on-going activities. After six months, the research team conducted a number of measurements. Firstly the number of *active users* were measured – active users were defined those users who have accessed the system at least once. Secondly the knowledge embeddedness of the three systems was measured through the level of the *authoring activity* that had taken place in the system. Two authoring variables were measured: the number of items<sup>15</sup> uploaded into the system and the corresponding author. Thirdly the members’ system *reading* activity was measured by recording (automatically through the system) the number of times that each network member had accessed a part of the system. This measurement was normalised by dividing the captured hits by the number of active users<sup>16</sup>.

The final round of research was an attempt to appraise the members’ perceptions for the platform impact to the network routines. A questionnaire tool was developed in line with the identified clusters of routines that are ‘inclined to be assisted’ by ICT. The questionnaire included 52 questions in seven scales: a section of demographic questions, a section on the members’ perception of the interface with the system, four scales in line with the identified repertoires of IT-susceptible routines and one scale on the contribution of the system to the overall improvement of the network organisational processes. An anonymous survey was sent to 60 participating managers (20 members in each network), getting a response from 53 of them (88% response rate). The reliability of the whole questionnaire was found quite high (Cronbach  $\alpha=0.94$ ). The reliability of individual scales was also found very satisfactory for the system interface (Cronbach  $\alpha=0.88$ ) as well as the three multiple items scales in line with repertoires of network routines ( $\alpha=0.79$  for Planning and Management of Learning Activities,  $\alpha=0.88$  for Communication and Informal Knowledge Sharing and  $\alpha=0.82$  for Organisation and Access to Resources and Contacts).

#### **4. The Three Focal Learning Networks**

Although all participating networks followed the ‘classical’ inter-organisational learning model, their knowledge sharing and learning approaches were different.

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<sup>14</sup> For example experienced facilitators, members of the network steering committee etc.

<sup>15</sup> A system item could be anything from an explicit knowledge resource such as a document, to a simple vote in the voting functionality, a published piece of news in the relevant board or a message in the discussion forum.

<sup>16</sup> Users from the IT development, the research team and the network broker were excluded from this measurement. The number of active users was different at the network and the different group levels.



#### 4.1 Auto Cluster Styria

Auto Cluster Styria (ACS) is a network of automotive companies in south central Austria which was established in 1996 as a result of an initiative from the local government and the local business promotion and four main vehicle manufacturers<sup>17</sup>. The network has currently 200 firms-members and aims are to improve the climate for inward investments, the performance of automotive supplier, the networking between automotive firms and the possibilities of a successful and reliable outsourcing and finally create qualified companies.

ACS facilitates learning by bringing together people who deal with the same problems but in different contexts. As put by a network member:

The innovation is that competitors talk to each other ... So if you are sharing the possibilities, new ideas, or business ideas with us, you are learning, you get feedback -which is the fastest way

It appears that the learning groups have been particularly effective at bringing partners together and creating social networks outside of the formal learning network. The members' returned logs showed a strong involvement in the network outside of specific events sponsored by ACS, either to exchange information or to conduct joint business (Table 2). In ACS learning takes place primarily through face-to-face sessions organized by the cluster. Learning sessions focus either on an individual company or on direct suppliers of a large company. In these sessions, knowledge exchange occurs primarily in an informal way. Other learning mechanisms include factory visits, seminars and workshops.

<i>30-04-02</i>
Meeting at AC Styria to talk about audit in QM. Our company is interested in learning how other companies are doing the ISO 9001-2000 audit.
<i>06-05-02</i>
Talked to Mr Erkingler about QM and how to organize the QM system at FISCH-TOOLS. How to use [transfer] the QM system from the car manufacturing companies to our company.
<i>07-05-02</i>
Talking with Meccom [member of AC Styria] about a spare part of a machine. They have a spare part that our company can use. We met at AC Styria and now Meccom is a customer of ours.
<i>08-05-02</i>
Spoke with the General Manager of TCM [a tool management and consulting company] about tool management in his company.
<i>10-05-02</i>
Talking with TCM at Meccom about a special tool coating. Talking with Balzers Coating about wood cutter coating.

**Table 2: A Sample Weekly Log of a Network Member in AC Styria**

ACS has created special learning groups to focus the knowledge sharing process: the Automotive Quality Management Club, the Human Resources Club, the Future Factory Club and the Controller Group. These learning groups meet on a regular or ad hoc basis, in order to discuss a specific topic and exchange ideas.

<sup>17</sup> AVL-List, Steyer-Daimler-Puch Fahrzeugtechnik AG – SFT AG, Eurostar a Chrysler/Steyr-Daimler-Puch Joint Venture and Magna Company.

#### 4.2 *Ecole De Paris*

The *Ecole de Paris* (EdP) a “Business management salon” started back in 1993 with 15 members who came together on a regular basis “to provide an original contribution to management issues”<sup>18</sup>. As word spread, more people joined, eventually leading to 500 members and 40 major sponsors. The principle characteristics of EdP are:

- Diverse participants: Practitioners and academics alike can participate, as well as students and retirees. Sliding scale membership pricing supports this policy.
- Open discussion: Seminars are limited to 20 members and sufficiently long enough—usually two to three hours—to avoid superficial discussions.
- Written reports: After each seminar a thorough written report, including the discussion portion, is published in the network’s bi-monthly journal and posted on its web site.
- Unusual topics: The network moderator select topics that tend to be outside the norm<sup>19</sup>.

EdP is “an unorthodox club of reflection” where learning takes place through a process of listening, reflecting and debating. Constructive interaction occurs during the group seminars, where the role of the knowledge provider and the role of the knowledge seeker are not clearly defined. One network member described EdP as “theory in action,” another referred to it as “applied philosophy.” At its core, said a board member, is the understanding that “generating innovation—and therefore success—is not always restricted or limited to what is written in text books or academic journals, or even taught in standard business schools.” A member from one of France’s largest bank, “I can’t say there are immediate applications. It’s more a new way of thinking”. An R&D manager at Renault echoed this statement:

Most of the people working with us come from a classical training background—the Grandes Ecoles. But that has nothing to do with training. When it comes to leadership, you need to look elsewhere. We don’t talk about it as ‘learning’, we see it as an *ouverture d’esprit*.”

The EdP monthly group seminars are organised around 4 topic areas: Technological Resources and Innovation for decision-makers in R&D; Collective Life looking at people identities in association with their professional lives; Entrepreneurs, towns and regions looking into business and regional development; and the Business Life examining the new forms of management in the face of the ever-increasing tempo, tertiary activities, and internationalization of business life.

#### 4.3 *Plato Network (North Dublin)*

Plato-North Dublin is a “business support forum for networking, community learning and market expansion” with 450 members. Plato-North Dublin is part of Plato Ireland which has 1,000 participating SMEs and around 100 large companies in 7 regional networks. Plato is a European wide network, with over 8,000 SMEs and 800 large firms in Belgium, Holland, Germany, Denmark, Slovenia, France and Finland. Plato has recently expanded in Poland and Slovenia. The Plato model has won the European Commission “Job Challenge Award” for the number of jobs it has created through supporting business growth.

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<sup>18</sup> Network Moderator interview information

<sup>19</sup> A typical example was the case where as a result of network sessions it was argued that brain-drain is a positive phenomenon for draining-out countries provided that they can keep the relationship with the emigrating people. This conclusion reversed the orthodox policy of trying to retain the home qualified scientists and engineers.

Plato forms small groups of SME Managing Directors (up to 20 people) to share knowledge and experience. The group is facilitated by a network facilitator and is led by an executive from a large company, the so called “parent company”. The executive is supposed to provide managerial knowledge to the SMEs while the large firm also provides the venue and other in-kind contributions. However, during the process, the roles are reversed with the parent company getting ideas from the participating SMEs on specific technical expertise areas or on how to build a more entrepreneurial and flexible structure. The group activities are complemented by workshops from experts and other specialists.

A group was formed in Plato-North Dublin comprised of leading owner-managers, who have already participated in Plato learning groups and are now focusing on implementing specific strategic goals within their firms. This group was asked to be the first to use the implemented technology platform.

## **5. ICT-Enabled Learning Networks Routines**

The research focused on identifying the ground activities within learning networks i.e. what “people do every day to get their work done” (Orlikowski, 2002, p. 249) to enable their participation in the network. Research focused only on repetitive activities since “a pattern of actions that occurs only once is not a routine” (Feldman and Pentland, 2003, p. 103). However the research team was aware that “even if a pattern of actions repeat, it needs to become recognizable as a pattern... a disconnected collection of performances does not constitute a routine without a corresponding ostensive category that makes the routines coherent and recognizable as a routine” (ibid). To enable the definition of ostensive routine categories, the Bessant and Tsekouras (2001) networking activities was initially adopted as a frame of reference. However a weakness of this framework was that it did not differentiate between activities carried out by different stakeholders within the network. To remedy this gap the basic roles of a learning network were defined.

### *5.1 Roles in A Learning Network Organisational Structure*

Firstly, the *Network Moderator* is the Managing Director of the network, having all strategic responsibilities for the network from reporting to the network board and ensuring sufficient funding to monitor the network managers job and represent the network to the external world. The Network Moderator is also the final reference point for all network members and ultimately responsible for conflict resolution and any disciplinary behaviour.

Secondly the *group facilitator* directly responsible for the core process of knowledge transfer and knowledge creation within learning networks. His/her role is very significant since he/she leads “the most efficient way in the field of knowledge sharing and learning [i.e.] learning in small group discussions” (Plato Broker interview). He/she is responsible for all the group logistics as well as to maintain the group dynamics. Both Network Moderator and the group facilitator(s) belong to the network broker.

Thirdly, the *network members* i.e. the organisations –usually but not always firms- which are in the network for the purpose of increasing their knowledge and their capability. The members usually pay an annual subscription and they can be either floating –i.e. registered in the network but not belonging to a group- or members of a smaller group.

Fourthly, the *group members* are those network members who choose to be active in a knowledge sharing and learning group at a point. They act as the

knowledge gatekeepers for their organisations. In case they come from a private company, they can be either senior executives of large firms or Managing Directors of smaller firms; in any case they are people with management responsibilities and decision-making authority. Although the life-time of groups varies, the minimum period groups stay together is about a year to allow the members to develop trust to each other, a critical ingredient of knowledge sharing.

Finally, the network activities are complemented by *special experts* who come to provide expertise in order to help members to apply things and change their organisations.

### *5.2 IT-Susceptible Activities And Practices In A Learning Network*

Research provided a wide range of activities and everyday practices which are carried out by the different stakeholders of network (Table 3). The identification of these everyday practices helped to refine the initial ostensive categories of networking routines. In fact the refinement was done, bearing in mind that this research was interested on those networking routines that are susceptible to ICT support. For instance, according to the conducted fieldwork it was considered really unlikely that the Network Moderator, who is ultimately responsible for conflict resolution (and perhaps disciplinary action if needed), would perform any relevant action through a technology platform; as a result decision-making and conflict resolution were merged into the wider ostensive category of planning and managing the learning activities which is more relevant to ICT support.

To make knowledge more relevant to ICT, it was broken into the communication and informal knowledge sharing activities which refer more to the tacit knowledge (e.g. communication, exchange of experience etc.) and the organisation and management of learning resources which refer more to the explicit part (e.g. resources, documents etc.).

The information processing category was considered inappropriate because, according to the conducted research, information processing activities are taking place in different contexts such as the planning and management routines, the knowledge exchange process etc.; as a result information processing activities were incorporated into the other clusters of routines where the contribution and the impact of ICT could be better identified. The same is the case for the integration category which can take place in the context of decision-making (e.g. integrate different priorities) or in the context of knowledge interaction (e.g. integrate different bodies of knowledge).

<i>Repertoire of Routines</i>	<i>Broker Activities</i>		<i>Other Activities</i>	<i>Members Activities</i>	
	<i>Network Moderator</i>	<i>Group Facilitator</i> <sup>20</sup>	<i>Expert</i>	<i>Group Member</i>	<i>Network Member</i>
<i>Planning and Management of Learning Activities</i>	Decide with the board: (i) learning area; (ii) membership requirements and fees Ensure sufficient funding for the network Select group members for each group Monitors group facilitators activities Nurturing and disciplinary behaviour	Organise and execute group members prioritization of learning needs and topics Organise experts' workshops according to the prioritization of the group Identify experts to be invited in the group Make sure that members receive in-time sessions material including agenda, discussion papers	Prepare for the event Get information about the session venue, time etc.	Finding information about planned learning events Identifying and proposing new learning topics Prioritizing learning activities and topics Evaluating experts and learning sessions Follow group sessions	Finding information about network events Informed about changes in network policies (e.g. membership fees)
<i>Communication and Informal Knowledge Sharing</i>	Supervise/support group facilitators Organise exchange of facilitators experience Continuous communication with network members	Negotiate with and prepare experts for group session Making sure sufficient communication exists between expert and group members Become aware of new members interests Share experience/solutions with other facilitators	Understand members positions & needs before session Respond to members requests after the session	Contribute to group discussion e.g. explain work issues to group Get ideas, potential solutions from other group members Report to group progress of solutions at work Possible communication with another member outside actual meetings	Comment on broker/network decisions
<i>Organisation and Access to Learning Resources and Contacts</i>	Publish network events to members Keep a record of facilitators performance Creates experts database	Distribute to members useful material including templates, papers etc. Prepare a list of network fellows and experts, including	Send material to members before or after the event Present him/herself to the group	Access covered material if missed a session Retrieving group sessions material when it is required in his everyday	Retrieve network resources when required in his/her everyday job Find partners, suppliers

<sup>20</sup> Grey area indicates group level activity

	Develop network's library Be aware of individual members backgrounds and requirements	information and contact details on them		job Find contacts' details of group members when (s)he needs to discuss something	etc. from network membership Marketing his/her company to other network members
<i>Learning Dissemination</i>	Strategic responsibility of IT systems Recruit for forthcoming groups and events	Publish events to members Ensure that members receive useful material including templates, papers etc.	Keep informed members of on-going developments in the area	Rise awareness of issues discussed in the session among colleagues at work	Inform peers for interesting discussions, events

**Table 3: Routines and Activities in Learning Networks**

Similarly risk and benefit sharing can substantiate either as formal decisions (e.g. level of fees) or as emerging actions (e.g. in the knowledge exchange process with emerging winners and losers in terms of knowledge). As a result five clusters of networking routines were identified that are open to support from ICT:

- Planning and management of learning activities, including the network decision-making process at the level of the network (e.g. within the network board), the decision-making at the level of the group (e.g. for the knowledge priorities) etc.
- Communication and informal knowledge sharing, including the reflection and experience sharing before, during and after the face-to-face sessions
- Organisation and access to knowledge resources and contacts, including access to explicit knowledge resources as well as details on other network members
- Knowledge dissemination at various levels –for instance from the group to the wider network, from the participating managers to colleagues back at work etc.

## 6. The Implemented System

### 6.1 Implemented System Functionalities

A relatively mature platform was adopted to be introduced into the three networks. A team of IT designers in collaboration with the network brokers identified the missing tools which were then integrated into the system (Table 4). Learning networks are very aware of confidentiality issues because their success relies on the exchange of sensitive information and experiences. As a result it was decided that the system would be designed and deployed at three different levels.

<i>ICT Objective</i>	<i>ICT Functionalities</i>	<i>Potential Impact on Learning Network Activities</i>	<i>Main Beneficiary</i>
To facilitate planning and management of learning activities	‘General’ Area, Events Calendar, News <sup>21</sup> , Voting Forums, Members’ Directory (experts), Search	Learning topics in line with members needs Members more committed to the learning process	network member
To enhance communication and informal knowledge sharing	Discussion Forums, Chats, Instant Messaging	Accelerate the learning process More thorough understanding of the issues around learning	network member
To support organisation of and access to learning resources and contacts	Resources Library, Members’ Directory, Documents Edit Online, Search	More comprehensive understanding of the topics	moderator & members
To facilitate learning dissemination	News, Search	Learning to a wider audience Create allies for change within the organisations-members	network member
To facilitate the network’s dissemination	‘General’ Area, News	More members considering to initiate learning cycle Attract new members for the network	network moderator
To improve the network operation	Reporting System	More efficient learning process	network management

**Table 4: Incribed Structures in the Designed System**

<sup>21</sup> This table refers to functionalities at all usage levels (e.g. network, group or personal level – see Table 3), unless otherwise specified.

<i>System Area</i>	<i>Technological Functionalities</i>	<i>Usage Level</i>	<i>Change Authority</i>
'General' Page	General information, useful links, websites etc.	Network – Group	Network Moderator and Group facilitator
News	Latest news, announcements	Network – Group	Network Moderator and Group facilitator
Members' Directory	Name, Contact Details, Job title, Business sector, Company services/products, groups membership, network publications	Network – Group - Personal	Network Moderator and Group facilitator
Events Calendar	Details about the venue, the content of the session etc.	Network – Group	Network Moderator and Group facilitator
Resources Library	Documents, audio-visual resources etc.	Network – Group - Personal	Moderator for network resources Group facilitator for the group Individuals for personal resources
	List of the unseen uploaded resources (e.g. new documents)	Network – Group	Automatic
	Group Editing of learning material		Depending on the resource
Members' Interaction	Asynchronous Discussion Forums	Network – Group	Everybody in the network
	Synchronous Chats (e.g. initialise, invite individual members or groups)	Network – Group	Everybody in the network
	Instant Messaging (e.g. storing received and sent messages, compose new message)	Network – Group – Personal	Everybody in the network
	Informing for all users synchronously connected to the system	Personal	Automatic
	List of the unseen communication items (e.g. posted messages)	Network – Group	Automatic
Decision-making	Voting Forums (e.g. explanation forum, current/earlier results)	Network – Group	Network Moderator and Group facilitator for the group level
Search	According to system area, usage level, key word etc.	Network – Group – Personal	Everybody in the network
Reporting system	Authoring and reading activity according to functionality, date, stakeholder and network level (group, individual etc.)		Network Moderator and Group facilitator for the group level

**Table 5: System Functionalities, Usage Level and Change Authority**

Firstly, the *Network level* was related to the activities of the network and was password protected. Different kinds of content/functionalities could be located in this area: information related to the esoteric life of the network, functions of the network board, information or content about network-wide sessions etc. Furthermore this area was useful for the network dissemination strategy. A number of learning networks wish to diffuse part of the knowledge captured or developed as part of their groups' activity.

Secondly, the *Group level* was directly relevant to the activities of the learning groups, which operate within the network. Obviously these areas were password



protected since all managers participating in these groups share organisation-sensitive information. Categories of information/functionalities in these areas include the group infrastructure, the group members and their communication to each other, the group activities, the group learning resources, and the group knowledge. The system would develop a special case for each learning group. The existing groups could be seen by everybody in the network but the content of the group area and the right of using the relevant functionalities was given only to the members of the group.

Thirdly, *the Individual Member level* containing two bodies of information. On the one hand the information which related to the participating persons and their organisations such as the position of this person within the firm, previous experience, services or products that this firm offers etc. This information was open to all network members since it provided a (desired) transparency which could lead potentially to the development of new learning or business relationships. On the other hand the system provided the possibility of storing personal resources and information which were only accessible by the focal user.

A number of functionalities were offered at different levels (). In general the system had all the ‘standard’ content and communication capabilities as well as some decision-making capabilities (e.g. voting forums).

## 6.2 System Interface and Reliability

The members in all three networks found the system interface very satisfactory. In particular using an 11 item questionnaire (scale 1-5) the surveyed network members were asked to grade the system in eleven dimensions<sup>22</sup> after using the system for six months. Members rated very high the first impression, the screen layout and the training support. The networks members thought also high of the system reliability proving that the system’s operation is sound and without any significant technical problem<sup>23</sup>.

		<i>Opinion on</i>	<i>N</i>	<i>Mean Difference</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>
Pre-system experience of KM/learning software	No	Interface With System	31	30.81	4.35	.78
	Yes		11	<b>34.82</b>	6.72	2.03

**Table 6: Pre-KLB Experience of KM/Learning Software And System Interface**

In fact the interface was one of the system’s strongest points. Through a t-test implemented in the whole of the sample, the members who have had previous experience of any Knowledge Management or learning software were found that they liked more the interface with the system than the rest of them (Table 6).

## 7. System Activities

The system was given to the focal networks as an ‘empty cell’ with all its functionalities but without any content. The network brokers were responsible for all preparatory work (e.g. register members, fill up profile ‘cards’, creating the specially-dedicated areas for the groups) and to provide the initial amount of content. The system was introduced to the various network groups and the members were asked to start using the system as part of their on-going networking activities. After some

<sup>22</sup> The questionnaire was found of high reliability (Cronbach a=0.88).

<sup>23</sup> The following scores were given by the network members to the system: First impression 3.65; Screen layout 3.62; System navigation: 3.19; Inform of new data 3.38; Easy to learn 3.42; Trial and error 3.44; Training support 3.55; Response time 3.47; and System Reliability 3.73.

period, the research team measured the authoring and reading activity in different system areas.

### 7.1 System Knowledge Embeddedness

The measurement of authoring activity reveals two trends:

- the extent to which different network stakeholders are motivated to instigate technologies-in-practice (Orlikowski, 2000) in the context of learning networks
- the degree that the various network players are prepared to become transparent (Larsson et al, 1998) to other network stakeholders through the IT system<sup>24</sup>.

The first, rather surprising, finding was the lack of interest to ‘democratize’ the decision-making structure. Despite the claim of the IT designers, which became one of the main selling points of the system, a few questions were posted for voting in the relevant forums and a small number of members cast their vote, especially in ACS and EdP (Table 7). No network stakeholder has a major interest in substantiating a technology-in-practice which could challenge the established decision-making authority. The network broker has a natural interest to maintain the main decision-making authority and therefore continue justifying its role in the process. On the other hand the network members, although they have an obvious interest to influence decisions in their favour (e.g. to focus learning on their needs), they have no appetite to expose themselves in the open politics of decision-making, which may involve clashing with the ‘opposing’ views.

	Issues for Vote	Cast Votes
ACS	3	10
EdP	2	17
Plato	7	36

**Table 7: Usage of Voting Forum Functionality**

A second impressive finding is the very low, almost negligible, level of authoring in the network area in EdP (Table 8). Authoring activity was also impressively low in the news areas (News Categories, News Folders, News Items etc.) as well as in the library area (e.g. Documents/Categories, Folders, Files) for both network and group areas, despite the strong interest of the broker. The reason for this is EdP had already created a database for members with the minutes of past network sessions -over 500 documents at the time. EdP had also created a monthly letter distributed to 3,300 people through e-mail while it was preparing films and video clips to upload on its web site. According to the EdP moderator, these functions would not be introduced into the focal platform as such, for three reasons:

Firstly, the current site is designed to use FileMaker Pro data-bases. To transfer everything on the platform would mean a significant amount of work which is pointless. Secondly to access the platform, one needs to enter a login and a password, which might be off-putting for non-members, who represent a wide audience for the EdP... [Thirdly] the existing networks’ members have firmly rooted habits which will make the cost of abandoning their former system to transfer everything to the new system too high

<sup>24</sup> This should not be confused with the extent that network members are prepared to be transparent in the network in general; it could be the case that network members are more (or less) prepared to become transparent through the system rather in face-to-face sessions.

	Network Area	Groups Area
ACS	15%	85%
EdP	0%	100%
Plato	49%	51%

**Table 8: Breakdown of Authoring in Network Area Versus Groups Areas**

The split of authoring activity between the network area and the groups areas present a divergent picture. The authoring activity in the network area was very low in ACS and EdP as opposed to Plato where there was considerable authoring activity (e.g. 50 Forum exchanges, 35 Network<sup>25</sup> files and 92 Calendar items). Plato was clearly the network with the most active authoring activity in the network area, splitting the authoring activity almost equally between the network and the groups areas (Table 8). In ACS there was a certain authoring activity at the level of the network -in areas like the calendar, news and documents- but the groups had by far the strongest presence.

In ACS and EdP, the system concentrated on supporting the most important cell of knowledge sharing namely the learning groups; in this sense the system deployment had concentrated on the existing top priorities. In contrast, the system in Plato created a virtual space connecting (potentially) the various network stakeholders in new ways. The Plato broker engagement was accompanied by the recurrent engagement of network members –which accounted for 28% of authoring in the network area (Table 9). These technologies-in-practice increased the transparency of both the network moderator and network members in Plato with several potential implications for the network routines.

<i>Network</i>	<i>Network Area</i>		<i>Groups</i>		<i>All Authoring</i>	
	<i>Broker</i>	<i>Members</i>	<i>Broker</i>	<i>Members</i>	<i>Broker</i>	<i>Members</i>
ACS	100%	0%	32%	67%	42%	57%
EdP	0%	0%	42%	58%	42%	58%
Plato	67%	28%	85%	15%	76%	22%

**Table 9: Broker versus Members Authoring Activity in Focal Networks<sup>26</sup>**

More specifically the increased transparency of network moderator can improve the routines of managing the joint learning activities by giving an enhanced capability to the network moderator to publicize the forthcoming events. The increased transparency of the members can deliver better structures for planning the joint learning activities since the moderator has a better chance to get a picture of the emerging members needs through their exposure in the system. The increased transparency of the network members can also deliver better routines for communication and informal knowledge sharing (a) either among members belonging in different groups or (b) between group members and the floating members -those firms which are registered in the network but they did not belong to a particular group at the particular moment. Network-wide events in learning networks, where firms not belonging to the same group have the chance to meet each other, do not happen very often in an ‘average’ learning network; through the instigated technologies-in-practice

<sup>25</sup> As opposed to group files and resources.

<sup>26</sup> To calculate the breakdown of authoring activity between the broker and members, only the system areas where both stakeholders had authoring rights were taken into account. Areas like the calendar and the voting forum initiation were not taken into account since only the broker had authoring authority.

network stakeholders which were previously separated by time, space or even network restrictions have the chance to become more transparent and exchange information or perhaps knowledge<sup>27</sup> with each other.

However the development of this virtual space does not necessarily mean the enactment of new routines or structures<sup>28</sup>. The instigation of a new technology-in-practice needs to be combined with compatible technologies-in-practice from other partners to be able to influence the network routines. To illustrate this, let's take the example of the Plato network. The Plato broker instigated a new set of rules (i.e. becoming more transparent to network members) and resources (i.e. identifying and uploading appropriate knowledge resources to the Network area of the system) which was reconstituted in the specific recurrent engagement with the system at hand; however this does not prove the actual enactment of new or improved network routines. This recurrent engagement could go on for several days, months or even years, without reaching the eventually 'targeted' recipients (i.e. the network members in this case) or in other words without affecting the relevant routines of the learning network. Indeed several of the deployed portals today suffer from an information overload which represents the continuous instigation of a technology-in-practice on the one side -the information providers- but this technology-in-practice is not met by the other required half, namely the technology-in-practice of the supposed recipient of this information; this imbalance can go on for years as far the information providers can justify in their organisations the cost of their continuous (re)engagement with the system. The instigation of a technology-in-practice which helps an actor to become more transparent –what can be called a *transparent technology-in-practice*- is a necessary but not sufficient condition for a new inter-organisational routine or structure to be enacted.

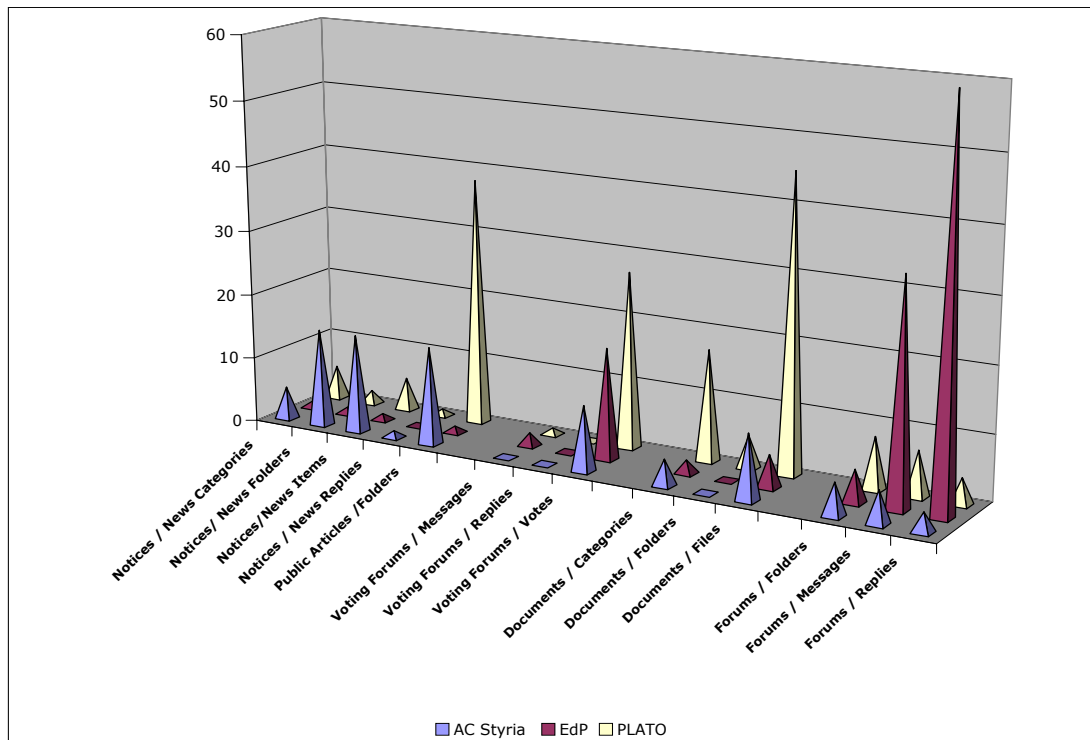
The picture emerging from the *authoring activity at the group level* is also revealing. In ACS, the groups showed lower authoring activity than the groups in EdP and Plato. The most distinguished authoring activity in ACS was shown in the wider news areas either in the form of Group News or in the form of "Public Articles" i.e. news from the wider network communicated to the group (Figure 1). A better insight of this authoring behaviour is gained when the split between the network broker and the members is observed (Table 10). In particular, with regards to the authoring of group news, ACS members accounted a share as high as 87% while in Public Articles their share is 53%. In other words the system helped the members to increase their transparency towards the other members of the group (through the Group news) or towards members of other groups (through the Public Articles). However exposing your firm to other members through the news is an one-way system.

A different story was deployed in EdP, where the group members also accounted for a very high of authoring in the Forums area (68% in the first messages area and 67% of replies). This authoring contributes also towards increasing the transparency of members to other network fellows but in an interactive way.

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<sup>27</sup> It does not matter whether this exchange of information is about actual sharing of knowledge or about 'exploring the ground' or getting familiar within another firm: in all cases the actual process of knowledge sharing is accelerated whenever it starts.

<sup>28</sup> For instance the creation of a virtual space at the network level could be the initiative of an ambitious broker or an active IT team which uploads a lot of content to the relevant area.



**Figure 1: Authoring Activity At Pilot Group Level**

The broker in EdP instigated a limited authoring activity in the area of the Library, despite the presence of the existing strong database; this activity is related to the uploading of documents absolutely necessary for the forthcoming events and the deploying discussion in the system forum (e.g. meeting agenda, speaker's presentation or paper). It seems that the broker did not want to upset the members by asking them to access two different systems for one event, so in a few cases he used the focal system to upload the necessary material.

The authoring activity in Plato was more widespread, proving the very active position of the network broker in the system. The Group documents and files were the most popular areas, "Public Articles" coming as the second most popular. The split between the network broker (including both the moderator and the groups facilitators) and the network members revealed that the Plato's broker was responsible for the lion's share of authoring in both learning resources (Table 10). However it is not possible to know whether the broker's technology-in-practice was translated to new routines supporting the organisation of learning resources and contacts. It remains to be seen whether the members responded to the increased broker's transparency by being receptive to the relevant information; only in this case the enactment of a new routine or inter-organisational structure can be claimed.

	<i>ACS</i>		<i>EdP</i>		<i>Plato</i>		<i>All Groups &amp; Networks</i>	
	<i>Groups Areas</i>		<i>Groups Areas</i>		<i>Groups Areas</i>			
	<i>Broker</i>	<i>Mbrs</i>	<i>Broker</i>	<i>Mbrs</i>	<i>Broker</i>	<i>Mbrs</i>	<b><i>Broker</i></b>	<b><i>Mbrs</i></b>
News Categories	20%	60% <sup>29</sup>	(100%) <sup>30</sup>		90%	10%	<b>75%</b>	<b>20%</b>
News Folders	<b>13%</b>	<b>87%</b> <sup>31</sup>	(100%)		100%	0%	<b>43%</b>	<b>57%</b>
News Items	<b>13%</b>	<b>87%</b>	(100%)		90%	10%	<b>53%</b>	<b>47%</b>
Public Articles	<b>47%</b>	<b>53%</b>	(100%)		<b>95%</b>	<b>5%</b>	<b>81%</b>	<b>19%</b>
Library/Categories	50%	50%	(100%)		94%	6%	<b>90%</b>	<b>8%</b>
Library/Folders	0%	0%	-		100%	0%	<b>79%</b>	<b>0%</b>
Library/Files	70%	30%	100%	0%	<b>93%</b>	<b>7%</b>	<b>94%</b>	<b>6%</b>
Forums/Folders	40%	60%	100%	0%	50%	50%	<b>70%</b>	<b>30%</b>
Forums/Messages <sup>32</sup>	40%	60%	<b>32%</b>	<b>68%</b>	29%	71%	<b>39%</b>	<b>61%</b>
Forums/Replies	0%	100%	<b>33%</b>	<b>67%</b>	25%	75%	<b>25%</b>	<b>75%</b>

**Table 10: Groups Authoring Activity Of Network Broker And Members**

As for the Public Articles, the high share of the network broker revealed a similar trend but with similar problems. Given the high share of the broker's authoring action in the Public Articles (95%), the level of receptiveness of network members needs to be examined before deciding whether this was translated to a new or improved inter-organisational routine.

### 7.2 Members Reading Activity

The measurement of reading activity discloses two trends:

- the extent to which network members are prepared to instigate relevant technologies-in-practice (Orlikowski, 2000) in the context of learning networks
- the degree that the network members are "receptive" (Larsson et al, 1998) to knowledge or information from other stakeholders through the IT system<sup>33</sup>.

Seven areas were identified at the release of the system, the reading activity of all members in these areas was automatically recorded and the final results were normalised. The three networks presented a different picture (Figure 2).

The highest reading activity in ACS occurred in the Files Visits which was also the area where the broker showed some activity in terms of embedding resources (Table 9). The Files area was not the area where most of the content was embedded in the ACS system; Public Articles and News were higher in terms of the embedded content. Nevertheless the network members seemed to undervalue the content of these categories -reading in these areas is rather low. The members' technology-in-practice to make themselves more transparent to the rest of the network was not matched by a receptive technology-in-practice of the 'targeted' members. On the contrary network members were very receptive in accessing useful knowledge resources provided mainly by the broker (library and files areas). The transparent technology-in-practice instigated by the ACS broker providing learning resources was met by the receptive technology-in-practice of the network members to access and download these resources. In this sense the new system substantiated a new inter-organisational structure building bridges between the broker and its capability to identify relevant

<sup>29</sup> Third party (e.g. IT team) were responsible for the unaccounted percentage.

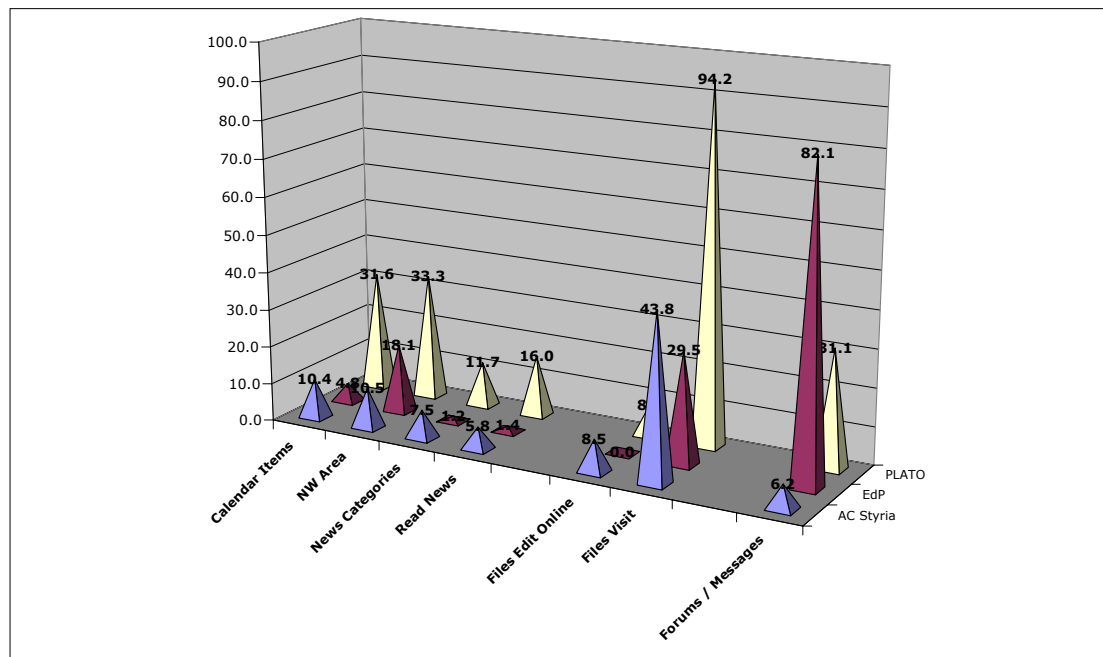
<sup>30</sup> Parenthesis indicates very little, almost negligible, authoring activity.

<sup>31</sup> Bold indicates the groups areas with the highest authoring activity.

<sup>32</sup> This category is differentiated from the "Forums/Replies" in the sense that a message initiates a thread of discussion while a reply responds to a discussion initiated already.

<sup>33</sup> This should not be confused with the extent that network members are receptive in general; network members can be more (or less) prepared to become receptive through the system rather in real sessions.

knowledge and the members' receptiveness in terms of absorbing new knowledge.



**Figure 2: Average Visits Per Active Group Member**

In EdP, the network members demonstrated a high reading activity in the Forums area –the second highest in all system areas in all networks (Figure 2). In fact this is the area where a lot of content has been embedded in EdP in the form of messages and replies (Figure 1). The messages and replies were supplied to a large extent by network members, although the network broker did contribute to a significant degree. In other words network members in EdP seemed to be both transparent and receptive to the opinion, experience or knowledge of other network players, using the deployed system for enhancing the communication and informal knowledge sharing routines.

EdP members instigated a moderate receptive technology-in-practice in the area of Library by accessing the documents uploaded by the network broker in the relevant area. As mentioned before these files are absolutely necessary for the forthcoming events and obviously the members preferred to access this material through the same system where the discussion was being deployed.

Finally in Plato, the members showed a record-high reading activity in the library area -the highest level of all reading attained in all three systems. Through this behaviour the members show that they were very receptive in knowledge resources provided by the network. In Plato, similarly with ACS, the vast amount of these resources (93%) were provided by the broker. Here again the transparent technology-in-practice instigated by the broker in terms of providing knowledge resources was matched by the receptive technology-in-practice of the members to visit the library and access the content of these resources. The system substantiated a new structure to line up the broker's capability (to search, identify and make available relevant knowledge resources) with the members high receptiveness to learn about new trends in management accommodating clearly the relevant network routines.

Another system area where significant reading activity occurred in Plato was the Network area; this was matched by a significantly high level of authoring taking place

at the network area of the system (Table 8) undertaken by both broker and members (Table 9). The Plato members also visited often the events calendar, an area populated with a lot of content by the network broker (92 items). Here again the broker's instigated technology-in-practice to make the network sessions and activities more transparent met by the members receptive technology-in-practice to become aware of the opportunities for knowledge sharing.

In Plato, the implemented system built bridges at different levels: between the broker and the members, the various operating groups and the floating and the group members. The instigation of this virtual space came as an amalgamation of several technologies-in-practice:

- the broker's transparent technology-in-practice providing a lot of content and resources
- the transparent technology-in-practice of the members, expressed as significant authoring contribution in the Network area
- the receptive technology-in-practice of network members, expressed as active reading in the network or group area.

In few words, in all three cases, transparent and receptive technologies-in-practice emerged<sup>34</sup> which have succeed or failed to align with each other. The critical question is how the success or failure to align these technologies-in-practice affected the network routines.

## **8. Emergent Technologies-in-Practice And Enacted Routines in Learning Networks**

The impact on inter-organisational routines and the players everyday practices and activities was investigated through a survey of members from all three cases. Given the completely voluntary character of participation in these networks, the received responses can give a very honest account of the value of the deployed technology for influencing particular network routines and the overall network. Furthermore the parts of the system, that were appreciated more, are also more likely to be used again; this can be considered as an indicator of the enacted technologies-in-practice which are more likely to survive in the long-term.

The survey asked the participants to evaluate (on a scale from 1 to 5) the impact of the system on the four repertoires of network routines identified by fieldwork. The results for each scale was summarised to a single index<sup>35</sup>, giving one price for each repertoire of routines in each network (Table 11). The results provided very useful insights.

ACS members gave their lowest score to the system impact to dissemination routines (2.97), which was actually the lowest score given in all scales in all networks. This is related to the failure to align the considerable members' authoring activity in areas like the Group News and the Public Articles with the members' reading activity in the same areas. It seems that the transparency pursued by the network members in the above areas was more about marketing their firms in the hope of getting more business rather than exposure as part of a knowledge exchange process; as a result network members became disinterested and the network routines have not been substantially affected. In contrast, the ACS members gave their highest score to the system's impact on the routines for the organisation and access to resources and

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<sup>34</sup> It must be emphasised that transparent technologies-in-practice do not always emerge as authoring activity into the system. A typical example is the Voting Forum where a potential 'authoring' activity of the broker to authorise a new poll would make him more receptive to members opinion and ideas.

<sup>35</sup> This was possible because the reliability of all scales found very high.



contacts – a direct reflection of the alignment achieved within the system between the moderate broker’s authoring activity in the Library area and the high member’s reading activity in the same area.

In EdP, the aligned members’ technologies-in-practice in authoring and reading in the Forums area enabled the system to have an immense impact on the communication and informal knowledge sharing routines of the network, with its members claiming the highest score in all scales in all networks (3.88). It seems that the members interaction in this area was about knowledge exchange rather than marketing themselves –as it was the case in ACS. The partial alignment of the broker’s (low) authoring activity in the Library area with the members’ (moderate) reading activity convinced the members to claim a quite high score on the system’s impact on the organisation and access to learning resources and contacts; probably this high score can also be taken as their strong desire to see a seamless system where all interactions and necessary information can be co-located in the same place –at least form the users’ point of view.

Further insights were provided, especially on the actual ways that the network routines were influenced by the technologies-in-practice through the examination of the system impact on each repertoire of routines.

<i>Repertoire of Routines</i>	ACS	EdP	Plato
Planning & Management of Learning Activities	3.12	3.52	3.53
Communication & Informal Knowledge Sharing	2.90	3.88	3.57
Organisation & Access to Resources & Contacts	3.22	3.72	3.38
Learning Dissemination	2.79	3.61	3.25

**Table 11: Members Survey About the System’s Impact on Network Routines**

### *8.1 Planning and Management of Learning Activities*

Plato members gave the highest score to six out of eight dimensions of this scale among all networks, reflecting the positive impact the aligned technologies-in-practice have had on these routines in their network. More specifically, according to Plato members the system helped the group to identify new learning needs and topics (3.90 in a scale 1-5) and assess the appropriability of experts (3.83). The technologies-in-practice in Plato delivered a process which enabled groups to identify more topics, members to make more informed assessments of experts and the network to plan and manage its activities much better.

### *8.2 Communication and Informal Knowledge Sharing*

ACS members traced very little system impact on the communication and informal knowledge sharing routines of their network (Table 12)– one more clear sign that the highly transparent members’ authoring activity in Public Articles and Group News was more about marketing themselves rather than knowledge sharing.

In contrast, EdP members scoring in the same category stands out against the other two networks, giving the highest score in five out of six related questions. The interaction of the highly transparent members’ technology-in-practice with their highly receptive technology-in-practice in EdP helped them substantially to advance understanding before knowledge sharing sessions and become aware of new topics. This resulted in improving the communication mainly with the group members but also with the network broker (36% of responses) and the network members outside their group (Table 13).

	<i>ACS</i>	<i>EdP</i>	<i>Plato</i>
Variety of channels	3.00	3.40	3.65
Interaction with fellows outside actual meetings	2.95	3.89	3.75
Advance understanding before session	2.79	4.19	3.37
Deepen knowledge after session	2.77	3.83	3.56
Become aware of new topics	3.13	4.03	3.92
Easy to participate in chat/forum	2.77	3.94	3.19

**Table 12: System Impact On Communication and Informal Knowledge Sharing**

	<i>ACS</i>	<i>EdP</i>	<i>Plato</i>
Group Fellows	52%	38%	31%
Network members outside your group(s)	10%	21%	24%
Network management	19%	21%	12%
Group facilitator	10%	15%	29%

**Table 13: System Contribution in Improving Communication With Other Players**

Plato scoring was also high in this category but of different nature. Plato members found very satisfactory the variety of communication channels in the system (top score among all networks) while, to their opinion, the main contribution of the system was to make them aware of new topics and increase the interaction with network fellows outside the actual meetings. In fact when asked how the system improved communication, the Plato members gave the highest ranking among all three cases to the communication with network members outside their groups (Table 13). Plato members also hit the highest score among all three cases in the system contribution to the communication with the network broker (41%). This is related to the extended virtual space created in Plato connecting the various operating groups with each other, the network broker with the network members as well as the floating members with the members belonging to groups. This virtual space was developed as a result of the interaction of several technologies-in-practice (Table 16).

### *8.3 Organisation and Access to Learning Resources and Contacts*

There was a remarkable difference in the ways the system impacted the networks routines for managing knowledge between ACS and EdP and Plato (Table 14). More specifically in ACS members appreciated (71% of responses) the explicit resources (e.g. papers, presentations from network sessions etc.) put into the system while a minor share of responses valued the system support to profiles and contact details of fellow members and experts (17%). On the contrary, in EdP 43% of responses valued the system support to profiles and contact details of fellow members and experts, leaving 45% of responses recognizing the significance of the system support to explicit resources. In similar vein, the biggest share of Plato members recognize the contribution of the system in supporting the profiles and contact details (49%), with only 37% recognising its value for explicit resources.

	<i>ACS</i>	<i>EdP</i>	<i>Plato</i>
Documents, Papers etc.	41%	27%	15%
Presentations presented in network sessions	31%	18%	22%
Audio-visual material	10%	4%	15%
Profiles/contact details of fellow members	10%	25%	21%
Profiles/contact details of experts	7%	24%	22%

**Table 14: System Resources Significance**

This difference is associated with the system failure in ACS to instigate technologies-in-practice which connect in new ways either the members with each other (informal knowledge sharing) or the network broker with the network members (closer to planning and management of network activities). On the contrary, the technologies-in-practice instigated in EdP have supported considerably communication routines which in turn gave the members higher visibility to the involved experts as well as their fellow members. Similarly, the technologies-in-practice instigated in Plato have created the virtual space which gave the opportunity to various network stakeholders to connect with each other.

#### *8.4 Learning Dissemination*

The major difference regarding the system impact on the network routines for learning dissemination is between the ACS and EdP members and the Plato ones: the former found limited system contribution to help them accessing learning resources of other groups (12% and 29% respectively) as opposed to the latter whose 41% of responses recognized a significant impact (Table 15). Similarly, 38% of responses in Plato found the network resources (as opposed to group and personal resources) important while the corresponding percentage was 28% for EdP and 14% for ACS.

	<i>ACS</i>	<i>EdP</i>	<i>Plato</i>
Disseminating to colleagues/business partners at work	35%	26%	32%
Disseminating to peers outside your firm and the network	41%	38%	18%
Access to learning resources of other network groups	12%	29%	41%

**Table 15: System Contribution in Improving Learning Dissemination**

<i>Case</i>	<i>Transparent Technology-in-practice</i>	<i>Receptive Technology-in-practice</i>	<i>Routines</i> <sup>36</sup>	<i>Impact</i>	<i>Specific Routines Changes / (Reason)</i> <sup>37</sup>
ACS	Moderate members authoring activity in Group News	Low members' reading activity in Group news	(i) LD (ii) CIKS	No	(i) (Members interested in knowledge sharing, not selling pitches) (ii) (Members market themselves instead of knowledge sharing)
ACS	Moderate members authoring activity in Public Articles	Low members' reading activity in Network area	LD	No	(i) (Members interested in knowledge sharing, not selling pitches) (ii) (Members market themselves instead of knowledge sharing)
ACS	Moderate broker's authoring in Library/Files	High members' reading activity in Library/Files	OALR	Yes	Receive relevant papers, presentations from sessions
ACS & EdP	Low members' voting in Voting Forums	Low broker's authoring in Voting Forums	PMLA	No	(Consensus that members avoid open politics)
EdP	High members authoring activity in Forums	High members reading activity in Forums	(i) CIKS (ii) OALRC (iii) PMLA	Great	(i) advance understanding before session, become aware of new topics (ii) implicit access to profiles/contact details of members and experts (iii) easy to propose topics
EdP	Negligible broker's authoring activity in the Network area	Low members' reading activity in the Network area	PMLA	No	(Strong database already in place)
EdP	Low broker's authoring activity in the Library area	Moderate members' reading activity in the Library area	OALR	Partial	Files only directly relevant to discussion: one system-stop for members
Plato	Moderate members' voting in Voting Forums	Moderate broker's authoring in Voting Forums	PMLA	Partial	Help the group to propose new topics (only if broker agrees)
Plato	High broker's authoring activity in Library/Files	High members' reading activity in Library/Files	OALRC	Yes	(i) Access to other groups resources (ii) Identifying and accessing experts
Plato	High broker's authoring activity in Public Articles	High members' reading activity in Network area	(i) CIKS (ii) PMLA	Great	(i) Improve communication with group facilitators (ii) Good quality of information about planned events
Plato	High broker's authoring activity in the Network area	High member's reading activity in the Network area	(i) CIKS (ii) PMLA	Great	(i) Improve communication with broker (ii) Good quality of information in the system
Plato	High broker's authoring activity in the Calendar area	Moderate member's reading activity in the Calendar area	PMLA	Yes	Good quality of information about planned events
Plato	Moderate member's authoring activity in the Network area	High members' reading activity in Network area	(i) CIKS (ii) PMLA	Great	(i) Virtual space btw groups & btw floating-group members (ii) Group identifying new needs and topics

**Table 16: Emergent Technologies-in-Practice and Enacted Inter-organisational Routines in Learning Networks**

<sup>36</sup> CIKS: Communication and Informal Knowledge Sharing; LD: Learning Dissemination; OALR: Organisation and Access of Learning Resources and Contacts; PMLA: Planning and Management of Learning Activities.

<sup>37</sup> Parenthesis indicates a failure to impact the network routines.

### 8.5 Do the new routines deliver a better network?

What became evident from this discussion was the combination of appropriate technologies-in-practice can change specific routines and as a result the way the network operates. The crucial question though is whether the system had the capability to improve the network critically; the emerged system practices might have been welcome improvements which however have no capability of developing routines which change the nature of the network all together.

To respond to this question, the survey asked the participants to indicate on a scale whether the system implementation delivered a better network.

	<i>Planning &amp; Management of Learning Activities</i>	<i>Communication &amp; Informal Knowledge Sharing</i>	<i>Organisation of Learning Resources &amp; Contacts</i>	<i>Learning Dissemination</i>	<i>Network Improvement</i>
<i>PMLA</i>		.749 <sup>38</sup> .000 26	.787 .000 17	.616 .002 22	.855 .000 24
<i>CIKS</i>			.653 .002 20	.686 .000 26	.741 .000 30
<i>OALRC</i>				.465 .052 18	.683 .001 19
<i>LD</i>					.536 .002 32

**Table 17: Correlation Between Members' Opinions**

A number of correlations were performed to explore whether the opinion of the members about the system impact on one repertoire of routines is correlated in any way with the opinion of the members about the system contribution on the network improvement. The strongest correlation was found between the system impact on the communication and informal knowledge sharing routines and the network improvement. In other words, members were convinced that the impact the system can have on communication and knowledge sharing routines can have critical implications for the very nature of the network, giving the opportunity to the network to develop the meta-routines.

The tests also produced a strong correlation between the members' opinion on the impact on planning and management routines and the network improvement (although with a smaller sampling). A medium correlation was found between the members' opinion on the impact on the management of resources and contacts and the network improvement while the weakest correlation appeared in between the members' opinion on learning dissemination and the network improvement.

In few words, the members pointed out to a strong correlation between the impact of the system on the network routines and the overall improvement of the network. This is an evidence that the system contributions to various aspects of learning and networking do not simply enhance existing network processes; they have the power –under the appropriate circumstances- to change the very nature of the network capabilities.

<sup>38</sup> Pearson Correlation (r), Significance (2-tailed), Number of sample (N) respectively.

## 9. Conclusions

Learning networks represent volatile conditions for a number of reasons. Firstly, unless there is one single and powerful organization coercing its partners into 'collaboration', networks are based on voluntary participation. In fact, there is not so much at stake from a possible network failure: in the worst case scenario the network can be dissolved but the participating partners can go on with their business. Secondly, the distributed character of the networks requires the development of a "deep competence" (Orlikowski, 2002) of organising across geographical, cultural and organisational boundaries. Thirdly, knowledge dynamics are by nature very unstable leading potentially to winners and losers depending on a number of combinations (Larsson et al, 1998). Yet, learning networks are becoming increasingly valuable forms of knowledge acquisition, since contemporary knowledge becomes more complex and the innovation process more open.

The implementation of ICT has the potential to augment and enrich the efficiency and the effectiveness of a learning network. However the implementation of ICT hides a big surprise element -which was confirmed in this research. This paper has relied on a number of different theoretical traditions to investigate the effects of ICT implementation on organisational forms and functions of learning networks. The basic assumption was that learning networks –as indeed any other form of organisation- need to be identified in terms of on-going routines and everyday practices (Orlikowski, 2002) pre-existing to or enacted after the introduction of ICT; this is the only way to measure the real innovation potential of ICT.

This research has confirmed that "situated and recurrent use of technology simultaneously enacts multiple structures" (Orlikowski, 2000, p.411). These multiple structures proliferate in the context of a network since it is an amalgamation of different stakeholders' interests and perspectives. However, there are two generic kinds of technology-in-practice: those that enhance the network players transparency and those which contribute to the players receptiveness. This is a departure from earlier considerations where no variation or typology of situated usage of technology has been considered.

What is really more important is the potential of these two kinds of situated usages of technology for changing organisational forms and functions. This paper has found that only when the two generic kinds of technologies-in-practice are aligned, a real innovation outcome is generated for the network in terms of changing its routines.

In this alignment process hides the big potential for democratizing the organisational forms of learning networks. More specifically, this research has revealed that network stakeholders are reluctant to get involved in an open political battle to influence decisions to their advantage, probably because of the volatile character of learning networks. However what they are prepared to do is to instigate usages of technology which, in practice, influence network routines to their benefit. In fact what the alignment of technologies-in-practice can deliver are routines that are more individualistic than before (such as absorbing knowledge from more network players, choosing the time and the way of the network participation etc.) but at the same time they enhance the collective character of the network. For instance, in this research, the alignment of technologies-in-practice generated more communication between network members. Probably this compromise is achieved because the 'individualistic' routines relieve the participating managers from the time pressure they usually witness when they participate in forums like learning networks -previous research has shown that increased time pressure discourage new routines development

and lead to a preference of routines rehearsed more often (Becker, 2004).

Nevertheless it must be admitted that the full understanding of the economic and knowledge implications of this alignment process is far from clear. For instance future research should look in more detail at the role of the network broker. Several issues are open to investigation. First the ways that a system can be introduced into a network and the ways to influence the norms and the interpretive schemes of potential users. Moreover how situated and recurrent usages of technology from different stakeholders can be managed and aligned is also a critical question which is far from having sufficient answers. The role of a broker is again likely to be crucial in this respect. Of course the answers to these dilemmas will be associated with the economics of this process such as the question of who is supposed to undertake the cost of initial instigations of technologies-in-practice. Longitudinal studies are also required to examine the long-term impact of technologies-in-practice to the organisational forms and functions of networks, although the situated character of the studies should be preserved as a valuable asset.

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