Personal Networks and IT Innovation within the Esprit and IST Programmes: some evidence from the UK [1]

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Abstract

The European Strategic Programme for Research in Information Technologies (Esprit) was created back in 1983 as a defensive response to the US and Japanese lead in Information Technologies (IT). Esprit was driven by the belief that intra-EU collaboration is an effective means to enhance the competitiveness of the European IT industry. Esprit has undergone a number of changes to facilitate collaboration and innovation. Yet, only after eighteen years of Esprit did the European Commission appreciate the need to encourage worldwide co-operation within its Fifth Framework Information Society Technologies (IST) Programme. In the emerging information society and economy it is conceded that new ideas are as likely to be found outside Europe as within. This paper aims to investigate the personal networks of UK main contractors in Esprit and IST programmes with regard to national boundaries and informal external linkages. The empirical evidence is based on the comparative evaluation of 10 successful Esprit and IST projects with UK main contractor. The findings show that the world of IT innovation is borderless and that UK firms accommodated a broad range of informal external linkages valuable for IT innovation with counterparts in the US, despite a Euro-centric policy from Brussels.

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Introduction

Established in 1983, Esprit (the European Strategic Programme for Research in Information Technologies) is the oldest of the European Commission's research and technology development (RTD) programmes. It is also the largest and has been a model for all the Commission's other RTD programmes. Esprit arose from the fear that Europe was lagging far behind the US and Japan in vital Information Technologies (IT) (Assimakopoulos *et al*., 2000a; Georghiou, 1999; Mytelka and Delapierre, 1987). Collaboration, rather than competition, among Europe's IT companies, it was imagined would yield synergies, the flexibility to adapt in volatile markets, and the shorter product cycles essential to international competitiveness (Assimakopoulos and Macdonald, 1999). The complementary notion of pre-competitive research allowed the Commission to subsidise RTD while avoiding the accusation of interfering in the market (Quintas and Guy, 1995). The collaboration of Esprit has attracted considerable academic attention (e.g., Hagedoorn and Schakenraad, 1993; Hagedoorn *et al*., 2000); whatever Esprit's success in encouraging innovation, it has become a classic in innovation policy.

Esprit in the 1980s was very much the child of the large firms of the European IT industy, the Big Twelve. Some would argue that Esprit was still fulfilling their requirements in the late 1990s, when a much broader range of stakeholders was involved in building the emerging information and knowledge societies. Over the years, the Commission has attempted to transform Esprit by encouraging the participation of firms from Europe's less developed regions, of small and medium size firms from across the EU, and lately of stakeholders from throughout the IT supply chain, including users from a broad range of institutional settings. Even so, Esprit stands accused of retaining its technology-driven approach to IT, not necessarily because this produces more innovation and greater competitiveness, but because of the political advantages offered by the doctrine of collaboration (Piekkari *et al*., 2001).

The dual purpose of this paper is to analyse the geography of personal networks of Esprit main contractors based in the UK according to national boundaries, and also explore the significance of

their informal external linkages for IT innovation. The empirical data is based on 10 Esprit projects with UK main contractor, examined as case studies. Particular attention is given to the informal networks that link members of Esprit projects to the most dynamic parts of the IT world in the US and beyond. How do these function in the midst of collaboration and the formal networks it imposes (Osborn and Hagedoorn, 1997)? Formal networks are defined as those bound by a formal contract between the Commission and project partners. In contrast, informal networks include many unacknowledged partners acquired through inter-personal links that transcend formal agreements (Johannisson, 1998). As in other fast developing sectors, informal relationships in the IT industry seem to bring the tacit information and embedded knowledge that is conducive to complex knowledge intensive innovation (Assimakopoulos and Macdonald, 2002; Boisot, 1998; Badaracco, 1991).

The rest of the paper is in four sections. In Section 2, a brief history of Esprit and IST is provided, examining the changes that have taken place within these Programmes to encourage collaboration and innovation in the European IT industry. Section 3 describes the research methodology, and section 4 presents the main findings, based on the ten Esprit projects. Finally, Section 5 draws some conclusions.

Esprit and IST

In the early 1980s, European firms had begun to realise that their technology was lagging in such core high technology areas as IT and some had already begun to collaborate (Mytelka and Delapierre, 1987). Policy makers were becoming increasingly concerned about the gradual loss of competitiveness they perceived in the European economy and in the European IT industry in particular. The globalisation of high technology industries (Narula, 1999), and the wide disparities between industrial and technological capabilities of the various country members revealed by the continuing expansion of the EU (especially evident in the divide between the wealthy countries of the European North and the poor countries of the European South) further reinforced this perception (Hagedoorn *et al*., 2000). Moreover, policy makers on both sides of the Atlantic had become very enthusiastic about ‘Japanese-style’ collaborative research and the perceived success of ‘keiretsu’ (Georghiou, 1999; Ray, 1998).

European industry generally was beginning to show much more interest in collaborating in R&D, previously an activity conducted secretly and independent of competitors' R&D (Narula and Hagedoorn, 1999). According to Narula (1999), the underlying objective of the Framework Programmes of the European Commission was not to encourage collaboration *per se*. Rather, it was to encourage collaboration in the run-up to the single European market in 1992. Collaboration would allow EU industry to restructure and be better able to face the competitive environment of the single market. It was hardly surprising, then, that collaborative R&D became central to Commission policy in the early 1980s (Peterson, 1991), and thus that collaboration became central to Esprit. In 1981, the Commission suggested that the Big Twelve take a concerted approach to IT, and invited their collaboration in drawing up a common strategy (Mytelka and Delapierre, 1987). Following the launch of a small pilot programme in 1983, Esprit proper was started in 1984. There have now been four phases of Esprit research (Esprit I: 1984-87, Esprit II: 1987-90, Esprit III: 1990-94, and Esprit IV: 1994-98), all jointly funded by the Commission and the participating organizations. The Fifth Framework Programme (1998-2002) initiated the Information Society Technology (IST) Programme, placing all European Commission information and communication technologies RTD, including Esprit, Acts and Telematics, under one umbrella programme.

The early Esprit was very much driven by the belief that collaboration among industry, universities and public research institutes across Europe was an effective means of narrowing what was perceived as a technological gap between European companies and their American and Japanese competitors (Hagedoorn *et al*., 2000; Mytelka and Delapierre, 1987; Narula, 1999). As Mytelka and Delapierre (1987, 233) point out, collaboration among European firms was more attractive than alliances with non-European firms because it was thought to involve less risk and to enable firms to take advantage of economies of scale in one or more of their production processes while remaining separate entities.

Over the 1990s, Esprit went through vast changes in its organization and scope (Assimakopoulos *et al*., 2000b). The European Commission responded to new trends in the collaborative behaviour of the IT industry by, for example, expanding Esprit participation, encouraged collaboration throughout the IT value chain, and increased emphasis on the users of IT. Some of these

developments are summarised in Table 1. Despite these alterations in emphasis, many of the characteristics of the early Esprit were evident until the conclusion of the Programme in 1999. For example, Esprit always insisted that the research it supported be collaborative in nature, specifically that there had to be a minimum collaboration in each project of two partner organizations from two EU member countries.

Table 1: Summary of Changes in Esprit and IST from the early 1980s to the early 2000s

Dimension	***Esprit (1983-1998)***	***IST (1998-2002)***
Participants in collaboration	Dominance of electronic firms, IT suppliers, and participants from northern Europe as well as less favoured regions	A heterogeneous group of organizations representing the entire IT value chain and including SMEs and user organizations
Nature of collaboration	Pre-competitive	Collaboration in competition
Focus of collaboration	Hard science	Soft science (emphasis on socio-economic research)
Organization of collaboration	Research project	Research clusters and networks
Role in the broader community	Inward oriented, isolated	Outward oriented, integrated

The early Esprit was also determinedly pre-competitive, focusing on research that was considered to be distant from the individual market interests of collaborators. The notion of pre-competitive research provided a convenient label for the activity undertaken within collaboration, one acceptable to the free market ideology of most European governments of the period (Georghiou, 1999). It was argued that collaboration in pre-competitive research did not constitute government interference with market forces (Quintas and Guy, 1995), and fitted comfortably within a technology-push model of innovation. However, sweeping changes in the IT industry, together with improved understanding of how innovation is generated, have encouraged Esprit to change its emphasis from technology-push to market-pull. This has required abandoning the idea that partners can collaborate only when they are being pre-competitive. It has been accepted that they may also collaborate when they are cooperating in competition. Indeed, the success of the IST Programme was dependent on the willingness and ability of partners to collaborate in competitive circumstances.

The early Esprit was dominated by the rigid conviction that innovation emanated, quite obviously, from science and engineering. Just as the model of innovation within Esprit has changed from technology-push to market-pull, Esprit research is no longer confined to science

and engineering and now includes at least some social science research. The IST Programme acknowledged that socio-economic research cannot be isolated to a single domain, but must underpin all its IT research. In consequence, the IST Programme cannot be accused of fostering innovation intended to benefit only the suppliers of IT equipment: IST innovation is now directed towards all users of IT. It has been accepted that European competitiveness in IT depends not so much on increasing IT research capital as on increasing social capital. There is now no part of the economy which is not heavily dependent on IT.

The research consortium - termed the 'project' by the Commission - has long been the primary unit of Esprit organization. The project has often seemed to be the only unit. All Commission organization was centred on the project, as was most monitoring and evaluation. In 18 years (1983-2000), some 2,250 Esprit projects have been completed and more than Euro 5.5 billion has been spent (Assimakopoulos and Macdonald, 1999). The project officer – the key Commission official – tended to regard projects as self-contained, to be completed within a specific timeframe as specified by a formal contractual agreement.

The changes that Esprit has undergone in IST with respect to participation, focus, organization and orientation were responses to particular trends and developments in the IT sector, and more general shifts in the competitive environment. Throughout the history of Esprit and IST, the main objective of the Commission has been to create and sustain a fertile platform for collaboration and innovation in research and technological development in IT. However, it is difficult, perhaps impossible, to confine collaboration and to harness innovation by restricting them to a single geographical region, even one with all the resources of Europe. More important, it may be pointless as it will be discussed below.

Research Methodology

The sample for this research involved all 67 Esprit projects with UK main contractors included in the Prosoma showcase (www.prosoma.lu) between June 1997 and September 1999. Administrative leaders of these 67 projects were contacted by post or/and e-mail between November 1997 and June 1999, and asked to identify the individual they considered to be the technological leader of their project in the UK. The findings presented here are based on network

data collected from 10 of these Esprit projects. A formal network for each UK main contractor was identified from the Prosoma and Cordis (www.cordis.lu) databases of the Commission. Subsequently, personal informal networks were mapped following a multi-step approach. Individuals identified as technological leaders within the participating main contractors were sent postal questionnaires and each was asked to nominate up to seven other individuals who had provided information of significant value for innovation related to the specific Esprit project (see Giusti and Georghiou, 1988). In the second round, these nominated individuals were themselves contacted and asked the same question. The nomination process continued until resources were exhausted and in some cases extended to five rounds. For the majority of the projects, semi-structured, face-to-face interviews were conducted. It is from these that the quotations used in this paper are derived (unless otherwise stated).

The computerised network analysis made use of two software packages for social network analysis and visualisation: Ucinet 5 (Borgatti *et al*., 1999) and Mage 5.4 (Richardson and Presley, 1999). The former was used to compute a sets of coordinates for the personal network of each technological leader, following a common three-step approach. It placed all nominations within a binary symmetrical socio-matrix, revealing who was connected with whom within a particular project. An assumption was made that all ties were reciprocal in nature since nearly all respondents indicated that they supplied information for innovation of more or less equal value. Secondly, it calculated Euclidian distances among the nominated individuals. Euclidian distance is a measure of structural equivalence or similarity among the nodes of a network. If, for example, two individuals have identical patterns of connections to all others in a network, then the Euclidian distance between them is zero (Wasserman and Faust, 1994). Thirdly, based on Euclidian distances, a set of (x, y, z) coordinates for each individual was calculated using a 3-dimensional scaling routine (Borgatti *et al*., 1999). Based on each set of coordinates, Mage produced three-dimensional kinetic images for exploring the social structure of each personal network. It is pertinent that Mage was initially produced for the visualization of protein molecules, but has since been used to visualize and make sense of social structures (Freeman, 1998).

Furthermore, based on the contact details (ie postal address) of nominated individuals across the ten projects it was possible to compile a symmetrical valued matrix showing which country is connected to which other country. The value of each cell, excluding the cells of the main diagonal, in this matrix reflected the number of nominating links connecting the two countries. The values of the main diagonal showed how many nominations were made within each country. Subsequently, Ucinet was used to compute the Euclidian distances among the nominated sixteen countries showing the extent of structural similarity among these countries. A set of (x, y, z) coordinates for each country was also calculated using a 3-dimensional scaling routine of Ucinet. Based on this set of coordinates, Mage produced a three-dimensional kinetic image for exploring the structure of this global IT innovation network spanning Europe, North and South America, and Australia.

Main Findings

Figure 1 summarizes some of the main findings according to the nature of nomination links and organizational and project boundaries. It is worth noting that a link is a nomination tie showing that information considered of significant value for IT innovation was exchanged between two individuals involved in one of the ten projects. Formal links - within an Esprit project network and formal agreement with the Commission - are yellow when they connect people within the same organization, and blue when the two individuals belong to different organizations. Informal links - connecting two individuals who are not both members of a formal project consortium - are red when they link people from two organizations and orange when they link people who belong to the same organization. It is striking that more links valued for innovation across the 10 projects are informal 53.1 per cent, rather than formal 46.9 per cent, highlighting the significance of exchanging information valuable for innovation across project boundary with personal contacts not tied in any formal contractual manner with the Commission. Moreover the differentiation within formal (blue 40.6 % and yellow 6.3 %) and informal (red 46.1 % and orange 7.0 %) categories highlights even more clearly the importance of information sharing and exchange across organizational boundaries since only a tiny minority of links is between people who belong to the same organization regardless if this organization is a member (or not) of the formal Esprit consortium and agreement with the Commission.

Figure 1: Nature of links for 10 Esprit projects

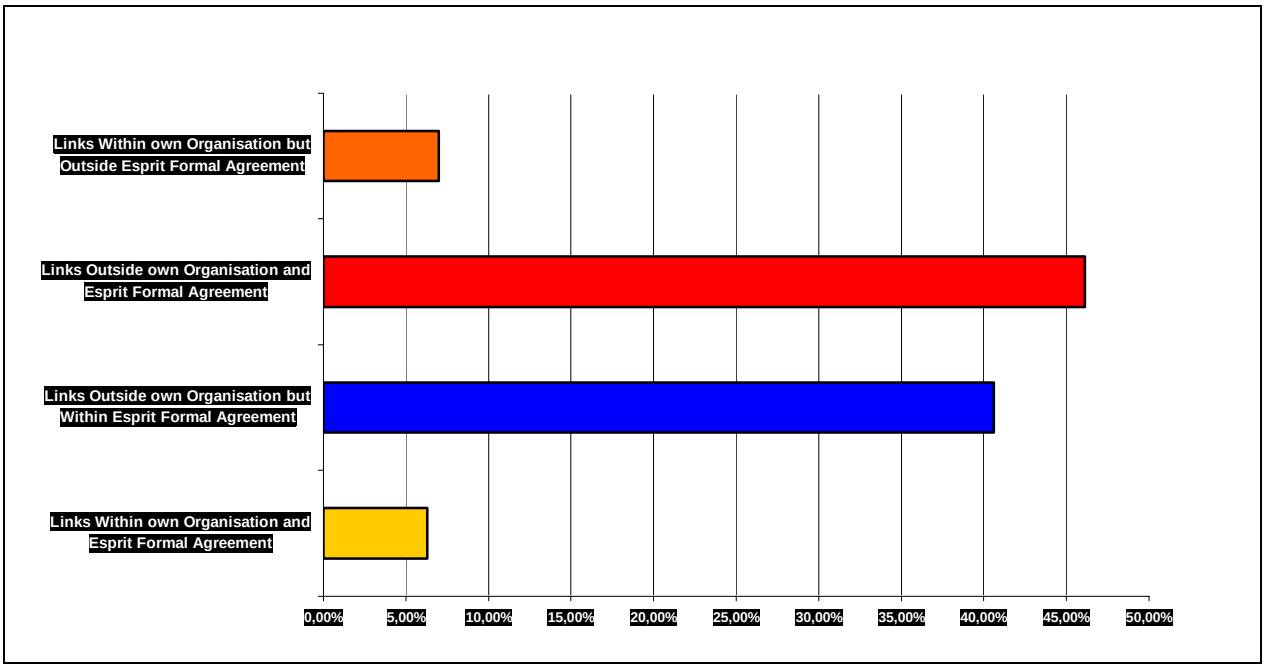


Table 2 presents the main findings according to a simple North – South classification of countries involved in the study. North includes the following countries: UK, Ireland, France, Germany, Austria, Netherlands, Belgium, Italy, Finland, Norway, Sweden, USA and Australia. The underlying assumption here is that all countries in the North include links between people and organizations based in information rich and well developed regions of Europe and worldwide. For example, nominated people in Italy are based around the Milan metropolitan region, not the "less favored" regions in the South of the country. On the other hand countries in the South include: Greece, Spain and Brazil, where regions are assumed to be "less favored" than the ones in the well developed North. As Table 2 shows, the information flows of only three of the ten projects connected people from the well developed countries in the North with people in the less developed countries of the South. Out of the 171 dyadic links most valued for IT innovation, the vast majority (87 per cent) were confined within the information "rich" North of Europe, USA and Australia. Only 13 per cent of links important for IT innovation exchanged or transferred information from the North to the South and vice-versa. Since the EU has placed a premium for supporting "less favored regions" in its South for four succesive Framework Programmes this is an important finding. It reflects the discrepancy between the ability to provide financial support through formal contracts and the "failure" of policy to re-direct informal information flows from

the information "rich" in the North to the information "poor" in the South. Furthermore, the nomination of people as far apart as Norway, USA and Australia indicates the global nature of IT innovation networks as UK main contractors accommodated informal, unacknowledged partners outside the EU with the aim of acquiring information valuable for their innovation from far beyond the EU boundary (see, also, the more detailed analysis of internal and external linkages below).

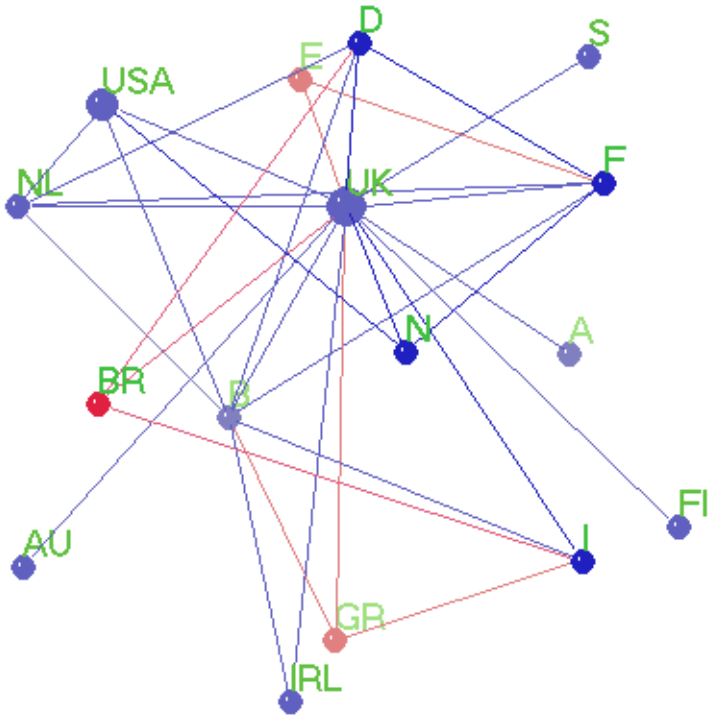
Table 2: A North – South analysis of links for 10 ESPRIT projects

Project	***N-N (%)***	***N-S (%)***	***Total Number of Dyadic Links***
AMULET	10 (100)	0	*10*
DELPHI	21 (100)	0	*21*
E2S	16 (100)	0	*16*
FIRES	8 (47)	9 (53)	*17*
FLACSCOM	18 (100)	0	*18*
IMPRIMATUR	26 (100)	0	*26*
IMPROVE	21 (100)	0	*21*
PEPSE	18 (100)	0	*18*
PIPER	5 (38)	8 (62)	*13*
TIMELY	6 (55)	5 (45)	*11*
Total Number of Dyadic Links (%)	***149 (87)***	***22 (13)***	***171***

Graph 1 shows the global innovation network of UK main contractors based on the ten Esprit projects and the sixteen nominated countries. Countries are represented by balls positioned in a 3-dimensional space according to their structural equivalence in the network. Countries in the North are blue and the ones in the South are red. The colour of ties also varies according to their natures. Ties connecting countries in the North are blue, and ties connecting North countries to the South are red. The size of balls also varies according to their degree centrality (Wasserman and Faust, 1994, 178) computed by Ucinet (Borgatti *et al*., 1999). As was expected, the most central country in the network is the UK itself. However what it seems surprising is that the second most central country in the network is the USA. The UK and USA are respectively

followed in the third, fourth and fifth places by France, Germany and Belgium. The centrality score of USA, a non-EU country that is not allowed to participate as an "equal" partner in EU funded projects, begs for questioning further the role of informal partners in Esprit innovation networks. Towards this end, they are explored below in some depth the patterns of internal and external linkages of the ten projects.

Graph 1: A country-based analysis of links for 10 Esprit projects



A Austria	D Germany	I Italy	NL Netherlands
AU Australia	E Spain	IRL Ireland	USA
B Belgium	F France	GR Greece	UK
BR Brazil	FI Finland	N Norway	

Table 3 summarizes the main findings with regard to internal linkages (dyadic ties within the EU boundary) and external linkages for the ten Esprit projects. Note that most external linkages were

dyadic ties connecting individuals between an EU and non-EU country, while in some cases both individuals worked for organizations outside the EU.

Table 3: Internal vs. External Links for 10 ESPRIT projects

Project	***Internal Links Number (%)***	***External Links Number (%)***	***Total Number of Dyadic Links***
AMULET	10 (100)	0	*10*
DELPHI	15 (71)	6 (29)	*21*
E2S	3 (19)	13 (81)	*16*
FIRES	9 (53)	8 (47)	*17*
FLACSCOM	3 (17)	15 (83)	*18*
IMPRIMATUR	19 (73)	7 (27)	*26*
IMPROVE	21 (100)	0	*21*
PEPSE	17 (94)	1 (6)	*18*
PIPER	13 (100)	0	*13*
TIMELY	9 (82)	2 (18)	*11*
Total Number of Dyadic Links (%)	***119 (70)***	***52 (30)***	***171***

As Table 3 shows, the information flows of only three of the ten projects were confined to the EU. Out of the 171 dyadic ties, almost a third (31 per cent) transcended the EU boundary. This is an important finding, given that none of the 10 projects had any formal partners outside the EU. If there was no contractual need to involve outsiders, it seems that the only plausible explanation for these external links is that individuals in the majority of projects believed that external, informal contacts were particularly useful for innovation (Aldrich and von Glinow, 1992). It would seem that the majority of Esprit projects with UK main contractors accommodated informal, unacknowledged partners outside the EU with the aim of acquiring information valuable for their innovation.

As might have been expected, the majority (57 per cent) of UK main contractors' external linkages were with the USA. EU firms have generally been eager to participate with the US

companies because of their technological lead in IT (Narula, 1999). The cultural and linguistic connections of individual in UK firms would also explain US dominance of their external linkages. Also striking is the global spread of external linkages: through these individuals, UK main contractors maintained important links with such countries as Australia, Brazil and Norway. As it has long been known that UK organizations participating in the Commission's RTD programmes have more collaborative links than their partners (Georghiou *et al.*, 1992), it is perhaps worth speculating that the attraction of a UK partner may lie less in its intrinsic qualities than in its links with the USA (see, for example, Coles *et al.*, 2003).

A case study examines in more detail the role of external linkages. Some 29 per cent of linkages in the DELPHI project were outside the EU. Semi-structured interviews with individuals from the project were conducted both in England and California and indicate that external linkages play a critical role in IT innovation. They transcended local social circles and brought in valuable information from well beyond the specific project boundaries.

DELPHI (Development of Libraries and Physical Models for an Integrated Design Environment)

Delphi was a 3-year Esprit III project carried out from 1993 to 1996. It aimed to address issues related to the accurate prediction of the temperature of critical electronic parts at the component, board and system level; and also to create and validate 'detailed' 3-D conduction models for thermal analysis at all packaging levels. Component thermal management is getting more and more crucial, as ever more transistors are incorporated into single pieces of silicon and applications require more computing power and ever faster processors. The UK main contractor was Flomerics (see, http://www.flomerics.com) a start up company backed up by venture capital back in the late 1980s and today a public company world leader for electronics thermal analysis, based in Kingston, South-East region of England.

> "Flomerics has a very strong product (Flotherm) for process-orientated design issues. Companies, such as Intel and HP, who depend on Flotherm have reduced already short design cycles by several weeks. Flomerics has been retained by these companies because it is the industry benchmark standard for electronic thermal models. This means that there is a huge community using and improving the

> software, building a vast library of standard models that can be dispersed across departments and suppliers." (downloaded from the company web-site on 23/01/03)

According to the Cordis and Prosoma databases the DELPHI project network also included the following formal partners: Alcatel-Bell (Belgium), Alcatel-Espace (France), National Microelectronics Research Centre (NMRC) at University College Cork (Ireland), Philips-CFT (Netherlands) and Thomson-CSF (France).

Graph 2 shows the personal network of the DELPHI main contractor / project manager intertwined with the personal networks of other key players for the project. The balls represent individuals and the ties represent nomination network data. The size of balls varies according to degree centrality (Wasserman and Faust, 1994), and the colour of ties varies according to their natures (internal or external). Internal ties are blue and external ties are pink. The first striking finding is that the most central individual in the network (according to the number of nominations received by all members of the network) is a Dutch engineer in Philips Research Labs at Eindhoven. Second most central is a Belgian engineer at the Alcatel Bell research division on thermal compatibility in Antwerpen, and third is the UK engineer, project manager who nominated the Dutchman and Belgian engineers in the first place. What is even more interesting is that more than half of the Dutcman’s personal network is outside the Esprit formal agreement. His network includes sources of information essential to this Esprit project in the US (i.e, Motorola, Stanford University, University of Minnesota) and outside the project with colleagues in Philips Semiconductors in Nijmegen. The network also includes sources in Germany (Siemens Semiconductors in Munich) and Italy (SGS-Thomson Microelectronics in Milan).

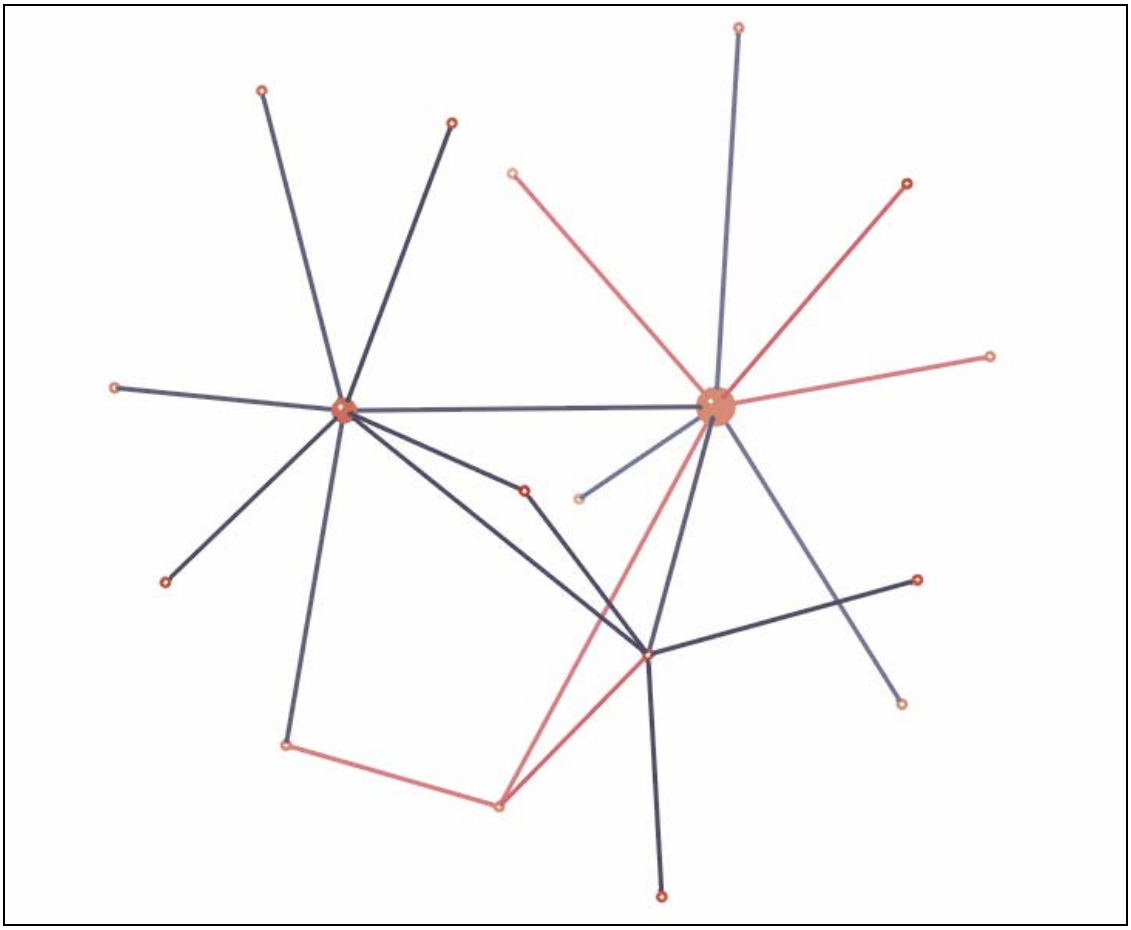
It is notable how nominated sources outside the Esprit project themselves nominate sources of information within the project so that networks which might have been thought to have been internal to Esprit are in fact intertwined with external information networks. The extent of overlap can be seen in the case of an American professor (bottom middle of the Graph)

> “Personal contacts are the only way to keep current. Publications lag by about 2 years. Only personal contacts are ‘adaptive’, in that the flow of conversation follows natural channels rather than be prescribed by editorial style and limitations on page

count. We should all possible to encourage personal contacts among workers in each field – and encourage cross-pollination as well. ”

from Stanford University who is linked with the UK main contractor, but also with two other nominations of the latter: the Dutchman and Belgian engineers mentioned above. Such overlaps allow valuable information for Esprit innovation to flow back and forth from the UK to the USA via a number of direct and indirect routes within and outside the project consortium.

Graph 2: DELPHI personal networks: Internal links (blue) vs. External links (red)



Concluding Thoughts

Esprit was the first, the largest and the longest of the European Commission's research programmes. Understandably, it became a model for other research programmes, but it was also a child of its time. The early 'eighties expected and required government involvement in high technology, in which IT was fundamental. Europe expected to be internationally competitive in IT, both in the industry itself and in other industries through the use of IT. Government involvement took the form of supporting if not national champions then European champions, firms reckoned to be large and strong enough to take on the best and biggest in the world. In the Esprit case, government involvement also took the form of supporting pre-competitive research carried out in collaborative, technology-driven projects which, because of the way they were formulated, monitored and assessed, tended to focus on what the Big Twelve, the equipment suppliers, wanted to do anyway.

Innovation and technology policy has moved on in the last two decades. The IST Programme, which replaced Esprit in the Fifth Framework (1998-2002), was very much market-driven and user-driven. Market-pull has replaced technology-push and the contrived notion of pre-competitive research, which did not survive to see the end of Esprit any more than did the dominance of hardware over software. And yet, the Commission's insistence on collaboration in much larger project networks is as strong as ever in the Sixth Framework (2003-2006) programme. It is true that collaboration in IST can still be justified in the terms in which it has been justified in Esprit over the last two decades. It is also true that collaboration among firms is hardly going out of fashion, though it commonly takes the form of mergers, joint ventures and acquisitions these days. But European firms would rather collaborate with firms outside Europe, especially firms in the USA, than with those in Europe, and they certainly have no desire to restrict their collaboration to technological innovation. It is surely sobering that an indication of the success of Esprit is that "prior to Esprit European firms sought out American companies for technological partnerships. Because of Esprit European companies now seek out European partners" (Peterson and Sharp, 1998, p.73).

But collaboration did not endure in Esprit and has not been retained in IST for the advantages claimed for it in the early 1980s, nor because it is still fashionable. No, the Commission has

retained collaboration in IT research for other reasons altogether, basically so that SMEs, firms from the “less favoured regions” in the South of Europe, and now the users of IT, can be included in projects.

> "The reasons the Commission have to impose some partners is that they will be left out if they don't, and they put money into the pot in Europe, and occasionally they are saying why don't you pick up this company in trouble... Yeah, all right we will have them in the project... It is a pain but we did it because it helps.... The EC is full of politics. Full of it, and we try and avoid that, and try and focus rather hard on what we try to do."

Mere inclusion does not guarantee that new participants actually do participate in projects, that they contribute or benefit at all; the reality of collaboration can mean the same old groupings and little new blood. Though the Commission justified its requirement for collaboration among participants in its RTD programmes in terms of the advantages for innovation, collaboration also satisfied the Commission’s own political requirements. Collaboration may bring political benefits for the Commission, but not necessarily benefits in terms of IT innovation. Much Esprit collaboration was nominal in that it was arranged to satisfy application requirements, to improve prospects of funding, or to please project officers with the consequence that some partners made little or no contribution to innovation. Such collaboration could hardly have improved the prospects of innovation. It may even have imposed a cost on innovation for which the benefits brought through informal networks extending beyond the formal collaboration were some compensation.

This study indicates that much of the information for innovation in Esprit did come from external sources – external to Esprit projects and often external to Europe. Very often it was acquired by personal and informal means. It would seem that the formality of collaboration in Esprit managed to accommodate this informal networking, not because the Commission was sensitive to the importance of these networks and anxious not to disrupt their operation, but because their

members were absolutely determined that the Commission would not interfere with their networks.

Non-European firms may now participate in European Commission programmes, but as non-funded and therefore unequal partners. This is some concession to reality, but still inadequate recognition of the non-European contribution to EC programmes in IT. The Commission still requires European firms to collaborate so that they may be more efficient in IT research, more innovative, and thus more competitive, especially against the Americans and Japanese. Such a notion is really no longer appropriate in the modern IT industry, an industry whose product, structure, ownership, research, innovation and market are utterly global. It is positively surreal in a research programme like IST, which specifically seeks to exploit networks and clustering, and in the very IT technology which facilitates information networking, both formal and informal. The consequence of the Commission's continued insistence on European collaboration may well be reduced IT activity in Europe, and this is far too great a price to pay for the political convenience of the European Commission.

References

Aldrich H and von Glinow M (1992) Personal networks and infrastructure development, in Gibson D *et al.* (eds) *Technopolis Phenomenon*, Rowman and Littlefield, New York, 125-145.

Assimakopoulos D and Macdonald S (2002) A Dual Approach to Understanding Information Networks, *International Journal of Networking and Virtual Organizations*, 1, 1-16.

Assimakopoulos D and Macdonald S (1999) Collaboration and Innovation Networks in Esprit, *Prometheus*, 17, 299-308.

Assimakopoulos D, Piekkari R and Macdonald S (2000a) ESPRIT: Europe's Response to US and Japanese Domination in IT, paper presented at the Eighth Schumpeter Conference on 'Change, Development and Transformation', CRIC, University of Manchester, Manchester, July.

Assimakopoulos D, Chrissafis A, Gustavsson P, Macdonald S and Marschan-Piekkari R (2000b) *Exploiting Informal Information Flow in the IST Programme*, Final InEsprit (project 29538) Report, Brussels, June.

Badaracco J (1991) *The Knowledge Link*, Boston MA, Harvard Business School Press.

Boisot M (1998) *Knowledge Assets*, Oxford, Oxford University Press.

Borgatti S P, Everett M G and Freeman L C (1999) *UCINET V*, Columbia, Analytic Technologies.

Coles A M, Harris L and Dickson K (2003) Testing Goodwill: Conflict and Cooperation in New Product Development Networks, *International Journal of Technology Management*, 25, 51-64.

Freeman L C (1998) Exploring social structure using dynamic three-dimensional color images, *Social Networks*, 20, 109-118.

Georghiou L (1999) Socio-economic effects of collaborative R&D: European experiences, *Journal of Technology Transfer*, 24, 69-79.

Georghiou L et al (1992) *The Impact of European Community Policies for Research and Technological Development upon Science and Technology in the UK*, Report prepared for DGXII, UKIMPACT, London.

Giusti W and Georghiou L (1988) The use of co-nomination analysis in real-time evaluation of an R&D programme, *Scientometrics*, 14, 265-281.

Hagedoorn J and Schakenraad J (1993) A comparison of private and subsidised R&D partnerships in the European information technology industry, *Journal of Common Market Studies*, 31, 373-390.

Hagedoorn J, Link A N and Vonortas N S (2000) Research partnerships, *Research Policy*, 29, 567-586.

Johannisson B (1998) Personal networks in emerging knowledge-based firms: spatial and functional patterns, *Entrepreneurship and Regional Development*, 10, 297-312.

Mytelka L (1995) Dancing with wolves: global oligopolies and strategic partnerships, in Hagedoorn J (ed.) *Technical Change and World Economy*, Edward Elgar, Cheltenham, 182-204.

Mytelka L and Delapierre M (1987) The alliance strategies of European firms in the information technology industry and the role of Esprit, *Journal of Common Market Studies*, 26, 231-253.

Narula R (1999) Explaining the growth of strategic R&D alliances by European firms, *Journal of Common Market Studies*, 37, 711-723.

Narula R and Hagedoorn J (1999) Innovating through strategic alliances: moving towards international partnerships and contractual agreements, *Technovation*, 19, 283-294.

Osborn R and Hagedoorn J (1997) The institutionalization and evolutionary dynamics of inter-organizational alliances and networks, *Academy of Management Journal*, 40, 261-278.

Peterson J (1991) Technology policy in Europe: Explaining the Framework Programme and Eureka in theory and practice, *Journal of Common Market Studies*, 29, 269-290.

Peterson J and Sharp M (1998) *Technology Policy in the European Union*, Macmillan, Basingstoke.

Piekkari R, Macdonald S and Assimakopoulos D (2001) In bed with a stranger: finding partners for collaboration in Esprit, *Science and Public Policy*, 28, 68-78.

Quintas P and Guy K (1995) Collaborative, pre-competitive R&D and the firm, *Research Policy*, 24, 325-348.

Ray T (1998) Collaborative research in Japan and the West: A case study of Britain's response to MITI's fifth generation computer initiative, in Hemmert M and Oberlander C (eds) *Technology and Innovation in Japan*, Routledge, London, 151-169.

Richardson D and Presley B (1999) *MAGE 5.4*, Biochemistry Department, Duke University, Durham NC.

Wasserman S and Faust K (1994) *Social Network Analysis*, Cambridge University Press, Cambridge.