

Innovation Cooperation Networks: Case of a Multisectoral and Interdisciplinary Partnership

Jorge de Carvalho Alves¹, Celeste Amorim², Maria José Marques³, Irina Saur⁴

¹ jalves@egi.ua.pt

² camorim@egi.ua.pt

³ haneman@dao.ua.pt

⁴ isaur@egi.ua.pt

DEGEI, Department of Economics, Engineering and Industrial Management, University of Aveiro, Aveiro, Portugal

Abstract

Network cooperation processes gained special interest in the new knowledge economy as they provide better conditions to innovation and knowledge creation and diffusion. Although the importance of this strategic tool has been increasingly recognized, individualistic behaviour tends to prevail within small and medium-sized firms and many of them continue to exhibit an attitude of resistance when dealing with collaborative experiences.

This paper has two main goals. First, it explores how networks can promote innovation and help overcome the difficulties inherent in cooperation processes. Second, it illustrates an innovative approach to network cooperation in a multisectoral and inter-disciplinary environment, presenting the experience of the "House of the Future" network in Aveiro, Portugal.

Introduction

In a period characterized by radical economic and social changes, new competitive pressures are increasingly challenging the productive systems. In this context, firms are forced to adapt their organisational and managerial settings, in order to face increased competition.

Inter-firm networks arise as an attractive organisational solution for firms due to their low overhead costs, increased responsiveness and flexibility and great operational efficiency. There is a tendency to move from the traditional competition paradigm to collective competition, where firms rely on network-based advantages to differentiate themselves from their competitors (Gomes-Casseres, 2003: 329).

Innovation, one of the key drivers of firms' competitiveness, should be regarded as a result of interactive processes (rather than the product of a single actor), usually based on networking. Networks represent a distinctive form of economic organisation, now extensively used to optimize the creation and use of knowledge leading to innovation.

The complexity of scientific and technological inputs, the uncertainty of economic conditions and the risks associated with tentative technological trajectories have reduced the advantages of vertical and horizontal integration and made hierarchies a less efficient way of responding to market imperfections. The need to respond to and exploit the market imperfections has pushed inter-firm networks at the forefront of corporate strategy (Chesnais, 1988; Powell, 1990).

Inter-firm networks provide the ideal context for the innovation processes to occur more effectively, as they facilitate and speed-up information and knowledge access, sharing and diffusion. As smaller and medium-sized firms usually lack the necessary resources and competencies required to innovate, their participation in such networks can overcome those limitations and turn innovation into a strategic goal applied to day-to-day routines.

Networks based on multisectoral and interdisciplinary co-operation can bring additional benefits for these firms, as the information and knowledge flows are more intense and the shared competency set is richer and based on complementarities.

Yet, networks' creation, management and organization processes differ from one network to another. It is essential to comprehend which are the factors that determine networks' success, in order to help networks' managers and promoters to do "the right thing".

This paper underlines the importance of cooperation processes in promoting small and medium-sized firms' innovation capacity and identifies conditions suitable for networks success. It illustrates an innovative approach to network co-operation in a multisectoral and interdisciplinary environment, based on the case of the "House of the Future" network that has been operating in Aveiro, Portugal.

We begin by addressing the relationship between innovation, knowledge creation and firm's size from a theoretical perspective. We continue with the benefits and challenges of small and medium-sized firms' networking for innovation and we put particular emphasis on multisectoral innovation and interdisciplinary partnerships.

We then present the "House of the Future" project and indicate some success factors, presenting the vision of the management team and of the participants themselves, in various moments during the network's existence. We conclude by suggesting a paradigm for stimulating smaller and medium-sized firms to innovate in a sustainable way, using as an instrument multisectoral and interdisciplinary co-operation networks.

The overall emphasis of the paper is placed on the attributes of co-operation networks addressing strategic, technological and innovative purposes and on the creation of platforms supportive of interactive learning processes.

Innovation, knowledge creation and firm's size

In today's uncertain and fast moving economic environment, innovation appears as an important driver of firms' competitiveness. One of the bases of innovation is organizational knowledge creation and absorption (Nonaka and Takeuchi, 1995). To create knowledge, two factors are essential: competency crossing (to share tacit knowledge) and easy access to relevant and diverse information, namely related to science, technology, markets, production, social trends, economic climate, etc. (Hamalaian and Schienstock, 2000).

New knowledge is typically created when different types of knowledge are exchanged and combined or when the same knowledge elements are combined in a new way (Grant, 1996 and Nahapiet and Ghoshal, 1998). Even when combining high diversity knowledge bases, the benefits to learning and innovation more than justify the inevitable problems due to communication difficulties.

It is important to emphasize that knowledge creation does not, by its own, ensure long-term competitive advantage. Direct impacts on firms' competitiveness require not only the creation of knowledge, but also its practical application under the form of new products and services (Zahra and George, 2002a cited by Carlsson, 2003).

Furthermore, to increase their innovative capacity, firms need to adapt their structures (Shapiro, 2002: 21) and foster new instruments and new ways of working. The comparison with other firms' behaviour and solutions (benchmarking) provides impetus and reliability for this sort of organizational innovation.

The degree of flexibility and the available resources for innovation vary significantly across firms and sectors (Malerba, 2002). Large firms usually have the human and financial resources required to sustain and develop innovative activities (Carayannis and Samanta Roy, 2000). They normally have R&D activities, trend analysis and forecasting teams, strategy setting groups, and other innovation promoting tools in place and functioning effectively. Innovation is part of their strategy and tactics.

However, their heavy organizational structures and structured analysis and decision making processes raise obstacles to change (Carayannis and Samanta Roy, 2000). Fast and profound change is particularly difficult for many of the large firms. Most of their innovation tends to be incremental. However, it is argued that competitiveness is driven by a combination of incremental and breakthrough innovation (Kassicieh et al, 2002).

Smaller firms usually lack sufficient human and financial resources. They have limited access to relevant and diverse information sources, as external ones are costly and internal ones

insufficiently developed. They have difficulties in putting together consolidated R&D activities and the resources allocated tend to be small when compared to larger firms (Narula, 2004).

Yet, their structures tend to be more flexible than in larger firms (Hoffman et al, 1998: 49, Narula, 2004 and Carayannis and Samanta Roy, 2000) and can cope better with changes associated with breakthrough innovation. However, it can be argued that there is a tendency to concentrate firm's efforts in less risky activities and in solving day-to-day problems. Consequently, even when innovation is seen as a conscious strategic goal, short term tactics usually take precedence.

In spite of their flexibility, small and medium-sized firms generally lack: a) organized research activities; b) diversified human resources; c) access to relevant and diverse information sources (Carlsson, 2003). This leads to the question: how can smaller firms overcome these difficulties and increase the quality and quantity of their product and process innovations?

One common answer is smaller firms' participation in co-operative arrangements (i.e. networks) with other firms, organizations and scientific & technological institutions (e.g., universities). Inter-organizational networks promote interaction and co-operation between members and can benefit their members in various ways (Szeto, 2000: 150 and Carlsson, 2003). It is argued that small and medium-sized firms participate in networks 'in order to gain the advantages of bigness while keeping the flexibility of smallness' (Sydow and Windeler, 1998: 265).

These arrangements can ensure multidisciplinary competency crossing and sharing of information (Freel, 2003). The knowledge resulting from these processes can be shared within the organization, stored or used by knowledge workers to create new products (Nonaka and Takeuchi, 1995). Innovation-related networks can be seen as 'learning experiments', a response to the 'appropriability' of key tacit knowledge (Ciborra, 1991). Seufert, Krogh and Back (1999: 8) emphasize the role of the network in knowledge creation and transfer, considering it as a privileged place for such processes while accelerating the innovation rate.

Networking benefits members in ways that transcend individual efforts, such as: a) 'increased scale and scope of activities'; b) 'shared costs and risks'; c) 'improved ability to deal with complexity'; d) 'enhanced learning effects'; e) 'positive welfare effects'; f) 'flexibility and efficiency' and g) 'speed' (Hamalaian and Schienstock, 2000, Narula, 2004 and Freel, 2003).

The involvement of scientific & technological (S&T) institutions brings to these cooperative networks up-to-date and easily searchable information sources, as well as multidisciplinary human resources (Westhead and Storey, 1995, cited by Freel, 2000) that allow vigorous competency crossing. They are an important source of new scientific knowledge (Lofsten and Lindelof, 2004).

Although the relationships between S&T institutions and small and medium-sized firms are not pain free, they can help overcome smaller firms' limitations and promote successful innovation. The S&T institutions look for sponsorship from the firms for their basic R&D processes and the firms wish to apply the results of this research and launch new products (Szeto, 2000: 154 and Lofsten and Lindelof, 2004).

Multisectoral innovation and interdisciplinary partnerships

The co-operation for innovation of firms from various sectors and S&T institutions can lead both to incremental and breakthrough innovation and can ensure that firms' tactics are in line with medium and long range strategic goals centred on innovation.

It is argued that the complementarity of actors triggers mechanisms of growth and leads to innovation (Malerba, 2002). The so-called 'diagonal networks', made up of actors with complementary competencies acting in different sectors, have been emerging in the last decade (Shapiro, 2002: 22).

As innovations in one sector can spill over to other sectors (Dietzenbacher, 2000: 28) and ensure first mover advantage, firms have much to gain from multisectoral co-operation networks. Additionally, multisectoral co-operation processes provide better conditions to elude the communication constraints associated with single-sector competitive environments (Szeto, 2000: 154 -155 and Shapiro, 2002: 21-22).

Consequently, multisectoral co-operation networks can be extremely successful in promoting innovation and can lead to sustainable technological development in participating firms (Nelson and Rosenberg, 1993 cited by Malerba, 2002).

In spite of the existence of this type of networks, where direct competition between actors does not exist, smaller firms' short-term view and individualism tend to prevail (Narula, 2004 and Freel, 2000). Moreover, even when the benefits of this type of networking are recognized and valued, smaller firms face difficulties in getting organized and in mobilizing resources to engage in satisfactory cooperative agreements with firms from other sectors. This is explained by cultural preconceptions and by the high complexity of the processes. Consequently, multisectoral and multidisciplinary co-operation between small firms rarely occurs spontaneously.

The scientific community and practitioners have been looking into the success factors and challenges of co-operation networks, in order to detect new instruments to promote sustainable co-operation processes.

The success factors most commonly identified include: a) leadership – managing each relationship carefully, planning and committing resources to the network in a rigorous way etc.; b) trust – favouring open communication and developing and nurturing relationships between people; c) geographical proximity; d) actors' positive attitude towards co-operation; e) existence of learning processes – ensuring the actors communicate, share knowledge, objectives and goals etc. and f) escalation of commitment and satisfaction – ensuring that the benefits and contributions of each actor are equally perceived (Moreira and Corvelo, 2002; Doz, Olk and Ring, 2000: 241 – 242 and Arias, 1995:55).

The network organization and management seem to be intimately related to the success of the network and specific elements related with these two processes have been referred to in the literature (Moreira and Corvelo, 2002 and Doz, Olk and Ring, 2000: 241 – 242).

Organizing a co-operation network is not easy. Finding a common goal for co-operation, a 'triggering entity', creating a structure to support the network and establish trust are some of the challenges that organizers face (Doz, Olk and Ring, 2000: 241 – 242). Narula (2004) emphasizes that co-ordinated action from scientific & technological institutions can promote successful multisectoral co-operation calling for multidisciplinary competencies, shared information and resources pooled around common goals, both with smaller and medium-sized firms and larger ones.

Managing a co-operation network is not an obvious process either, as: a) the actors that form the network have different degrees of independence and ways of working and b) the mechanisms that glue the actors together are unstable (Arias, 1995: 53). Moreover, 'the interactions and interdependencies between the constituent elements in these networks are so complex that is virtually impossible to control and design them hierarchically' (Akkermans, 2001: 179). In multisectoral networks, the actors are characterized by higher cultural, technical and knowledge diversity, which makes the management processes even more complex.

It needs to be emphasized that each network is singular and distinctive, due to the specificities that characterize its creation and evolution. Only a balanced combination of factors can ensure the equilibrium needed for successful networking. However, it is not clear which are those factors in each specific case, nor which are the tools required to measure and evaluate them effectively. Consequently, network managers and promoters are left wondering: Are we doing the right thing?

To answer this question, many more successful case studies need to be analyzed and discussed by the scientific community, professionals and policy decision-makers.

The second part of this paper contributes to such an analysis and discussion by presenting a successful multidisciplinary and multisectoral network, gathered around a common conceptual and technological goal: the conception and building of a House of the Future. We discuss some approaches used to inspire, stimulate and manage this network, and we suggest some of its success factors.

The “House of the Future” Co-operation Network

The “House of the Future” co-operation network was created in 1999 in the Aveiro Region, in Portugal. The promoter was the University of Aveiro, which, at that time, was looking into the role of companies in regional development. The network began rather informally and the initial purpose was to provide a co-operation forum for firms acting in the meta-sector of habitat. It took in firms concerned with the project, construction and furnishing of houses and other buildings.

Table 1 – “House of the Future” co-operation network: main characteristics

Network start date:	1999
N.º of partners (May 2004):	12
Funding:	Self-funding (100% private)
Strategic goals:	Innovation in the Habitat field; Create conditions to build a House of the Future.
Network type:	Open diagonal network

The network evolved and became a formal association, called AveiroDOMUS, whose statutory objectives are “the promotion and dissemination of theoretical, scientific and technological innovation related to new product and processes from the habitat field, particularly by creating the necessary conditions to design and build a structure called House of the Future”.

Currently, the network comprises the university and one dozen firms from different industrial sectors. Most of those are medium sized firms. Each member pays an annual fee (at present around 6.000 euros) and the funds are used to organize and manage all network activities.

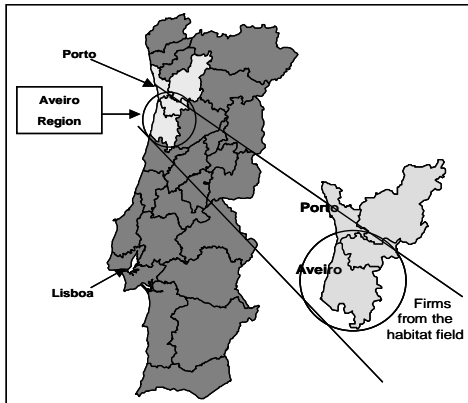
Linkages amongst members and with firms outside the network are encouraged and surge spontaneously, and in many cases have provided opportunities for actual business deals. Occasionally, some linkages are suggested by the project management team.

Table 2 shows the main area of activity of each one of the network members. The concept of a House of the Future calls for wider competencies than those present today in the network. The network is open to new members in order to fill in the competency gaps.

Table 2 – “House of the Future” co-operation network: partners’ characteristics

Main area of activity:	Localization:
Furniture & Fixtures	Aveiro
Aluminium profile	Aveiro
Flushing cisterns and sanitary equipment	Aveiro
Architecture	Aveiro
Pre-fabricated concrete elements	Aveiro
Gardening and Watering systems	Aveiro
Ceramic tiles	Aveiro
Sanitary ware	Aveiro
Civil engineering and building	Porto
Kitchen appliances	Aveiro
Hardware	Aveiro
Research & Development (University)	Aveiro

The Aveiro Region offered good grounds for the creation and development of this network. It is included in the economically dynamic northern coastal strip of the country. Entrepreneurial spirit is quite strong, and there is a large number of export oriented small and medium-sized firms.



The industrial model which characterizes housing industries of this region is the result of a spontaneous agglomeration of firms, sharing the same industrial activity, the same labour pool and the same technical culture. These agglomerations were generated by a process of extensive growth based on productive imitation.

However, the firms involved in this process generally fail to display technological vitality. Most of them employ traditional production models and equipments, basing their competitiveness more on price than on technology and innovation based differentiation. In this they reflect the attitude of the house building sector, which in turn replicates the conservative demands of the buying public.

The initial network strategy was centred on the promotion of technological innovation related to new product and process development. This is a rather vague strategic pronouncement. A more tangible challenge was needed to bring together the associated companies and the university and to build a stable and satisfactory relationship.

Table 3 – “House of the Future” project: main characteristics

Duration:	2004 – 2006
Responsible entity:	AveiroDOMUS
Nº of partners (May 2004):	12
Project goal:	Create the Construction Plan of the House of the Future
Funding:	75% Public & 25% Private
Total funding amount:	~ 3.400.000,00 €

This challenge took the form of a multidisciplinary and multisectoral R&D project called “House of the Future” (see Table 3). This project’s main result will be the blueprints for the actual construction of the first version of the House of the Future. At the same time, it will create conditions for the conceptual and technological development of innovative products and solutions that will enhance the competitiveness of the participating firms.

The approach to the Construction Plan of the House (blueprints) was by itself innovative. It would not be possible to use the traditional techniques to prepare the plan or require the services of a Project Company. In each specific aspect of the House, both conceptual and constructive, it is necessary to foresee tendencies and futuristic solutions, without the limitations of current methods and practices.

The Construction Plan is based on a number of sub-projects, independently developed and guided by the futuristic orientation of the solutions, but subject to strong co-ordination and interlinking (see Table 4).

Table 4 - “House of the Future” Construction Plan: sub-projects

Sub-projects	
Architecture	Furniture & Fixtures
Access & mobility	Gardening & Sprinkling
Acoustics	Heat isolation
Air quality	Illumination
Civil Engineering	Maintenance & cleaning
Communications	Recycling
Domotics	Security
Electricity	Specific rooms
Energy	Water
Entertainment	

Part of the specifications and a preliminary design of the House have been elaborated by the network members. All products to be developed within the “House of the Future” project are required to follow these specifications (see Table 5).

Table 5 – “House of the Future” specifications

Specifications – Guiding principles	
Adaptable and customizable according to the inhabitants	Infrastructural flexibility
Comfort	Proximity and integration in the environment
Demonstration and test of innovative products and processes	Quality of materials and constructive processes
Entertainment and well-being	Robustness
Environmentally friendly	Security
Evolution capacity	

The “House of the Future” network aims to develop breakthrough innovation while strengthening inter-firm cooperation and university-industry relations. This is achieved through: a) tight central coordination; b) informal and formal communication channels; c) stimulus to knowledge sharing and team working and d) creating pressure for firms’ co-operation.

First, the university plays an important role in the creation, organization and pushing up of the network. It has facilitated the creation of trust between participants and has provided the infrastructure and the organizational resources required for effective and efficient functioning. It is considered the glue that binds the network together.

Second, the “House of the Future” network creates opportunities to develop new (formal and informal) communication channels amongst firms and between firms and the university. These channels bring the participants together to design tomorrow’s products and systems, but also provide excellent opportunities to co-operate in today’s business.

Third, the “House of the Future” project creates a favourable co-operation environment, which stimulates knowledge sharing and team working towards a common goal. All network participants have been making arrangements to accommodate the challenges posed by the “House of the Future” project and the strategic goal of AveiroDOMUS, which are being integrated into each firm’s strategy.

Multidisciplinary and multisectoral teams are being created to effectively and efficiently address the project objectives and to maximize the benefits to the participants. These teams comprise researchers from the university and professionals from firms and are being facilitated by the project management team led by the university.

Table 6 shows the multidisciplinary teams formed to deal with each sub-project that will integrate the Construction Plan. Each team includes a mix of participants from firms and from different departments within the university. Consequently, there is a variety of competencies and high multidisciplinary in most teams. The average team size is 12 people.

Table 6 - Participation in the multidisciplinary teams to build the Construction Plan

Sub-projects	N.º of departments involved	N.º of firms involved	N.º of people involved
Architecture	3	6	17
Access & mobility	5	4	10
Acoustics	4	3	11
Air quality	2	1	4
Civil Engineering	2	5	18
Communications	4	2	11
Domotics	3	4	15
Electricity	3	2	7
Energy	4	5	15
Entertainment	4	2	9
Furniture & Fixtures	2	4	12
Gardening & Sprinkling	5	4	18
Heat isolation	4	3	13
Illumination	4	1	6
Maintenance & cleaning	3	2	5
Recycling	6	3	16
Security	3	3	9
Specific rooms	3	5	16
Water	3	3	17

The scientific and technological information sources that the university is used to access create a strong, diverse and up-to-date R&D knowledge base, indispensable for sustainable innovation. The multidisciplinary competencies that the university possess complement the competencies of the various firms, as it is illustrated in the previous table.

Finally, the initiative of the House of the Future creates a favourable pressure for firms' co-operation. The network dynamism and the intensity of the relations between participants have created a highly responsive environment and the common high expectations that were developed compel each participant to innovate.

The network is expected to have dynamic effects on firms. First, they will improve their technological capacity and new product innovation processes.

Second, explicit project strategy and tactics internalized by all the network participants forces smaller firms to comply with their "innovation objectives", which are usually put aside due to day-to-day pressures and problems. Consequently, the network drives its members towards the inclusion of the innovation strategies into their current management processes.

Third, the image of the participating firms will benefit from the visibility and charisma of the project, an example of multisectoral and multidisciplinary co-operation between firms and university leading to breakthrough innovation.

As far as the University is concerned, the project is stimulating interdepartmental co-operation and multidisciplinary R&D and is developing horizontal competencies for the meta-sector of habitat. The ambition is to create a large educational and scientific research programme

inspired by the habitat meta-sector. This will contribute to strengthen the institution's identity and to differentiate it from other higher education establishments.

The "House of the Future" network welcomes new members, either firms or S&T institutions. The network's strategic goals represent a big challenge that requires more skills than those provided by the present members. The network will grow, and with this growth there might be an opportunity to create a modern habitat cluster in the Aveiro Region.

House of the Future network: Success Factors

The next paragraphs describe three different perspectives related to the critical success factors of the House of the Future Network.

The first perspective is based on a study of best practices in networking developed by the University of Aveiro in 2003 for IFEA (Institute for Advanced Professional Training), which focused on the analysis of the main success factors of the "House of the Future" network. The second perspective represents the network firms' perspective based on informal conversations between the project management team and the network participants. Finally, the third perspective reflects the opinion of the project management team.

a) IFEA study results

The objective of the study (Alves, Costa and Soares, 2003) was to identify the success factors and the drawbacks of the network at that time. The success factors distinguished in the study resulted from interviews with some of the network firms and from the authors' analysis and opinions.

Some of the success factors identified are quite subjective: the challenge that the network represents to each partner and its multidisciplinary and diversity characteristics.

Other success factors were more factual. In the first place, the initial number of firms involved was quite small, there were no direct competitors and opportunities for informal gatherings between partners were frequent. All this allowed for the partners to know each other and to develop a cohesive core of firms acting within the same frame of mind.

Secondly, the university assumed a key role in the network dynamics and organization, and this was well accepted by the other participants, who looked to the university as an impartial partner.

Thirdly, the University involved a Vice-Rector in the network, which led to the same high-level representation on the side of the firms.

Fourthly, the theme of the network was attractive for all network members

Finally, there was strong empathy amongst participants – which helped network functioning and internal linkages establishment.

b) Firms' current perspective

The project management team has been trying to understand what are the factors that explain the continuous involvement of the network participants. Therefore, frequent informal conversations are being held at each encounter with the participants (sensibly each month) to investigate if firms' perspective has altered. The main findings are described in the next paragraphs.

Firstly, firms believe that the opportunity to gather informally and frequently maintains trust and promotes continued communication and linkages. The network members see informal meetings as a way to detach from the day-to-day working problems, share opinions and identify actual business opportunities with the other network members.

Secondly, firms acknowledge that trusting the other network members is essential for their participation in the network. Without trust, open communication would not be possible, nor would be joint business deals.

Thirdly, network members consider that the environment created by the existence of a project with deadlines forces the firms to innovate. As there are compromises with the other network members, firms are forced to consider innovation as a continuous priority, part of their day-to-day processes. This "forces" them to include the strategic goal of innovation into their tactics.

c) Project management team's perspective

The House of the Future Project Management team has also been looking into the factors that promote the project's success, since 2003. A number of these factors have been identified.

The first one is related to the fact that the network firms have been carefully selected. They stand out, in terms of their regional impact, innovation capacity, export orientation, competitiveness, etc.

The second one relates to the participation, in the network meetings, of firms' top executives. The initial contacts were established personally by a Vice-Rector of the University. Given the prestige of the university in the region, almost all the firms reciprocated and involved their CEO's in the network. These individuals have the capacity to decide on the spot for their firms, and this allowed for an agile and flexible decision making process.

The third one is the opportunity for these top executives to develop common business deals, which go beyond the network's strategic goals. This reinforces their perception that networking brings benefits.

The fourth is the existence of a long-term strategic goal (i.e. the planning and construction of the "House of the Future"), aligned with the individual strategic goals of firms and the university.

The fifth success factor is the availability of the financial resources needed to organize and manage the network. It is important to underline that these resources have been provided so far by the very actors of the network and not by public funding.

The sixth success factor is the role the university played in stimulating and organizing the network. The university is regarded by the other actors as an independent and impartial element which facilitates relationship and mobilizes partnerships.

The project management team also considers that trust, the opportunity and frequency of informal gatherings and absence of direct competitors have played an important role in network success. The formal and informal gatherings promoted trust, as each actor could witness the dedication of the others. The absence of direct competitors facilitated frank and honest co-operation between members, in a region where individualistic behaviour and peer suspicion seems to prevail.

Table 7 – Success Factors: Three different perspectives

IFEA Study (1999 – 2003)	Firms (1999 – 2004)	Project Management Team (2003 – 2004)
No direct competitors	-	No direct competitors
Frequent opportunity for informal gatherings	Frequent opportunity for informal gatherings	Frequent opportunity for informal gatherings
University: motivator and organizer	-	University: motivator and organizer
Presence of the Vice – Rector	-	Presence of top executives
Initial number of firms was small	-	-
-	-	Careful selection of participants
Attractive network theme	-	-
-	-	Long term strategic goal
Strong empathy	-	-
-	Trust	Trust
-	Project with deadlines	-
-	-	Common business deals
-	-	Financial resources

The relevance of some of these factors changed over time and new ones were identified. This emphasizes the advantages of looking into such case studies during the various phases of their evolution, to ensure the correctness of the inferences and to update previous interpretations.

Conclusions

We have studied a multisectoral network with partners from industry and from a university. To our knowledge, such networks are not frequent, and very few are successful.

The “House of the Future” case contributes to a better perception of the way these networks function and presents the success factors as seen by the firms’ representatives and by the project management team. Some of the identified factors are common, some are not and in some aspects they evolved over time. We consider that this multiple perspective adds new value to networks’ analysis.

The dynamism of the network points out to the necessity to continue studying its behaviour along its life, trying to understand the evolution of the conditions for its success.

Each network is a specific case, hence generalizations are always precarious. However, we can and must try to learn from the House of the Future experience, and point out some methodological principles that might be successfully replicated in other contexts.

The House of the Future network benefits from three main elements that provide a paradigm for stimulating smaller and medium-sized firms to innovate in a sustainable way: a) a co-operation network with participants from firms and university; b) multidisciplinary and multisectoral competencies / actors and c) a long-term strategic vision.

We consider that replications of this experience could gain from a methodological approach guided by the following principles:

- First, network participants should exhibit complementary idiosyncratic abilities. The integration of these abilities provides a base for common developments.
- Second, a long-term strategic goal seems essential to ensure network sustainability and to persuade the firms that the effort is worthwhile.
- Third, an efficient management structure must be put in place, in charge with network logistics but also with the motivation and inspiration of network members.
- Fourth, the participants in the network should be top-executives or people close to them, with capacity to decide and engage their organizations.
- Fifth, a S&T institution should be involved, as an active member.

We emphasize that the process of creating, organizing and motivating a multisectoral network between firms and institutions is long and can be costly. Therefore, the network actors need to be aware that some of the potential benefits will only become tangible on the long-run.

Beyond this methodological approach and the study of the network’s success factors, we believe that other research directions can be investigated.

The specific experience described in this paper can also help to comprehend how multisectoral networks can serve to increase university-industry relations and to stimulate regional economic development, and so influence regional policy design. Future research could address multisectoral networks’ implications in the fields mentioned above.

References

Akkermans, H. (2001): Renga: A systems approach to facilitating inter-organizational network development, in: *Systems Dynamics Review*, vol. 17, 3, p. 179 – 193.

Alves, J., Costa, D. and Soares, A. (2003): *Rede de Cooperação da Casa do Futuro: Caso de sucesso ditado por Dinâmicas de Rede de Inspiração Sectorial*. Estudo n.º 12. Programa Empreender – Melhores Práticas. IFEA, Lisbon.

Arias, J. (1995): Do networks really foster innovation?, in: *Management Decision*, vol. 33, 9, p. 52 – 56.

Carayannis, E., Samanta Roy, R. (2000): Davids versus Goliaths in the small satellite industry: the role of technological innovation dynamics in firm competitiveness, in: *Technovation*, vol. 20, 6, p. 287 – 297.

Carlsson, S. (2003): Knowledge managing and Knowledge Management System in Inter-Organizational Networks, in: *Knowledge and Process Management*, vol. 10, 3, p. 194 – 206.

Chesnais, F. (1988): Technical Co-operation Agreements Between Firms, in *STI Review*, 4, OCDE.

Ciborra, C. (1991): Alliances as Learning Experiments: Cooperation, Competition and Change in High-Tech Industries, in: Mytelka, L.K. *Strategic Partnerships: States, Firms and international Competition*. Pinter Publishers, London.

Dietzenbacher, E. (2000): Spillovers of Innovation Effects, in: *Journal of Policy Modeling*, Vol. 22, 1, p. 27 – 42.

Doz, Y., Olk, P., Ring, P. (2000): Formation processes of R&D consortia: Which path to take? Where does it lead?, in: *Strategic Management Journal*, vol. 21, p. 239 – 266.

Freel, M. (2000): External linkages and product innovation in small manufacturing firms, in: *Entrepreneurship & Regional Development*, 12, p. 245 – 266.

Freel, M. (2003): Sectoral patterns of small firm innovation, networking and proximity, in: *Research Policy*, vol. 32, 5, p. 751 – 770.

Gomes – Casseres, B. (2003): Competitive advantage in alliance constellations, in: *Strategic Organization*, Vol. 1, 3, p. 327 – 335.

Grant, R. (1996): Toward a Knowledge-based Theory of the Firm, in: *Strategic Management Journal*, Special Issue, p. 109 – 122.

Hamalainen, T. and Schiestock, G. (2000): *Innovation Networks and Network Policies*. OCDE.

Hoffman, K., Parejo, M., Bessant, J., Perren, L. (1998): Small firms, R&D, technology and innovation in the UK: a literature review, in: *Technovation*, Vol 18, 1, p. 39 – 55.

Kassicieh, S., Kirchoff, B., Walsh, S., McWhorter, P. (2002): The role of small firms in the transfer of disruptive technologies, in: *Technovation*, vol. 22, 11, p. 667 – 679.

Kline, S. and Rosenberg, N. (1986): An Overview of Innovation, in: Landau, R. and Rosenberg, N. (eds.): *The Positive Sum Strategy: Harnessing Technology for Economic Growth*, National Academy Press, Washington.

Lofsten, H. and Lindelof, P. (2004): R&D networks and product innovation patterns – academic and non-academic new technology-based firms on Science Parks, *Technovation*, Article in press, Corrected Proof.

Malerba, F. (2002): Sectoral systems of innovation and production, in: *Research Policy*, vol.31, 2, p. 247 – 264.

Moreira, P. and Corvelo, S. (2002): *Cooperação interorganizacional: das trajectórias às redes*. INOFOR, Lisbon.

Nahapiet, R. and Ghosal, S. (1998): Social Capital, Intellectual Capital and the Organizational Advantage, in: *Academy of Management Review*, vol.23, 2, p. 242 – 266.

Narula, R. (2004): R&D Collaboration by SMEs: new opportunities and limitations in the face of globalization, in: *Technovation*, vol. 24, 2, p. 153 – 161.

Nonaka, I. and Takeuchi, H. (1995): *Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*, Oxford University Press, Oxford.

Powell, W.W. (1990): Neither Markets nor Hierarchy: Network Forms of Organisation, in Straw and Cummings, L.L. (eds.) *Research in Organisational Behaviour*, vol 12, 2.

Rollett, H. (2003): *Knowledge Management: Processes and Technologies*. Kluwer Academic Publishers.

Seufert, A., Krogh, G., Back, A. (1999): Towards Knowledge Networking, in: *Journal of Knowledge Management*, 3, 1999, p. 180 – 190.

Shapiro, C. (2002): *STI Working Papers 2002/11: Competition Policy and Innovation*. OCDE.

Sydow, J. and Windeler, A. (1998): Organizing and Evaluating Interfirm Networks: a Structurationist Perspective on Network Processes and Effectiveness, in: *Organization Science*, vol. 9, 3.

Szeto, E. (2000): Innovation capacity, in: *The TQM Magazine*, Vol. 12, 2, p. 149 – 157.