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# NETWORKS OF SMES: THE ECOLEAD APPROACH TO SUPPORT COLLABORATION AMONG SMES

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# NETWORKS OF SMES: THE ECOLEAD APPROACH TO SUPPORT COLLABORATION AMONG SMES

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## Abstract

*Faced to the globalization of the markets, SMEs develop new forms of relationships aimed at reinforcing their productivity. One of them is based on the development of networks of SMEs. Even if this concept is not new (see Italian Industrial Districts in the 19<sup>th</sup> century), it is now growing at a dynamic pace. The concept of Virtual Organizations Breeding Environment (VBE) is one expression of this phenomenon deeply developed in the Ecolead's project. This paper proposes to deliver insight on this promising concept, associated ICT tools and also a presentation of an in-progress case study.*

*Keywords: SME cluster, virtual organization, breeding environment, collaborative network, Ecolead.*

## 1 INTRODUCTION

The challenges posed by the globalization process are reshaping inter-firm relations. Competition is shifting from a traditional "firm Vs firm" configuration towards the confrontation of extended enterprises (Archibald, Karabakal, & Karlsson, 1999 1999)(Lavie 2006; Grant & Baden-Fuller 2004) and the creation of value networks (Tekes, 2006). Strategic alliances and new forms of cooperation based on trust emerged as viable strategies for SMEs to pursue competitiveness (BarNir & Smith, 2002; Bunduchi, 2005; Yamada, 2003), leaving a gap between the theories explaining the cooperative behaviour and real case observations (Lavie, 2006). Despite their relevance (Innobarometer, 2006) and the fact that a plethora of authors already analyzed different forms of industrial aggregations, including their effects on firms' competitiveness (Bernal, Burr, & Johnsen, 2002 2002; Hoover, 1948; Macneil, 1980; Marshall, 1922; Micelli & Di Maria, 2000; Nassimbeni, 1998; Panicia, 1998; Varaldo & Ferrucci, 1997) they hardly provided adequate indications for the development of appropriate tools to support collaboration in these dynamics environments. On these premises, this paper presents a set of guidelines and tools for helping SMEs to participate in collaborative networks, such as Virtual Breeding Environments, on the base of a common ICT infrastructure.. The results presented in this paper are part of the EU FP6 funded project "Ecolead" (European Collaborative Networked Leadership Initiative) that deepened the understanding of collaborative networks. The first section will present a brief introduction on the theoretical progresses achieved on Virtual Breeding Environment (long term association of organizations). The specificity of the research work achieved is that tools comprise not only software prototypes but also methodologies, guidelines with the aim to deliver to SMEs the necessary "preparedness" required for collaborative actions. In particular, supporting and delivering ICT and non ICT solutions (i.e. training, consultancy) for SME networks is to be conceived around three main inter related dimensions:

- trust building in a context where "coopetition" occurs (being at the same part partner for one customer demand and competitor on other projects) and where historical roots may be seen as a barrier;

- developing a reliable and updated competency map;
- ICT solutions appropriation since networks of SME are often geo located and used to face to face meetings.

Final part of our paper will be dedicated to the empirical investigation of Ecolead's pilot activities, as a first step in the validation process of the Ecolead's results. The case study will explore IECOS, a Mexican network of SME acting in the area of integrated product development: product design, process design and manufacturing systems design. IECOS is partner of Ecolead since the beginning of the project and has actively participated to the different phases of the research: from the conceptual framework for establishing a Virtual Breeding Environment (VBE) to the development of tools. This position in the project has prevented a top down approach, often too technological driven and has put the end users at the core of the approach. The conclusion of our paper will propose further research avenues for fostering collaboration among networks of SME.

## 2 THEORETICAL BACKGROUND

### 2.1 Collaboration and network

The strategic relevance of collaborative networks has become, in the last decade, one of the main research fields in organizational studies (Coe, 2001; Enright & Roberts, 2001; McDonald & Vertova, 2001). The origin of these studies can be traced back to Marshall's works (1922) and the concept of externality. More recently, the development of new organizational forms, hardly conceivable within a dichotomous logic of either market or hierarchy, generated different and divergent interpretations of what was being observed on the market (Grandori & Soda, 1995; Podolny & Page, 1998). This condition, together with a "phenomenon-driven" research effort of scholars, left a certain gap between the empirical evidence and the theories explaining cooperative behaviours. A gap filled by an overabundance of formulations investigating cooperation's causes and consequences (Grant & Baden-Fuller 2004). Despite the unsolved debate among scholars regarding firm's networks, their acknowledgement as an independent and new form of organization (Grandori & Soda, 1995; Powell, 1990) allowed the advancement of the theoretical research on multiple "fronts" (Brown & Lockett, 2004): *strategy competition and collaboration - network structure and embeddedness - trust and governance - classification and evaluation*.

The complexity of the phenomenon is reflected in the numerous studies proposing a typology for the classification of network forms (e.g. Aldrich and von Glinow 1992, Snow et al. 1992, Hinterhuber and Levin 1994, Poulin et al. 1994 - pp. 39-48, Grandori e Soda 1995, Rosenfeld 1996, Campbell e Wilson 1996, Cravens et. al. 1996, Lamming et al. 2000, Brown e Lockett 2004) often based on criteria reflecting researchers' objectives (Brown & Lockett, 2004; Lamming et al., 2000). A new challenge is then posed by the new collaborative forms enabled by ICT and supported by Internet based applications (Camarinha-Matos et al. 2005), engaging scholar in assessing both the study of ICT role in fostering collaboration – transcending geographical barriers – and the development of methodologies supporting the creation and exploitation of this new virtual organizational forms.

### 2.2 ICT and collaboration

The study of ICT role in redefining "organizational boundaries, interorganizational relations, and marketplace competitive and cooperative practice" (Konsynski, 1993) has interested the IS field since the first boundary spanning systems were conceived (Kaufman, 1966). In particular, ICT use was acknowledged to be correlated to a greater collaboration among partnering firms because of its ability to effectively enable collaborative process (Chi & Holsapple, 2005). Several studies support this assertion (Chae, Yan, & Sheu, 2005) suggesting a general agreement on the positive effects of ICT on collaboration. However, as reported in a relative small number of cases, these positive outcomes can be influenced by social and organizational factors such as the trust between partners, the role played by people in building their relationships, asset specificity, interaction routines and log-term orientation (Chae et al., 2005; Patnayakuni, Rai, & Seth, 2006). Thus, ICT is just a part of the problem. The

availability of the technological infrastructure facilities support the collaboration effort, and is reported to enable it in some cases. Nevertheless, the creation of a sustainable collaborative network requires a comprehensive and holistic approach encompassing the complexity of the interorganizational environment.

### **2.3 Ecolead's approach for Virtual Breeding Environment (VBE)**

Ecolead's vision states that by 2013 "in response to fast changing market conditions, most enterprises and specially the SMEs will be part of some sustainable collaborative networks that will act as breeding environments for the formation of dynamic virtual organizations." These sustainable collaborative networks are called VBE and represent a long term cluster/association/pool of organizations delivering them tools, methodologies, guidelines, that's to say the "preparedness" to create and operate Virtual Organizations (seen as temporary alliances of organizations for a specific customer's requirement) (Mowshowitz, 1994). Several current solutions for enabling collaboration among different entities focus on providing ICT tools for the operational phase (communications solutions, inter organisational ERP) but solutions for the creation of a VBE are currently scarce. It is half surprising since creating a VBE is certainly the most difficult phase and strongly impacts its success while delivering to its members the necessary materials to start collaboration under the form of a VO. The level of "preparedness" of a VBE will determine its ability to react in a proper way when a business opportunity occurs. The highest it is, the stronger trust among its members, knowledge about other's competences is. This will give to the VBE a substantial competitive advantage and increased chances to win the bid. The current state of the art on organizations profiling / competency is actually limited to defining concepts in the strategic management field. Several authors aim to write about core competences as a way to achieve competitiveness for one organization, but a few have also written about the creation, development, or implementation of a profiles / competences catalogue. Ecolead's consortium has developed a Profile and Competency Management System (PCMS) which is dedicated to the creation phase of a VBE. The PCMS integrates concepts and specifies for profiles / competences catalogue as well as mechanisms to support the entire life cycle of the VBE. The main challenges of PCMS are divided into four domains for enabling replicability (industrialisation of the solution): thus it needs to take into account the domain variety, its evolution, mechanisms for obtaining profile and competences information, and scalability. An important point to mention is that the main purpose of the PCMS is to support the management of profiles / competences as it is related to the VBE and the VBE operations. This decision is made based on the fact that several main operations of the VBE management system (i.e. the partner selection for the VO creation, the promotion of the VBE competences to attract external customers, etc.) are highly dependent of the competency management in the VBE.

## **3 IECOS CASE STUDY**

IECOS S.A de C.V (Integration Engineering and Construction Systems), is a brokerage company, created at CIDYT (Centre of Design in Innovation and Technology) of Monterrey Tech, Mexico, with the aim to validate and demonstrate how a Broker company could be designed, developed and operated. IECOS initiated operations in 2000 searching for business opportunities and selecting several Mexican SMEs as its main manufacturing and engineering partners. IECOS, as an engineering company, is focused on the development of innovation and technology projects through the integration of the capabilities and competences of its network, guarantying customers' satisfaction and competitive offers through an efficient supply chain management and effective integration of SMEs' core competences.

### **3.1 Ecolead demonstration activities in IECOS**

IECOS, together with its members, can be considered a VBE where the Broker role is usually performed by IECOS' engineers. In the event of a collaboration opportunity, IECOS acts for the creation of a VO with the selected partners to fulfil the competences needed according to the requirements of the collaboration opportunity. IECOS has exploited several business opportunities

based on the VO model in different fields such as: manufacturing of maintenance tooling for the aerospace industry, manufacture of standard parts for capital goods equipment, and design and production of medical devices. Nevertheless, the application of Ecolead results was thought to increase IECOS management and operation efficiency and to discover additional opportunity areas. Consequently, two preparation meetings were carried out together with IECOS General Director and Supply Services Manager and enabled to detect the following three main deficiencies:

1. *Registration of new members*, the identification of profiles and competences are un-standardized processes that should be formalized and supported by the use of ICT,
2. *IECOS management activity* is subjectively measured. The definition of performance indicators that measure the operation of the VBE members, the VOs and the VBE as a whole are not formally defined.
3. *The use of standard procedures for VO creation* is a weakness, each Broker in IECOS manage the VO creation according to intuitive procedures.

Therefore, the Ecolead pilot activities resulted in chartering the subsequent objectives:

1. Improvement of VBE member registration process
2. Formalization of the VBE performance management system,
3. Semi-automation of VOs characterization process for competences deployment.

For each objective one scenario was developed defining the actual situation, the main objectives, the Ecolead results that will be used, and the expected impact. Following section will describe the first scenario, regarding the “Registration of new members, profile and competency management”.

### **3.2 Registration of new members, profile and competency management in IECOS using Ecolead tools and methodologies.**

The registration process for IECOS’ new members is not a well defined and standardized process. Potential partners are identified through a search on “yellow pages”, or by references, and then they are visited and apply for a survey asking for information about their processes, resources, capacities, etc. Such visit done by brokers aims at: finding specific partners for a concrete existent project (when required competences are not found in current database); inviting new partners to IECOS with the purpose of enlarging the database and having more information and partners available for future businesses. IECOS to-be model for this scenario proposes to optimize the process for register an IECOS new member (evaluation and selection), as well as define a clear structure functioning for the profiles and competency management through implementation of ECOLEAD tools, specifically functionalities of the VBE Management System. The improvement of member registration process through *Membership Structure Management System (MSMS)* will allow a standardized mechanism for applicants to be part of IECOS, to ensure that all the information related to membership applicants are appropriately entered into the respective database and to provide to new applicants the needed information regarding the roles they can play inside the network. In addition, the *Profiling and Competency Management System (PCMS)* as semi-automated tool will allow IECOS Supply manager to better sort and storage organizations information (profile, skills, capacities, etc.) of IECOS itself, IECOS members and IECOS projects, and so decreasing operational time in searching partners’ competences. Finally, the outcome for Discovery of new competences, as a functionality of *Ontology and Discovery Management System (ODMS)*, is a list of competences that IECOS can use further for requirements of new VOs. In parallel, the implementation of the following methodologies, results of Ecolead research tasks, will provide a standardized process for complete registration of new members in the VBE: Methodology for guiding the steps that must be taken to register a new member, methodology to define and assign governance principles, roles, rights, and responsibilities, methodology and mechanisms for verification of information validity provided by members during registration of new members and updating their profiles. In order to implement these tools, different activities for IECOS involvement have been developed: 1) Instructive and training meetings , aimed to train in VBE Concepts and VBE operational model to IECOS brokers; 2) Ecolead ontology and tools language were adapted according to IECOS language; 3) IECOS business process modeling, each actual business process was modeled in order to be compared and analyzed after Ecolead tools and

methodologies implementation; 4) Definition, identification and measurement of appropriated indicators according to each business process, that will be the base of comparison after demonstration activities; 5) Training sessions for each specific Ecolead tool; 6) Basic and specific information from each business process have been identified and shared with ECOLEAD partners in order to validate each tool and prepare the trial sessions 7) Trial and take-up sessions, feedbacks and testing results after each session is shared and discussed with Ecolead developers in order to improve the tools. Since, Ecolead project is continuously in a development phase, these first tests of Ecolead tools represent the beginning of the Take up phase, which will continue until March 2008. Main results achieved during these last months are: information required for each tool were documented, feedbacks from end-users regarding recommendations of the usability of the tools and ideas for new versions were also shared, and IECOS brokers are ready to start using the tools in their daily environments. Discussions about IECOS business models in relation with the VBE and VO model were also performed; new improvements for VBE methodologies in Ecolead were the main result of these discussions.

## 4 CONCLUSIONS

Developing tools to create sustainable Virtual Breeding Environment is of paramount importance for the European industry. The issue of reinforcing their foundation is confirmed by IECOS and the other partners of Ecolead acting as end users who are currently implementing methodologies, guidelines and software prototypes in the pilot phase of the project. Nowadays European networks of SMES have in common the search for an increased efficiency in order to improve their cross-organizational business processes with the aim to face the effects of the globalization. It is indeed an important first step towards competitiveness but it shouldn't remain at this level. But it would be of paramount interest to reinforce research on how innovation and also open innovation can be achieved in networks of SMEs for ensuring perspectives of long-term business opportunities. Since networks of SMEs are often knowledge intensive networks, one investigation could focus on the feasibility to bring web 2.0 tools to these networks in a context of open innovation for instance.

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## 5 REFERENCES

- Aldrich, H. E., & von Glinow, M. A. (1992). Personal networks and infrastructure development. In Gibson, D. V., Kozmetsky, G. & Smilor, R. W. (Eds.), *The Technopolis Phenomenon: Smart Cities, Fast Systems, Global Networks* (pp. 125-145). New York: Rowman and Littlefield.
- Archibald, G., Karabakal, N., & Karlsson, P. (1999, December). Supply chain vs. supply chain: using simulation to compete beyond the four walls. *Proceedings of the 31st conference on Winter simulation: Simulation---a bridge to the future* 1207 - 1214 Phoenix, AZ.
- BarNir, A., & Smith, K. A. (2002). Interfirm Alliances in the Small Business: The Role of Social Networks. *Journal of Small Business Management*, 40(3), 219-232.
- Bernal, S. M. H., Burr, C., & Johnsen, R. E. (2002). Competitor networks: international competitiveness through collaboration. *international Journal of Entrepreneurial Behaviour & Research*, 8(5), 239-253.
- Brown, D. H., & Lockett, N. (2004). Potential of critical e-applications for engaging SMEs in e-business: a provider perspective. *European Journal of Information Systems*, 13(1), 21-34.
- Bunduchi, R. (2005). Business relationships in internet-based electronic markets: the role of goodwill trust and transaction costs. *Information Systems Journal*, 15(4), 321-341.
- Campbell, A. J., & Wilson, D. T. (1996). Managed networks: creating strategic advantage. In Iacobucci, D. (Ed.), *Networks in Marketing* (pp. 125-143). London: Sage.
- Chae, B., Yan, H. R., & Sheu, C. (2005). Information Technology and Supply Chain Collaboration: Moderating Effects of Existing Relationships Between Partners. *IEEE Transaction on Engineering Management*, 52(4), 440-448.

- Chi, L., & Holsapple, C. W. (2005). Understanding computer-mediated interorganizational collaboration: a model and framework. *Journal of Knowledge Management*, 9(1), 53-75.
- Coe, N. M. (2001). A hybrid agglomeration? The development of a satellite-marshallian industrial district in Vancouver's film industry. *Urban Studies*, 38(10), 1753-1775.
- Cravens, D. W., Piercy, N. F., & Shipp, S. H. (1996). New Organizational Forms for Competing in Highly Dynamic Environments: the Network Paradigm. *British Journal of Management*, 7(3), 203-218.
- Enright, M. J., & Roberts, B. H. (2001). Regional clustering in Australia. *Australian Journal of Management*, 26.
- Grandori, A., & Soda, G. (1995). Inter-firm networks: Antecedents, mechanisms and forms. *Organization Studies*, 16(2), 183-214.
- Hinterhuber, H. H., & Levin, B. M. (1994). Strategic networks - the organisation of the future. *Long Range Planning*, 27(3), 43-53.
- Hoover, E. M. (1948). *The location of economic activity*. New York: McGraw-Hill.
- Innobarometer. (2006). Innobarometer on cluster's role in facilitating innovation in Europe (No. 187, Flash Eurobarometer Series). The Gallup Organization Hungary & Gallup Europe upon the request of DG Enterprise and Industry, from [ftp://ftp.cordis.europa.eu/pub/innovation/docs/innobarometer\\_2006.pdf](ftp://ftp.cordis.europa.eu/pub/innovation/docs/innobarometer_2006.pdf)
- Kaufman, F. (1966). Data Systems That Cross Company Boundaries. *Harvard Business Review*, 44(1), 141-151.
- Konsynski, B. R. (1993). Strategic control in the extended enterprise. *IBM Systems Journal*, 32(1), 111-142.
- Lamming, R., Johnsen, T., Zheng, J., & Harland, C. (2000). An initial classification of supply networks. *International Journal of Operations & Production Management*, 20(6), 675-691.
- Lavie, D. (2006). The Competitive Advantage of Interconnected Firms: An Extension of The Resource-Based View. *Academy of Management Review*, 31(3), 638-658.
- Macneil, I. R. (1980). *The new social contract*: Yale University Press.
- Marshall, A. (1922). *Principle of Economics*: Mac Millan.
- McDonald, F., & Vertova, G. (2001). Geographical concentration and competitiveness in the European Community. *European Business Review*, 13(3), 157-165.
- Micelli, S., & Di Maria, E. (2000). *Distretti Industriali e Tecnologie di Rete: Progettare la Convergenza/Industrial Districts and Network Technologies: Planning the Convergence*: Franco Angeli.
- Mowshowitz, A. (1994). Virtual organization: A vision of management in the information age. *The Information Society*, 10(4), 267-288.
- Nassimbeni, G. (1998). Network structures and coordination mechanisms: a taxonomy. *International Journal of Operations & Production Management*, 18(6), 538-554.
- Paniccia, I. (1998). One, a hundred, thousands of industrial districts. Organizational variety in local networks of small and medium-sized enterprises. *Organization Studies*, 19(4).
- Patnayakuni, R., Rai, A., & Seth, N. (2006). Relational Antecedents of Information Flow Integration for Supply Chain Coordination. *Journal of Management Information Systems*, 23(1), 13-49.
- Podolny, J. M., & Page, K. L. (1998). Network Forms of Organization *Annual Review of Sociology*, 24(1998), 57-76.
- Poulin, D., Montreuil, B., & Gauvin, S. (1994). *L'entreprise réseau - Bâtir aujourd'hui l'organisation de demain*. Montréal (Québec) - Canada: Publi-Relais.
- Powell, W. W. (1990). Neither Market nor Hierarchy: Network Forms of Organization. *Research in Organizational Behavior*, 12, 295-336.
- Rosenfeld, S. A. (1996). Does co-operation enhance competitiveness? Assessing the impacts of inter-firm collaboration. *Research Policy*, 25(2), 247-263.
- Snow, C. C., Miles, R. E., & Coleman, H. (1992). Managing 21st century network organizations *Organisational Dynamics*, 20(3), 5-20.
- Tekes. (2006). Sara - Value Networks in Construction 2003-2007. Presentation material (ppt), from <http://www.tekes.fi/english/programmes/sara>
- Varaldo, R., & Ferrucci, L. (1997). *Il distretto industriale tra logiche di impresa e logiche di sistema (The industrial district between entrepreneurship and system logics)*. Milano: Franco Angeli.