The innovative model of the VDO for collaborative networked enterprises: the GPT network case study

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Abstract. The paper presents one of the most interesting Collaborative Networked Organizations in Italy, namely Gruppo Poligrafico Tiberino (GPT), the first adopting the governance model with the Virtual Development Office (VDO) structure. The network is constituted by 21 companies belonging to the paper converting, packaging and logistics sectors. The nature of the collaboration is based on a long term strategy vision, giving to the network more competitive advantages, in respect to the classical collaborative alliances in Italy, such as the industrial districts, the cooperatives, the consortiums or the temporarily associations. Started from a national research project, it is nowadays a very fast growing up reality; the significant results achieved and the strong interests coming from Institutions, Ministries and Universities, make GPT a real success both under the industrial both under the academic perspectives.

Keywords: Case study, SMEs, Virtual Development Office, Enterprise Network.

1. Introduction

In the last years new forms of Collaborative Networked Organizations, CNOs, have been considered as a solution to the present and future issues of Small and Medium Enterprises, SMEs (Das and Teng, 1998, ECOLEAD project, 2005, Camarinha-Matos, 2009, Camarinha-Matos et al., 2009). In this manner it is possible for SMEs to face the growing worldwide competition. A SME can act as a part of a big organization, when it operates within the CNO, but it can still behave as a single entity, outside CNO, keeping its autonomy and flexibility.

While several models of Collaborative Networks have been proposed (Camarinha-Matos et al., 2009) this issue is still under investigation. This mainly because of the complexity of the form of CNOs: collaborations could concern the procurement process (Cagnazzo et al., 2009a), the implementation of Dynamic Supply Chains (Rabelo et., 2004), the product development (Alonso-Rasgado et al., 2004) and many other aspects. In any case the problem of finding a general framework able to find the right form of CNO for a specific set of SMEs is still far to be solved.

But probably the most important result in this field of research is the introduction of the Virtual Breeding Environment, VBE, (Afsarmanesh et al., 2009, Camarinha-Matos et al., 2009, Romero and Molina, 2010). With the VBE model of CNO the dimension of “prepparedness” is clearly introduced. Preparedness is the ability to create an environment where SMEs can quickly build up Virtual Organizations (Martinez et al., 2001) to access to new Business Opportunities that will be impossible to exploit if SMEs were standing alone. In this sense VBE respond to the need of increase SMEs markets.

The case considered, GPT, that is an evolution of VBE, can further increase SMEs possibilities, because it specifically addresses innovation. This thanks to the introduction of a facility belonging to the CNO, the Virtual Development Office, VDO. VDO is specifically devoted to promote new and innovative Business Opportunities within the CNO.

In the following GPT will be deeply analyzed starting from its history, its current management, its governance, showing some successful cases of Virtual Organizations promoted by GPT, discussing also financially issue and future perspectives.

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2. GPT: Gruppo Poligrafico Tiberino

2.1 History of the network
The scenario in which the first example of VDO was born is the district of paper converting, printing and publishing in the Centre of Italy (in the ‘Umbria’ region). Such a district, composed by over 160 enterprises, is characterized by a high technical-productive specialization due to an historical handicraft tradition in the mechanical and printing field. The competitive potential of the district is severely limited because it lacks the ability to spontaneously aggregate its activities, a situation exacerbated by the absence of leader firms capable of providing direction for the system as a whole. In this regard the Umbrian paper converting, printing and publishing district can be seen to embody the problems of the Italian SMEs. In such a scenario, three firms (Pasqui, Litop and Litograf), characterized by a range of complementary products and by a partnership based on a solid personal knowledge of the entrepreneurs, decided to form a new company: G.P.T., acronym of “Gruppo Poligrafico Tiberino” with the first intent of integrating the commercial and marketing functions.

However, from this scenario GPT perceived the need to expand its own business-borders and therefore sought the involvement of academia to drive the company strategy. In 2005 the relationship with academia had grown to a point where the University of Perugia was acting as a bridge with other Italian Universities and foreign Business Schools. This brought a considerable amount of attention to the GPT case. In the same year a relevant national research project presented by the University of Perugia named MIGEN – Innovative models and tools for the networks management - was approved and GPT became a two year field test for the models and tools being developed. Since then GPT has established permanent relationships with the academic community to be assisted with the execution of innovation projects and the definition and management of its business strategies. It also established similar relationships with financial institutions for the funding of these projects and with public institutions for the diffusion of the business model. From 2005 to 2010 GPT grew from the three initial partners to the 21 current members. Today, it is a fast growing company with an innovative business model and a new positioning on the market. It is pushing interesting strategies for the consolidation of the Italian market and is currently entering markets in South America and Northern Africa.

2.2 Type of business: products/service provided
The goal of GPT is to provide integrated, complete and innovative solutions in the fields of communications, packaging and the related services. GPT wants to be a global supplier of products and service systems for important national and international, public and private customers, through innovative solutions. GPT offers products, technologies and skills to satisfy customers needs in the Printing, Packaging, Plastic and special materials and associated Services sectors. In particular products/services provided are:

- Printing: Offset, Rotoffset, Digital, Flexography, Labels, Custom forms, Security paper
- Packaging: General packaging, Cases, Paperboard, Shoppers, Cylinder-shaped box, Promotional items.
- Plastic and special materials: extensible films, printed plastic films, biodegradable films, polypropylene, EPS packaging shoppers, polystyrene, non woven technical materials.
- Services: Consultancy on concept design, Prototyping, Manufacturing, Logistics, Procurement, Mailing, Packaging automation, Global Services for Hospitals.
- Print on demand: extreme personalization and short runs. Books, catalogues, brochures, posters, photographic and painting reproductions, newsletter, company documents.

GPT technologies are:

- Printing: digital, offset, flexographic, typographical, letterset, rotoffset, serigraphy, hot foil, security paper, labels.
- Post-press: numbering, plastic lamination, laquer, UV laquer
- Finishing: binding, bending, fanfold, die cutting, foil blocking, punching, personalized packaging.
- Packaging: integrated machinery for composite cylinder boxes and for all the traditional packaging.
- Plastic films: extruder, co-extruder, machine coater
- Variable data management

### 2.3 Management Structure, the VDO model

GPT is based on the Virtual Development Office (VDO) framework, a long-term strategic alliance, that operates following a goal oriented approach through the dynamic formation of VOs, that can be triggered by an opportunity. Thus there is some similarity with the Virtual Organizations Breeding Environment (VBE) network model (for details on the VBE framework see for example Camarinha, 2009, Afsarmanesh et al., 2009).

The VDO model can be defined as “A strategic association/alliance of organizations and the related supporting institutions, adhering to a base long term cooperation agreement and adoption of common operating principles and infrastructures, with the main goal to create innovative BOs. This goals is accomplished by introducing a new for-profit company, the VDO, operating as a permanent network management/coordination entity. In pursuing these business opportunities the VDO realizes VOs and VEEs of network members and/or external partners”. From this definition it is noteworthy that the VDO model is similar to the VBE one, but it is focused in particular on innovative businesses, and introduce the formation of a new for-profit company. This newco, the VDO (GPT in our case study), promotes research, marketing and innovation and is continuously looking for Business Opportunities. In this sense it acts as a permanent broker. GPT members focus on their core business keeping traditional activities and independence, but they can increase their competitiveness thanks to the activities of GPT, always searching for innovative BOs. GPT represent and implementation of the VDO Model. Figure 1 shows in particular the VDO model: through its external market intelligence activities VDO must capture BOs and transform them into collaboration opportunities that are characterized by innovative and integrated products and services; VDO must select the most appropriate companies from inside the network that will satisfy the BO, creating either a “virtual enterprise” (VE), if only member companies are involved, “virtual organization” (VO), if institutions and/or research centres are required, and “virtual extended enterprises” (VEE) if external companies participation is required.

![Figure 1. GPT The VDO model](image)

Comparing the VBE and the VDO frameworks, the main structural difference can be synthesized in the following characteristic. While in a VBE the roles of Opportunity Broker, VO planner and VO coordinator cannot be static (ECOLEAD, 2005), and are assumable each time by a different member, in the VDO these roles are permanently concentrated in the central entity, that also assumes all the other supporting roles related to network activities (like network administration, knowledge management, etc.).
This characteristic, together with the for-profit nature of the VDO, implies a particular way to face the collaborative network issues in the network creation and management phases. Figure 2 shows the main issues related to creation and management phases of a collaborative network of enterprises. In the following, how these issues have been approached in the GPT case study is described.

3. GPT creation

3.1 Selecting the partners/staff in the network.

An important aspect of a collaborative network is the selection of participants. A relevant decision dimension is for example the industry sector of each member. In Industrial clusters, for instance, members belong to the same industry, even if this aspect could lead to barriers in information sharing since the competition among them. From this point of view, the VBE framework provides for members belonging to multi-speciality sector (Camarinha et al., 2009) and from the VBE definition by Romero and Molina (2009) the heterogeneity of the partners seems to be a requisite. In the VDO model, beyond heterogeneity, it is important to consider and evaluate complementarities between companies. This will positively influence the innovation attitude of the network, reducing conflicts, increasing trust and information sharing. In the network formation phase and in its evolution, GPT has integrated partners with different competencies in order to reduce difficulties in knowledge network sharing and improve the attitude of new product/service system (PSS) identification. Among the 21 network members, the vast majority (19) are companies covering different area of service/products. Their complementarity allowed to set up the diversified portfolio of products/services described in section 2.2. Another important network member is a spin-off company from University of Perugia, named NetValue, whose role is to apply in GPT network models and paradigms coming from scientific research and to provide GPT with management staff. Finally, the network community is completed by Gepafin, a finance company for SMEs jointly created by the Umbria Region and the European Commission, with the contribution of 15 credit institutions at national level. Gepafin is able to support the network both by participating in the GPT venture capital, and by easing loan access for GPT and the other network members.

Another aspect in the partner selection of participants is their geographical position. One of the actual main trends characterizing manufacturing scenarios is represented by the internationalization of production processes; the geographical shape of global production networks results from a combination of local, regional and trans-regional dynamics (Scott, 1996). We could think at the previous as different
stages or aspects during the network life cycle; even if the first pool of enterprises participating the network will be probably located in a geographically limited community where those enterprises can already have proactive environment in terms of diffused trust, collaboration, knowledge, etc., the network can be then composed by companies coming from different regions or country, where each region can be characterized by a specific competence. In effect, even if the geographic closeness can foster the development of a network in its first life cycle stages, the structure of the network should allow the participation of companies coming from different countries. The same process can be found in the development of GPT, where the geographic closeness, with its vantages in terms of informal links and shared values, has balanced the lack of formalized processes, information technology tools, etc., while its structure allows to strategically managing link between a VE composed by companies coming from different regions or country.

3.2 Revenue sharing definition.
An important issue in CNs that provide the formation of VOs in order to catch upcoming business opportunities is how revenues are shared among network members. As a VDO based network, GPT individuates a BO (usually characterized by the need of innovative and integrated products and services) and selects a set of members in order to form a VO, through which the products/services associated to the BO are provided to the final customer. The entity that sells the final product/service is GPT, while the network members that were selected to participate in that particular VO see GPT as a client, to whom provide its own products/services and from which to be paid. Following this logical flow, it is easy to understand the consistent revenue sharing policy: GPT is remunerated for the added value brought by its marketing, innovation and coordination activities, while the members will receive the benefits related to their increasing volumes.

3.3 Selecting the CN governance.
The governance structure plays a key role not only in the creation and distribution of value, but also in the coordination of networks. From a strategic perspective, the coordination of a network requires some degree of centralization in order to ensure an efficient use of resources, rapid decision making and the emergence of a global vision driving the network. For these reasons management researchers stress the role of the leader firm, continuously engaged in attracting and selecting members, in sustaining network relationships by managing conflicts and learning, in positioning the network in the market and in building the structure and culture of the network (Sydow, 1992). In a network composed by SMEs we can’t find a subject that can play naturally the role of leading actor over a long time horizon. In our case, GPT is a formally defined entity that plays the role of a permanent figure (leading actor) operating within an enterprise community that survives the single VE (whose mission is specific for a business opportunity).

GPT is a for-profit company, with its own board of director and its own independence. Network members are share-holders of GPT, but they actually are not in the majority. The VDO has to be essentially an independent company because there are many phases of the network strategic and operative activities (e.g. partner selection in a VO) in which clash of interests could arise if the VDO were controlled by one or more members. The participation as share-holder of GPT allows network members to profit by the extra benefit consisting in GPT dividends, participating in this way to the revenue sharing related to the added value activities performed by GPT itself.

3.4 Trust establishment.
Close to the problem of coordination and cooperation within the network is the concept of trust (Jap, 2001). A certain amount of inter-firm trust is indispensable, and can result in lower transaction costs, easier conflict resolution, or lower need of formal contracting (Das & Teng, 1998). Trust, while advocated by many authors (Stuart & McCutcheon, 1996), was recognized as needing time and care to build (Sobrero & Schrader, 1998). GPT, for its ‘external’ and independent role that put it at a different level with respect to all the other members, which see GPT as a common client that brings them new orders, can efficaciously play the crucial role of maintaining and consolidating the trust of companies involved in the network. For example, due to its for-profit nature, GPT is obliged to involve the most suitable (in its own judgement) members when creating a VO; this eliminates any need of impartial
assessment procedure of partners selection, because the economic nature of GPT goals acts as an implicit guarantee.

3.5 Responsibilities and roles definition.
As already mentioned, the GPT governance model is a structured framework in which all the network roles are essentially concentrated in the central entity, the newco GPT itself. The detailed responsibilities of all the companies, GPT included, are a-priori established in a formal ‘network contract’, that has to be undersigned by the partners joining the network. Particularly, GPT is committed to reach its mission involving with priority the network members. At the same time GPT must not compete with the network members, in terms of serving the same customers with the same products. On the other side, each member continues to perform its traditional business, but is committed to put at GPT disposal its know-how, technology and production capacity.

4. GPT current management overview

4.1 Relations with external subjects.
Network organization should promote the cooperation between firms and government, research and financial institution to find and efficiently manage resources and competences needed by the network for its development. Katz and Darbishire (2000) have shown that country specific labour market structures and institution play a critical role in shaping employment relations systems, although they are affected by the spread of new practices in highly globalized sectors. GPT can interact for the community with institutional subjects as a single entity promoting innovation activity with research centres or other supporting of financial institutions (banks, government offices, etc.).

Another advantage of the organizational model adopted by GPT is that it can formulate and manage over a single business opportunity a jointly development strategy within the community and drive the network toward continuous improvement and learning. Those network models where relationships with external subjects are not necessarily managed by a central entity, may face some drawbacks. For example, when customer management is not systematically addressed by a specific entity, it is not easy to promote the network brand. GPT has the possibility (because it directly manages all the final customer-related activities) and the interest (because of its for-profit nature) to promote the network brand, in order to reach the highest visibility in a medium/long term horizon and acquire in this way a tangible competitive advantage.

4.2 VE/VO/VEE realization & coordination.
Realization and coordination of VO require a considerable amount of expertise. One of the aim of long-term collaborative networks is for example to provide decision supporting tools to assist the VO’s planner member in its activities (competences mapping, partners selection etc.). However, the complexity of the role makes preferable these issues to be handled by a specialized entity (rather than by a network member that changes every time). By assuming the permanent role of VOs planner and coordinator, GPT can assure the required level of competences and experience.

Another main features of GPT is that, even preserving the dynamism of a typical VO in responding to market needs, it allows to centralize and to manage, on a long time horizon, some critical “company” activities (i.e. the development of a well-known trademark, a long-term maintenance guarantee), without the limitations of a typical VE. In effect

4.3 Management of collaborative operations.
One of the main advantages in networking is the ability to maintain the flexibility of the SMEs involved, while achieving an increase of effectiveness and efficiency of the core operational activities through collaboration, as the possibility to appear as a single and larger entity in supply and procurement processes. For example, the aim for ISOIN network in Spain and CeBeNetwork in Germany (Camarinha-Matos, 2009), two VBE cases of success, was to be qualified as single supplier of a final customer, since this one decided to reduce the number of suppliers to interact with. For the same reason it is also possible to improve other services, thanks to the dimension of the network, for instance in terms of credit access possibility. GPT can take full advantage of the aggregation effect, because the supplier/customers
interface it is always GPT itself, and never a single member. GPT always represents the whole network and naturally behaves like a larger dimension virtual entity.

4.4 Marketing/innovation management.
Although inputs for new BOs can in general arise from both internally and externally the network (Camarinha Matos and Oliveira, 2005), when BOs are always promoted by the network members it is difficult to implement an effective Network Marketing and Strategy. Given the growing importance of intangible activities such as understanding customer needs, product development and brand building, the definition of a subject whose mission is to constantly interact with market can positively influence network competitiveness. Since GPT manages the knowledge and the most important intangible assets of each network member, marketing and strategies activities can be developed in a more complete way, involving the network as a whole.

Considering also the innovation management, it is clear that it is not advisable for an SME to spend its limited resources in activities that could be delegated to a dedicated entity in a more effective way. Members can market their traditional products while GPT can promote the innovative ones. Thanks to GPT proactive activity it is possible to stimulate research and innovation at the network level, in a centralized and proactive way. This could increase the innovation processes in the SMEs within the network.

4.5 BO identification.
CNs, especially when members belong to different industries, can offer one contact point to the customer for all its needs, considerably improving the value of products/services provided. However, to achieve the goal represented by the identification of new BOs, it is important to have a comprehensive vision of network members competencies and capabilities. It is difficult to optimize the BO identification process without a stable entity that simultaneously knows in deep members capabilities and is devoted to combine it for providing innovative services/products. GPT fully accomplishes this tasks, because simultaneously assumes the opportunity broker and the manager of CN competences roles.

4.6 Management of CN competences, Member’s Trust, Knowledge Management, CN Performance Measurement, Member’s management
This group of operational activities can be view as supporting activities. Due to the expertise required in performing this activities, and the relations between them (eg. member’s trust and knowledge management) it is preferable to assign all of them to a specialized and independent entity. In effect, these activities are also related to other network activities (eg. management of CN competences and partners selection in a VO). This reinforces the validity of the idea of essentially concentrating all the network activities in the VDO, an entity that for its nature views any network activity as a core activity, being the networking its core business. In particular a knowledge management systems (Taticchi et al., 2009) and a CN Performance Measurement System (Cagnazzo et al., 2009b) have been tailored to the GPT network.

5. Pasts and present challenges
As a first industrial case of network based on the VDO model, and of course as a startup company, GPT faced up with several challenges, especially at the beginning of its life. The main pasts and present challenges can be resumed as follows:

- new BO related to innovative products and services
- acquisition of new bigger clients/ new market
- cost reduction thanks to collaborative operations
- capability to raise funds
- increase the skills and knowledge of the network

In the next sub-sections details on how GPT successfully approached the above mentioned challenges are presented. These challenges still represent a never ending improvement opportunity for GPT.

5.1 The Diplomas Printing and Delivering service: an innovative BO
An example of how GPT works and a real success for the network is represented by the Business Opportunity of the certifying documents: it concerns with the university diplomas, even if it is nowadays
extending also to quality certificates, medical certificates, fiscal documents, arraignments, etc. The innovative nature of the Product Service System (PSS) related to this Business Opportunity is demonstrated by the fact that it has been registered as a national patent. The BO represents a clear demonstration of how GPT works. Starting from the market strategy phase and from an analysis carried out by GPT, Italian Universities follow 3 different procedures for the diploma delivery:

1. Diploma information management, printing and delivery completely realized internally to the university;
2. Diploma information management and delivery realized internally to the university, but the printing phase demanded to outside companies;
3. Diploma information management internally performed by the university, and the printing and delivering phases demanded in outsourcing.

By this analysis, GPT identified the need of developing a new service for the final customer with a unique interface. The “University Diplomas Printing and Delivering service” in fact is an innovative opportunity in which GPT represents the central actor of the system. Starting from the data furnished by the institutions and received as parametric information (name of the student, etc.) by the GPT system, the network is coordinated in order to produce and consequently deliver a customized product with high quality standards. This is assured by the very specialized skills of the GPT partners in the printing and packaging field, that collaborating towards the same direction can achieve low lead times and costs but high degrees of customization and quality.

The process is constituted by three main phases, as depicted in Figure 3, and in particular:

1. The phase of data transmission by the university to GPT;
2. The phase of the physical realization of the product, involving some partners of the network;
3. The phase of shipment, that is the product delivering to the student and a receipt to the university.

![Figure 3. The Business Opportunity of diplomas – a global view](image)

The first point is directly managed by GPT, while the last two points are realized by other members of the network under the direct coordination of GPT. In order to understand how the partners cooperate together for realizing the final PSS, it is important to give a detailed view of the BO physical realization and shipment, as represented in Figure 4.
The BO of the diplomas is a clear demonstration of how the belonging to the network can increase competitiveness to the partners. Without the membership in fact the SMEs couldn’t benefit the important economic results coming from this BO: potentially there are 94 universities in Italy with more than 300,000 graduating students a year, and more than 500,000 diplomas for undergraduates.

The product realization and shipment phases could be summarized in 4 distinct phases. Each of this phase involves different partners internal and external to the network. In particular: for the phases of paper securing process, printing and leather tubular container realization, GPT selected three different companies internal to the network, due to their capabilities in performing these particular operations; for the phase of delivery, GPT involved an important Italian shipping company, external to the network.

5.2 New clients/markets acquisition: becoming supplier of a big company.

Another case of success that demonstrates the importance of the SMEs belonging to a stable long term strategy network is the fact that recently GPT became a supplier of the most important Italian company in the energy field, for marketing and advertising materials. This is a very important result achieved by GPT, since it has been recognized as a stable enterprise network, respecting all the requirements imposed by the customer. In fact, single SMEs cannot become its supplier since there are several restrictions in terms of total turnover, employees, etc. In this sense GPT has been recognized not only as a mere aggregation of numbers for reaching a critical mass, but as an effective collaborative network with shared skills, knowledge and technologies. As supplier of this important company, several BOs, that involve almost all the GPT partners, are arising.

Several other VEs are nowadays working on for the benefit of the network and important other results are being achieved by GPT, thanks to its innovative business model, to the constant relationships with institutions, research centres, universities, and to a mixed management, both from the academic and to the industrial world.

5.3 Cost reduction: the raw materials collaborative procurement project.

GPT performed a cost reduction through a collaborative procurement project. Collaborative procurement opportunities have been evaluated utilizing the EASM procedure, that provide four phases, namely: Exploring, Analyzing, Selecting, Managing (Cagnazzo et al., 2009a). Through the Exploring phase the most common products/services purchased in the network have been investigated. Since the manufacturing nature of the partners, several products/services belonging to the manufacturing industry have been individuated through the use of a questionnaire, such as for example pallets, cardboard, paper, transportations, software applications, services, etc.. The Exploring and Analyzing phase, where classifications and multi-criteria evaluation were performed, resulted in the identification of 3 potential
Collaborative Procurement Opportunities: pallets, cardboard and paper. These choices are justified since the purchasing of these products within the network covered very high volumes. During the Analyzing phase the best suppliers were identified and the VEs/VOs have been built up in the Selecting phase. During 2008, nearly 2,000,000€ of Collaborative Procurement Opportunities have been evaluated, and cost reduction has been estimated about 5%. This money saving is due to an increasing contractual power of the companies with the suppliers. Companies that were before buying raw materials from different sellers, can now benefit of best prices, since the very high requested volumes. This is an important result, since the identified CPOs involve low value-added products. Thus, direct costs have significantly been reduced, achieving the most important Collaborative Procurement objective.

5.4 Raising funds: financing industrial research and competitive development projects.
One important aspect for the maintenance and development of the network is the financial sustainability of the project. In particular GPT is continuously looking for financing the projects and facilitating the activities trough funds coming from industrial research and competitive advantage projects. For the firsts, the Research Projects of Relevant National Interest (PRIN 2005) denominated MIGEN (new models and tools for managing Enterprise Networks) and presented by the University of Perugia jointly with the GPT management has been one important financial contribution for supporting the first phases of the development of the Network, with a total amount requested for the project of about 250 K€ and with a 150K€ approved. Other two research projects have been presented for public funding, still under review and to be approved.
For the second, it is remarkable the contribution of regional financing projects. In particular three projects (2005-2007-2009) for research and development (RESTA Projects, funding long term strategy network) have represented important achieved goals, for a global amount of about 15M€ requested, which 4.5 M€ of them coming from public funds.
While the PRIN projects have been focused on basic research, such as new frameworks and tools for the creation, management, coordination and development of the GPT network, the RESTA projects are strictly focused on the applied industrial research. For this last point it is interesting to highlight the strategic role of both the typologies of projects that strongly contribute to the success of the GPT project: PRIN projects increase the innovation of the network since the development of managerial frameworks and tools, while RESTA projects allow the companies to invest on innovative productive machineries and facilities for cooperation, new collaborative product development, jointed research projects, etc. Finally it is fruitful to remind that one of the GPT strategic partners is a financial company, that often has represented an important link with financial institutions, guarantying GPT for the funds requested to the banks.

5.5 Increasing the knowledge of the community: a knowledge management project.
GPT implemented a knowledge management project in collaboration with the University of Perugia, that brought to the implementation of an ICT-based KM tool with the aim to facilitate a systematic approach to convert part of the tacit knowledge embedded in improvement projects and management best practices into explicit form (Taticchi et al., 2009). A team composed by researchers, together with GPT management, have worked to identify the characteristics that the desired tool should have had. This teamwork has permitted therefore to design the tool following both an academic and practical approach.
The above mentioned activity has permitted to highlights the following needs:

- **NEED 1** - Within VDO Networks, the hub, namely the VDO, has knowledge management issues related to fact that it has to respond quickly and successfully to new BOs and therefore it needs to knows network members competences and capabilities. Therefore, a KM tool, in this case, has also the role of supporting decision making activities.
- **NEED 2** - SMEs can acquire new knowledge by participating in partnerships or networks with other companies, sharing similar or complementary problems in order to become more competitive. This raises the issue of how to facilitate the operation of such networks. Therefore, sharing knowledge about the implementation and outcomes of such projects among the VDO Network members should promote implementation of similar and new initiatives to improve their competitive position.
NEED 3 - SMEs have poor managerial competences and scarce know-how of technological innovations. As a consequence of that, the KM tool should be a support in these issues, by helping promoting managerial best practices and sharing of technological know-how within the network.

NEED 4 - SMEs desire to use simple tools, with easy user interfaces and the possibility of managing documents, drawings, procedures, spreadsheets, etc..

NEED 5 - SMEs do not have the resources for investing in informatics infrastructures for implementing new tools. As a consequence of that, tools based on Internet knowledge portals are desired.

The above-mentioned characteristics have been considered for designing the KM tool. The KM tool (KMT) is based on a multi-user database management system (DMS) built under a Microsoft Office Access application. A DMS was chosen as best for its ability to separate data storage and analytic elements. The system integrates five main functions:

1. creation and searching of electronic library of cases/projects by main attributes: company, manufacturing sector, manufacturing group, country and subject;
2. directory of network companies;
3. resources on GPT and Network as overall;
4. resources of common interest such as journals, conferences, forum etc;
5. library of management resources (technologies and management best practices).

By collecting network cases/projects and management best practices, the KMT helps knowledge sharing in the network, best practices for improvement projects and therefore fixes the bases for characterizing the GPT network as a learning network. The KMT allows recording, monitoring and controlling the development of improvement projects as they are being carried out by members of GPT. The user-friendly front end of the KMT provides two main sections. The first section, identified as the GPT Network Cases/Projects, contains links to a knowledge database related to the practical application and implementation of improvement tools and best practices. The second section of the application provides links to an electronic library of Management Resources, which offers resources regarding technologies available in the network together with management best practices.

The GPT Network Cases/Projects section allows access to four areas: directory of GPT network members; library of cases/projects; GPT network; support: external resources. The tool allows creating a file with the information related to a single independent company, or GPT, or the Network as overall. This characterization remarks the company characteristics, the company field of business, the available technologies and other relevant information. For each company, previous and current cases of improvement projects and best practices can be added and classified. The external resources area is designed to communicate information about issues of common interest to the members of the KMT such as literature, web sites, conferences, training issues, newsletters and discussion forums.

The library of Management Resources includes two main areas, technologies and best practices management. In the technologies section, a mapping activity of all technologies available in the network has been carried out. Such information is therefore organized through description, presentations, references, and external links. A discussion area is available to share opinions about each technology between different users. The section dedicated to management best practices is structured similarly to the previous one.

The KMT tool has been implemented and tailored over GPT characteristics in a period of about 4 months. A first populated version of the tool has been released on July 2008 and given to GPT Network companies under the form of a readable (not modifiable) Microsoft Access database. Nowadays, a web version of the KMT is under construction in the form of a restricted area (accessible only by network members) of the GPT network website. A first important achievement is the structure of the KM tool itself; indeed all the identified NEEDS (from 1 to 5) have been met: NEED 1: through the directory of network members and their related characterization; NEED 2: through the electronic library of cases/projects and their related characterization; NEED 3: through the library of management best practices and technological resources; NEED 4: through the possibility of uploading and reading all common files like documents, presentations, spreadsheets, etc.; NEED 5: thanks the adaptability of the DMS methodology allowing a quick conversion to a web version of the KM tool.
5.6 Tangible economic performances.

GPT presents a 200 M€ aggregated turnover, more than 25 production facilities, over 1.000 employees, more of 100 of them involved in R&D activities. Since the innovative VDO model adoption, GPT has already achieved important results. Although it still represents a starting-up reality, the numbers of GPT in these years can be reassumed in: 2007-2009

- For the market point of view, 2 M€ of orders produced by GPT for the network;
- For the Product/Service innovation dimension, more than 150K€ of orders on NEW products for the companies belonging to the network. In this case they represent radical innovations, completely new for the partners;
- For inter-business and collaborative procurement (CP) aspects, more than 2M€ of examined values and 100K€ of orders obtained on CP projects;
- For Research & Development projects, 10.7M€ in R&D projects for increasing the innovative attitude of the network.

6. Conclusions and Further research

The paper presents the Virtual Development Office (VDO) model and its first application represented by the GPT network. The VDO model main innovation is the definition of a central actor, the newco GPT in the case study, operating on a long-term base strategy; it can positively influence some key factors as strategy definition, trust and collaboration, information system management, and goal congruence, with wide potential margins of success in achieve the mission. GPT born as a research project, while now it is one of the first formally structured Collaborative Enterprise Network in Italy. For the very important results achieved by GPT, it has been widely recognized as an important success case from the academic, scientific and the industrial worlds, as demonstrated by the interest coming from Italian ministries, Institutions and Research centers. Further research will be addressed towards the VDO model and its applications to other CNOs; new research areas and supporting tools will be developed in order to increase the network capability and competitiveness. Finally, analysis on the evolution of the GPT network, will be performed in order to understand the future sustainability of the existing partners, evaluating the possibility to involve new companies, exclude some inefficient partners or strengthen the relationships among them.

7. References