European Virtual Center for Innovation Excellence Assessment

Advanced Draft

A reference model for excellence in innovation management.

The VIVA project contribution

January 2007

SIXTH FRAMEWORK PROGRAMME

Supported within the 6th Framework Programme of the European Commission

Table of contents

Part 1
The concept of innovation and the definition of excellence in innovation

1 Concepts and definitions

1.1 Innovation is not a linear process

The first problem which we must come to terms with is the discussion, something that we feel is essential, of the "standard" concept of innovation in the national and international agencies. According to this concept it is a linear process, based therefore on the avant-garde results of scientific research and the so-called "high-tech" competences that functionally and temporally precede the industrial process.

This concept has been submitted to a critical analysis, also using empirical material, in the PILOT Project, over the past three years. The straightforward observation which this critical revisitations starts from is that there are companies that are not "high-tech", according to the formal definition of the OECD based on the Frascati handbook, which are highly successful on the economic level and that are capable of putting new, reliable and profitable products onto the market; in short, companies that have all the characteristics that Schumpeter attributed to an innovative company. Such companies are often, even if not always, SMEs and in the vast majority of cases do not have a Research and Development centre, nor do they have formal mechanisms intended for innovation; in any case it is difficult to argue that they are companies whose development mechanisms are "science-based", i.e. dependent upon the application of scientific discoveries mediated by sophisticated technologies. The number of companies in Europe that match this definition is rather large and they provide a significant contribution to the GDP and to employment. Are these exceptions that will gradually disappear or different mechanisms of innovation that teach us something about the complexity and the variety of the innovation mechanism that actually exist?

If, as the Pilot project's empirical findings, the answer is yes, then it is a matter of trying to broaden the innovation concept in such a way that it will be congruent not just with the standard model but also with these alternative paths. The advantage that accrues is that of being able to develop far more realistic and flexible operative instruments and, something that is very important for us, viable for the SMEs. Furthermore, if it is possible to have innovation that is not "science-based" and "high-tech", what type of wealth of knowledge, competences and organisational and cognitive processes are mobilised in such cases? Are these artisan residues, useless in the upcoming scenarios, or vice versa fundamental mechanism for every type of innovation, even those that are not incremental, and if so, which are they? Finally, if such mechanisms exist which are the socio-organisational and cultural conditions that foster their growth, their build-up and their development?

The last decade of organisational, psychological, economic and management studies has produced an important theoretical and cultural elaboration, as well as a significant collection of qualitative and quantitative case studies that will prove helpful for us to answer these questions.

Let's go back to the main point, that is, the critique of the linear and formal character of the innovation process. The main point, very briefly, is that

"There is no evidence supporting the argument that the high-tech economies are also the high-growth economies. This suggests that different economies can follow different paths of economic growth. Countries play different roles in the differentiated international economic system with clear patterns of division of labour among the highly developed economies.

Based on these conclusions we would hypothesize that growth is primarily rooted not on the creation of new sectors but on the internal transformation of sectors which already exist and/or are

growing, such as, the service sector. Overemphasizing the role of the high tech sectors seen as isolated contributors to growth ignores this major dimension of change due to transformation in advanced economies.

Such oversimplifications are rooted in fundamental assumptions supporting modern research and innovation policies, which by overemphasising the role of R&D in economic growth they often underestimate processes of change and needs in those sectors of the economy with low R&D-investments."[5]

1.2 Innovation is a multidimensional phenomenon

As we shall see later in greater detail, also on the grounds of the existing literature, it is not a question of a juxtaposition between knowledge-based innovation paths as opposed to those based on "making do", but an extension of the concept of knowledge; "knowledge" does not exist but rather plural forms of knowledge and does not exist of standard content of different forms of knowledge, i.e. the scientific-technological form, but different possible contents. It is not a question therefore of choosing for a knowledge society, privileging a certain kind of industry as opposed to others, but of exploiting the unutilised knowledge potential in the whole of the existing sectors, without of course waiving the chance for create new ones, both innovating them as such, and exploiting the often unexplored functional relations between the different sectors and, in the actors themselves, between the companies that are "high-tech" and those that are not.

A first practical consequence is the multidimensional nature of innovation. This implies that in the processes for the evaluation of excellence we cannot only consider the R&D indicator but it is necessary to consider other factors as well; for example in the PILOT project at least five or even six were identified:

- R&D intensity;
- Design intensity, which includes a broad design concept including parts of what hitherto has been included in the "D" of R&D;
- Technological intensity;
- Skills intensity (human capital orientation);
- Innovation intensity;
- Organisational set-up.

This is not the right place to discuss them at length, as you may refer to the original essay[6], but the need should be recorded for a multidimensional approach and also the fact that the degree of co-evolution of the different "dimensions" of the innovation becomes a fundamental key in evaluating the efficiency of the innovation paths, a key therefore to excellence.

We are thus driven, by these critical analyses, in the direction of those studies that put the stress on the resources that the companies have at their disposal: in the first place the individuals' knowledge, both tacit and formal, in order to achieve a competitive advantage of an innovative type and on their capacity to know how to use it appropriately and strategically, the latter being something that characterises excellence.

---

[5] Kaloudis, A.; Sandven, T.; Smith, K. 2005: Structural change, growth and innovation: the roles of medium and low-tech industries 1980-2000. Paper for the Conference "Low-tech as Misnomer: The Role of Non-Research-Intensive Industries in the Knowledge Company", 29-30 June, Brussels

[6] Laestadius, S.; Pedersen, T.E.; Sandven, T. 2005: *Towards a new understanding of innovativeness – and of innovation based indicators*. Paper for the Conference "Low-tech as Misnomer: The Role of Non-Research-Intensive Industries in the Knowledge Company", 29-30 June, Brussels

In short, we can isolate two aspects of excellence:

a. The capacity to co-develop various dimensions, i.e. in practical terms, a certain number of corporate "policies";

b. The capacity to know and be able to use all the resources, in the first place the unused individual and available knowledge, both tacit and formal, in a clear and well-articulated strategic design. We refer to the theory of dynamic capabilities

1.3 First conclusion

Innovation is:

(a) a non linear process;

(b) a multidimensional phenomenon;

Excellence in innovating largely depends:

(a) upon the degree of co-evolution of the different dimensions of innovation;

(b) the availability of dynamic capabilities at corporate level.

2 The Dynamic Capabilities or the Dynamic and flexible expertise - skills

The title already indicates the multifarious approaches possible to the issue of individual capabilities – the "capabilities" of Zollo and Winter[7], the "skills" of Le Boterf[8] , and a variety of contributions on the skills linked to expertise, such as those by Meghnagi[9] and Newell and Simon [10] . To these names we should add those of Dewey and Argyris.

2.1 Knowledge evolution

From the practical point of view the problem can be delimited in the following way:

In a very turbulent ambient subject to very rapid changes, the innovative and excellent companies have, amongst the other possibilities, that of "science-based" innovations, the capacity to rapidly gasp the important and/or strategic external changes and to restructure their operative behaviours, besides their long-term choices. How does that happen, and what conditions foster such skills?

This Figure, taken from Zollo and Winter, is highly explicative:

---

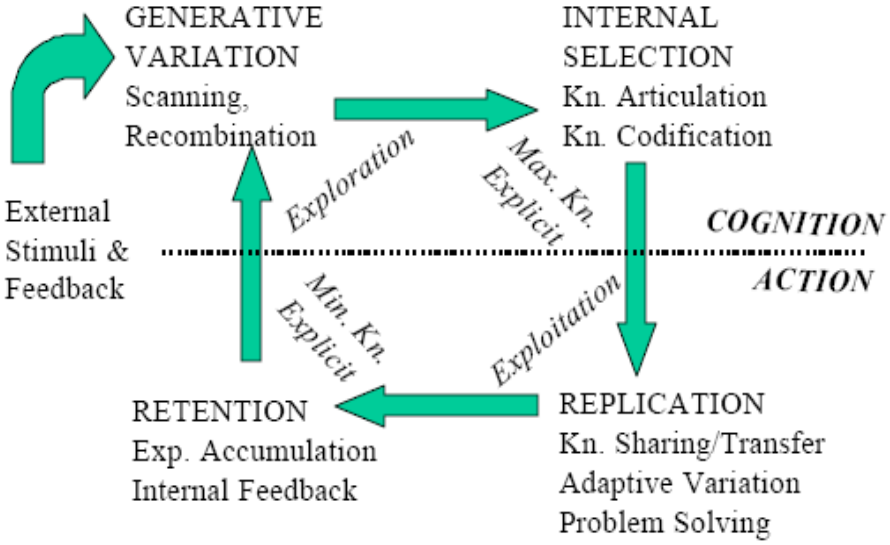
7 Zollo, Maurizio; Winter, Sidney, 1999 – From Organizational Routines to Dynamic Capabilities – WP 99-07 – The Wharton School University of Pennsylvania.

8 Le Boterf G., 2002 – Développer la compétence des professionnels – Edition d'organisation, Paris

9 Meghnagi, S., 2005- Il sapere professionale Milano, Feltrinelli, Milan

10 Newell, A., Simon H.A., 1972 – Human Problem Solving – Englewood Cliffs, Prentice Hall.

Figura 1 – Knowledge Evolution Mechanisms



The basic chart is a cycle that from a stage of generative variation, which is born from a combination of an impulse external to the company and some ideas, even in a tacit and/or embryonic form, with its consolidated routines, moves from a stage of internal selection that explicitly evaluates their potential. These first two phases are exploration and explicit phases of the external stimuli and involve some cognitive processes in an important way. There follow two phases, the replication and the retention, in which action typically prevails. The first action is the utilisation of what has previously been selected and leads to the reproduction of the routines, in the light of the context modifications – an adaptive variation, therefore, and the second, of explicit, is an action of experience accumulation, in the new context, something that determines the new set of procedures, an action of recombination, therefore. Cognitively speaking, the cycle moves, from right to left, in the direction of explicit forms of knowledge, well-articulated and codified, while from left to right, the knowledge tends towards tacit forms "as it becomes highly embedded in the behavior of the individuals involved in the multiple executions of the task".[11]

2.2 A definition

That having been said, what then is a dynamic capability? It is

"*a learned pattern of collective activity through which the organisation systematically generates and modifies its operational routines in pursuit of improved effectiveness*."[12]

Thus, for a company, to have that dynamic capability or not to have it is not a "target hit or missed" with an isolated and singular act of creativity, but the availability, or non availability, of stable structures and/or operational patterns. It is not even an individual mechanism in a strict sense even if it has been set off and conveyed by the people involved.

---

[11] Zollo, Maurizio; Winter, Sidney, 1999, op. cit., p. 7
[12] ibidem, p. 10

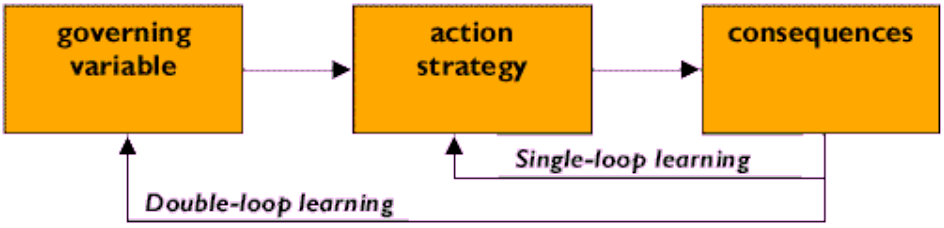
Zollo and Winter rigorously define the three mechanisms involved in this dynamic process: the organisational routines, the articulation and the codification of knowledge. Let's look at these in detail:

A. The organisational routines are distinguished into operational, and learning or search; for our discussion the latter are decisive.

B. Knowledge articulation.

Knowledge articulation is for us essential because it consists in the implementation of a collective learning mechanism that spins off from the chance for the individuals to express their opinions and beliefs by means of a constructive dialectic discussion with others, even by contesting their points of views. These forms of learning enrich the capacity to elaborate learning or search organisational routines. This involves a specific organisational pattern which, in the first place, allows one to express oneself freely and, in the second place, to have time and place resources to allow this dialectical interchange: the possibility, in other words, to organise discussion groups, seminars, etc..

From this analysis, therefore, accrue the minimum criteria for organisational specification that allow for different organisational set-ups, respecting some criteria that can defined as part of the conditions laid down for excellence in innovation. This part refers directly to the theory of Argyris on the double-loop learning process that is intuitively comprehensible from the following chart:



and the consequent need to go from Model I to Model II, what he called theories-in-use, that is approximately to say the routines. In short, Model II can be summarised like this:

The significant features of Model II include the ability to call upon good quality data and to make inferences. It looks to include the views and experiences of participants rather than seeking to impose a view upon the situation. Theories should be made explicit and tested, positions should be reasoned and open to exploration by others. In other words, Model II can be seen as dialogical – and more likely to be found in settings and organizations that look to shared leadership. It looks to:

- *Emphasize common goals and mutual influence.*
- *Encourage open communication, and to publicly test assumptions and beliefs.*
- *Combine advocacy with inquiry* (Argyris and Schön 1996; Bolman and Deal 1997: 147-8).[13]

2.3 A highly conducive organisation

The specifics of the system thus become increasingly clear and well-defined. We can speak of a set of conditions about the organisation that in brief are contained in the definition of highly condu-

[13] http://www.infed.org/thinkers/argyris.htm

cive organisations[14], meaning by conduciveness the structural capacity of an organisation to allow, for example, the activities indicated previously in Argyris' Model II, and specifically allowing the members of an organisation to share a "mental space"[15].

Moreover, the ManVis study reaches similar conclusions. The study underlines, in line with what has hitherto been said:

> *"Knowledge-based manufacturing needs a learning organisation: the experts endorse a company's responsibilities for this issue, using own resources and developing individual organisation cultures. However, they do not see self-employed individuals as a realistic vision for manufacturing operations"*[16]

But it also states that:

> "*There is a market tension between the low importance ratings on improving work-life balance conditions, on one side, and the positive views on long-term competence development, on the other side: therefore, the often-seen pre-requisites are rated lower than the preferred outcome of competence building. Further debate on this issue is needed as adequate education and qualification is seen as the most relevant barrier in this field.*[17]

Thus going so far as to consider as prerequisites necessary for the realisation of such dynamic capabilities as are capable of fuelling excellent innovation, not just the existence of a highly conducive company or, if we prefer, capable of learning, but also of equilibrium conditions between life and work that allow for medium long-term investments, by some individual and some companies, in their working competences, which implies a reduction in the degree of working instability. We shall be looking at this point in the next Chapter.

A highly conducive organisation can be described very precisely. The problem remains open of the compatibility of such an ideal-typical organisation with the possibilities of the SMEs. The greatest difficulty is the availability of sufficient resources to have the time and the spaces that allow for these dialogical activities. In actual fact, these difficulties lead us back to our project's general problem: how to allow the SMEs to access the excellent behaviours hitherto reserved to great companies.

The problem can be partially solved, as far as this specific point is concerned, if we hypothesise forms of organised collaboration, within the scope of a cluster, a filière, a sub-supply network, a horizontal collaboration network between SMEs, etc.. Excellent examples are reported in the literature, for example Sweden [18] and in the more recent research, for instance in PILOT the case of BMS in Norway and Postillo in Italy; as a matter of fact:

> *"BMS collaborates closely with one customer from concept to finished product. Again, in the case of the Italian firm Pontillo, the company is involved in constant product innovation, is capable of modifying extremely high-tech equipment and is closely involved in the design phase and feasibility study along with its clients"*[19].

ManVis considers an essential strategy for the future to be that of the enterprise networks:

---

14 Garibaldo F. (1996), Workplace innovation: the making of a human-centred industrial culture, in Gill KS (ed), Human machine symbiosis: the foundation of a human-centred system design, Springer, Berlin Heidelberg New York, pp. 449-452; Garibaldo F., Rebecchi E., Some reflections on the epistemological fundaments of an Italian action-research experience, "AI & Soc" (2004) 18:44-67, SpringerVerlag, London, p. 53

15 Ibidem.

16 ManVis Report 2 – p. 53

17 ibidem, p. 53

18 Lundberg, M.: Tell J., From Practice to Practice: On the Development of a Network of Small and Medium Sized Enterprises, "Concepts and Transformation" 2:1 1997.

19 IPL team in Pilot Project – WP4 final report – p. 9

"*almost all experts believe that specialised SME networks which compete successfully in the global marketplace enhance Europe's competitiveness and employment rates*"[20].

The Emilia-Romagna regional government at the beginning of this year created a specific innovation centre (Pi.M.I.NET) devoted to boost networking among SMEs.

The aim of Pi.M.I.NET innovation centre is to overcome the fragmentation that typically characterizes local productive systems with a large presence of small and medium sized enterprises by supporting the creation of horizontal networks among complementary companies, instead of the traditional vertical integration processes. This strategy will allow the valorization of existing synergies between companies while maintaining at company flexibility. To this end, the Innovation Centre will support processes of organisational innovation[21].

C. Knowledge codification

Knowledge codification, that is the production of written materials, of "tool boxes", of decision supporting systems, etc. is one of the explicit objectives of our project. What should be made explicit is the fact that in the model of Zollo and Winter it is underlined that the codification is a costly process in two senses. In the first place because it absorbs time and money resources, key problems for the SMEs, and also because it tends to produce a greater "organisational inertia". The point underlined by the two authors, which for us is of great importance, is that the latter cost does not automatically derive from the codification process but depends on a series of circumstances that can be controlled. A good case in point is the **IMP³rove project** - http://www.europe-innova.org/index.jsp?type=page&lg=en&classificationId=4958&classificationName=Innovation%20Management&cid=5128 – which will deal with the today need for companies to have the capabilities to manage the process of innovation, from original idea to final product. Innovation management is not just a means in itself, but is about developing and organising endogenous capabilities within companies and translating them into competitive advantages and profits.

For small companies, which are often the most innovative, the challenge is two-fold. On the one hand, they must satisfy the demands of existing customers; on the other, they need to keep pushing the boundaries in the quest for new ideas and opportunities. Large corporations too have dilemmas related to innovation. In order to be successful, they concentrate on their best customers and their profits, trading in more sophisticated and expensive products and ignoring low-end product niches which are less profitable. It is these niches that small start-ups can exploit in order to take a share of the market from large companies. The recent success in internet phones is one such example.
Many SMEs and young innovative companies do not possess the entrepreneurial skills needed to exploit innovation successfully and survive in a competitive market. IMP³rove, Europe INNOVA's innovation management project, is specifically aimed at supporting innovative companies in overcoming these problems.

IMP³rove aims to provide innovation facilitators with new and better tools to consult enterprises on innovation management issues. The project activities will support innovative enterprises, innovation intermediaries and financial as well as policy actors.

2.4 Capability building

Therefore, having seen the nature of the dynamic capabilities and some of their underlying mechanisms, how can they be constructed according to Zollo and Winter?

---

[20] ibidem, p. 17
[21] See www.piminet.org

"Dynamic capabilities emerge from the co-evolution of tacit experience accumulation processes with explicit knowledge articulation and codification activities."[22]
Very concisely this is a further reiteration of the need for systemic and stable structures and modalities.

What seems to be much more interesting for our project is the concept of Learning Investments Function, i.e. an estimate of the joint functioning of the three mechanisms described in A, B and C. As is obvious its minimum point is when the company only rests upon consolidated routines, growing in the case of articulation and reaching its maximum in the case of codification. By definition our project reaches average and high levels of the indicated function.

What is interesting and not obvious is calculating whether and when, specifically for the SMEs, such an investment is justified. Whether the set of arguments laid down here and put forward to propose our project constitute a strong response and, instead, when it is necessary to address our research and elaboration efforts.

Zollo and Winter provide a logical framework for dealing with the problem.

They take for granted what our project has assumed from the start i.e. that the situations in which there are important changes and with a strong acceleration – conditions that today characterise nearly all the European SMEs; furthermore, the situations in which the market positioning itself suggests and explorative orientation as concerns the products and the services provided. On this last point the essay will go back in greater detail in the next Chapter. A last class of cases is that in which the variables are the frequency, the homogeneity/heterogeneity of the task experiences that the company must deal with and their greater or lesser causal ambiguity, i.e. the clarity for those who must carry out a task on what must or must not be done.

Zollo and Winter lay down three hypotheses on which we could work in the specific case of the SMEs. Here they are:

H1 *The lower the frequency of experiences, the higher the likelihood that explicit articulation and codification mechanisms will exhibit stronger effectiveness in developing dynamic capabilities, as compared with tacit accumulation of past experiences.*[23]

H2 *The higher the heterogeneity of task experiences, the higher the likelihood that explicit articulation and codification mechanisms will exhibit stronger effectiveness in developing dynamic capabilities, as compared with tacit accumulation.*[24]

H3 *The higher the degree of causal ambiguity between the actions and the performance outcomes of the task, the higher the likelihood that explicit articulation and codification mechanisms will exhibit stronger effectiveness in developing dynamic capabilities, as compared with tacit accumulation of past experiences.*[25]

These three hypotheses select broad classes of SMEs, i.e. those that have productive processes characterised by:

a. Low frequency; i.e. short series
b. High heterogeneity; i.e. high variances
c. High ambiguity in the cause-effect relationship; i.e. scarce operational formalisation.

It is a matter of performing a careful reconnaissance as the project unfolds. The considerations of the SIG 3 here find further supporting elements.

---

22 Zollo, M.; Winter, S., 1999, op. cit., p. 17
23 ibidem, p. 26
24 ibidem p. 26
25 ibidem p. 28

2.5 Second conclusion

Dynamic capabilities depend upon:

(a) Stable structures and operational patterns;

(b) a model of work organisation allowing people: I)to participate to dialectical interchange (discussion groups; seminars; etc.); II) encouraging open communication and to publicly test assumptions and beliefs; III) to share a “mental space” in order to properly manage complex task and problems;

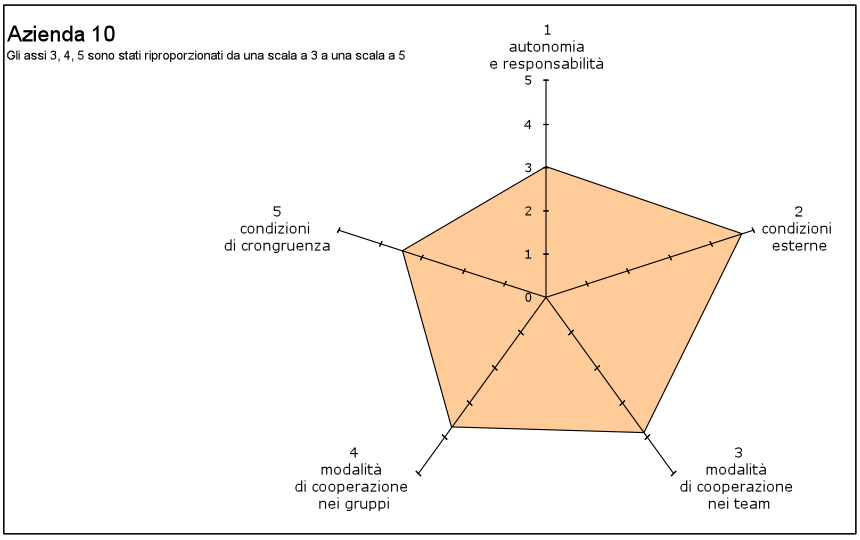
(c) an adequate educational and qualification policy that can be measured through the Learning Investment Function;

(d) a process of optimisation of the Learning Investment Function moving towards Production Organizational models based on I) short series; II) high variances and III) scarce operational formalisation.

2.6 Measurement questions

Up till now 8 criteria and 6 subdivisions of some of the criteria have been listed. How to measure these issues? A mere quantitative and parametrical analysis of these issues is not achievable;it seems effective the foot print analysis scheme. It means to represent each parameter with a conventional set of scores – for instance from 1 to 5 – on a chart; see figure 1; in this case quantitative and qualitative measures can be used at the same time for different dimensions.

Figura 2 - Footprint analysisi example; measuring professional autonomy dimensions in a car factory



2.7 SMEs and innovation assessment

A simple SWAT analysis scheme can sum up what is specific for SMEs in pursuing innovation.

SWOT-Analysis: What are the issues affecting innovation (management) in SMEs?

Strengths	**Weaknesses**
• Fast access to information via intranet • flexible organisation • huge potential to be leveraged (regarding employment) • Awareness at some SMEs of the lack and need for innovation management • Owner is really interested in company (not only a "financial" shareholder) • Many knowledgeable consultants	• Lack of willingness (change) • Lack of resources, lack of delegation power • Short term vision • Lack of competencies and contact networks • No existing innovation management • Too shy to contact research institutes • Lack of interest by managers on innovation management • Individual or family controlled SMEs may be afraid to change or to grow • Traditional management approach (non-flexibility) • Low participation of SMEs to EC co-funded R&D and innovation programs • Difficulty for SMEs in exploiting the results of R&D and innovation programs • Lack in knowledge protection by patents •
Opportunities	**Threats**
• Profits for innovators • Innovative companies can be bought by big companies • Large companies realize the importance of clustering with innovative SMEs • Anticipate market changes • Push innovation to OEMs • Innovation as a resource for gaining competitive advantage	• Globalization • Lack of money for innovation (Basel II) • No evolution, but changes of environment -> death of company • Non innovative SMEs tend to disappear soon • Innovation requires more and more expensive technologies • Change in social structures, gap between rich (want to work in multinational company) and poor (is not able to run a SME) -> Where are the entrepreneurs? **Competitive advantage obtained via innovation can be difficult to be sustained with internal resources (exposition to business riders)**

3 Beyond Schumpeter: the nature of innovation

A third dimension, in addition to being holistic and multidimensional, is required; it is concerned with the nature of innovation. As was pinpointed in the concept of open innovation by the CRF con-

tribution, and as it is stated in many definitions, for instance the definition by Rothwell[26] of the 5th generation kind of innovation, innovation will become more and more the outcome of cross-sectors fertilisation around broad "themes". These themes cannot be simply deduced by technology trends or sectional analysis, they comes from new and old complex societal demands not afforded at all or inadequately afforded by the existing supply of goods and services; for instance the sustainable mobility of people, namely in strongly congested metropolitan areas in Europe. These themes are too complex to be afforded by a single branch or sector of industry, and from a single discipline; they need interdisciplinary R&D and cross-sector innovation. So two more specific capabilities should be built. The first deals with the capacity to tune the internal creativity, based on dynamic capabilities, with societal dynamics, it can be called **strategic thinking** capabilities, the second deals with the problem of operating in networks and can be called **networking** capabilities.

3.1 Strategic thinking

The arguments hitherto laid down come under the hypothesis that innovating consists in putting new, reliable and the products onto the market, i.e. Schumpeter's idea. So there are not ecological considerations strictly speaking, nor of so-called social sustainability, meaning with this the set of the issues classified by the international agencies as Corporate Social Responsibility (CSR). On the more specifically labour issues in this paper we have so far proceeded inductively under the entry: "organisational and systemic conditions that allow for and facilitate innovation", but as is obvious this is not enough in respect to the European social model that presupposes the existence of a precise set of rules for the Industrial Relations (IR) and the presumption of achieving a high quality of work. Both as concerns the CSR, on the side of labour quality, and the IR, there is a copious amount of literature available, and in any case, the decisions already taken within the scope of the Union have laid down the constraints that every organisational reality must consider as a matter of fact. We are left with the task of laying down the foreseeable consequences of the different innovation models on the quality of work in the organisational, to set up models of excellence which, all other things being equal, exclude any processes that penalise Work. As is stressed by the experts of the ManVis report, it is initially a question of bridging the discrepancy between the demand for competences and the disinvestment in the necessary conditions, so that it can all be made possible.

The question is different if we introduce both the ecological constraint and those components of CSR that concern the macro-social issues.

Indeed, if we introduce considerations of a macro-economic as well as social kind then it becomes necessary to pose a series of questions:

1. Innovate what? The products, the processes, or both?
2. Innovate to achieve what? To generically satisfy a client/consumer irrespective of the nature and the quality of the demand? Or vice versa establish the hierarchies of the objectives?
3. Why innovate? Generically, as a condition to be competitive? Or more selectively for a specific configuration of competitiveness?
4. Who is responsible and how are the unexpected social consequences of the innovative processes managed?

[26] Rothwell, R. (1977) "The Characteristics of Successful Innovators and Technically Progressive firms", *R & D Management*, 7: 191-206.

We can make some more analytical preliminary considerations on each one of these questions, gleaning from them further criteria for a minimum specification of the requisites for innovative excellence.

We can, heuristically, consider two analytical segments: 1 and 2, and 3 and 4.

Innovation strategies

The need for product innovation

There is a broad consensus on the fact that in Europe there is at the same time a need for the innovation of productive processes, for the reasons illustrated in Chapters 1 and 2 of this report, and of the products, for the deep transformations in progress in the international division of labour. And it is the opinion of this research team that the true mark of excellence consists in the capacity to tie together the two moments by developing specific synergies; such possible synergies are today determined by the product innovation side. In short, it is not only a question of applying the latest formula of in vogue management techniques irrespective of any other consideration, but of supporting the product innovation elements with adequate and specific organisational innovations; this is a particularly relevant consideration for the SMEs. Underlining the idiosyncratic elements does not mean not considering a series of horizontal needs for organisational innovation, well-grounded in the two previous chapters, but knowing that these horizontal innovations constitute a set of minimum specification criteria, or if we prefer, a generative matrix, of solutions that are to be sought for *ad hoc* and balanced as a function of the product strategies being pursued.

The dominant theme of the situation is the product innovation and this is motivated by the fact that Europe's market positioning and specifically that of some European countries – such as Italy – is no longer sustainable, given the constraints of the European social model, unless this is done through a profound innovation in the relationship between domestic market and international market, and the products and service offered on both markets. A realignment between the domestic market and the outside market offers the opportunity to sustain, profitably, a process of product and service innovation that transcends the models hitherto pursued.

The previous statements can be better illustrated with a few examples. The case of the automobile is a very clear one. All the international agencies agree on the fact that there is an excess productive capacity installed in the sectors both at the European and at the international level. In 2005, 54.559.023[1] passenger cars were produced worldwide, of which 17.772.480 (32,57%) in European plants and the new registration of passenger cars in Europe was slightly less than 15 million, it means almost 3 million in surplus that should be sold outside Europe. If the worldwide production of European brands is taken into consideration the challenge for European producers is even bigger; for instance in 2005 the production of passenger cars made by German manufacturers abroad was up to almost 5 million, that is roughly half of the overall German production. In 2005 the worldwide demand for passenger cars was 53 million vehicles. It means that there is a strong unbalance among production and sales data while the pace of productive capacity building, by each historical brand, is increasing in the attempt to widen the market share and therefore increasing the plant's utilisation rate and rising profit margins. The capacity installed is 80 millions cars per year. There is on average a worldwide utilisation rate of the plants around 75%, which means an overprice for the consumers; the average rate is the outcome of very different rates depending on the producers and this is becoming a competitive factor in terms of costs or profits or both. In the meantime new brands, mainly in China are increasing, mostly in joint ventures with western historical brands, new plants or expanding existing ones

Thus, if such a disequilibrium could not be resolved in the medium term, what does an excellent process of innovation in the sector consist of? In the first place, of course, in the technological search for engineering solutions that measure up to the energy crisis and the pollution problems.

This is the answer of the most innovative companies and of the research policies of the European Union. Such a strategy, certainly a valid one, has an upper limit that is evident in the prices of the products on offer, rather than in the costs for the producers, so that they can only be acquired by a minority of the population, a substantially large minority in the rich countries, but negligible percentage-wise in the emerging countries. The percentage calculation does not take account of the possible sales volumes, given that the minimum percentages in the populous countries are translated into substantial volumes in respect to the existing productive capacity, at least in the short-term, but already in the mid-term this is a matter of opinion given the frenetic growth rate of the productive capacity. So it seems reasonable for Europe to utilise the opportunity of stabilisation and growth for European OEMs – and the relative profits – coming for the market growth in China, India and other countries to develop a long term strategy based on:

1. maintain some strong specialisation such as the premium segment;
2. move the European sector in the direction of a sustainable mobility: a new generation of engines, new mobility patterns (vehicles and services) for metropolitan areas, developing an ecological dismantling cycle.

It is necessary to add that along this innovative line there is also room for the SMEs, actually for the SMEs that are specially born to exploit these new technologies, such as the fuel cells, carving out niche markets for themselves[27].

So the pursuit of such innovation strategies and the possibility to identify positions of excellence in such a field are not underestimated at all. Instead we want to identify a possible field of different innovation, as a case of illustration of the previously expressed concepts and to introduce some new ones. If, for example, we considered as a product of the car industry not the car itself, a private four-wheeled means of transport with an internal combustion engine, but the mobility of which the car would only be an instrument among the many possible, then many alternative possibilities would open up, not only the ones already mentioned for replacing the internal combustion engine with alternative systems of propulsion. Among these the idea of mixed mobility platforms seems interesting, that is, not just based on the car and the traditional forms of public transport, and integrated for the metropolitan areas[28]. Europe is a case of world importance for its structure based on high-density cities and metropolitan areas, and a population that is increasingly sensitised to the issues of mobility and pollution. The answer therefore to a public and private domestic demand, both individual and collective of this kind, is capable of building a supply of products and services on a global scale. Furthermore, it exemplifies another important innovation possibility deriving from the collaboration between different economic sectors, such as that of the motor-car and that of urban planning, between government systems and governance systems on a meso-territorial scale. Indeed, the concept of platform for mobility implies a task to be done not only on the means for mobility, but also on the architecture of the urban areas and on a synergy specifically designed between two action strands.

The previous example makes it easier to represent more abstract concepts such as the chance to have, around some great collective and/or individual demands of the internal European market the convergence of companies from different economic sectors capable of constructing *ad hoc* responses and wholly innovative in terms of products and services; products and services that, fu-

---

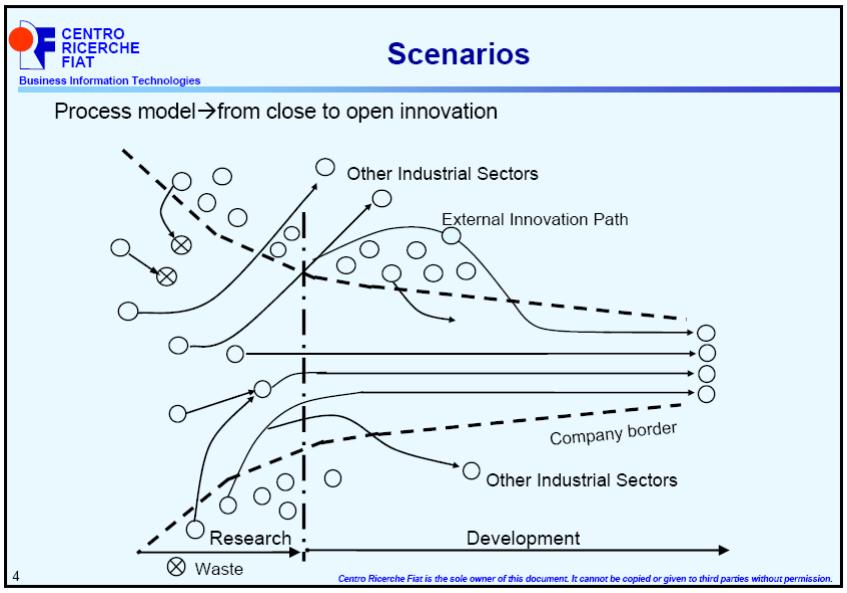
[27] Bardi, A.; Garibaldo, F., The automobile filière in Emilia- Romagna: strategic positioning and the consequences of the Fiat Auto crisis , in Garibaldo F., Bardi A., 2005, Company Strategies and Organisational Evolution in the Automotive Sector: A Worldwide Perspective, Peter Lang, Frankfurt am Main, pp.331 - 375

[28] See the materials of the congress organised by IPL, CERIS and CNEL in Turin on 25th Octoberl 2002 entitled: *Alternative Propulsions and the Car Sector*: *Possibile options, economic constraints and development potential*. In particolar, the paper delivered by Garibaldo F. “The means of transport and the flexible systems for mobility”, by Cervellati P., University of Venice, “Impacts and implications for the cities” “; by Larrue, P. – INSTEAD, France – The role of the public decision-maker from the case of the State of California.

fuelled by the internal demand have the chance to present themselves competitively on the global market. As is demonstrated by the case of the motor-car, in some of these new scenarios there are not yet any size cut-offs to the entry of new actors, in any case the SMEs networks that cooperate to organise complex responses are perfectly capable of entering these new markets. Furthermore, innovation is not necessarily based on high-tech; in some cases the innovating element is the original combination of existing technologies and easy access, to supply answers to a collective and/or individual demand that had not found, until that moment, an acceptable response. Within such a perspective, above all for the SMEs, the idea of horizontal and vertical cooperation between companies with different productive specialisations is essential.

If we consider the analytical block of questions 3 and 4 there come to mind further elements reinforcing what had been said with reference to questions 1 and 2. If indeed the global market is not read as a place for a homogenisation of the compartments, a reason why everyone would compete on everything, with the only difference being between those who have the control over the high-tech and those who don't, then we can identify segments in the world market, and the more such segments are referred to the demand for highly specialised and complex products and services the more they offer opportunities, on the one hand coherently with the constraints of the European social model and on the other with the economic sustainability, for the reasons laid down in Chapter 2, of productive models based on innovation as a structural fact and on the selection of a workforce and organisational models based on innovation strategies. The very same ecological norms, including the stricter ones, instead of becoming a constraint, in this scheme constitute an opportunity, given that the problems that find a solution through these norms are rapidly becoming more and more explosive all over.

This argument seems wholly coherent with the elaboration of the SIG 1 - Innovation Strategies and Processes - and namely with the scheme of the 4th Generation of R&D Management.



The open innovation scheme shows that innovation can come from the interplay of different knowledge and competencies, stored in different industrial sectors, and driven by an unfulfilled individual and/or collective demand.

3.2 Third conclusion

The excellence in innovation depends on the capacity to tie together process (it means also organisational) and product innovation by developing specific synergies; we label it as **strategic thinking** . The driver of this process is **product innovation**.

Product innovation should be linked to:

I. a different mix of domestic and global market's demands;

II. some big societal unfulfilled demands such as sustainable mobility;

III. addressing specific market segments.

IV. Eventually the basic idea of an interplay among different firms and sectors stress the relevance of public supported policies and strategies – that is industrial policies – to transform an accidental interplay in systematic co-operation. This is a critical point for SMEs.

3.3 Networking

We cannot go on, in particular as regards the SMEs, speaking of innovation by considering the companies irrespectively of their being "situated".[29]

The Table discussed in SIG 2 on innovation culture has outlined the nature of the relations:

SIG 2 approach – Innovation culture matrix

	Company level	*Transactional aspects*	*Contextual aspects*
Hard	Infrastructure	•Labs •Logistics •ICT	•Legislation •General infrastructure
Soft	•Organization •Managerial tools	•Services •Clustering •Supply chain	•Research system •Educational system •Industrial relations •Financial system (venture capital, private agency)
Intangible	•Values •Beliefs •Behaviours •Attitudes •Customs	•Knowledge system (Know why, how, when) •Industrial atmosphere	•Work culture •Intercultural dynamics

We thus have both the transactional aspects and the contextual ones that characterise the conditions of a company as a situated reality.

[29] Garibaldo, F.; Jacobson, D. 2005 : The role of company and social networks in low-tech industries. Paper delivered for the Conference "Low-tech as Misnomer: The Role of Non-Research-Intensive Industries in the Knowledge Company", 29-30 June, Brussels

As concerns the transactional aspects the processes undergoing change in the division of labour have pushed many authors to speak of a New Division of Labour (Eksted, 2004) in which a company becomes part of a "*wider system, such as networks, clusters, industrial districts, innovation systems, knowledge blocks, etc.]*[30]. Thus new forms of industrial organisation arise amongst which the project-based organisations, forms that are relevant to the SMEs. In these cases we have:

"The expansion and spread of project-based organisations challenge the traditional industrial structure. The activity of these organisations is in most cases closer related to its customers than is the case in industrial organisations. As already mentioned, it is not unusual that the seller and the buyer work on the same project. The "exit" mechanism of the market is to a noticeable extent being replaced by "voice", and sometimes even by "loyalty", which is a third and more intimate category in Hirshman's model. Most transactions are preceded by negotiations. Some of the more successful companies have developed sophisticated negotiation methods to handle the "voices" of their customers. The multinational contractor Skanska performs most detailed contractual discussions with its subcontractors and customers. High negotiation costs in the early planning stages of a project will be reimbursed if it contributes to fewer mistakes when the whole production apparatus is involved later on (Ekstedt & Wirdenius 1995)."[31] These considerations must be encompassed within the general project scheme; it is evident that this new division of labour is perfectly suitable to support a concept of open innovation and of strategic thinking also for SMEs.

SIG IV report indicates the innovation factors at the transactional environment level:

- Strong support on regional, national, European levels;
- Socio-economic policy supporting innovation (grants, subventions);
- Networking (clusters, supply networks, technological platforms);
- Innovation culture – public awareness, recognition;
- Strong support for joint ventures and collaborative efforts that develop and commercialise innovative solutions;
- Innovation awards.

For the contextual aspects, bearing in mind the previous analysis, we must underline some critical aspects that we ought to deal with:

(1) According to the PILOT project: "*Another policy problem is the **circulation of knowledge**. Low and medium-tech firms are actually utilising high tech knowledge in original and often informal ways. To facilitate these processes of knowledge exploitation the presence of a dense network of institutions favouring knowledge circulation is critical. The policy problem is, therefore, to support **capacity-building** for low and medium-tech SMEs to access knowledge resources in a critical and selective way. Policies for the support of knowledge circulation and capacity building for low and medium-tech SMEs can also be implemented through networking techniques. In this case, the network is not a functional-operative scheme for the delivery of products and services, but a way to cooperate on specific goals. Shared facilities for product innovation or a policy coalition lobbying for particular policies, for instance specific vocational policies to strengthen the labour market, are examples of this kind of network*." This argument also applies in general to the SMEs. The idea of innovation through the SME network of the line of the SIG IV. The SIG IV report stresses the advantages of networks and/or clusters for SMES saying that "*the manufacturing networks combine some good characteristics of large companies, such as critical mass, competencies, development potential, economy of scale, vast capital, etc. with advantages of SMEs, such as entrepreneurship, niche products and markets, flexibility, responsiveness, adaptiveness, etc.***"** It is also arguing that" t*heoretically,*

[30] Ekstedt, E. – **The New Division of Labour** – paper presented at the Japan Workshop on Corporate Social Responsibility & Changing Wage Systems – the Role of Trade Unions – Hitotsubashi University, Tokyo; Japan, November 26th 627 2004

[31] ibidem, p. 9

clusters / networks are complex adaptive systems (no mathematical models available, we have to work with non-linear, stochastic, non stationary systems and with uncertainty)"**.** In the circulation of knowledge we should include the problem of training; from what has been said in Chapter 2 there emerges the key role of training investments which, according to ManVis, can only be medium and long-term. The duty must first of all shouldered by the companies, within the scope of the calculation of the investment function, in order to avoid *free raiding*; in spite of that public policies remain essential, not so much for financial reasons but to determine the educational institutional picture that valorises the importance of this investment fostering new methods and approaches (forms of adult education, network support to training, including individual training, etc.). the ManVis project underlines some aspects relating to the corporate level and to process innovation: *"The majority of the experts assumes that education and qualification are the barriers for a realisation of the following statements:*

- *S015: Self-managing teams with a wide range of tasks, including planning and con-trolling, are widespread in the shop-floor organisation of production (80% of respondents).*
- *S053 Knowledge based manufacturing leads to a share of less than 10 percent of unskilled labour in the workforce (80 percent of respondents).*
- *S021 Companies promote the sharing of knowledge amongst individuals through the establishment of a communication friendly organisational culture and the provision of communication channels across formal structures (77% of respondents).*

Two statements of the strategy, organisation and management section and one referring to the working conditions section are estimated as being difficult to realise because the level of employees' education and qualification is regarded as insufficient.

Interestingly enough, four statements of the section strategy, organisation, and management are among the top five ranks. Thus, in order to realise new organizational concepts comprising higher qualified and more diversified employees such as self-managing teams or knowledge companies, the qualification of the employees is apparently estimated as being not high enough."[32]

(2) Today's financial system, on the eve of Basle II, an extremely critical element in the SME situation, above all in the hypothesis of a circuit of excellence for the SMEs; this presupposes easy access to credit even before highly innovative forms of medium-term investments.

(3) The local social and institutional context plays an essential role in sustaining innovative excellence. According to the results of the PILOT project, for example, for a balanced dynamic between global and local, **local policies** operating on all sets of "environments" to which a firm belongs, aiming at the creation of public goods supporting the innovation process must be stressed. Clusters and fragmented economies need strong intermediate institutions and institutional infrastructure to provide local collective goods. To set up such institutions the positive combination of the vision of the public bodies and the interests of the stakeholders (collective actors) are important factors. The crux of the argument is that technological evolution and innovative capacity evolve, among other things, as a result of the social context. Generally firms, and particularly small and medium Low Medium Tech firms, are highly sensitive to the solidity of the institutional set-up both of the national and the sub-national specific dimension. "Solidity" here means a mix of physically available infrastructures, and educational, vocational, knowledge creation, diffusion and brokerage facilities and institutions.

[32] ManVis Report 2 . pp. 19-20

4 Summing up

Summing up the conclusion of the first part of this paper on the "definition of innovation excellence in Europe" this is our understanding of the problem:

1. Innovation is a non linear, multidimensional and dynamic phenomenon;
2. Excellence in innovation strongly depends upon two basic factors: a) the capacity to co-develop various dimensions, i.e. in practical terms, a certain number of corporate "policies"; b) the capacity to know and be able to use all the resources, in the first place the unused individual and available knowledge, both tacit and formal, in a clear and well-articulated strategic design. The key factor is an integrated and coherent set of policies and practices;
3. These two factors are fully developed in organizations able to mobilize the dynamic capabilities of their people; this theme can be labeled as ***the conducive organization*** theme;
4. Excellence in innovation means also to go beyond the existing competitive path – to be more efficient in the existing set of products and services – and to create a brand new set of products and services able to fulfil existing not satisfied societal demands;
5. Organizations don't operate in a void and their performances are strongly influenced by transactional and contextual factors. As to the transactional factors, a key problem is how to manage the new division of labor in which a company becomes part of a "*wider system, such as networks, clusters, industrial districts, innovation systems, knowledge blocks, etc".* As to the contextual factors, key elements are the existence of systems of i) circulation of knowledge, ii) of ***capacity-building*** for low and medium-tech SMEs to access knowledge resources in a critical and selective way, iii) policies for the support of knowledge circulation and capacity building for low and medium-tech SMEs can also be implemented through networking techniques, iv) financial managing capabilities support, v) local integrated policies.

Part 2
The main pillars of excellence in innovation: definitions, examples and available tools

5 Introduction

The main pillars of our platform are:

1. **A conducive organisation** allowing people to develop dynamic capabilities, that is to achieve:
   a. ***Transformative capability*** is the "enduring ability to transform available general knowledge/competence into plant/firm/task specific knowledge and competence."
   b. ***Configurational capabilities*** is the **"**enduring ability to synthesise novelty by creating new configurations of knowledge, artefacts and actors."

   A conducive organisation should be built starting from some critical success factors such as:

   A. hygienic, physical and ergonomic factors;
   B. social relations and organisational factors;
   C. knowledge and competence management;
   D. human factors management.

2. **Strategic thinking capabilities**; the capacity to tie together process (it means also organisational) and product innovation by developing specific synergies. The driver of this process is ***product innovation.*** Product innovation should be linked to:

   I. a different mix of domestic and global market's demands;
   II. some big societal unfulfilled demands such as sustainable mobility;
   III. addressing specific market segments.
   IV. Eventually the basic idea of an interplay among different firms and sectors stress the relevance of public supported policies and strategies – that is industrial policies – to transform an accidental interplay in systematic co-operation. This is a critical point for SMEs.

3. **Networking capabilities**.

   Organizations don't operate in a void and their performances are strongly influenced by ***transactional*** and ***contextual*** factors.

   As to the ***transactional factors***, a key problem is how to manage ***the new division of labor*** in which a company becomes part of a "*wider system, such as networks, clusters, industrial districts, innovation systems, knowledge blocks, etc".*

   As to the ***contextual factors***, key elements are the existence of systems of

   1. circulation of knowledge,
   2. capacity-building for low and medium-tech SMEs to access knowledge resources in a critical and selective way,
   3. policies for the support of knowledge circulation and capacity building for low and medium-tech SMEs can also be implemented through networking techniques,
   4. financial managing capabilities support,
   5. local integrated policies.

6 A suitable organisation for European excellence in innovation: the definition of a conducive Organisation

6.1 Adapting vs. shaping

It seems to us that an extreme simplification of reality such as this antithesis of two basic patterns of action, **adapting** vs. **shaping**, can be useful for heuristic reasons; it does not describe reality, normally more ambivalent, but it helps to grasp the dominant patterns of real life. What we mean by adapting is a label for a class of different actions basically built on the belief that change must be introduced and mastered by experts, owners of a positive knowledge, either scientific or technical, and therefore other people must be taught how to come to terms with the new reality starting a process of adaptation. Today's quest for creativity and mental flexibility and ingenuity strongly clashes with adaptation, as a passive and manipulating process, for realistic reasons: normal human beings are strongly affected by this pattern and the main faculty to be jeopardised is creativity. In last decade research on creativity this phenomenon has been described many times, for instance in the research into the creativity of the product development department of Barilla workers (IRES, 1994), the researchers found: "(...) the presence of trust in the group that reproduces its presence in the work, allows us to state that the latter is organised in such a way as not to undermine, or undermine significantly, the trust that each individual has placed in it", and the participants in the research expressed this feeling like this: " (..) a person expresses himself at his best, freely (..) if he doesn't always feel judged, touched by what is said (..) if he feels he is in the realm of purposeful freedom (..) which means that if someone says something that is not shared by the others he doesn't feel that he has his back to the wall (..) even if he says something stupid (..) the atmosphere here is reassuring, so it enables people to express themselves better (..). Besides, we can also focus on trivial things, because until something has actually been shown to be trivial, it just isn't like that (...)."[33]

More recently, in research on software factories people writing software were asked to describe the role of knowledge and creativity in their work and if these role was acknowledged; this is synthesis of many different answers:

Knowledge and creativity are both important but while direct, specific and concrete actions may be performed on the former, development actions are more indirect on the latter. In any case, their creativity is completely different from the styleme of the "creative", like the advertiser, for example. Knowledge is the direct function of the investments that a company allocates to training and there are many obstacles to achieving a good level of investments: in the first place the markets and the economic constraints that stem from them; all of this means that the investments in training are not continuous, but cyclical which, in given moments, privileges some to the detriment of others. So there is a divergence between the needs of the individual for whom training, that is to say knowledge, is vital and the corporate cycles; it would be necessary to shift the equilibrium in favour of the individual because in the long-run this is an advantage for the company as well.
The greatest obstacle to this prospect lies in the outsourcing practices linked to the short-termism of the employment contracts. Indeed, the idea of buying the competencies required just-in-time, exactly when they are needed, prevents the company from stabilising and internalising new skills, thus hampering their development, and in the long-run, also depressing the professional development of the stable workers seeing that the philosophy of investments with immediate returns is taking root. Fortunately, this is not yet the situation of "A firm" although they do fear these developments that are so widespread nowadays. Stability is correlated with the growth and the accumulation of knowledge, something that is strategic to their work. Creativity largely depends on doing

[33] Barilla case study report, Ires Materiali,

new things, from being obliged to deal with new problems in day-to-day practice, but at times problems of industrialisation become a constraint to this possibility as, in the short-run, it would appear to be more convenient to keep the individual in the same job for a long time.[34]

More generally, it can be said that even if it isn't possible to explain the single creative act, it is legitimate to formulate hypothesis on the environment that can encourage it. Trust, as observed by many, derives from a solid environment and, in turn, allows for the emergence of the thought of the primary process, the premises for creativity.

So adapting is a term to describe the *as is* the situation and accordingly, ***shaping*** a term for the *to be* situation. ***Shaping*** means the active attitude, that is the bilateral process of adaptation of people to changes coming from outside the world of their experience and of the environment to their cultural, inheritance, willingness, needs, etc... We can sum up all this under the label: **a conducive organisation**, that is an organisation designed to support the process of shifting towards the *to be* standard.

Bender & Laestadius (2005)[35] distinguish two analytical dimensions of innovation enabling capabilities:

Transformative capability is the "enduring ability to transform available general knowledge/

competence into plant/firm/task specific knowledge and competence."

Configurational capabilities is the **"**enduring ability to synthesise novelty by creating

new configurations of knowledge, artefacts and actors."

That is a different wording for the same kind of dynamic.

6.2 Critical success factors of a conducive organisation

The critical success factors of a conducive organisation are:

A. Hygienic, physical and ergonomic factors;

B. Social relations and organisational factors;

C. Knowledge and competence management;

D. Human factors management.

A. Hygienic, physical and ergonomic factors

The European Agency for Safety and Health at Work [36](http://europe.osha.eu.int/about/agency) in Bilbao can help in identifying good practices, beyond the accepted international standards, to create a suitable workplace for each activities.

---

[34] Bolognani, M.; Fuggetta, A.; Garibaldo,F. – Le fabbriche Invisibili – Meta,Edizioni, Roma, 2002 – p. 107

[35] Bender, G./ Leastadius, St. (2005): Non-science based innovations. On capabilities relevant to generate ***profitable*** **novelty,** Paper in the project "PILOT: Policy and Innovation in Low-Tech" (www.pilotproject.org).

[36] Whose goal is "In order to improve the working environment, as regards the protection of the safety and health of workers as provided for in the Treaty and successive Community strategies and action programmes concerning health and safety at the workplace, the aim of the Agency shall be to provide the Community bodies, the Member States, the social partners and those involved in the field with the technical, scientific and economic information of use in the field of safety and health at work."

B. Social relations and organisational factors

Some sub-critical factors can be identified accordingly to the general definition:

a. Procedures, time and methods for cooperation;

b. Professional autonomy and responsibility;

c. Procedures, time and methods for integrating newcomers and young people.

d. Organisational framework supporting cooperation, responsibility and social integration

The sub-critical factor d) will be considered in its interaction with a), b) and c).

Cooperation

The kind of social cooperation within a group of people carrying out a common goal can vary considerably. Social analysis alone is unable to assess both the reason for the success or failure of team-working and the nature of group dynamics within teams. It is therefore necessary to turn to a psychological perspective. First of all, this perspective highlights the nature of the interaction:

There is a sociological and a psychological definition of the group ... which is very different. In the first instance, we have a description of those activities and actions that are accomplished at the group level. Vice versa, the psychological perspective is more oriented towards the description of what happens in the group at the mental level. It not only takes account of the actions that take place in it but also of all the mental parts that are activated by being in the group, whether they are of a rational or emotional kind.[37]

At the first stage of group working, there is inevitably a series of resistances that hamper the work itself. These resistances have been catalogued and described in various ways; some are well-known (for example, dependence, pairing up, attack and fleeing). Instances of these occur in all the work groups... In short, it may be said that when defences are triggered in a group, the collective activity is compromised; the group functions as a group work only when the defences are absent.[38]*.*

From a psychological perspective, it is possible to describe the following factors for group-working:

a. The existence of a definite theme, an exact goal.

   It seems obvious but *'each one of us brings everything of himself to the meeting he/she is taking part in his/her personal and family problems, etc.'*[39]*.* There needs to be an authority to see to the agenda and ensure it is achieved. Regretfully, this means that the group-work is not in itself as democratic as someone might think it is.

b. There must be a leader.

   Once the above two conditions are achieved, this does not necessarily mean that the work-group will become effective. It depends on many other conditions, which are dependent on both the social environment and the vision of the organisation. Two primary issues arise:

   1. the possibility of transforming the context by the group; in many cases, however, the environment can impede the activities and the goal of the group (adapting vs. shaping);
   2. group work is basically a functional activity, illustrated by the following:

[37] Rebecchi, E. –Difficulties and Potentialities of Group Work – AI & Society, vol. 8.3

[38] ibidem

[39] ibidem

... the group's work is essentially heterogeneous as it combines different experiences of a more complex knowledge... The group work questions Taylorism because it not only establishes that the duties broken down by Taylorism must be reassembled (the so-called 'reparative' aspect), but suggests that group-work modalities must be utilised in order to realise creative and complex jobs.[40]

This is what we can call a **shared mental space**, that is the cooperation of people to deal with complex jobs.

Team setting

It is possible to see a strong convergence between the sociological /organisational perspective, and the psychological perspective. The empirical evidence supports this kind of close relationship between the scope of creativity and self regulation, as being the main reason for team-working. It also determines the degree to which the advanced group working paradigm can be implemented.

The analytical digression on the nature of team-working has been influenced by our bias against the very simplistic concept of 'team-working' which is prevalent among social actors and policy makers. The basic concept seems to be that team-working is only a matter of social and organisational engineering: what in the old organisational model was designed as being divided, in the new model it has to be integrated. According to the analysis above, the setting up of teams in the socio-organisational perspective means to jeopardise the old structure as a whole and this is very difficult to attain and requires a large coalition of forces within each organisation involved in the process of change. This process will take a very long time because it will change the daily life of the organisation which is the solid base of the organisation. It will also interact with all social features - visions, values, culture, vested interests, and will involve all levels of analysis and action - micro-, meso- and macro. It means that setting up teams cannot be taken for granted and defined *à priori*.

We thus have two problems common to social research and psychological research: what are the conditions of reality that foster the onset of co-operative working models based upon a shared mental space and how should the organisational structures be interpreted?

On the grounds of the outcomes of the previous argument we can posit a very strong hypothesis: **teams are a *meta–level* of organisational development;** in other words **teaming** is a **state of functioning** and not a permanent feature of an organisational structure. What we mean is the capacity of an organisation to allow and to support a “call to life” of **shared mental spaces** as the very modern form of co-operation. From a practical point of view it implies that what should be inquired to assess an organisation and what should be developed to improve an organisational reality is not the very existence of permanent structures called teams but the **structural conduciveness** of the chosen organisation to allow the level of functioning called teaming. It could also be demonstrated, on the ground of empirical evidence, that there is an inverse relation between the degree of organisational embedment of team-working and its effectiveness. It doesn’t mean that the organisational structure is irrelevant because it must be conductive so it must be a *requisite organisation*, requisite for our purpose. There is not the *one-best-way*, the real conductive organisation, there are, indeed, a set of binding criteria defining *a space* of the possible variety of such an organisation. This space is not shaped and bounded only by the conductivity criterion but from broader criteria referred both to the different societal levels (analytically) and to many different societal goals (practically).

So our way of reasoning can be summed up, in a practical perspective, in a scheme based on different levels and tools. Our general purpose is to identify a social framework, shared

[40] ibidem

by social actors and sensible to individual's quest for autonomy and creativity at work, to create a new breed of organisations.

Examples

There are clear examples of it. For instance, as illustrated in one of the papers from the European funded PILOT project (financed within FP5 Key Action Improving the Socio-economic Knowledge Base (HPSE-CT-2002-00112) [41] the example of a **German paper mill** with approx. 100 employees8 may stand as a prototype:

*for a systematic improvement of transformative capabilities in the paper & pulp industry. In general the innovation processes in this sector can be differentiated into two phases. There are **periodic fundamental innovations**, which are always connected with very high investments in the development – or better: the purchase – of a new paper machine.*

*Such a 'break-through' is usually followed by a series of **incremental innovations**, which are additionally needed to yield the maximum return of the high investments of the past. Apart from improvements of the paper-quality, innovations oriented towards an enhancement of productivity or to lower costs are largely prevailing in the dominating field of mass-paper production. As in the late 90ies during the new economy boom the demand for newsprinting paper increased significantly, the analysed paper mill thought of enhancing their production capacity in this sector. After the idea was given up to modernise an already existing company site it was decided in 2000 to found a legal independent subsidiary and thus to build up a totally new plant with extraordinary modern machinery and rather innovative organisational structures in the green field. Within the process the paper machine plays an outstanding, central role. Modern ones are up to 140 metres long, up to 25 metres high and can produce 1900 m/minute of paper. Hence the key challenge in this industry is to adapt all other productive factors hierarchically to the paper-machine. According to the company's business strategy requiring total productive maintenance the production process is characterised by a very modern and innovative **work organisation**. The huge paper machine is operated in a five shift system, each shift consisting of 14 workers, who run the whole production line. Each shift can on its part be further differentiated into four teams of three and one team of two – whereas each team is responsible for a specific segment of the paper machine. The different shifts and teams operate – in contrast to the usual very hierarchical work organisation in the paper industry – relatively autonomously and self-responsible. For example the change of the shifts is organised by the respective shift personnel themselves. The workers in a team have different, distinct qualifications. In general one is a paper-maker, one is an electrician and one is a mechanic. Such hybrid team qualifications are necessary, as the teams have to fulfil an extraordinarily wide range of various tasks and activities. Quite remarkably each shift is namely not only responsible for the running and operating of the machine, but also at the same time for its maintenance.*

*The reliance on the knowledge of its workers is foremost reflected by the fact, that only **skilled workers** are employed. Thereby it is interesting, that only a minority of the workers are explicitly trained as paper-makers or could yet gain any practical experience regarding paper production, when they started to work in the company. Because of this lack of practical experience resp. knowledge, the new workers were sent for four months to another paper plant of the company before they began to work at the company. There they could gain by various training-measures the ne-*

---

[41] Organisational learning – knowledge management and training in low tech and medium low-tech companies – Contribution by Holm-Detlev Köhler ,Foundation University of Oviedo, and Klaus Schmierl, Institute for Social Research Munich,
to the conference
Low-Tech as Misnomer: The Role of Non-Research-Intensive Industries in the Knowledge Economy
Brussels 29 + 30 June, 2005

cessary basic (practical and theoretical) knowledge about paper production. Apart from the paper-makers most of the workers were initially skilled mechanics, electricians or chemical workers. This specific composition of the work force is not so much a result of recruitment difficulties – though there actually existed serious problems – but much more a consequence of the company's special work organisation. The model of integrative maintenance namely requires ***hybrid qualifications*** *– within the entire workforce and even within the single work teams. Furthermore it was aimed, that by the implementation of these teams a flux and transfer of knowledge is enabled.*

Thereby ***a reciprocal training-on-the-job*** *of the employees shall be initiated, in the sense that for example the mechanics train the paper makers regarding the maintenance of the machines, while in turn the paper makers impart their paper-specific knowledge to their colleagues. Finally, the relevance of this internal source of knowledge is reflected in the efforts the management undertakes to* ***promote learning processes****. For example a specific collective agreement regarding the working time was implemented at the plant. Whereas the weekly working time in the paper industry is usually 38 hours, the workers of the company must work 39 hours. In the additional hour the employees are obliged to take part in on-the-job training – e.g. to learn to operate on different sections of the paper machine.*

Thereby it is striking, that the concrete proceedings of this training are not determined by the management. Much more the complete training – even the timing – is organised quite autonomously by the employees. Only its content is reconciled with superiors according to production necessities and the company's business strategy.[42]

A second case in point is Invenio's hierarchy and project-group system

Invenio is an international operating company with locations in different countries. All locations have the same structure and kind of team working. All teams use the same quality handbook and as result of this the same processes and standards of documentation. The teams are leaded by a team leader and have different sizes, normally between 1 to 12 persons. The team Manager is being responsible for all parts of his own profit center. The teams are specialized for example working for special branches or customers or depending on the service they provide, like the Digitizing team only does digitizing projects or the team for gearings in Rüsselsheim only works for the Powertrain GmbH of Opel. The size of the team depends of the markets situation and is not fixed. In the history of Invenio the number and size of the teams did change very often. Every employee of one team has to be able to change the team or the location, having a short introduction phase, than starting to do the job in a new team. This flexibility of changing teams and work is a must to stay competitive in market.

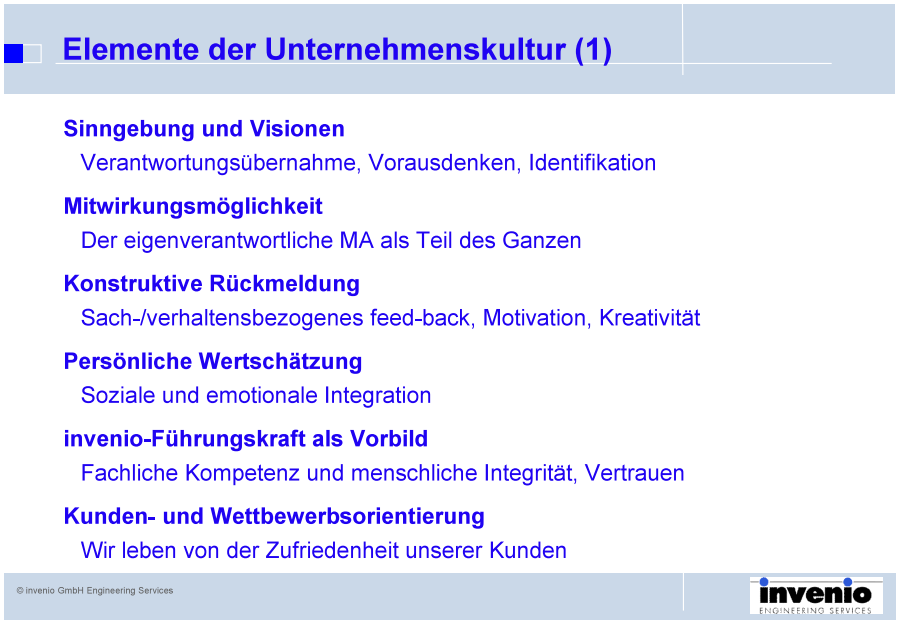
Because of the bright service of Invenio and the specialization of the teams, the employees often have to work together with another team of the company. In the locations you often find open-plan offices to work in. The whole team is sitting in one room and if possible also the leader is in the same room or very near to his group. Therefore all the employees know each other very well and they way and time to get necessary information or decision from the manager is very easy and fast. Also the working places are structured to each other, 4 tables are standing together. The four persons sitting there are looking direct into the face of the others and may ask questions or start discussion without having to leave the place. On the other hand Conference rooms can be used by all employees to have separated discussion. The history shows that the more rooms a location has and less people are sitting together in one room the communication is getting worse. The company provides always new technologies to share information. In Germany all locations are connected to the same data server. Personal meetings, net conferences, e-Mails and telephone are the normal ways of communication.

[42] Ibidem, pp. 18-19

Internal Culture considering the example written philosophy

Whether working in a large or middle-sized company the employees should get information about the corporate strategy. Invenio is certified by DIN EN ISO 9001:2000 and publishes on its intranet a quality management handbook with the companies goals, vision and processes. Moreover information and procedures which are not ISO relevant are stored in a special organizational handbook which is also on the net, accessible to all members. Here the employees find, for example all telephone lists, contact persons, rules in the specific locations and so on. One document shows the corporate philosophy, which was defined by the COO years ago. Split into short sentences the COO defines the way of working together and the attitudes an employee should have.

Figura 3 - Elements of company culture



Beginning with the Visions, like assuming responsibility and to think ahead, the document lists different themes. In a short sentence the headlines are described like the headline “possibility of workers participation” is explained as the employee having sole responsibility as part of the whole organization. Self-evident points were shown for example customer and competitive orientation, but also the culture of lifelong learning and to see Problems as challenge. The document is binding with all employees on all levels. Starting in the company the new employee is informed about this content and he or she can read it whenever it is necessary. The employees who get this information, especial young ones feel very well, because of the possibility to criticize, to ask and to do faults without getting trouble at the first time. Moreover they see the chance to think creative, to discuss solutions and to bring forward something until result. Also they recognize that they have to take responsibility for the result of their work. To publish this information and to control the performance is one of the critical success factors of Invenio.

Tools

Having defined what cooperation can be about it is quite evident that in this case, as in the case of professional autonomy and responsibility, there are two sets of tools to be designed: one to gauge the actual operative situation from the point of view of performance and one to assess the enabling conditions. The final assessment is the combined evaluation of both.

Secondly it should be defined a set of tools for a self assessment of the specific organisation, therefore a simple, easy and not much time consuming scheme addressed to the owner/s and /or

the manger/s of the organisation. After this stage, in order to start an actual process of change a more in depth analysis will be required involving also all or relevant parts of the employees.

Self assessment

A check list:

A. Performance factors

1. The rational of the cooperation scheme existing in the firm. Is there a scheme more oriented to cooperation among people carrying very different tasks and with different professional competences or more oriented to people performing quite equal tasks with very similar skills?
2. Was it a top down decision or were people some how involved?
3. Is this practice only restrained within the boundaries of a corporate function or also cross-functional?

B. Enabling factors

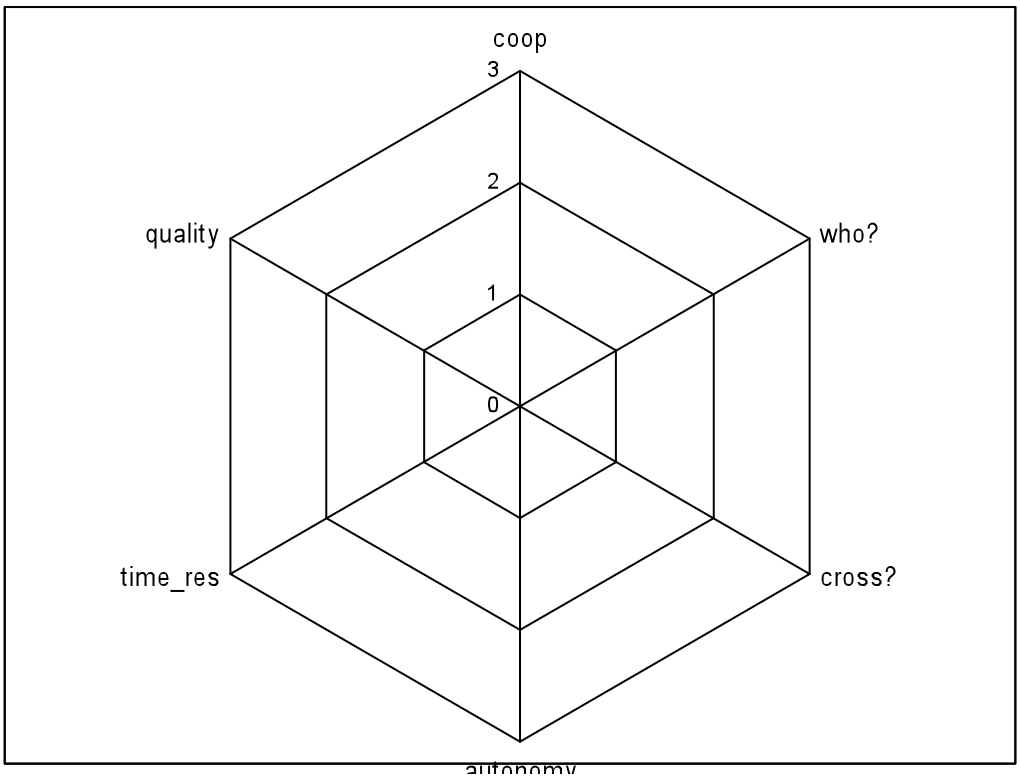
4. Are the team's members autonomous in deciding the way to perform and the timing to fulfil their goals? Have they some budget autonomy?
5. Are there time slots and facilities to allow people to meet to discuss their cooperation duties? Can they access to ICT tools and facilities to support their cooperation?
6. Is quality control a corporate central function or partly delegated to the teams?

It can be used a score table based on three scores: low, medium, high and quadrants can be drawn. There are tables describing which situation each score is identifying.

Cooperation pattern: a self assessment tool		**Enabling factors**		
		4	5	6
Performance factors	1			
	2			
	3			

Or a radar figure can be drawn based on the full set of factors without any distinction between performance and enabling factors. The first method is more oriented to identify causal relationships, based on the theoretical assumptions before illustrated; the second one is more oriented to a benchmarking exercise. To ease the self assessment exercise a table connecting scores and answers should be designed, possibly differentiating different kind of activities to make the exercise very up to the point.

Figura 4



In depth analysis

There are already existing questionnaires addressed to all or relevant parts of employees to assess in depth each of the previous factors.

Professional autonomy and responsibility

If we restrain ourselves to focus only on the problem of professional autonomy and responsibility two patterns are critical: the quest for individual professional autonomy and responsibility and the actual possibility, we mean the capability and the actual conditions to use it, for individuals to participate actively in cooperation based professional activities. The second pattern is only a different way to look at the problem of cooperation and can be afforded within the same operative framework. The first pattern is closely interconnected with the second one but it is not fully embedded in it; so we need a specific operative framework to assess it. Some concepts are useful; we have to make a clear distinction between the Argyris Model II and Model I; in practical and operative terms we can articulate this distinction contrasting two basic individuals' cognitive models: **problem solving** and **problem setting.** Problem solving is a functional ability to afford a problem in a structured situation and to go through it successfully; it is of course a very important asset for every organisation to have a large stock of this cognitive capability among mangers and employees. What can be considered a special feature of excellence for an organisation is to improve the stock of problem setting capability; we mean the specific cognitive capability to identify what the problem at stake actually is in a semi or non structured situation. It should be stressed also in an individual oriented perspective that this kind of cognitive capability is not only a personal capability but an interaction between personal capabilities and an organisational environment allowing, supporting,

recognising these capabilities as personal assets to be rewarded- that is again a problem of conduciveness.

Tools

As already said having defined what professional autonomy and responsibility can be about it is quite evident that also in this case there are two sets of tools to be designed: one to gauge the actual operative situation from the point of view of performance and one to assess the enabling conditions. The final assessment is the combined evaluation of both.

Secondly it should be defined a set of tools for a self assessment of the specific organisation, therefore a simple, easy and not much time consuming scheme addressed to the owner/s and /or the manger/s of the organisation. After this stage, in order to start an actual process of change a more in depth analysis will be required involving also all or relevant parts of the employees.

Self assessment

A check list:

A. Performance factors

1. Authority. The level of personal autonomy referred to the hierarchy, that is an assessment of the average delegation of power;
2. Planning. The possibility for individuals to plan their own tasks;
3. Direct contacts with customers. An assessment of the kind of roles and functions allowed to gave direct contacts with their customers;
4. Functional responsibility. An assessment of the kind of roles and functions with functional autonomy.

B. Enabling factors

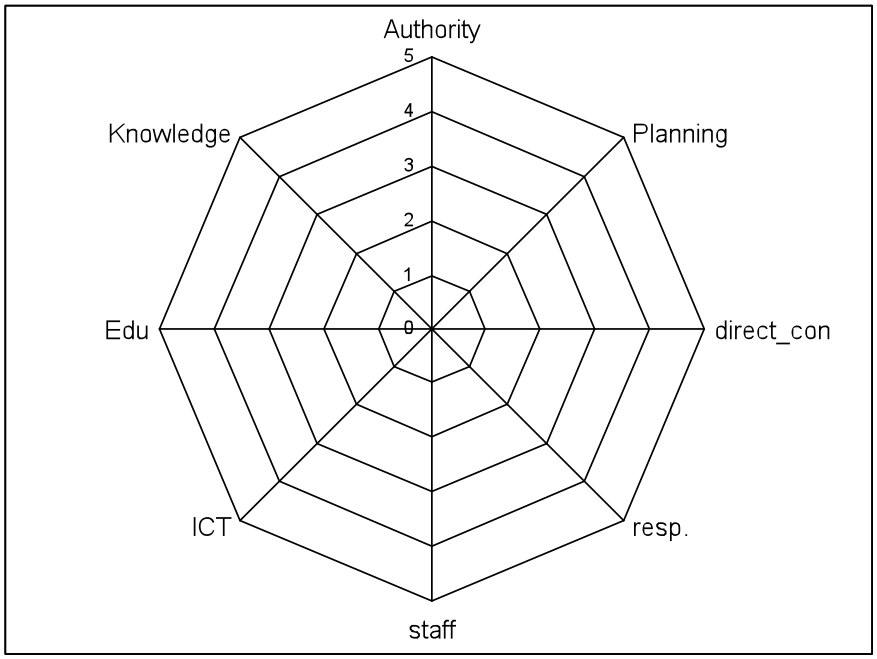
5. Staff size. Is the staffing level adequate for allowing people to have time for affording also non strictly functional tasks?
6. ICT. Are the ICT tools and facilities adequate to allow people to afford also non strictly functional tasks?
7. Education. Does it exist a continuous learning scheme? If so for whom?
8. Knowledge resources. Are general knowledge resources made available for people to afford also non strictly functional tasks?

It can be used a score table based on five scores: low, medium - low, medium-high, high and quadrants or a radar figure can be drawn based on the full set of factors without any distinction between performance and enabling factors. The first method is more oriented to identify causal relationships, based on the theoretical assumptions before illustrated; the second one is more oriented to a benchmarking exercise. The reason of a scale with five score instead of three is related to the difficulties to sharply drawing boundary lines among actual levels of personal professional autonomy. There are tables describing which situation each score is identifying.

To ease the self assessment exercise a table connecting scores and answers should be designed, possibly differentiating different kind of activities to make the exercise very up to the point.

Professional autonomy and responsibility: A self assessment tool		Enabling factors		
		4	5	6
Performance factors	1			
	2			
	3			

Figura 5



In depth analysis

There are already existing questionnaires addressed to all or relevant parts of employees to assess in depth each of the previous factors.

Procedures, time and methods for integrating newcomers and young people

The case of Invenio can be considered as a best practice to be taken as a benchmarking case.

Induction of a new employee at Invenio

Beginning in a new company always is a critical phase in business life for all people. The first days the person needs to learn about the rules and processes of the company, to get to know the colleagues and their corporate behavior. Maybe they are friendly or they are in a snit because they lose time training the new one. Many questions are waiting to be asked at the right time to the right person. The good and fast integration of new employees is one of the success factors in com-

panies. The idea of invenio is to accompany the new people personally and with written information on their first days. Before the new colleagues enter the door different things have to be prepared by the line manager, for example business cards or an introduction interview as information for the employees. The first day starting at invenio begins with an introduction seminar. Differentiated into two groups, employees and manager, the seminar has different contents and length of time. Starting with a short introduction of each participant, they feel well, because not being the only new one in the company. Basic Contents in both events are the presentation of the full invenio service by the sales department and the explanation of the philosophy. Another significant part is also the presentation of rules in the company (i.e. the whole office is non-smoking area; coffee in the kitchen is free for all employees, but the one who takes the last cup out of the machine, has to boil new one) and the social events (i.e.. every year in summer there will be a barbecue party for employees and their family). The new employee coming out of this seminar, they know about the necessary rules in the company, about the whole service and the spot, where he gets all written information (i.e. the storage location of the Quality manual or the Organizational handbook). After that the program follows with a round tour through the office, presenting important persons and infrastructure. The seminar for the managers lasts 2 days including the round walk and introduction to all management colleagues. Both groups get furthermore an introduction map with necessary information for the next days and a summary of the seminar. Accompanying the people in this way is helping them to start quickly and with a good feeling. Creativity and teamwork is cultivated and the corporate behaviour shown very well.

Education methods and appraisal interviews at Invenio

Lifelong learning is one of the tasks in the Invenio philosophy and a success factor for innovative companies. To secure the realization of this task a personnel education program is implemented. The program shows all training activities which can be offered by Invenio, differentiated in internal and external trainings and training methods. In addition a career model for all positions in the company is defined and published. Every employee is able to look at it, if he needs information about, because it is on a central storage place. Knowing about the two contents the employee may create his own goals for his personal and business future. Every year an appraisal interview between manager and employee has to be done. It is subdivided into two parts; the first is a review about the last year and the fulfilling of the tasks and personal competencies of the employee. The second part is future oriented and defines the new common goals and necessary trainings in the following year. This appraisal interview is not being very simple to handle, both participants have to prepare the contents before the meeting. Normally the expectations, the self-assessment and the person goals of the employee are different to the one of the manager. The task of the manager is to create a common understanding and goals. Both come up with their own estimation and discuss it to get a common agreement. After that the second part leads to define the tasks and goals for the future. One point of that is the definition of training requirements. The training program helps the manager to arrange everything with the employee without taking too long and without bureaucracy. The appraisal interview is a well structured form that leads the involved persons through all necessary points. The education program and the appraisal interview are some of the employee oriented processes which are part of the quality manual of invenio. This shows the high priority of these processes in the management strategy.

Introduction of a new employee at CRIT.

CRIT research implemented over the years a simple and easy methodology, that allows to develop, day by day, the relevant competences in newcomers, through an effective and comprehensive training on the job.

Newcomers are immediately involved in operative tasks, with an increasing awareness of the role and competences they are expected to provide to the company.

Basically, the methodology can be implemented by:

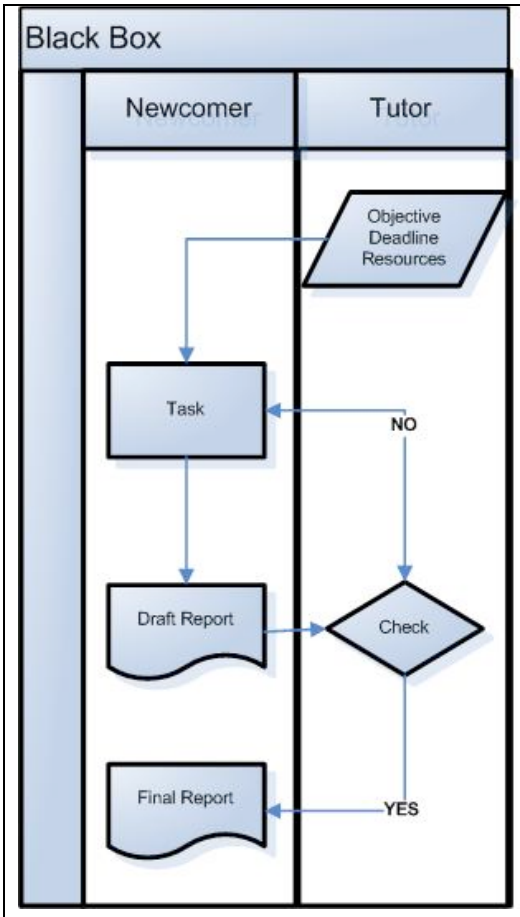
A. Black Box Session;

B. Tutorial Session.

Both systems are based upon interaction among two actors: company tutor (in charge of supporting new comers in the first period of activity) and new comer.

Following paragraphs clearly describe both approaches.

A. Black Box Session



Black box session has the objective to test the initial competences of new comers. Autonomy is assessed as well.

The company tutor gives newcomers some basic indications on the objectives to be achieved: expected outputs, deadline, available resources. Newcomers are left free to chose methods, tools and methodologies to solve the case.

Only a final check is performed.

In the case the output does not fit the planned objectives, executive tasks are performed again.

Benefits

This method allows to immediately evaluates resources as regards:

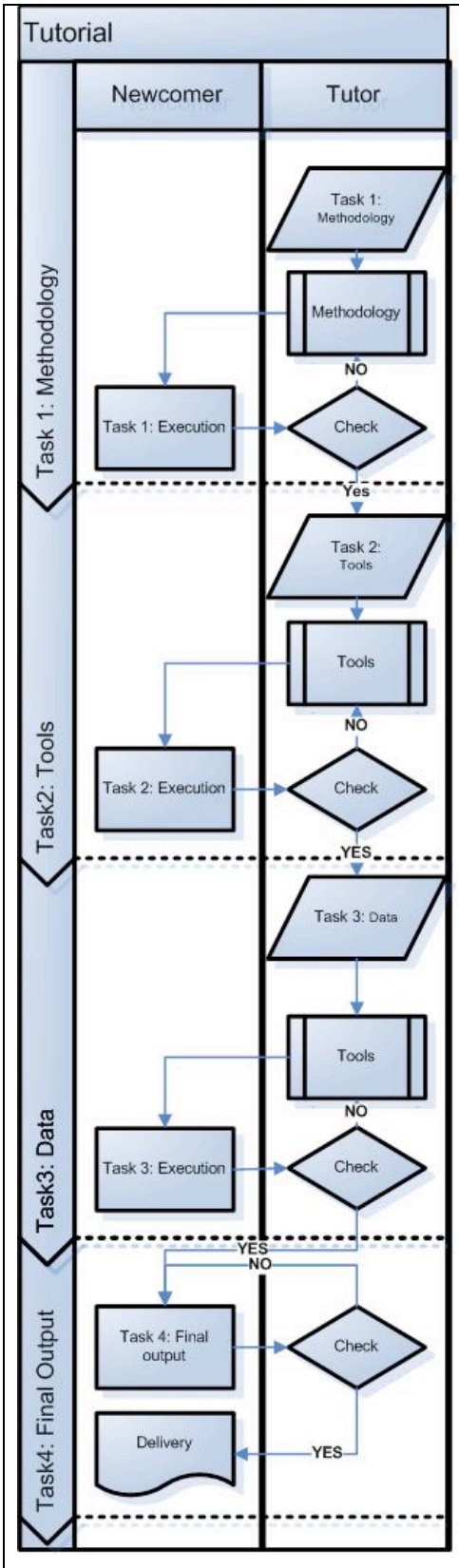
Autonomy,

Creativity

Motivation

Technical preparation

B. Tutorial Session



Tutorial session is a step by step process that allows to teach newcomers, on single tasks.

Main blocks that are considered are:

Methodology;

Tools;

Data.

Each executive step of new comers is checked and assessed, before prosecuting to the following task.

This methodology is quite more time expensive than Black Box session.

It requires an in depth tutoring of newcomers, whose activities are checked in details.

Benefits

This method allows to immediately evaluates resources as regards:

Technical preparation.

It does not allow to check and assess newcomers autonomy, neither motivation.

It is really useful for assess technical resources.

Tools

in WP 5 a list of available tools was draft:

- **Collaboration Environement tool**
- **Implicit KM**
- **Knowledge capturing systems and search engine** (Global retrieve image)
- **Explicit tools capturing, classifying knowledge automatically and tailoring it to each user** (Knowledge harvesting software, Tools for content-life cycle management and classification)
- **Personal knowledge management tools** (indexing and search tools, directories, dictionaries, visualization tools, e-mail management tools, social networking tools, publishing and authoring tools, including web logs, forums and wiki)
- **Mobile knowledge management tools** (mobile devises as PDAs and intelligent communicators, immersive virtual environment, intermental computer)
- **Tools integrating Semantic Web and Knowkedge Management System** (Webfountain, etc.)
- **High speed internet connection** for long-distance collaboration
- **Commercial video-conferencing software** that adds images to instant messaging
- **Teleconferencing environment creation** by keeping track of who is talking and when (wireless phones and handheld computers)

C. Knowledge and competence management

In VIVA Work Package 5 was chosen the conceptual approach of **open innovation**.

The concept is very convergent with that of a conducive organisation as to two main points:

a. stressing the relevance of the permeability of a firm's boundary from processes occurring outside and the existing or missing ability of that firm to internalise those processes as drivers of innovation;

b. the qualification of the organisational aspects of the process of change toward innovation excellence as a shift from vertical integration to smart organisation, one of whose feature is what we call the capacity of an organisation to allow and to support a "call to life" of shared mental spaces as the very modern form of co-operation, that is its conduciveness.

In the last decade the competitive global scenario has deeply changed compared to the past: a turbulent environmental and competitive contest, characterized by global competition, incentive to innovation, automation spread and information technologies development, replaced a relatively static environment. Organizational contest dynamics, in terms of both managerial culture and business disciplines evolution, replied to it.

Therefore, the birth of more and more flexible and transient flat structures, in which the individual and his competencies assume a central role, corresponded to the functional approach overcoming and to the adoption of the process vision: management system focus moves from organization to people, underlining the performance qualitative aspect.

For this reason at present competency-based systems of management (of human resources but not only) are spreading.

Competencies Management Subject is a set of methodologies and tools, supporting the firm in Planning, Selection, Evaluation, Human Resources Assignment, Training, Reward, Competencies

Diffusion, Carrier Planning, Document Management, according to business strategy, values and objectives.

The aim is to optimise human resources employment in business processes, in order to produce in requested times, at competitive prices and respecting quality objectives. For this purpose the main thing is to identify which competencies are required by the process taken into consideration and which ones are available in firm, in order to define human resources needs of each activity and to assign the most suitable resources to each one.

In particular, Competencies Management Systems diffusion involves highly variable and complex sectors, in which firms are forced to continually adapt to environment, in order to survive, and are pushed to innovate, in order to achieve a defendable competitive advantage.

A further parameter is joined to firm dimensions and processes/projects number and integration. The quantity of data to manage and the difficulty in Planning and Human Resources Assignment, typical of big firms, are added to differentiation and innovation needs, basic for small firms.

The FIAT Research Center (CRF) model

Fiat Research Centre has developed a set of tools and methodologies about Competencies Management during the last 5 years.

Once implemented, they allow firm to exactly identify and develop the competencies required by each role and those ones that each individual is able to offer.

The macro-phases of a Competence Management Approach are the following:

I. Competencies Mapping
II. Identification of Competencies in the firm:
III. Historical data analysis (work situations analysis, positions analysis, processes analysis).
IV. Interviews.
V. Results organization in list, tree or matrix.
VI. Definition of a knowledge levels legend for each professional figure (declaration).
VII. Competencies Evaluation
VIII. Identification of observers network.
IX. Evaluations Survey (interviews, questionnaire,…).
X. Evaluations analysis and join.

There is also the opportunity to support Human Resources Assignment and Activities Planning, analysing and comparing the available and required competence profiles before assigning resources to processes and activities.

Advantages/Disadvantages

The Competencies Mapping allows to identify a list (also structurable as a tree) of the competencies available and/or required by an organisation or a part of its, and/or necessary in order to implement their processes/activities. To reach these objectives, firm has to define values, strategies and business objectives, which are the phase inputs.

This activity is interfaced with the organization and its processes analysis, as with document management, being a valid support to.

Competencies evaluation methodologies aims to provide tools and methods for collection and join of (numeric or verbal) judgements, expressed by an observers network (bosses, colleagues, self-evaluation) on each individual. Each resource can be assessed, during several evaluation sessions, on the base of the competencies enacted in a work situation. It is necessary that this phase gets as input the organisation structure and/or its processes and competencies map.

The evaluation forms get out can be used in order to manage Selection, Rewards, Training, Carrier Planning and Mobility activities, on the base of the knowledge level individually or organisationally owned.

Finally, the opportunity to support Human Resources Assignment and Planning is dependent on the enterprise capability to identify the competence profiles requested by each process/activity and to compare them to the available resources, assessed on the base of their competencies.

Practice example of implementation

Company presentation: Alfa is a small molding enterprise, born in Southern Italy in1997. It is made up of 9 people and is organised in two unites, dedicated respectively to molding processes and administatration ones.

Initial Situation - Problem

To identify, analyse and organise the technological competencies for the molding production processes.

Application of method - Solution

Approach

Analysis of production processes.

Data gathering about the processes and the related competencies requested, throughout interviews to managers and technicians.

Analysis and organisation of collected information and competencies map building.

Activities done

The molding processes have been analysed. Several interviews have been conducted to managers and technicians in order to:

Identify different existing technologies, from the traditional to the innovative ones, by means of which the process is implemented.

Structure each technology in phases.

For each phase, identify the competencies requested to carry it out.

Link the specific professional role (job profile) to each phase.

With regard to each phase and technology, define a scale of knowledge levels (from Awareness to Application to Master), provided with a legend (declaration), and establish the related level requested for each competence.

Results

For each technology of each process, the map of competencies (with related knowledge levels) has been built.

For each process, the legend of knowledge levels (Declaration) has been built for each process phase.

Tab. 1 - Example of Competence Map for a process technology

TRADITIONAL INJECTION					
Competencies	**Level of knowledge**			**Phases of Process**	**Roles (Job Profiles)**
	Aw	**Ap**	**M**		
Knowledge of traditional simulation tools		x		Simulation (Calculation molding check)	CAE Analyst
Knowledge of traditional modelling		x			
Knowledge of fluidodynamics	x				
Knowledge of traditional process (polymer injection)		x			
Knowledge of material		x			
Knowledge of die components			x	Die Design	Technical Designer
Knowledge of material	x				
Knowledge of traditional process (polymer injection)	x				
Knowledge of CAD			x		
…					
…		…		…	…

Tab. 2 - Example of Declaration for a process technology phase

Process: traditional injection
Process phase: simulation (calculation molding check)

Competencies	**Awareness**	**Application**	**Master**
Techniques and tools to model physical phenomena. Knowledge of process Knowledge of modelling Knowledge of fluidodynamics Knowledge of material Knowledge of simulation tools	He knows the theory about the main performance parameters. …	He knows metrics and parameters describing physical phenomena in detail. …	He is a professional reference to his colleagues in understanding and interpreting the system performance data. …

Advantages, added value by the use of the tool

Comparison among existing technologies, from the traditional to the innovative ones, in terms of phases, competencies requested to carry out each phase and competence knowledge levels.

Opportunity to identify the competencies shared by several technologies and therefore more critical for the process.

Opportunity to identify the competencies gap and competencies knowledge levels gap between two technologies, in order to define specific training paths.

Conclusion and recommendations

Competence Management is cross-sectorial, therefore it can be applied without exception by:

Small and Medium Enterprises

Extended Enterprises

Sector Enterprises

Services Enterprises**D. Human factors management**

Again Invenio as benchmarking case.

The human resources of Invenio are one of the highest capitals Invenio has. Therefore many indicators were developed and measured to manage the persons in the company in good way. Some of them shall be explained afterwards.

Loosing people is loosing very much competence, know how and yearlong experience that means in sum having much new investment and a lack of time till a new one is able to replace the leaving one. Sometimes you loose direct with the person also the project he or she was working on. Because of this high priority one of the quality goals is to reduce the number of unplanned leaving employees. Setting the number of withdrawals as indicator for the company's success and quality, it is measured regular and in the case of having bad results the general management is informed and always actions have to be defined and practiced.

As service provider in the engineering area Invenio has to teach his employees very often. The range of the necessary number of training hours and the budget is defined as company goal every year. It is not a maximum budget, but a range to reach in minimum. For example the CAD-Software which is necessary to design and develop is not taught at universities. Therefore every young engineer starting after his Diploma has to be trained in the basic CAD-Software and normally every year he is getting update training or induction in new modules. Also project management, communication and creativity tools have to be taught. Invenio established a training department with trainers who work together with the employees in the operative work. The trainings they develop are real practice oriented and were also sold to other companies. The more training Invenio can produce inside, the better results Invenio reaches. But also new training techniques like E-Learning combined with training sessions are tested at Invenio.

From the beginning the new employee is leaded and coached. On one side an education program was developed and in the quality manual established. On the other side appraisal interviews every year find out and discuss the competences, goals and measure the well being of the employees. See also chapter 5.2.3.The quality audits check this in practice.

The training program and the standardized appraisal interviews of Invenio are kind of examples and indicators of Invenio to motivate employees to stay longer in the company and feel well.

7 Strategic thinking and scenario building

As it was already said in the first part of this report It is quite clear now that future excellent innovation will take place mostly around "themes" and there will be continually changing blend of technologies of various vintages (Bender, 2006). The starting point of an innovative process therefore is the clear understanding of the cross - business potentiality and of the technologies available for it, from the perspective of a specific business. This can be done, both by an extrapolative approach

and/or by a normative approach, depending on the degree of visibility of the possible interconnection of that specific business.

Scenario building is considered a technique, described in a specific scientific literature[43]. And a managerial technique often utilised by big corporations. Some of them developed its own method, for instance Royal Dutch/ Shell group (http://www.shell.com/home/Framework?siteId=royal-en&FC3=/royal-en/html/iwgen/our_strategy/scenarios/dir_scenarios_28022005.html&FC2=/royal-en/html/iwgen/leftnavs/zzz_lhn5_4_0.html), as Shell highlight it:

"The future is 'terra incognita': although we may be able to guess the outcome of events that lie close to us, as we project forward we enter an unmapped zone full of uncertainty. Paradoxically, the range of options this reveals can seem paralysing. No one can definitively map the future, but we can explore the possibilities. At Shell we use scenario building to help us anticipate what the future may hold and prepare ourselves more effectively. We also believe it can inspire individuals and organisations to play a more active role in shaping a better future—for themselves, or even on a global scale."

Khan was very clear in highlighting that scenario building is a totally different business from forecasting; it is exactly what is needed to introduce complexity in a manageable way in business decision making.

Scientifically speaking scenario building in an exercise on a mid-long term future from 15 to 50 years; to be useful in business terms it is possible to adapt it to a mid term exercise 10-15 years. After having selected some scenarios – it is possible, to treat them with classical planning techniques. The exercise is not futile at all as the Royal Dutch/ Shell group history makes clear; here the description of the case in point in the wording of Rasmussen (2005)[44]:

In addition, some of these enterprises established their own scenario planning groups, such as for instance the Royal Dutch / Shell Group in 1972. At that time the global demand for oil had increased from 6 % to 8 % per annum since 1945. But would it still be in the interest of the host governments of the oil producing countries to continue to increase production year by year? The scenario group at Shell approached this question as a mental drama, playing the roles of the major oil producing host governments. Thus, they created a scenario in which the oil producing countries reduce supply followed by a sharp price increase. Then it happened that the scenario suddenly became reality.

The Israeli-Arab conflict in 1973 had a dramatic effect on the oil prices: the oil supply was reduced, and the prices rose five-fold. Because Shell were prepared, they were able to take strategic action well ahead of their competitors.

So what happened was that (Heijden, 1996) :

"While most of the refining industry needed years to decide that something really fundamental had happened in the industry, Shell moved immediately, switching investments from expansion of primary capacity to upgrading the output of the refineries…… due to Shell's early adaptation of alternative policies, they suffered much less from overcapacity and outperformed the industry by a long

---

[43] Kahn H., Wiener, A., J. - *The Year 2000: A Framework for Speculation on the Next Thirty-Three Years*, - MacMillan Publishing Company (October 1967);
Geus, A.d (1988): *Planning as learning*. Sage UK;
Heijden, K. v.d. (1996): *Scenarios: The Art and Practice of the Learning Organisation.* John Wiley & Sons: Chichester, UK ;
Rasmussen, L.B. (2003): Action Research Toolkit II: The Scenario Workshop. In: Gill, K.S. and Jain, A. (eds) Navigating Innovations – Indo-European Cross-Cultural Experiences. Vol. 1: Brandt D. (Ed.): Enterprises and Cooperation networks for regional development. India Research Express, India. P. 241-258

[44] Lauge Baungaard Rasmussen - *Participatory scenario methodologies -Paradigm, Process and Validity*- paper for a conference at the University of Bologna – 2005.

margin. This later was shown to have had a fundamental impact on the way the company as a whole came through the turbulent 1970s and the early 1980s"

These methodology and techniques are well established and effective. Can they be adapted to develop an innovation management discipline?

They can. Through scenario building techniques is possible to transform the phase of identifying new products and/or services from a serendipity concept to an organised process.

According to Kahn (1998)[45] in inquiring on the future, people should :

choose between the extrapolative approach and the goal-seeking (or goal-avoiding), normative approach. In the extrapolative technique one examines an existing situation, selects certain tendencies that seem important or relevant, and then extrapolates these tendencies in a more or less sophisticated fashion. Various policy measures that might affect these projections and change the trends or results can then be examined. The normative (or goal-oriented) approach, by contrast, involves first setting up some future context or scenario that is either desirable to achieve or avoid, and then asking what sequence of events might lead to the realization of this objective. In many cases, a relatively implausible goal is examined, such as the achievement of a world government or total arms control, and then this goal is compared with the current situation and its most likely extrapolation. To connect the present and the postulated goal, it may be necessary to modify the image of the current world and that of the future world, and perhaps to use relatively implausible scenarios. These distortions are justified because the aim is to focus attention or discussion on some unlikely but absolutely important event or educational dimension.

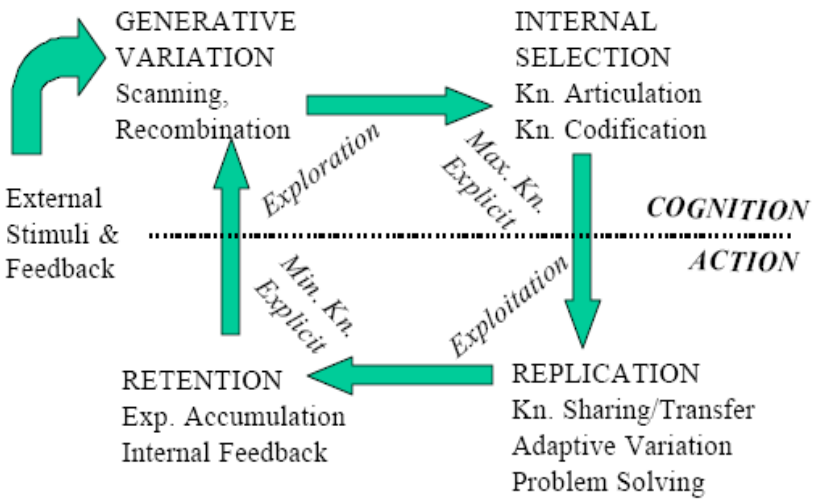
The scenario building is an heuristic tool with the power of regulating and organising our thinking; the outcomes are scenarios with an internal coherent structure and suitable for the usual techniques of measuring, accounting and planning. Therefore, it is possible, for instance to apply cost/opportunity assessment of these scenarios, to facilitate a decision.

It is also possible to go a step further. In case the innovation, a firm is aiming at, is strongly dependent on subjective preferences of customers or specific institutions and/or some kind of social aggregation (environmental groups, impaired people lobbies, old people representative organisations, etc) it is possible to use **participatory scenario methodologies** (Rasmussen, 2005), that is methodologies including stakeholders in the scenario building; these techniques have been already used to design brand new products in a process of "co-design" with potential customers (LEGO). The same kind of technique can be used in the value chain to start process of "co-design" of brand new products and/or services.

In this perspective innovation management and strategic thinking are connected in the scenario building activity, with two different roles; the roles can be highlighted also utilising the Zollo and Winter knowledge evolution mechanism, already illustrated in the first part of this report.

[45] Kahn, H.- ***Choosing a Perspective on the Future***
http://www.hudson.org/index.cfm?fuseaction=publication_details&id=1161

Figura 6 – Knowledge Evolution Mechanisms



The former will introduce in the scenario building an assessment on the internal resources – technology, people, accumulated experiences – available for innovation; it will participate in the **internal selection**, that is the evaluation of the potential of the different scenarios basic ideas, and will, at the end of the selection process, reorganise the internal resource allowing the selected ideas to become reality – products and/or services – in a sustainable economic process, that is the **replication phase**. The latter will introduce in the scenario building the **generative variation** phase, that is scanning and elaborating external stimuli, evaluating, on the basis of the networking capacity, the external resources – technology, market potential, people demands - ; then it will participate to the **internal selection**, namely in participating to recombine the external inputs with the internal resources.

8 Networking capabilities

A tentative selection of potential actions devoted to boost networking between companies and valorise interconnections among sectors are:

1. Mapping the interconnections among sectors and local productive systems, in other words the analysis of the existing and potential complementarities and synergies, among sectors and territories.
2. Mapping of the system of relationships among firms.
3. Analysis of the value chain inside of which the firm or network of firms operate.
4. Identification and analysis of the existing and potential complementarities and synergies among firms (market, product and technological synergies).
5. Evaluation of the possible areas of competition.
6. Research and selection of the network partners, if they haven't already been identified.
7. Organise innovation dialogues and workshops to involve stakeholders.
8. Definition of the organizational model of the network.
9. Definition of the distribution of the competencies inside the network and of the activities the coordinating node is in charge of.
10. Assistance in defining the system of governance (rules for entrance, exit, *benchmarking* against firms outside the network) and of the mode of formalizing the network.
11. Accompanying the implementation and monitoring of the network following the start-up phase.
12. Planning and implementation of the network's virtual skills center.

Part 3
Innovation management: serendipity or discipline?

This section will first of all afford the problem of the innovation management capacity and will inquire the possibility of a reference model. Secondly the reference model for the conducive organisation will be explicitly defined. Eventually the different parts will be connected in an overall reference model.

9 Innovation management capacity

The capacity to co-develop various dimensions, i.e. in practical terms, a certain number of corporate "policies" can be considered in different ways; for instance as a generic managerial capacity of coordination between the two opposite goals of organisation stability- routines, clear division of labour, etc , that is the closure instance– and the necessity of opening the organisation – searching for alternative ways, overlapping of competencies, etc. In this paper this capacity has seen as innovation oriented; it implies that the generic managerial capacity should become very specific and focused **: to develop and maintain an adequate and suitable innovative potential to be on the edge, in the specific field of the firm, of the competitive advantage**.

The first conceptual problem to be tackled is how to define the **creation** of innovation in a firm. On this topic there are many different schools; these different schools can be roughly divided into two main winds.

9.1 The triple helix model

The first one is convinced that "innovation itself remains unpredictable, non calculable, indistinct and fuzzy"[46]. The accent in this case is on the fact that there is not an assumed ideal model of innovation and so there in an endless transition from one state to an other – in a way very alike to the triple helix model, and not a defined journey. In this approach the results of innovation are arbitrary while the process to produce it is considered stable and based on a specific set of rules that are more or less based on social systems based on " managerial belief systems" on which people must agree in order to have real effects. In the actual world there are many competing "belief systems", each one with its own specific rationality so the results, as the outcome of the intersection of these competing rationalities, are normally sub-optimal, unpredictable and leading to many unintended consequences. The overall argument leads on the side of the single firm, to something alike to what in VIVA is the concept of a conducive organisation, and in general to the social network theory of innovation, that is the impossibility to isolate the innovation process of a firm from its broader social context. In other words is it possible to design social systems that are supportive of innovation but the outcomes are unpredictable because of the structural interplay of different actors with different strategies and rationalities at play simultaneously. A social system in itself is not a mere organisational blueprint, but the creation, development and maintenance of a specific culture supporting collective frames, which structure an accepted collective space for action. Summing up, in this perspective, innovation management is "the art of coping with indefinite system properties – of producing certainty and rituals in coping with uncertainties." Or "an art of communication, cooperation and 'playing the system' and "a collective art of changing the rules by playing the system.".

[46] Pohlmann, M:; Gebhardt, C. & Etzkowitz, H. – The development of innovation systems and the art of innovation management – Strategy, control and the culture of innovation- Technology Analysis & Strategica Management – VO. 17, No 1, 1-7, March 2005

What it seems a very key and unquestionable argument in this approach is the structural relevance of the interplay of many different actors, with different rationalities and strategies trying to shape a common course of action; no single actor can control all elements of an innovation system, the triple helix model is a way to represent it. In cultural terms this approach stress the complexity of the system and the impossibility to manage a corporate base innovation process as an independent process.

9.2 Innovation management as a discipline

On the other side there are the supporters of innovation management as a corporate discipline, that is not based on a random or hit-and-miss approach but design to reach a unique opportunity. In cultural terms this approach stress the possibility to reduce complexity , not to dismiss it, selecting what is functional to the specific target – innovation – not only inside the firm but in the broader social context; all thing considered the complexity of the system will introduce unintended consequences and these problems will be afforded through the traditional managerial practices. An example can illustrate the concept; in the medical sector, for instance, to have a good innovative idea is only a very small part of the product development strategy because, among other things, of the reimbursement models of the different National Health Systems; the model can incentive or disincentive an innovation depending on the kind of philosophy is pursuing: cost reduction or effectiveness of the devices for patients? In this case to reduce the complexity of the interaction cannot be restricted to the firm but should consider the broader context; what cannot be easily managed is the uncertainty of the evolution in the mid term of the national health systems in Europe.

9.3 An integrated approach

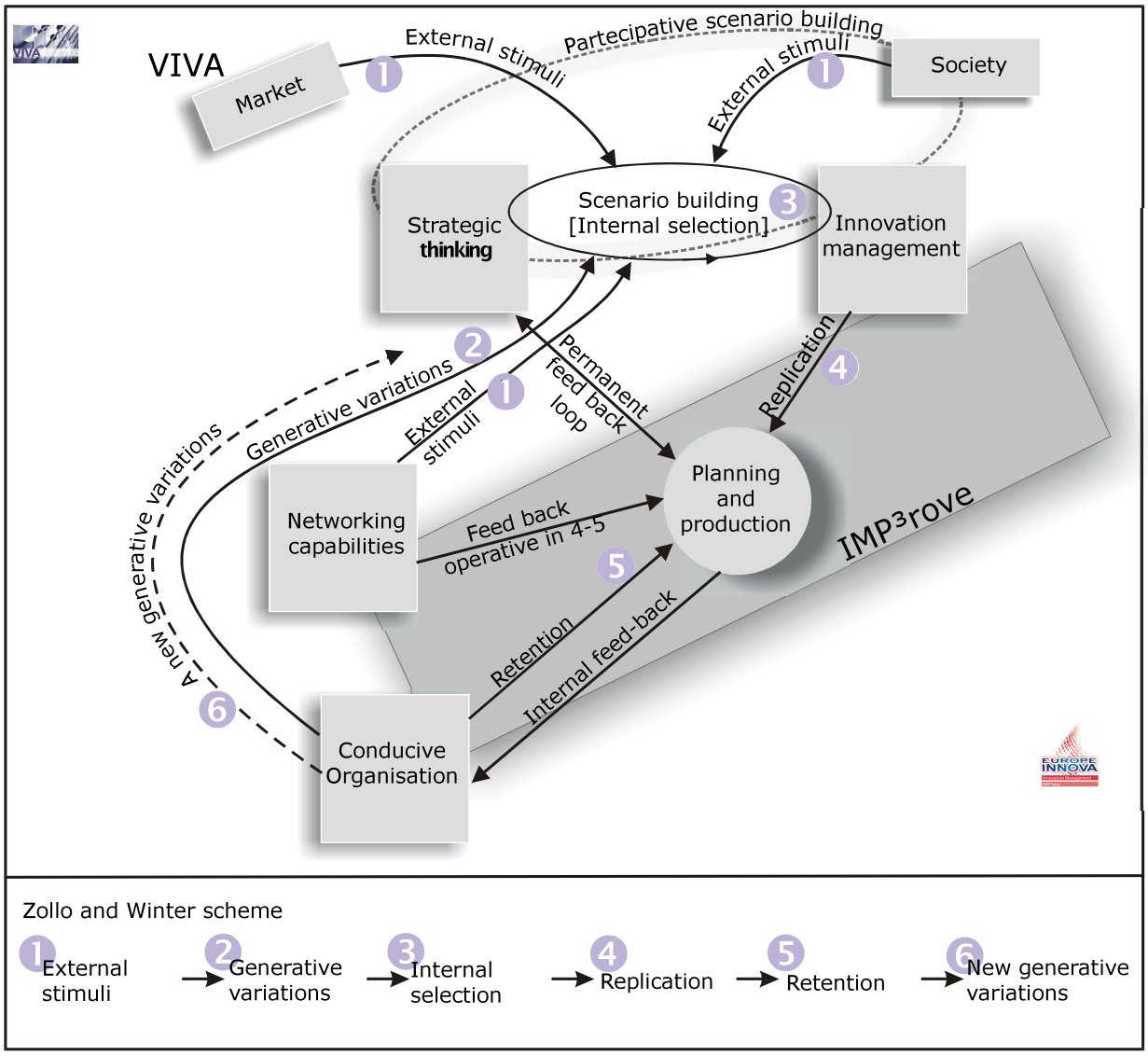
These two approach are not necessarily conflicting each other; this means that innovation management to become a realistic discipline should include complexity in some way. How? Designing alternative scenarios, accurately gauging the degree of probability of each scenario, describing in a realistic away other actor's strategies affecting the final outcome, introducing feedback mechanisms in the governance system and setting up, to the extent that it is possible, inclusive strategies and decision making procedures to include, from the very beginning, demands and objections coming from other non competing actors. This is a mix of social and technical steps, of qualitative and quantitative tools and indicators; the technical and scientific rigour of a discipline, in this perspective lies in the method and tools.

We have collected many different tools and described in this paper a general method of identifying the main building blocks to attain to excellence in innovation and to built up a suitable innovation management system. We are also aware that other EU backed project, such as IMP^{3}ove are dealing with innovation management, namely for SMEs.

So what we are designing is the way to manage this complex system of interrelations.

10 A general framework

The following figure is summarising the general framework.



This can be also translated in steps.

The system of innovation management oriented to excellence in innovation should be based on methods to support strategic thinking based on the concept of open innovation; we are suggesting, among other possibilities, to utilise **scenario building** techniques, both in the simplified version of an internal exercise or in the sophisticated version of a participative scenario building, including consumers and/or clients and/or representatives of the civil society.

Strategic thinking should also include **methods to capture market stimuli** in an systematic way.

The system of innovation management oriented to excellence in innovation should be also able to transform the strategic visions in a realistic planning and production reality. This side of the innova-

tion management is very critical for many SMEs, starting from the phase of a realistic assessment of the economic viability of a perceived strategic innovation possibility. A reference model for this is under way in the IMP^{3}ove project and it is planned to be operative some months after the end of VIVA project, so we relying on it for this part.

A system of innovation management should also be able to guide SMEs in the structural transformation necessary to make the system sustainable on the medium and long run. The building blocks of **networking capabilities** and of the creation of a **conducive organisation -** including beside very specific organisational issues, knowledge and competence management, human factor management, ergonomic factors - are the main contribution of VIVA to help mainly SMEs, but also bigger organisations, in a process of self assessment and identification of where to invest and to change.

Networking capabilities are very critical for the strategic phase too. The concept of open innovation lead to the idea that innovation can be and in the future must be the results of a structured co-operation among different firms in a trans- sectional scheme crossing traditional industries borders.

This innovation management system is strongly dependent on a reliable and robust sytem of feedbacks.

11 Smes

The general framework and each of the components are based on the existence of corporate functions that are easily available in medium and big firms but very difficult for SMEs and quite impossible to find in very small ones.

So the problem for these kind of firms is how to reach excellence in innovation coping with severe limitations in creating new specific corporate functions. The problem can be split into tow parts; on one side a specific change should be organised inside the firm; on the other publicly available institutions can support a part of the innovation process.

What can be done only inside is the part covered by IMP^{3}rove and the transformation of the organisation in a conducive kind of organisation; a role of innovation management consultancies (IMCs) such as the one devised in IMP^{3}rove.