Knowledge Management For Open Innovation: Collaborative Mapping Of Needs And Competencies

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ABSTRACT:

In view of the European knowledge economy, a full participatory process among different units and different organizations can be established to identify solutions that meet the expectations representing high value achievements of different stakeholders' objectives. The paper describes a reference model for a collaborative knowledge management (Co-KM) in an open innovation environment for futuring technology analysis (FTA) to support industrial innovation in the knowledge economy. This model with methods and tools allows K-community to operate more effectively and to proceed faster toward the common goal. Furthermore, it permits the mapping of community's needs and competencies. Two experiences of Co-KM carried on inside a European project are reported.

Keywords: *Open model, Collaborative method, Lean environment*

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1. Introduction

Over the last five years, the European Commission has brought forward a policy and strategy development for the broad-based innovation towards the European *knowledge economy*. Key importance is given to the improvement of knowledge generation and to a faster and lean knowledge transfer among research organization, academy, industry and government.

Industry plays an important role in the global economic development. Industrial success in current times needs to face higher efficiency in production processes and, also, sustainability aspects for environment and society (Jovane, 2005). Today, with the implications of globalization and economic recession, industries face fundamental changes due to globalized production and markets, shortened product/process life-cycle, rapid progress in technologies and turbulent business environment. Normally the solution is sought in the reduction of production costs. Fostering the knowledge economy, the competition will shift from cost reductions to high value. Companies need to rely upon innovative and new enabling technologies with related business models for new products and processes.

This new behaviour requires: a renewed research-innovation chain, research and development projects on specific technologies, time-to-market of new industrial technologies. The early forms of coordinating initiatives among public research,

industries and policy-makers have been the European Technology Platforms, the major organizations held by the relevant and interested stakeholders. These new knowledge entities have the objective to set out collectively the research and innovation strategies built by different stakeholders at different decision-making levels. The results of collaboration of the European Technology Platforms are their Strategic Research Agendas and Roadmaps that have involved the work of thousands of people, (Eumecha-Pro, 2007; European, 2006; Futman, 2004; INEMI, 2007; I*PROMS, 2004; ITEA, 2004).

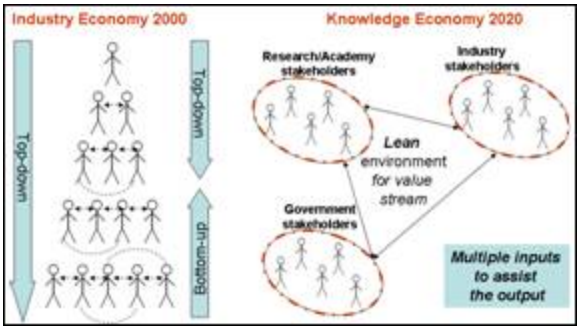

Figure 1: Evolution Of Problem Solving Strategies

This paper describes the collaborative knowledge management (Co-KM) reference model. This model is applied to open innovation environment and supports futuring technology analysis (FTA) for industrial innovation. Co-KM allows to operate more effectively and to proceed faster toward the common goal within networks of research/academy, industry and governments. Two experiences on Roadmapping activities are also reported.

2. Reference Model

The main result of the research work is a reference model of the collaborative knowledge management (Co-KM) inside an open and lean environment applied to the field of futuring technology analysis (FTA) to support industrial innovation in the knowledge economy. This is an open model for the collaborative process among different stakeholders that applied the SECI modalities. It could be considered an original reference model of the knowledge management for innovation in the K-economy, since it treats the process as an open model where K-enterprise and K-community are inter-related in the K-transformation process.

In this open information model, the convergence of knowledge concepts and elements, coming from stakeholders of the K-enterprise, permits the creation of a collaborative knowledge management environment (Chesbrough, 2006). It treats expectations and future goals enabling inflows and outflows of the knowledge domain though a continuous participatory process involving different actors of the K-community. Information modelling receives, from this convergence, the support to a fast changing environment and sustains people and their capacity of aligning their knowledge to future innovation mapping needs and competencies through a collaborative process

(Figure 2). The development of the open model allows the integration of prediction and responsiveness for continuous innovation contributing to foster the transition to high value stream.

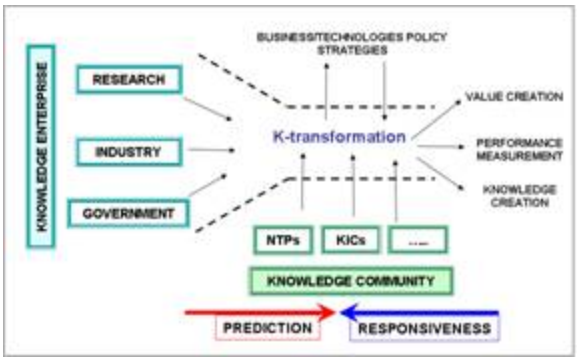

Figure 2: Collaborative Process Based On Open Model (Epplab Elaboration Of Chesbrough, 2006; Figure 1.2 P.3)

Knowledge management, as an adding value process, is essential to:

- develop stable interaction for innovation internally and externally;
- exploit the potential of the "knowledge base" of organizations such as SMEs, academy, government;
- add value to technical and business requirements to foster innovation development;
- involve people into a strategic process.

3. End-to-end Visibility Process

The lean environment benefits of knowledge management methods and tools for the end-to-end visibility. This is a new process for the full participation of different stakeholders enabling the ranking, the prioritization and the traceability of the whole advancements. The end-to-end visibility process is supported by a rolling programme. The development of the end-to-end visibility of life-cycle of large innovation processes is depicted in the Figure 3.

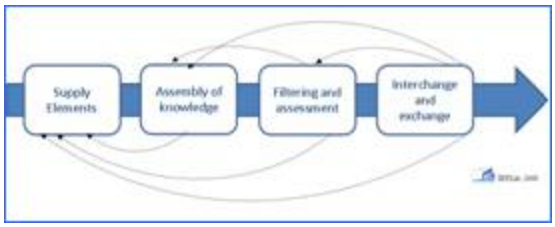

Figure 3: End-to-end Visibility

The building blocks of this process, each of them interlinked with the others, are:

- Supply elements referring to: foresight studies, roadmaps, working documents, best practices, scientific papers, project deliverables, surveys;
- Assembly of knowledge in selected domain, made with:
- K-transfer models, taxonomy and ontology (domain related),
- ICT tools for information management (xls and word files, catalogues, data-bases, templates),
- Mixed qualitative/quantitative method of data collection and data processing;
- Filtering and assessment achieved through validation procedures (team building, workshops with mixed multi-level stakeholders, questionnaires, interviews with key opinion leaders of industry);
- Interchange and exchange achieved with dissemination tools (conference, seminars, publications).

A rolling programme is applied to manage simultaneously large innovation processes. Regarding futuring-oriented technology analysis, the applications of Foresight, Roadmapping, Implementation, and Monitoring (FRIM) constitute the core of the "support service". FRIM carries on a process with different and sliding phases with several interactions. The rolling programme allows this continuous process of interactions and validation of results among stakeholders at different levels (Figure 4) (Cagnin et al. 2008). It enables to manage simultaneously large innovation processes running and tracing advancements of knowledge generation. The novelty lies in the fact that this knowledge process is directly managed and experienced by individual actors and interested groups.

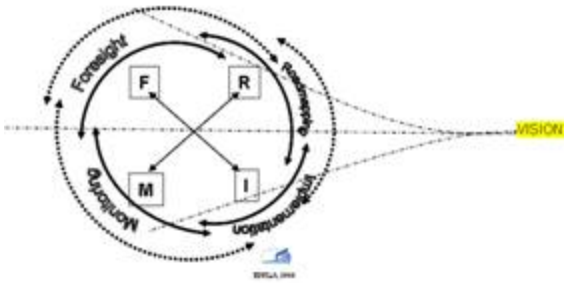

Figure 4: The Rolling Cycle-Oriented Programme

The FRIM applications have the scope to ensure effectiveness, efficiency and consistency to FTA for emerging production systems. The four Futuring activities are:

1. Foresight (F): demand-driven process for future technologies with attractiveness and feasibility analysis. It supports scenario-buildings, initial and continuous technologies updating and networked R&I policies for the knowledge economy.

2. Roadmapping (R): a community-driven open process for screening and planning of the prioritization of next generation technologies with feasibility and traceability of industrial expected impacts with time horizons (Westkämper, 2006).

3. Implementation (I): instruments-driven process for coordination of efforts and of stakeholders' interventions. It develops plans of priorities to minimizing threats, maximizing opportunities and reducing risks for new products/services, processes and business models. This is supported by the analysis on ground of best practices and pilot projects.

4. Monitoring (M): governance-driven process for assessment and evaluation of results of the research-innovation process. This activity is related to market knowledge capture and supports costs and especially value benefits analysis of options choice in strategic fields of industrial interests in terms of sustainability. The experiences in §4 report about the application of the collaborative knowledge management for open roadmapping.

The described roadmapping application is a full participatory process that applies the SECI model (Nonaka, 1995):

- Socialization: sharing tacit knowledge that is built upon existing experiences. It constitutes the design phase of the roadmapping process.

- Externalization: articulating knowledge and developing the organization "intellectual capital" through dialogue. It constitutes the implementation phase of the roadmapping process.

- Combination: expliciting the borders of expectations in terms of "competitive advantage". It constitutes the use phase of roadmaps in industrial sectors.

- Internalization: participating in a learning process. It constitutes the reconfiguration phase of the roadmapping process.

4. Experiences Of Co-Km

The new model on knowledge management for innovation, proposed in this paper, was developed and applied within the second FRIM activity - roadmapping - carried on within a FP6 SSA project at EU level in 2006-2007.

In this section two experiences of Co-KM model application within the project K-community are reported:

- the first experience regards the side of research;

- the second one focuses on knowledge elaborated within the side of industry.

4.1. The Side Of Research Of K-community

In 2006, a meeting of roadmappers - coming from research organizations - was held. Roadmappers from Germany, Italy, France, Netherlands, United Kingdom, Belgium, Poland, Spain and Portugal started a new process of European collaboration. They committed their scientific competencies and know how to exploit the high value in devising new strategic research interests of industrial potential. They acted as stakeholders building high-level research areas contributing to ensure the competition shift of European manufacturing industries. The objective of the meeting was to produce strategic research areas within 5 priority macro-areas, identified by the European Commission.

The 28 roadmappers were split up into 5 working groups, according to the related five priority macro-areas. Each working groups were composed by 4-6 experts. The roadmappers processed together, through a bottom up approach, different types of preparatory material. These material, distributed on a CD-ROM for handy use and uploaded onto Intranet, consisted of:

- A repository of more than 450 technology fact sheets provided by 63 roadmappers representing about 190 researchers from major organizations. These technology fact sheets were preliminary results from the analysis of more than 90 sources from vision and SRA published by European Technology Platforms.

- Input from European Commission by the project officer.

- Enabling technologies pre-catalogue and taxonomy for a reference classification of technologies.

This amount of material was processed to produce a ranking of strategic research areas of industrial interests. At the end of the workshop, 14 strategic research areas were produced to support the knowledge transformation of European industry. Looking to the end-to-end visibility process, this experience can be positioned in the second phase of the process (assembly of K), as reported in Figure 3. The outcome of the roadmapping meeting - supervised and approved by the High Management Board of the project - formed the input for the following phase (filtering and assessment), in which the results were put in discussion within the K-community of the project.

4.2. The Side Of Industry Of K-community

A joint conference between research and industry was held in Germany in the summer of 2006. This conference represented a major crossroad public event of anticipated industrial needs and technology push solutions at European level. It aimed to:

- seek industrial feedback on the strategic research areas;

- understand sectors requirements and priorities;

- rank the priorities (sense of urgency).

The 150 delegates from Industry, Research and Government K-enterprises, were split up into 6 groups, according to the following six sectors macro-areas:

i. Machine/Equipment area

ii. Transport area

iii. Materials & basic products area

iv. ICT area

v. Consumer Products area

vi. Food/Pharma/Bio area

The six panel sessions, chaired by industrial participants, discussed and identified industry research macro-sectoral R&D priorities in a strong collaborative way. Within these workshops, delegates processed and discussed the following preparatory material:

- around 14 strategic research areas (reported in the 4.1 section), produced by roadmappers;

- results and feedback from industry provided during companies' interview process. Out of 130 selected Key Opinion Companies, 65 were interviewed by project partner responsible for the proper sector. These surveys aimed at listening to and understanding the technological needs of industry. In these interviews a structured questionnaire was used. It intended to focus and prioritise strategic research areas in respect to global, sectoral and company drivers.

The outcome of this conference allowed to filter and rank strategic research areas to meet industrial interests and priorities. Looking to the end-to-end visibility process, this conference can be positioned in the third phase of the process (filtering and assessment), as reported in Figure 3. This conference marked a new European event: it showed a collective ground for industrial research driven technologies where research organizations made possible to identify collectively new fields as well as to maintain the respective identities and to assess the respective contributions.

5. Conclusions

The objective of the Co-KM for innovation is to operate more effectively across the different sides that form the K-community and to proceed faster toward the common goal. For this aim the reference model helps managing the high-value knowledge in an open environment. This facilitates the correlation of need and competencies of the whole K-community. The goal is to turn knowledge into innovation tracking and making the end-to-end visibility of the advancements.

The creation of a high value stream for R&D through available competences and sound directions permits to sustain stakeholders in shifting the emphasis from measurable data to sustainable knowledge.

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