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Projects as Knowledge Swirls in the Technological Innovation. Romania's Situation

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Abstract. The present paper uses as research basis a new way of thinking regarding the relation between innovation and knowledge - the Knowledge Flow Percolation Model (KFPM). In this model's center, human beings are seen as thinking electrons, both consuming and generating knowledge flows. Through the interdependent actions of individuals, knowledge circulates inside organizations, allowing them to innovate in order to obtain competitive advantages. But there is a wide range of barriers which impede the creation and movement of flows in the model grid and consequently, hinder their change into innovation. The solution proposed by this paper as one of the most adequate instruments to make KFPM more spreadable is the *project*. On this basis, in an empirical study, we try to demonstrate the hypothesis of the positive influence of projects, as knowledge swirls, on the development of innovative skills which will help solving problems in the organization, creating and widening of knowledge and reducing the barriers in knowledge transfer.

Keywords: innovation, projects, knowledge flows.

1 Introduction

Summarizing the opinions of a great number of authors – [1], [2], [3], [4], [5], [6], [7] etc., we define the technological innovation as new applied knowledge, with abilities to produce changes and to support the organizations in reaching their goals. Innovation is a phenomenon with clear positive connotations, but it is characterized, at the same time, by an increasing complexity. This complex influence of innovation in micro- and macroeconomics makes the research topics related to it to be far from covered. Also, as Drucker wittily pointed out 27 years ago, its knowledge content gives innovation a "temperamental, capricious, hard to administer" character and mingles even more the threads of research.

One of the models which aim to elucidate the contribution of knowledge to innovation is Knowledge Flows Percolation Model (KFPM) – see [8]. KFPM is based on a cumulating model firstly used in Physics in order to prove whether resources can „flow" (be percolated) in a network or a grid. In engineering, percolation models are used in order to analyze if fluids can flow through a solid material (such as water through absorbent soil, for example). In the KFPM, we can associate the individuals

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generating and consuming knowledge to the knots of this model. The more persons transferring knowledge among them, the more channels are opened, and the organization may pass to another innovation level. We can also use the model at the national level, substituting individuals with organizations and keeping the same hypotheses. Another interesting aspect is that more opened channels in the model represent more possible paths for knowledge – the grid entirely becomes more fertile. The KFPM is a dynamic model, where the configuration of the knowledge flow is permanently changing. The results of these flows are accumulated inside the system, making it more robust and more capable to support further knowledge development and better innovation.

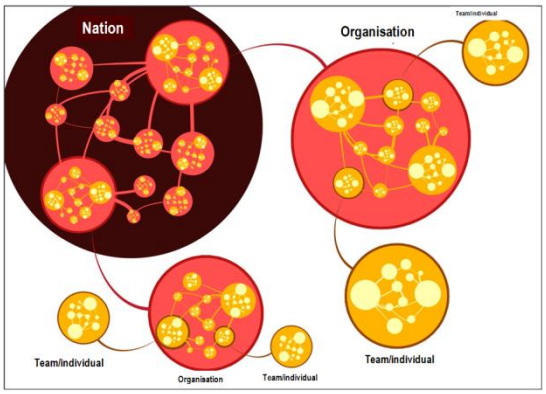

Fig. 1. Knowledge Flows Percolation Model

For this model, the author notices that on individual, organizational and national level there is a wide range of barriers which hinder the creation and movement of knowledge flows and consequently, their change into innovation – as is widely presented in [9]. Considering these obstacles in the way of knowledge flows, which impede them to transform into innovation, several authors propose different solutions. The problem which appears is to identify actual and definite methods for which the above mentioned solutions, looking more like desiderata, could become true. In other words, we wish to find a cure with a wide area of application in the process of transforming knowledge flows into innovation. In our view, one of the most adequate instruments to make KFPM more spreadable is the project.

2 Theoretical framework

A project is defined as a succession of activities delimited in time, accomplished on the basis of certain resources purchased with organizational and/or public finances, oriented to reach objectives which suppose solving some problems or exploiting certain opportunities, by accomplishing products or services characterized by a certain degree of uniqueness. Even though the idea of the project as a means for innovation is not new – see [10], [11], [12], [13], in what follows we shall try to bring more

consistency to this statement, showing the reasons for which we believe that projects, knowledge and innovation are tightly connected in a creative continuum.

Projects can be conceived, planned, and implemented at *different levels* of KFPM – individual, organizational or national level. They are swirls of knowledge flows which could come up at different ”floors” of KFPM, having the tendency to become recurrent, to associate in recognizable forms regardless of the level we are watching from. An extravagant hypothesis of fractalic self-similarity is thus allowed by our model. The ”drawings” of the flows could be emergent (as results of self-organization) or deliberately created (centralized by the human agents working in teams). Thus, *projects have a tri-dimensional impact, entailing the change in KFPM both horizontally (on each level) and vertically (between levels)*.

Projects obtain milestones at the level they are implemented. These results must not necessarily be spectacular. Even if they do not lead to disruptive innovations, still they could make a small change in the agent’s working environment, solving one of his problems or putting into value one of the opportunities he noticed. Added up together, these small innovative changes make a more fertile KFPM chart, they make the grid an open field for the knowledge flows to be woven in. The new products of the exploring activities from projects can be seen as physical or conceptual exchange parts which could be later used in new combinations, thus ensuring progress. This is how projects answer to Johnson’s observation [14], which says that ”the secret of the ability to come up with good ideas is not that of staying in a splendid isolation, trying to conceive great ideas. The secret is to lay on the table as many pieces as possible”. From another point of view, many projects have prototypes as a result and, according to Schrage [15], many important names in the innovation area concentrate on making prototypes, as their first skill. Even more, the actual results obtained in a definite period of time motivate at the same time the project team members to produce and use knowledge, innovation included herein. Thus, as we mentioned above, they quickly add the fulfilled objectives to their resumes, this being a stimulus to have a dynamic, innovating behavior, as it is described by [16].

Projects are clearly structured on activities which have to be accomplished following a plan, in a specified time frame, according to a certain budget and a series of quality requirements defined in clear indicators. The projects create an *equilibrium between knowing and doing* - knowledge makes actions more efficient and action creates and transfers new knowledge. Projects represent an opportunity to learn on the way – and learning-by-doing is one of the most efficient methods of transferring tacit knowledge, which is so valuable in innovation.

Projects have a previously-set time frame, with a clear beginning and a clear ending. They *mingle but also dissolve the created knowledge flows*. As they are not permanent, but time limited, including teams which build up and separate according to necessities, projects keep the KFPM chart in a *liquid, fertile state*, very favorable to innovation. The liquid state is situated at the ideal distance from the gaseous (anarchical, chaotic) but also from the solid (catatonic, inert) one. Taking into discussion the state of facts, not letting it to freeze, to become too satisfying, the *projects let the new come in*.

Projects rank in the *”innovating mania of the eraser”* (Gregory Bateson, quoted in [15]). They present a clear stage of closing up, of forgetfulness in their life cycle. And

forgetfulness is recognized as an essential part of progress, change, and innovation, as opposed to stereotypes and conservatory spirit.

Projects ensure the *acceptance of failures, tolerance to get exposed to risks* and these features are essential for *learning by mistakes*, less common in certain cultures (the Romanian one here included). In projects, failure is normal, by failure there is learning, the knowledge flows are purified, renewed, self-corrected.

The project teams are chaording micro-environments, characterized by freedom and constraint, ideal pots for cooperation, but also conflicts and creative disputes. The project team has room for working in tandem but also for tension. The project team members are mostly characterized by enthusiasm for new, change, variety, openness to collaboration – and these features stimulate creativity, innovation, progress. The project managers are the ones especially close to the term leader. We consider essential their role in the projects as stimulating collaboration, so necessary in Romania – where phrases like ”Romanian companies do not collaborate enough”, ”there is recorded a weak collaboration between the Romanian companies” constantly appear in national or European reports – see [17], [18]. Collaboration is present especially because the teams organize themselves, compete and then the best are chosen. The relationships are based on *trust* – and this is the key to a successful exchange of explicit and tacit knowledge, according to [5]. The number of project team members is often the best one to stimulate the creation of knowledge networks which are elastic and solid enough at the same time. Without being too small or routine ground, but neither too big nor inefficient, the project teams have the ability to stimulate their members, so that their willingness to produce and receive knowledge reaches an optimum peak. The reasoning output coming from one member will quickly be the input for another member, in a network of persons characterized by high connectivity and a high degree of clustering. The team includes members from different departments or even different companies – and this is another aspect capable to refresh collaboration, problem solving, and creativity. In this way, projects are forms of *collaborative, sometimes symbiotic, innovation.*

Projects *implement dreams, create creeds, stimulate, and require involvement in a certain direction*. They are responsible for the new or improved products, processes, services from an organization. Projects help the companies to move from intention to real innovation. Through projects, the vision of the organization is shared by all its members, there is developed a common vocabulary and a feeling of loyalty and communion is created. In face-to-face interaction, the members of the organization get to know one another – and socializing is an essential element for the creation of knowledge flows. Being examples of good practices, projects *radiate the new to other* places as well. We could say that projects have the potential ability to teleport, to appear in a replica in other areas where they actually improve the conditions.

On the other side of the story, a number of authors [11], [12], [13], [15], [19] notice that projects are associated with big failure rates, the individual resistance to imposed procedures and practice in standardized project management may not be neglected, and risks are a major feature of projects.

In conclusion, projects which have appeared as an answer to the changes of organization environment are the most adequate form under the conditions of shorter and shorter life cycles for the products, of shortened optimum periods to launch new products as well as narrowed services, fewer technical specifications, global markets

with more and more demanding members. They appeal to the team members' knowledge and lead to new knowledge, apt to be changed into innovation. As "all the work can be changed by projects and there is no task so mechanical, so common that cannot take the form of a project with a significant potential to added value" – [15], we propose *the proliferation of projects as a panacea, a solution to reach a permeable KFPM chart.* On the basis of these conceptual delimitations and the analysis of the literature in the field presented above we formulate the following main hypothesis:

Projects helps generating and consuming knowledge flows in KFPM, thus stimulating technological innovation, on personal and organizational level.

3 Methodology

In order to test the hypothesis, during June-August 2012 we have made a study based on a questionnaire. The questionnaire was set to determine the relationship between working on projects, knowledge flows and technological innovation and was addressed to project team members. It was created using the Google applications, as a spreadsheet type document with an attached web-form. The forms had been sent to 12 main universities and 41 county town halls from Romania exclusively by electronic mail. As for the distribution to organizations in the private sector, we had asked for help from the owner of *finantare.ro* website who posted a hyperlink inviting the visitors to fill in the questionnaire. The number of received answers was 148. Out of the 148 respondents, referring to the period 2007 - 2012, only 106 had been involved in projects. This is also the number of valid answers. The structure depending on the age category of the respondents is as it follows: 21-30 years old: 24%, 31-40 years old 40%, between 41-50 years old: 20%, between 51-60 years old: 9%, and that depending on fields of activity: 71% are from universities, 25% from private sector and 4% from local public administration.

The lack of uniformity of the answers from the analyzed fields of activity can be explained by the great number of respondents from the local public administration and from the private sector who answered "No" to the question "Have you been involved in any projects since 2007 to the present?". The absence of positive answers makes us believe that the density of projects is smaller in the local public administration and in the private sector, in comparison to the universities. The experience of working in project teams (quantified by us in the number of projects in which the individuals have been involved since 2007 to the present), as well as the distribution on roles played in them (project manager, member of the implementation team, participant on short term – as expert, counselor, trainer, so on) was rather symmetrical.

4 Findings and results

In what follows we present the way in which the data analysis confirmed or denied the hypothesis we have defined.

Firstly, we found that, on personal level, participating in projects helps individuals to:

- develop useful skills required to solve problems in their field of interest (Q7a);
- increase knowledge on the relevant persons (Q7b);
- create new knowledge, valuable for the respondent as a person (Q7c);
- increase willingness to consider new knowledge, valuable for the respondent as a person (Q7d);
- practice associative thinking (Q7e);
- observe the surrounding world without prejudice, with acuity and interest (Q7f);
- experiment the permanent contact with new people, things, information, stay out of the mostly taken road (Q7g);
- increase the will to change the current situation (Q7h).

All the features mentioned above (Q7a-Q7h) refer to the individuals' capacity to create and consume knowledge flows, in order to become innovators. We mention that for the estimation of the impact of project on the individuals' characteristics we have used a scale from 1 (Reduced impact/No impact) to 4 (Very great impact). We can notice from figure 2 that the human agents in KFPM consider that projects have a positive impact on all the analyzed characteristics (or, so to say, innovative genes), on personal level. The impact average scores rank within the margin [2.46-3.18]. The characteristics which rank over the margin given by 3 (Great impact) are the following:

- development of useful skills required to solve problems in the field of interest;
- create new knowledge, valuable for the respondent as a person;
- increase receptivity to new knowledge, valuable for the respondent as a person;
- practice associative thinking;
- experiment in continuous contact with new people, things, information, stay out of the mostly taken road;
- increase the will to change the current situation.

According to the respondents, projects have an impact which is measured as average and great on the increase of knowledge about relevant persons for them, but only an average impact in noticing without prejudice, acuity and interest the surrounding world.

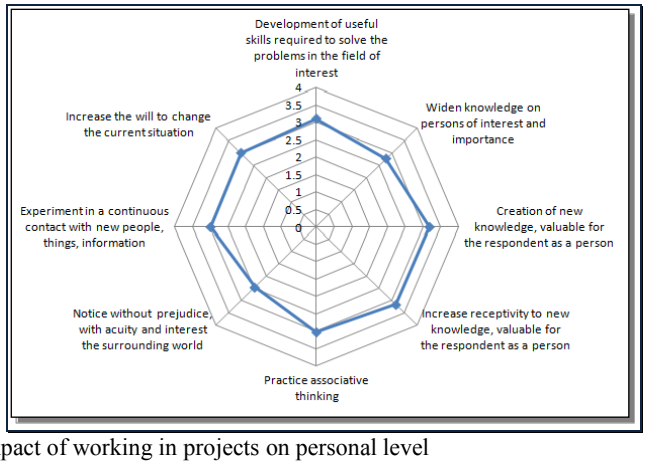

Fig. 2. The impact of working in projects on personal level

By adding a variable called “Participation in projects” and creating clusters (no projects/1 project/2 projects/more than 2 projects), we did an ANOVA which showed us that there are no significant differences, as represented in figure 3.

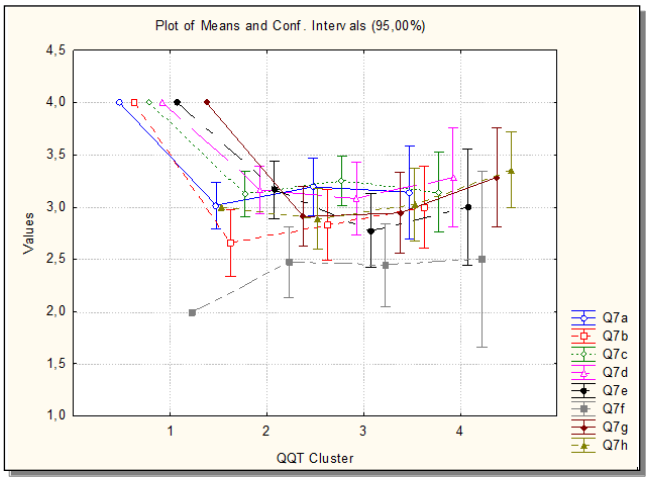

Fig. 3. The impact of working in projects on personal level, Analysis of Variance

The figure 4 shows us that on organizational level, participating in projects has a great impact on the following:

- develop skills which will help solving problems in the organization (Q8a);
- widen the knowledge on the persons with relevant activity in a particular field (Q8b);
- creation of new knowledge, valuable for the organization (Q8c);
- increase receptivity to new knowledge, valuable for the organization (Q8d);
- combine information in order to obtain new systematic and profound knowledge (Q8e);
- reduce the barriers in knowledge communication inside the organization (Q8f);
- reduce the barriers in communicating knowledge outside the organization (Q8g).

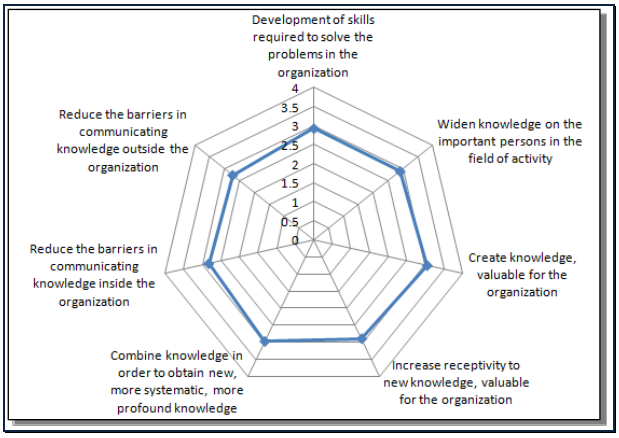

Fig. 4. The impact of working in project teams on the employees, on organizational level

The analysis of variances (figure no. 5) showed that there are no differences if we take into consideration the number of projects in which individuals have participated.

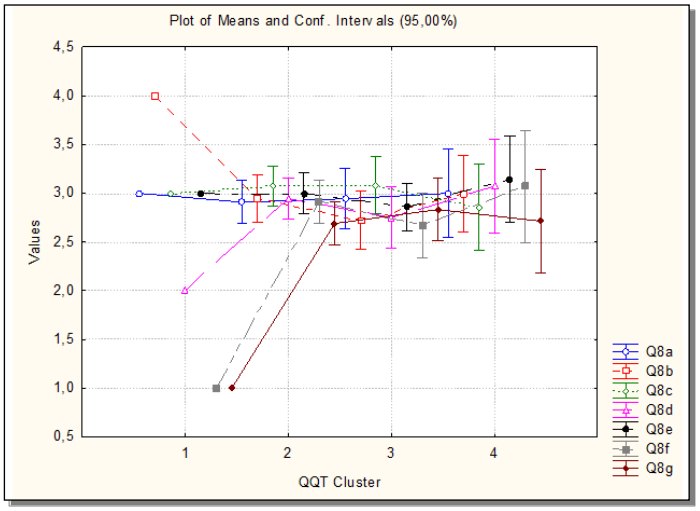

Fig. 5. The impact of working in projects on organizational level, Analysis of Variance

We also discovered that the greater the number of projects in which the individuals took part, the higher the scores they give for the innovative characteristics mentioned above. A SEM analysis showed us that the personal production and consumption of knowledge (Q7) influences direct and positively the same parameters at the organizational level (Q8), and also that the organizational generation and consumption of knowledge flows has a direct and positive impact on the number of new products created by taking part in projects, as is shown in figure 6.

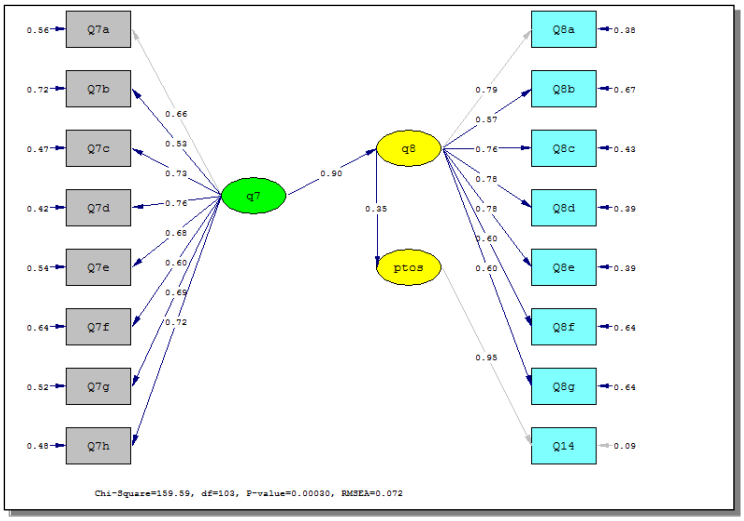

Fig. 6. The relation between personal and organizational production and consumption of knowledge and the number of new products created in projects, as revealed by SEM

5 Conclusions

Nowadays, the connection of ideas serves more than the attempt to protect them. When we see innovation in nature and culture, the environments building walls around good ideas tend to be less innovative on a long term than the more open environments. Good ideas want to connect, to fusion, to recombine. They wish to reinvent themselves transcending the conceptual frontiers, to complete each other so much more as they wish to compete one against another. Moreover, the innovative process is very much supported by an approach based on experimental discovery and solving of problems where failures are not punished but considered learning lessons and steps to success. The more diverse the ideas and solutions for problems at a certain level, the greater the recorded increase, since, when re-combined, old and new ideas and solutions exponentially generate other ideas and solutions. Mistakes are good because the solutions which are not viable can be reused at a later stage; that is why they should not be considered wasted time and money but gains in experience and surplus of intangible fortunes.

Our study showed especially that the Romanian academic environment is a nest of knowledge flows as well as a hub capable to guide them towards their practical use in the business environment. The knowledge web created in universities represents a creative, innovative, difficult to neglect potential and its valorization could lead Romania on a better position in the profile international rankings. In this respect, projects play a significant role. As a conclusion, we consider that the collected and analyzed data confirm the hypothesis we have defined at the beginning of the study and support the idea of projects as a panacea for turning the knowledge flows into innovation. The influence of the projects as knowledge swirls in the personal and organizational life is a positive one.

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