

BASIS FOR ELABORATION OF A CREATIVE PROCESS IN ORGANIZATIONS THAT DEVELOP TECHNOLOGICAL INNOVATION

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ABSTRACT

The really fundamental and fruitful ideas are to great extent luck and unpredictable accidents [1]. However it is also certain that creativity is not just an instant, it is a process that should be developed in logical and systematic way within organizations. It is in this creative process where solution principles are developed from the identified opportunities to push technological innovation. The aim of this paper is to show a methodology for the systematic application of a process that uses creativity techniques and technology in an integrated way. This is the authors newly suggested process for identifying solution principles and is called "Watch-creative process". This methodology involves the following stages: 1) Identification of the opportunity, 2) Search and processing of data and information, 3) Analysis and transformation of information in ideas, and 4) Simulation and evaluation of ideas. For the development of this methodological proposal, all stages have been experimentally tested and found to operate in a systematic way.

Keywords: Watch-creative process, technology watch, creative techniques, solution principles, technological innovations

1 INTRODUCTION

It is necessary to propose alternative ideas to give solution to the problems or perceived necessities to develop creativity [2]. But creativity is a process that should be developed in logical and systematic way within organizations. Multiple creative techniques have been used when generating new ideas. Also watching techniques have been used, to obtain ideas through existing knowledge. This document shows a methodological proposal for the application of a named process by the authors "watch-creative process", this means that a process which makes use of creative techniques as of technology watch (searching, analysis, diffusion, communication and use of information to decision-making) [3] of integrated way, with the purpose of identifying solution principles to push technological innovations.

2 REFERENTIAL FRAMEWORK

Schumpeter introduced in a first time an innovation concept in 1934, to emphasize the importance of technological phenomena in economic growth, under this context he defined the innovation process in three stages: invention (conceived as the generation of idea), innovation (conceived as commercialization of product derived from this idea) and diffusion (defined as the disclosure of innovation) [4]. It is from the conception of Schumpeter that multiple models of innovation have been developed, based on the

theory of *technology push* (first generation) [5], until a fifth generation in innovation process [6], that it is determined by key factors as: integration, flexibility, networks. In the innovation processes, the generation of ideas should be identified from the requirements, problems or opportunities for the organization. This paper has an approach to the identification of solution principles and it is the evaluation these which leads to the validation of the. Meanwhile, when the innovation discipline is developed in systematic way by organizations, it is important to study or analyze how to establish a process that allows identification of the solution principles that is the starting point for the application of a process of technological innovation. Under this context to following shows the methodology denominated by the authors "Watch-creative process".

3 PROPOSED METHODOLOGY FOR APPLICATION OF "WATCH-CREATIVE PROCESS"

From analysis of evolution and development of innovation processes, the proposed methodology - the "Watch-creative process" has been formulated. Figure 1 shows the following phases: Identification of the opportunity, Search and processing of data and information, Analysis and transformation of information in ideas, and Simulation and evaluation of ideas.

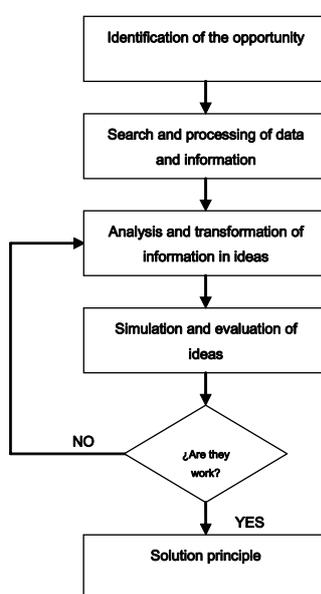


Figure 1 Relations between stages of "Watch-creative process"

"Watch-creative process" stages:

- **Identification of the opportunity:** for this purpose a specific team with responsibilities should be assigned and it can focus its work on the organization through the consultation of different internal or external sources. On the other hand the task of identifying opportunities for innovation in the organizations might be applied systematically through the exploration of several sources. The first are located inside of the organization, these are: the unexpected, the incongruous, the necessity of a process, the structure of market and the industry. The second group of sources is outside of the organization: such as: - demographic changes, perception changes, and new knowledge [7].

- **Search and processing of data and information:** When an opportunity to innovate has been identified and approved by the specified team, the next step is to collect all data and related information. In this stage, it is also necessary to assign a person to be responsible for searching and processing specialized information. Programs exist (derwent, espacenet, tetralogie, etc.) which make this process easier, in addition to techniques such as technology mapping that provides information that enables uncertainty to be reduced [8]. Scientometrics and librametrics make the elaboration of technology maps easier [9]. The development in this stage corresponds to application of activities of technology watch. These findings suggest that simply acquiring information from market research or technological breakthroughs is not effective unless this information is persistently disseminated, analyzed, and implemented [10].
- **Analysis and transformation of information from ideas:** This data constitutes a resource within the context of the identified opportunity, it produces information; which when analyzed in a logical manner gives rise to strategic knowledge. Armed with this knowledge, the team can find a reference source to apply it to its case. From this consideration, the fundamental activity in this stage is to generate ideas that can be tested to guarantee that they are solution principles. It is here where the participation of all team members is fundamental and application of creative techniques like brainstorming [11], lateral thinking [12], mind maps [13]. In innovation projects stakeholders either have to help to determine the goals of the innovation (clients), perform tasks or set boundaries in the innovation projects (designers and decision makers), or they are affected by the innovation outcomes or by the process of innovation (passively involved) [14].
- **Simulation and evaluation of ideas:** The selected ideas from the previous stage must be tested and evaluated by subject specific experts or teams in order to guarantee that a solution principle has been identified. In effect, these are two steps which support the validation of solution principles and even in the case of not validating them; they contribute information about what aspects have not been covered and their causes [15].

4 SURVEY APPLICATION AND VALIDATION OF PROPOSED METHODOLOGY

The data for this study was collected by means of a survey of people who are active members of the Spanish System of Science and Technology (SECYT) and each one participates in investigation and innovation projects in the organizations to which they belong. The survey was carried out in January 2008 with the professionals of each organization, 20 usable surveys were returned from a total of 22. This survey matches in a sequential way each of the stages in the proposed methodology and it allows analysis of its validation and to identify the application level of a creative process for the generation of solution principles.

5 OBTAINED RESULTS

The interviewees were classified in four groups and the following participation level are shown: firm researchers (38%), the second group were PhD students on technological innovation projects (31%), the third group were university researchers (25%), and the fourth group were technological centre researchers (6%).

The level of application of a creative process to identify solution principles in the organizations where the interviewees belong is shown in Figure 2.

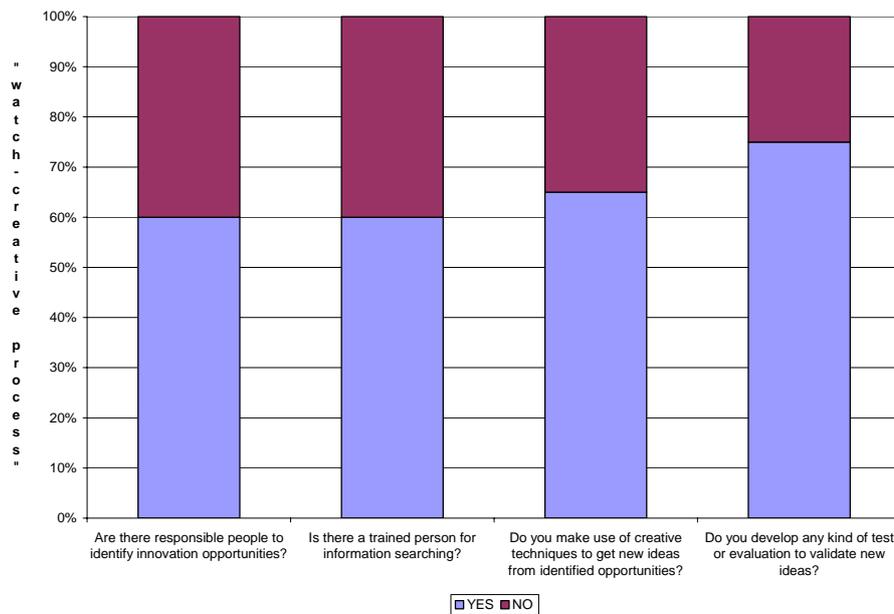


Figure 2 Application level of a creative process to identify solution principles

The research questions driving the study are as follows:

More than half the respondents (60%), consider it necessary to assign responsible persons for identifying innovation opportunities - 40% do not have such an assigned person. The interviewees (66%) answered that they use external sources to identify innovation opportunities, and 28% of them consult both sources, and only 6% of the organizations just use their internal sources to carry out this activity. Some of the sources used are: external; for example: making contact with firms, customers, universities, suppliers, scientific articles, benchmarking and others, internal; for example: employees' collaboration, information from laboratories, value analysis, and products defect rates etc..

In most organizations (60%), consider it necessary to involve trained people in their creative process for information searching. However 40% do not do this. When asked about the information sources most consulted to obtain related information to the opportunities of identified innovation the answer was: Internet 25%, specialized magazines 21%, technological centres 18%, data bases 16%, universities 11%, firms 3%, patents data bases 2%, laboratories 2%, and professional peer contacts 2%.

It is also reflected in the fact that the majority of the organizations apply creative techniques to obtain new ideas from the identified opportunities (65%) and 35% do not apply any kind of technique. Less than the half of the respondents (31%) use brainstorming technique to promote creativity and to obtain new ideas in the organizations, 27% have internal meetings, 12% apply economic incentives to employees, 6% use the TRIZ method, 6% make contact with firms and research groups, 3% use mind maps, 3% use lateral thinking, 3% use sleep-writing, 3% use Delphi method, 3% create specific objectives and 3% do product analysis in the market.

More than half (75%) of these organizations develop some test or evaluation to validate the new ideas, but 25% do not make evaluations. Some techniques most utilized are:

simulation and testing, prototypes and trials, specialized software, economic-technical evaluation. Other applied tests or evaluations are: scientist-technical criterion, statistical simulation, laboratory tests, selection of better projects, finite elements programs, markets, heuristic evaluation, relation cost-profit, interactive process (put into practice, evaluation and feedback), revision of experts, meetings with projects managers, making contacts with contracting firms and weighed criteria.

6 ANALYSIS SURVEYS' CONCLUSIONS

The professionals interviewed belong to organizations which are fundamental drivers for technological development in a society of knowledge as it is Barcelona, these are: firms, university researches, technological centre researchers and PhD students on technological innovation projects. Thus, these organizations permanently develop the discipline of innovation, in which the identification of solution principles in a systematic way is fundamental to facilitate this process.

However, from this investigation it has been identified that 40% of the organizations do not consider it necessary to assign a person to be responsible for identifying innovation opportunities. On the other hand 40% of them do not consider it necessary to involve trained people in their creative process for information search. The results also show that 35% of these organizations do not apply creative techniques to obtain new ideas from the identified opportunities and 25% of the organizations do not develop any type of test or evaluation to validate the new ideas that guarantee that a solution principle has been found. Initially for this reason the proposed "Watch-creative process", is not completely supported by the obtained results from the applied surveys to these organizations. It demonstrates that there is no systematic application of a process for the identification of solution principles, since some organizations recognize that they have not developed any expertise in this area. This allowed the validation the importance of the proposed methodology and also to understand the techniques and tools that are made use of by the interviewed organizations. This aided the development of the creative processes etc. to improve this proposal.

The results concluded from the current work allow the validation of the importance of the proposed "Watch-creative process" as a methodology for identifying solution principles, from the professional opinion of peers who participate in technological innovation activities who have recognized the importance of developing the creative process in a systematic way in their organizations.

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