Open Innovation Model: Facultative the market uptake of Innovation

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Abstract : The paper presents a case study on how to support the innovation process of a publicly funded research and innovation project by implementing an open innovation model. The project herein after referred to as *NANOAPPARATUS i*s being implemented by Process Innovation Nucleus S.R.L. (*PIN*) – an innovative SME (Small and Medium-sized Enterprises) from India. The successful market uptake of innovation requires a complex architecture of the innovation process designed to support and push a new idea throughout its life cycle. Research methodology comprises of a comparative analysis of the principles of closed and open innovation aiming at facilitating the design of an open innovation model. Still, a standard language, i.e. Business Model Process and Notation (BPMN), was put to use in order to transform the innovation process into a dynamic flow of activities allowing for the documentation, analysis, simulation and evaluation of the innovation process.

Keywords: **Open innovation framework; Business Process Modeling.**

1. INTRODUCTION

Open innovation represents a complex and interdisciplinary approach on the innovation process, being one of European Commission's instruments for implementing the EU Research and Innovation Policy having three goals: Open Innovation, Open Science and Open to the World [1]. Modeling the innovation process in an open innovation paradigm requires managing the organization as an open system using both internal and external ideas, and internal and external channels to market, when trying to advance technology and generate value [2]. As such, the research problem refers mainly to creating architectures of the innovation process aiming to increase innovation success rate.

Nomenclature

BPMN	Business Model Process and Notation
BPM	Business Process Modeling
PIN	Process Innovation Nucleus S.R.L.
R&D	Research&Development
SME	Small and Medium-sized Enterprises

2. METHODOLOGY

Research methodology comprises of a comparative analysis of the principles of closed and open innovation aiming at facilitating the design of an open innovation model. For the purpose of the comparative analysis a literature review of the principles of closed and open innovation was performed. Based on that, new principles of open innovation were drawn up and an open innovation model was designed and implemented to support the innovation process of *NANOAPPARATUS* – a publicly funded research and innovation project. Still, a standard language, i.e. BPMN 2.0, was put to use in order to transform the innovation process into a flow ofactivities.

When designing an open innovation model with the purpose of supporting the innovation process, the following main steps should be considered:

- Creating an innovation framework based on networking – formal and informal collaborations with various stakeholders;

- Creating a knowledge and information value chain aiming at ensuring the scientific input of the innovation process;
- Modeling the innovation process using standard notations, such as BPMN, and BPM instruments. One example of such freeware instrument that allows for process mapping is Bizagi Modeler. The research allowed for identifying the benefits of using standard notations and BPM instruments, thus emphasizing the importance of efficiently communicating the innovation process to all users and stakeholders.

3. RESULTS/MAIN FINDINGS AND CONTRIBUTION

Previous innovation models were a "closed" approach to innovation, having different principles compared to current "open" innovation model. In order to emphasize the differences between the two approaches, Table 1 synthesizes the principles of closed and open innovation.

Table 1. Open innovation principles versus closed innovation principles. Adopted from [1], [2], [3], [4] and [5]

CLOSED INNOVATION	OPEN INNOVATION
Bring experts to work for the enterprise as employees (i.e. use internal experts only)	Bring experts to work for the enterprise either as employees or as collaborators (i.e. use the input of both internal and external experts)
In order to profit from R&D, all stages of the innovation process should be undertaken by the enterprise	External R&D can bring significant value as long as the internal R&D is conducted to identify and claim the value needed to support and advance the internal innovation process.
The first market uptake of innovation is ensured only if the innovation is created and developed internally	Innovation exploitation is possible even when it was not created and/or developed by the organization itself. This is for example the case with technological transfer.

Based on the above principles, new open innovation principles were drawn up to allow the design of a new open innovation model to support the *NANOAPPARATUS* project (Table 2). The aim of *NANOAPPARATUS* is to research and develop a new apparatus for producing nanopowders by incorporating a patented method for producing nanopowders [6]. Considering project complexity, designing and implementing an efficient innovation model is imperative for increasing innovation success rate.

Table 2. New open innovation principles to support *NANOAPPARATUS*

No.	Open innovation principles
1.	Internal experts should constantly benefit from external knowledge input (i.e. knowledge exchange with external experts)
2.	Thorough and systematic research of similar and functional industrial applications is required (i.e. identifying and analyzing external research results in order to incorporate them into the internal innovation process)
3.	Establishing long-term partnerships with most of the suppliers of goods and services which were contracted during the implementation of the project can help the growing stage of the product life cycle, once the apparatus for producing nanopowders reaches the market.
4.	Bringing prospective clients to participate in R&D activities (i.e. integrating the input from future clients into the innovation process with the help of instruments such as product acceptance studies)
5.	Researching the cross-industry potential of the developed innovations (i.e. such approach can allow for developing an apparatus with long term profitability)
6.	Developing internal and external channels to the market with the help of

intellectual property instruments (e.g. own product fabrication combined with product licensing).

7. Designing and implementing a sustainable innovation model should aim to identify internal and external solutions for the complex problems of the innovation process with the purpose of significantly improving innovation success rate.

3.1. Creating an innovation framework based on networking – formal and informal collaborations with various stakeholders

The model designed and implemented to support NANOAPPARATUS relies on the aforementioned open innovation principles, while trying to match the high demands of this particular innovation process. The focus was to enhance internal knowledge and information by identifying accessible external knowledge and information sources and thus continuously improving the innovation process.

Sustainable implementation of open innovation principles requires aligning innovation objectives with the enterprise's overall strategy, while identifying as many key support elements and success factors for the innovation process. Preparing in advance each stage of the process is an important factor when having an integrated approach on innovation. Moreover, establishing channels to reach most relevant innovation shareholders is critical. As such, the design of the new open innovation model fundamentally relies on networking – creating formal and informal partnerships.

Figure 1 depicts the new innovation model based on open innovation principles. It includes the upstream entities which created the premises for adopting an innovation approach based on open innovation. The referred upstream entities are the funding bodies. Furthermore, an important role in the innovation process is undertaken by the owner and inventors of the patented technology for producing nanopowders, representing the research starting point of the NANOAPPARATUS project. The upstream entities are followed by downstream entities whose main role is to bring additional support elements for PIN's innovation process. Still, downstream entities help to establish external channels for the market uptake of innovation and comprise of innovation consultants to help guide the innovation process, external experts, service and goods suppliers and prospective clients. As such, the knowledge exchange between PIN's internal and external experts can take place, thus creating a framework for formal and informal partnerships. Moreover, same framework is extended to include currently contracted suppliers for a medium and long term policy covering upcoming phases of product life cycle. Once commercial relationships have been established it should be easier to initiate additional ones. Moreover, the framework includes the prospective clients and their input starting from the first stages R&D.

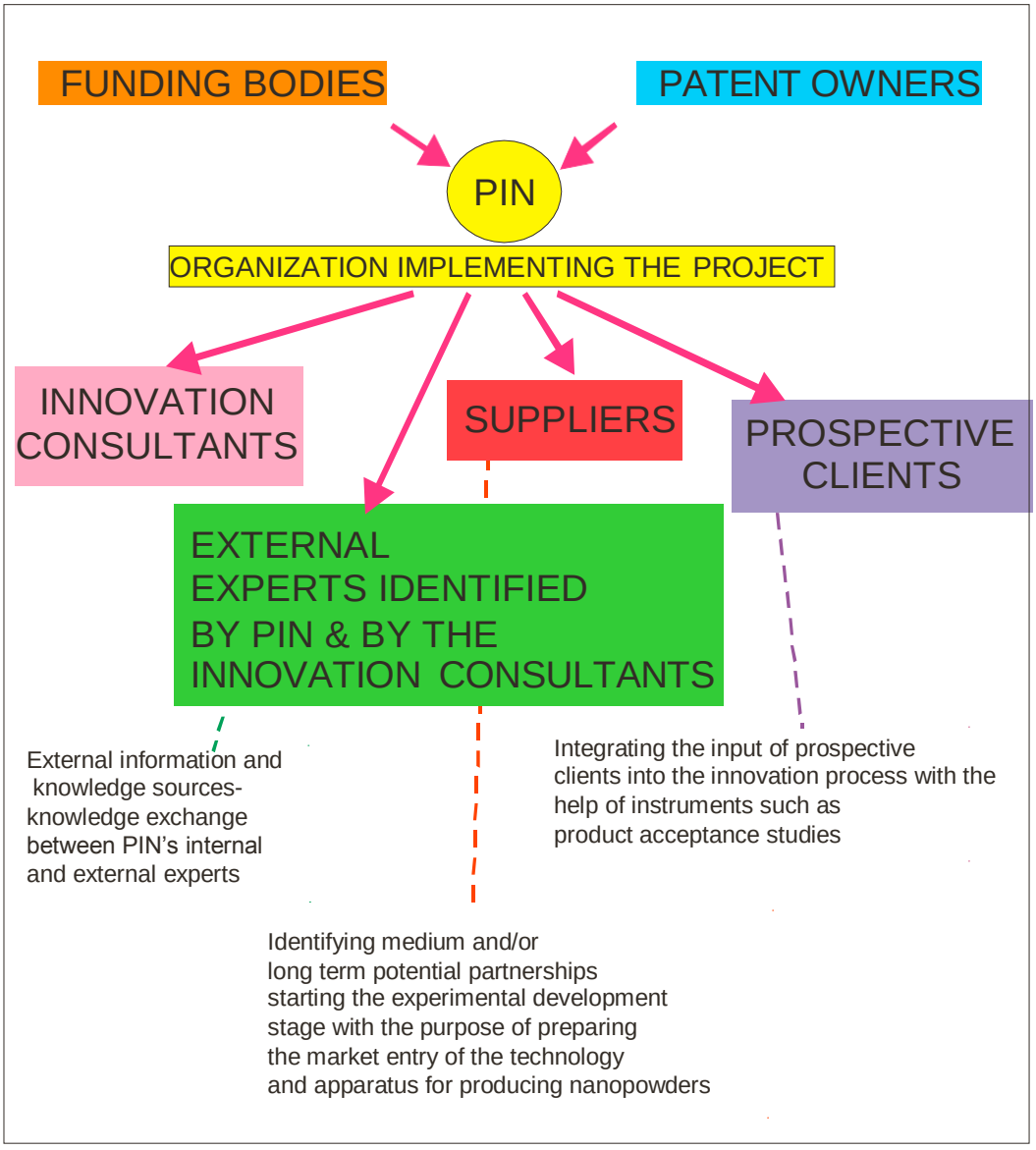

Fig. 1. Open innovation model – framework for formal and informal partnerships.

All the aforementioned entities allow constructing an integrated approach of the innovation process,

The model is thus based on a framework for formal and informal partnerships, creating a support network for the innovation process comprising of: organizations promoting and funding innovation; innovation consultants; internal and external experts for problem solving and for creating the know-how to deliver the market uptake of innovation, suppliers and prospective clients for early establishing the channels to market.

3.2. Creating a knowledge and information value

delivering results for PIN while serving the interest of all partner entities.

chain aiming at ensuring the scientific input of the innovation process

The new open innovation model has several support processes allowing for its efficient implementation. As shown in Figure 2, one such support process refers to creating a value chain of knowledge and information for providing the scientific and technical input required for advancing the *NANOAPPARATUS* innovation process.

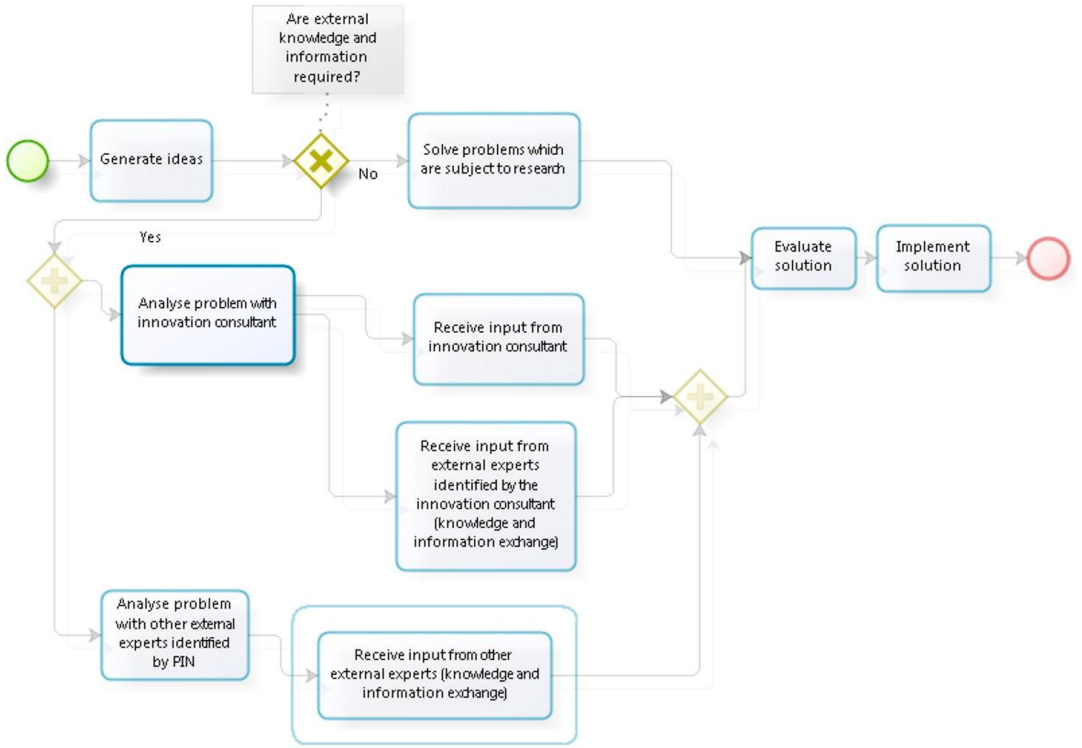

Fig. 2. Knowledge and information value chain model.

The knowledge and information value chain model constitutes a methodology for managing knowledge and information with the aim of finding solutions to research problems within *NANOAPPARATUS* project. The steps of the methodology can be synthesized as follows:

- Generating ideas and solving problems internally;
- Retrieving input from as many external knowledge and information sources;
- Evaluating ideas and solutions using evaluation criteria such as: the idea/solution should provide a quantifiable input for the problem subject to research; the idea/solution should be easily describable in order to quickly evaluate if the research direction is being shifted or maintained with no significant changes;
- Implementing selected ideas and solutions into the undergoing innovation process.

3.3. Modeling the innovation process using standard notations, such as Business Process Modeling and Notation (BPMN), and Business Process Modeling (BPM) instruments

The *NANOAPPARATUS* innovation process consists of specific activities covering experimental development, innovation activities to support R&D, transfer of new products and processes from R&D to manufacturing, procurement activities, dissemination of results, project communication and publicity, project management activities and project audit. In order to establish a common language for communicating the innovation process, the sequence flow is represented using the standard notation BPMN [7] with the help of Bizagi Modeler, a freeware modeling instrument (Figure 3). Other similar modeling instruments employing BPMN can be used for process mapping.

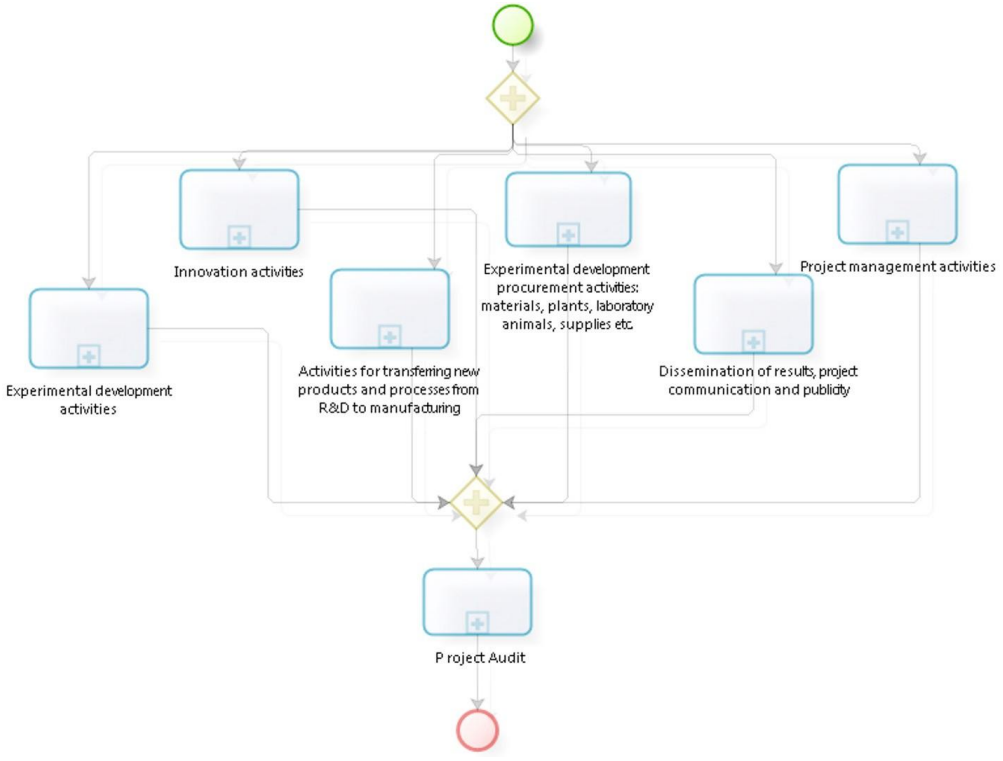

Fig. 3. *NANOAPPARATUS* innovation process – flow of activities.

When using BPMN, processes can be documented, analyzed, simulated, evaluated in terms of costs, execution time and human resources. For this purpose, each activity can be assigned with specific costs, execution time and human resources. As such, "*what if*" scenarios can be created to better understand the impact of changes, to identify bottlenecks in the process and to evaluate and insure proper resource allocation. By creating and running multiple "*what if*" scenarios, the enterprise can optimize the unfolding process.

The benefits of using standard notations such as BPMN and Business Process Modeling instruments can be summarized as follows:

- It provides a unitary understanding and communication of the flow of activities;
- It enables timely updating and correlation of project's objectives and actual results of activities;
- It improves the decisional process as any change in the activity schedule, such as advancing or delaying particular activities, may be subject to simulation. The results retrieved by simulation are perfectly correlated with the resources and specific timeframe of the project.
- Allows for process automation (process analysis, simulation and evaluation), while correlating all input and

output data, human resources, financial resources and execution time. BPMN allows for correlating all.

4. CONCLUSIONS

The comparative analysis of closed and open innovation allowed for drawing up new principles of open innovation to meet the high demands of a publicly funded research and innovation project and based on that an open innovation model was designed and implemented to support the innovation process.

Still, identifying the benefits of using standard notations and BPM instruments was possible by experimenting with modeling the flow of activities using BPMN standard language and thus emphasizing the importance of identifying a unitary communication instrument for communicating the innovation process to users and stakeholders.

Considering the complexity of an innovation process, especially in the case of publicly funded projects, it is recommended that enterprises focus more on exploring the use of standard notations and Business Process Modeling instruments for organizing, storing, documenting, analyzing, simulating and evaluating a wide range of data relevant to the successful implementation of a process. As a result, an efficient correlation between all data and information pertaining activities, inputs and outputs, human and financial resources and process execution time would be possible, thus increasing the innovation success rate.

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