International Journal of
Science and Engineering Investigations vol. 6, issue 60, January 2017
ISSN: 2251-8843

Tool for Managing an Innovation Process

Meriem Ben Miloud[1], Yasmina Kerboua Ziari[2], Hania Kherch[3]
[1,3]National School of Statistics and Applied Economics, Algiers, Algeria
[2]University of Science and Technology Houari Boumediene, Algiers, Algeria
([1]ben.miloud.meriem@gmail.com, [2]yasminaziari@yahoo.fr)

Abstract-With the competition increase and rapidly evolving markets, innovation is an essential component of business competitiveness. Innovation complex process involves the enterprise and its environment. It must be organized in order to guarantee its performance and sustainability.

Engaging in an innovation process is far to be an easy process. Multipart, generating and using a large amount of information, this process must be optimized to satisfy a concise need and brings a more affordable choice of solutions. Information is a very important resource for the proper management of this process and the setting-up of an information system. It allows to adapt a precise and effective methodology to understand the customer's needs to whom the innovative product is intended. In this paper, we proceed to design an innovation system which will manage all the process of innovation.

Keywords- *Information System, UML, Creativity, Idea Filtering, Innovation, Innovation Process*

I. INTRODUCTION

The evolution of any business depends on its ability to compete. Globalization has forced companies, to challenge themselves in order to be competitive and resist international competition. These companies are then in the situation to either innovate or disappear from the market. Indeed, among the means allowing the company to achieve these objectives, innovation presents itself as a strategic lever to acquire a competitive advantage and meet the needs of the market. Companies that innovate quickly and successfully are now those who have mastered their innovation process. It is then necessary to propose models for the elaboration of an innovation which allows describing, understand and then to pilot the innovation in an optimal way taking into account the specificities relating to the object of the innovation. However, initiating such a process is very challenging.

In fact, information is an expensive resource to manage this process. The implementation of its system makes it possible to adapt a precise and effective methodology to understand the needs of the customers to whom the innovative product is intended. In a first step, we have detailed the process of the innovation process. For each step we have presented the different methods and tools necessary for their realization [1]. After having identified all the information inherent in the process, we designed an information system for the management of the innovation process.

The main objectives of such a system are:

- Ensure an effective management of all the collected ideas (as well as the information gathered).

- Discard the uncertain ideas of achieving a commercial success in a preliminary stage, in order to limit the investments of the company.

- Assist decision-makers in gaining greater visibility into the feasibility of an idea.

II. INNOVATION PROCESS

For an enterprise change in the products or functions to be considered as an innovation, it must be new to or leads to a significant improvement. The concept of innovation is directly related to that of the organization and virtually all of the company's projects are originally based on an innovation [10]. However, others define innovation as the product of a specific activity as DURIEUX [11] for whom 'Innovation is content before being a process'. Different definitions of the concept appears in the technical and scientific literature (under the field of automation or management) (Bescos and Mendoza [13], Lemoigne, Lorino, Vernadat,[14, 15, 16], Haurat and Théroude, [17]). The innovation process we have proposed is structured into three major phases, where each phase consists of a set of steps as shown in Figure1:

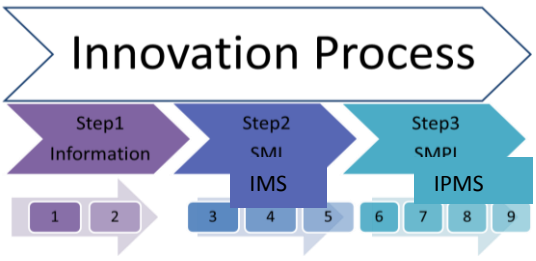

Figure 1. Innovation process

A. *Step1: Information*

1) *Phase 1: Raw information gathering*

Two sources types are illustrated herein from which information is relevant to the innovation process where it can be collected: external to markets and competitors, and internal to the company internal environment.

2) Phase 2: Data filtering

Once the raw information is collected, it must be processed and selected. The selection is mainly based on the external raw information. Among the methods of selection and processing of data, the method proposed by Martinet [2] is used. It consists in classifying the relevant information using the following two parameters:

- The information truthfulness probability
- The importance of information to the organization

B. Step2: IMS - Idea Management System

1) Phase 3: Ideas generation

It is important to develop and maintain a culture of innovation in the organization to encourage and motivate all staff to be creative and actively contribute to the innovation process.

a) Creativity :

Creativity is the ability to produce original and achievable ideas. This ability is present in every human being. It depends, however, on several factors: flexibility (coming out of established ideas), fluidity (allowing oneself quantity), originality (accepting and seeking shocking ideas), and elaboration (considering all practical aspects to realize the idea).

b) Creativity Methods:

Methods of creativity can be classified into two broad categories: so-called rational methods and so-called non-rational methods. Table 1 illustrates both categories.

TABLE I. METHODS OF CREATIVITY

Rational methods	Irrational method
Analysis of value [3]; QFD (House of Quality) MorphologicalAnalysis [4] TRIZ [5] ASIT	Brainstorming [6]: Synectic The lateral thinking (six-hat method [7]

2) Phase 4: Ideas evaluation

Among the flow of ideas generated and found, we must:

- Select the ideas that are most likely to succeed
- Eliminate ideas that are unrealistic

The phase of ideas selection is based on a set of criteria: Technical feasibility; Market feasibility; financial feasibility; Competition criteria

Assessment grid by John T. O'MEARA

This grid contains 17 criteria, each with 5 levels of answers grouped into 4 domains:

- Opportunities for marketing,
- Lifetime,
- Growth potential,
- Production potential.

Although the evaluation has few criteria, the analysis is now complete.

3) Phase 5: Concept development

From the previous step, one comes out with one or more ideas to be specified, a

It is necessary to establish their concepts.

The concept is a description of the objective characteristics and subjective, physical and perceptual what could be the final draft. A concept of new product or service may be defined as the "description of an idea that explains the main features of the future product and consumer benefits it offers" [12].

C. Step 3: IPMS - Innovative Project Management System

1) Phase 6: Market research

The purpose of the market research is to collect quantitative and qualitative information (Related to behavior). Market research is a diagnosis or an "inventory" of the existing one, namely supply, demand and the environment.

2) Phase 7: Prototyping

The prototype is made by hand. A set of indicators are deduced and synthesized in a document, which will be transmitted to the production department to start the prototype design and production: the number of parts, shape, size...

3) Phase 8: Protection

Industrial protection guarantees against abuse of its innovation and reserves a form of monopoly on its applications. It can reap the rewards of its innovation efforts, taking advantage of the market.

4) Phase 9: Production and marketing

Once the prototypes finalization is complete, the SME begins the industrialization phase of innovation. The product innovations sales launch must be done through a marketing strategy.

III. METHODOLOGY AND DESIGN

There are several design tools and we have chosen UML-based object-oriented modeling, which is a unified and powerful programming language. The RUP process, for which we have opted, is an approach that can support the UML tool, its objective is to allow the production of software of a high quality level corresponding to the needs of the end user [13].

We propose a schema that illustrates the different tasks for which the IS must perform. However, some tasks remain abstract and need to be described in detail in order to achieve a more complete design.

Expression of needs is an important step in the software building process.

A. Identification Of Actors:

An actor represents the abstraction of a role played by external entities (users, hardware devices or other systems) that interact directly with the system. The actors of the system are:

Entrepreneur: It has the right to consult, modify, evaluate and propose ideas and / or information; it is also required to make decisions.

External actor (Client / Collaborator / Supplier): He can propose ideas.

Employees: Employees have the right to consult relevant information (harvested and sorted), to consult the innovative ideas and to propose ideas

Researcher / Expert of the R & D Unit: He can consult, modify, evaluate and propose ideas and / or information

Administrator: The administrator has the right to create a new user and define the roles and privileges of the users of the system.

B. Census Of Use Cases

Functional requirements are based on user requests. These needs are structured in the form of use cases.

After studying the innovation process, the most important cases of use that need to be addressed by the proposed system have been identified. They are summarized in Table 2:

TABLE II. USE CASES

Use case	Details
1 : Collection and dissemination of information	1- Information gathering 2- Filtering of collected data. 3- Consultation data.
2: Idea Generation and Harvest:	1- Idea proposal 2- Generation and harvest idea. 3- Consultation idea
3 : Filtering and evaluating ideas	1- Selection of ideas for product innovations 2- Establishment of the mapping of ideas 3- Development of the O'MEARA grid 4- Consultation of ideas.
4: User Management	Emet: information about the user. Receives: - confirmation (password) - List of users with roles and privileges.
5 : User identification	Emet: - the coordinates. Receives: - Identification form. - Confirmation of the entry. - The working interface
6 : Viewing statistics:	Emet: request for statistics. Receives: statistics in various forms (tables, graphs ...).

An object approach realizes a case of use by means of collaboration between objects. The scenarios, instances of the use case, are represented by interaction diagrams (collaboration diagram and sequence diagram). To illustrate this, we present the two cases of use 'Management idea' and 'Evaluation Idea'.

- Use case "managing ideas":

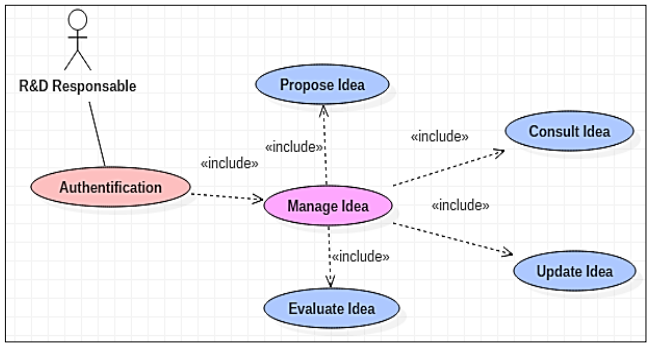

Figure 2. Use Case Diagram Ideas Management

Purpose: This use case allows the manager and / or the R & D department to manage the ideas collected. They can consult, evaluate, update, modify and offer ideas.

The actors: Leader and / or R & D

Text description: After authentication, the user can request a specific task to perform either the consulting or the evaluation of an idea. Depending on the task selected, the system displays the appropriate interface to allow the user to perform the desired processing.

Scenario:

Consultation: allows consulting a particular idea according to the following sequence:

1. The actor selects the idea he wishes to consult

2. The system displays the corresponding idea form

Update: allows you to update an idea according to the following sequence:

1. The actor asks to carry out the idea updating

2. The system displays the data and allows the actor to modify the data

3. The actor enters the desired changes

4. The system saves the change

* Sequence Diagrams: Consultation

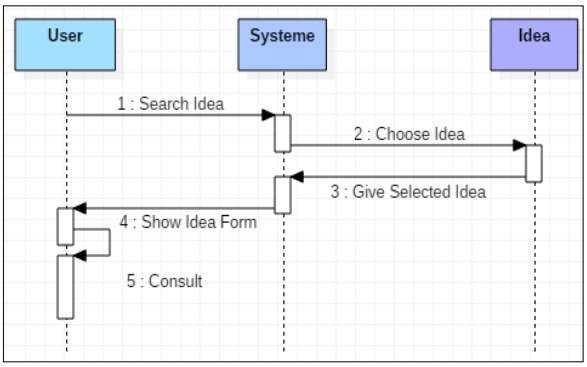

Figure 3. Sequence Diagram "Idea Consultation"

- Use case "evaluation idea":

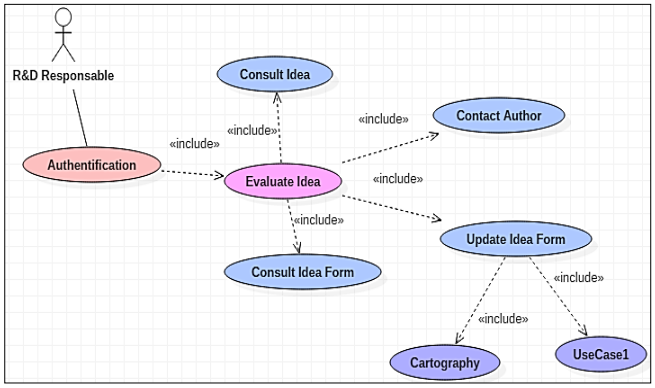

Figure 4. Diagramme de cas d'utilisation 'évaluer idée'

Purpose: This use case allows the manager and / or the R & D department to evaluate the collected ideas, judge their relevance and select the ideas most likely to succeed.

The actors: Leader or R & D

Text description: After the authentication of the actor

Scenarios:

- Consult idea.
- Consult given data.
- Contact author.
- Evaluation.

Cartography:

1. The actor selects an idea to evaluate

2. The system asks the user to choose the construction criteria for the mapping. The system proposes the choice between 2 or 3 criteria, and the user must specify his selection.

3. The user chooses the number and nature of the criteria.

4. The system displays all ideas one by one. For each idea it displays an evaluation form according to the criteria retained

5. The actor completes the evaluation form

6. The system records the evaluation and moves on to the next idea

7. Once all the ideas are evaluated, the system establishes and displays the mapping of all the evaluated ideas, and proposes to the user to choose the segment of ideas to be selected.

The user chooses the segment that contains the ideas most likely to succeed.

O'MEARA Grid:

1. The system retrieves the ideas contained in the selected segment and displays the evaluation criteria of the O'MEARA grid

2. The user enters the evaluation for each idea and validates

3. The system calculates the total and moves on to the next idea until all ideas are exhausted.

The human machine interface:

• Idea Research and Consultation Form

• Criteria Selection Form for Mapping Ideas

• Form of the O'MEARA grid

• Data search and retrieval form

Diagram of sequence evaluation Idea "O'MEARA":

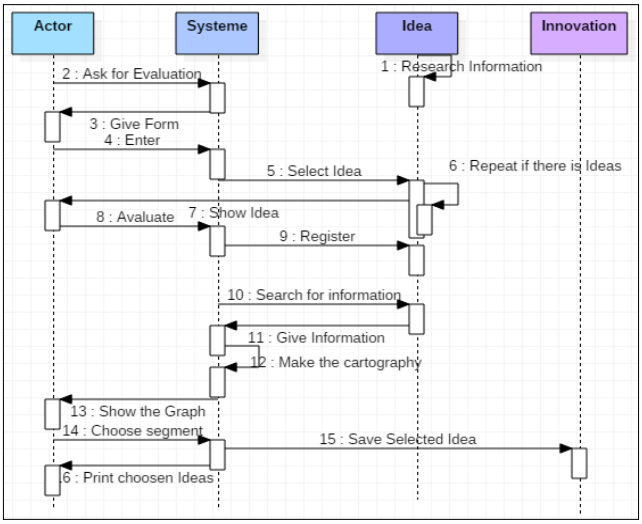

Figure 5. Diagram of sequence evaluation Idea "O'MEARA"

We have designed the information system for managing the innovation process in a company. The work carried out during this phase allowed us to identify the needs of the company in the management of innovation. The specifications derivated from the use cases formalized in UML language from the structural point of view with the class diagram and from the dynamic angle with the sequence, transition and activity diagrams, have made it possible to have a clearer vision on the structuring of the tasks of the innovation process and the integration of these into the information systems. This conception allowed us to develop the information system which manages all these stages from the acquisition of ideas to the launching of the production process in order to realize the idea.

IV. CONCLUSION

In this paper we were able to structure the company innovation process, where we have demonstrated the contribution and usefulness of an information system for the management of this complex process. We have shown that in order for an organization to innovate with greater reliability, in

order to improve competitiveness and to acquire new markets, it is necessary to mobilize the various resources that allow the management of the process 'innovation.

The study of the different concepts related to the information systems in the organizations, allowed us to understand the stakes and to know how to apply them in order to design an Information System for an innovation process management. Through this, a detailed description of an innovation process has been developed and has made it possible to design an information system for that purpose.

The information system provides a framework for managing a company's innovation management needs. The specifications derivate from the use cases have been formalized in the UML language from the structural point of view with the class diagram and from the dynamic angle with the sequence, transition and activity diagrams.

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