

# A Methodology for the Set-Up of a Virtual Innovation Factory Platform

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**Abstract.** BIVEE project will enhance a new point of view on the latest generation methods and on the industrial systems oriented to promoting and managing innovation. A new ICT platform able to manage the innovation process has been developed and installed in one of the end-user of BIVEE project. During the validation and comparison activities, end users and related stakeholders are called to provide feedbacks regarding any issues detected in the BIVEE Platform. Based on these feedbacks, a series of actions has been implemented on the BIVEE Platform. In this context the support of technical partners in order to map the requirements of the actual architecture of BIVEE is a fundamental aspect. This paper will present the set up procedure needed in order to test the effectiveness of BIVEE proposed approach.

**Keywords:** BIVEE, Innovation Space, Open Innovation, Virtual Enterprise, SME, KPIs, end users.

## 1 Introduction

The BIVEE Environment aims at deploying advanced methods for boosting creativity and innovation with an open innovation approach, for supporting their lean implementation and for monitoring the concrete outcomes, managing the innovation ventures in a collaborative networked industrial setting.

The Open Innovation approach written by Henry Chesbrough, who is considered the father of this model, in *Open Innovation: The new Imperative for creating and profiting from technology* [1] “is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. This paradigm assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology”. Open Innovation implies to access to distributed knowledge. New value is created from a new innovation environment, composed by people inside and outside the company. It is a way to accelerate innovation, and it can give the capabilities to improve velocity (Time to Market reduction), direction, and new business paths.

An important aspect is to establish a methodology to quantify Open Innovation level. There are a lot of existing works in the literature that try to define the concept

of Open Innovation but also several discussions and methods that suggest the development of the open innovation measure based on a diverse set of activities [2] [3]. For example, the degree of openness through the number and type of partners and the phases of the innovation process [4]. Rangus K, et al. [2] define the tendency for open innovation as “the firm’s predisposition to perform open innovation activities, such as external participation, inward Intellectual Property (IP) licensing, external networking, outsourcing of R&D, customer involvement, employee involvement, venturing, and outward IP licensing”. These aspects could become Key Performance Indicators (KPIs) for the measuring of Open innovation level of an enterprise.

The members of a Virtual Enterprise (VE) in a Business Ecosystem (BE), working on Open Innovation activities, require a continuous interaction because they have the intent to share common resources to do business together. Therefore the management of the VE, i.e. business partners moved from the ecosystem to a VE, removal of an enterprise from a VE, contact details for BE members, is a key aspect and it is handled through the BIVEE environment. [5].

For this reason the introduction of a platform able to manage the ideas and to follow their development is needed. BIVEE addresses the full lifecycle of the ‘inventive enterprise’ that spans from creativity and idea generation to engineering of new businesses, to continuous production improvement. The BIVEE platform is based on a *Mission Control Room* (MCR), for monitoring of Virtual Enterprises value production activities, of a *Virtual Innovation Factory* (VIF), for continuous innovation production and of an *Advanced knowledge repository* (PIKR). At the same time, BIVEE will provide means for measuring the success of any process improvement or innovation venture (Raw Data Handler, RDH) [6, 7].

Through the tool called VIF users proposes their idea, updates their proposal and lists other idea submissions. These submissions can have technical materials attached. Feedback mechanisms such as comments or likes are very useful. Validation shows itself in every domain in different levels. A validation mechanism, before the idea proposals, is published and this is conducted through a domain expert. Domain expert has an important role because he should call for ideas for pulling innovation and he should evaluate the inserted issues in order to eliminate irrelevant ideas.

The most important requirements related to open innovation tool are: Manage Virtual Enterprise, Collaboration, Partner Search, Invitations, Meeting management, Discovery Mechanism, Idea Management, Idea Approval, Idea Analysis, Idea Rejection, Monitoring Tool, Notification [8].

The BIVEE environment will be tested involving end users with two radically different pilot applications, addressing a spectrum of cases that involve different degrees of innovation activities. As end-users of the project, Loccioni and Aidima are involved in the definition of the pilot application scenarios for mapping the requirements of the pilot applications to the actual architecture of BIVEE. Two monitoring campaigns have been defined and will be carried out in order to verify its implementation.

During the Second Measuring Campaign (SMC) the validation of the two pilot applications follow a quantitative and comparative analysis for observing BIVEE impact. The introduction of full platform in end-user settings allows measuring the same

set of KPIs measured during First Measuring Campaign (FMC). During the SMC Loccioni, as end users, and its related stakeholders are called to provide feedbacks regarding any issues detected with the implementation of the VIF. In this context the support of technical partners for specifying the requirements of the actual architecture of BIVEE is a fundamental aspect.

## 2 Innovation Knowledge Flow, Storage and Monitoring with BIVEE Platform

The proposed innovation flow is organized in 4 (partially overlapping) parts that we refer to as *waves* [5] that evolve over time and their produced achievements are reported in a sequence of documents that follows a consistent logic. For each wave several groups of documents and a set of dependencies among documents are proposed. The 4 waves are: Creativity, Feasibility, Prototyping, and Engineering. Creativity starts with an innovation idea or a problem to be solved, described by a number of preliminary documents and with the creation of an innovation team. Feasibility defines impact and includes a refined planning to justify the required investment. Prototyping involves the first implementation of the initial ideas, achieving a first full scale working model that is tested and analyzed to verify the actual performance and characteristics. Engineering aims at producing the specification of the final version of the new product ready for the market, and the corresponding production process [5]. The full innovation flow from end user perspective is shown in Fig. 1.

The SMC will observe the relevant aspects related to innovation projects management of Loccioni Group, and to KPIs collection connected to innovative potential of a team or of a single project.

## 3 Virtual Innovation Factory (VIF) Platform

Before starting SMC, as end users, we collaborate with technical partner in order to detect technical problems, fixing bugs, and to indicate the “expected usefulness” of the platform components and functionality setup.

The VIF functionality [9] that we are testing during the preparation phase are:

- Personal Dashboard, where one can check all the personal notification, personal information about profile, and use the calendar.
- Ideas Dashboard where it is possible to insert a new idea specifying: which is the issue, the title, the description, some tags, document in attachment and cover, comments, which are the members that I can choose inserting the name or directly the skills connected to the idea, the visibility choosing between Virtual Enterprise (VE), Business Ecosystem (BE), or Public (PU). Then, the end user can choose if one want to submit the idea to a domain expert that can evaluate posted idea and launch an innovation project or simply save the idea in the draft panel, sharing it only with selected members.

- Innovation project panel shows the posted ideas submitted to domain experts and the launched innovation projects. When an Innovation project is selected, it is possible to enter in the specific project page where we can set the calendar, the Gantt and the project member, we can submit the document, insert comments and check the project status.
- Observatory panel that allows to select the sources that could come from social network, Semantic Web crawler, BIVEE organization dimensions ad Virtual enterprise, business ecosystem and world web.
- Collaboration panel and chat tool. with Meeting rooms or forum and chat
- VIF Admin tool to check, create and modify user list and related information, and VE.

Several internal tests are conducted in order to understand the idea visibility. When we create the idea in the draft panel one should share the idea wizard only with selected members, while, when one submits an idea he should share it with domain experts with specific competencies in the field of research of the proposed idea that should evaluate if the idea is good to start an innovation project.

Domain expert role is a very delicate aspect. In fact the crucial argument of discussion is related to the choice of domain expert. Should be chosen by the idea owner or there is a list of domain experts that could evaluate the idea? In this case when one can launch an innovation project? When just one expert gives a positive feedback or are there a minimum number of positive evaluations? In any case the idea should be attached to a specific domain because the choice of domain experts may be more accurate. We need to fix a deadline for this evaluation because usually, the time elapsed between posted idea and creativity wave start, from our point of view, needs to be very short. With respect to VE management, once the idea is inserted, we would like to decide with whom to collaborate in a VE in order to carry on the innovation project, considering the list of members chosen for their skills or for their degree and the list of selected comments related to the idea. The comments are not inserted only from chosen members but it should depend on the visibility that was set (VE, BE, PU). So we can choose, for example to collaborate with a “BIVEE user” that proposed a valid solution for an idea. For these reasons we should create a VE related to the single innovation project and we should set the visibility of the posted idea choosing from Loccioni BE, from other BEs or from a list of VEs.

There should be a sort of “moderator or administrator” that can check all the aspect related to proper right in order to accept an idea, the reliability of user profile.

Finally this innovation administrator should coordinates the evaluation of the ideas by domain experts, establishing reviewer, deadline,...In fact, who choice how “to take in charge” the evaluation of an idea? This evaluation should be obtained very quickly so this couldn’t be obtained only through a spontaneous candidacy of a domain expert but should be pushed by an administrator.

### 4 KPI Selection and BIVEE Platform

One of the most important aspects in BIVEE is to monitor and determine the current condition of an enterprise through values of a set of variables called Key Performance Indicators (KPIs).

Starting from a list of around 40 KPIs used in the FMC, we proceeded with the definition of the formula for these KPIs [7].

For example the KPI related to cost is equal to

$$\text{Cost KPI} = \text{material} + \text{labour} + \text{other} \tag{1}$$

Moreover the original list of KPI are repeated for each wave that are in turn split in 3 or 4 activities for each wave. So the number of KPIs increases from 41 to 126 (Fig. 1a).

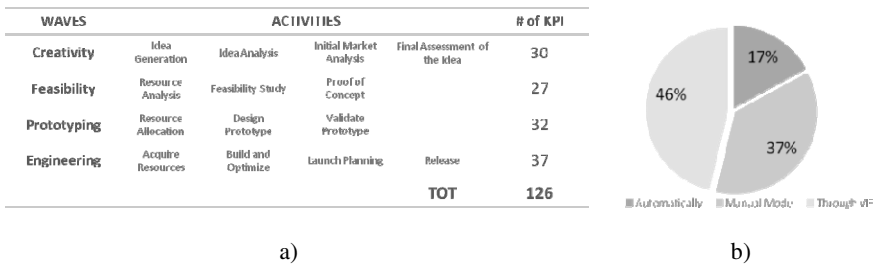


Fig. 1. a) Total number of KPIs; b) types of KPIs collection

After these steps we identified from the list of KPIs which of them could be collected automatically, which of them in a manual mode, and very important, which KPIs could be extracted directly from data inserted in the VIF. As we can observe from Fig. 1b there is a relevant number of KPIs that could be extracted by VIF or manually while there is a low number of KPIs obtained automatically updating these data from Loccioni’s database. Moreover, KPIs could be automatically downloaded from database only from the feasibility wave because the work order related to a single project is created only from the feasibility study in Loccioni. In fact, for example, all the cost related to the creativity wave are usually downloaded in a work order related to a particular competency. Then KPIs collected from VIF are useful because: we can’t introduce KPI related to creativity wave automatically; we can monitor the whole procedure of innovation potential followed by Loccioni Group because the application scenario is not related only to a single project.

The BIVEE Platform prototype [10] is composed by a Monitoring Platform that includes the Raw Data Handler (RDH) component and the Data Storage, the Service Platform and BIVEE Portal that includes the front-end to the BIVEE Platform and components. At the moment, through BIVEE Portal in the monitoring Platform, we are collecting manually or automatically the KPIs related to the projects monitored.

## 5 Conclusions

For the adoption and implementation of a VIF platform able to manage the innovation management the preparation phase was a decisive step, absolutely not negligible. From end user point of view some internal procedures have to be re-organized in order to understand if the new methodologies introduced by BIVEE platform will improve innovation project management. First of all we had to re-organize the way to create an internal “work order” and how to automatize some operations that before were done manually. The implementation was not a simple and short procedure, but meetings and formal steps should be organized before the complete adoption of the VIF that will be completed with the SMC.

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