Innovation Factory: An Innovative Collaboration and Management Scenario

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Abstract. The Open Innovation model has its foundations on a very basic theoretical ideas: it is necessity to combine ideas internal to your enterprise and, at the same time, draw information and resources from the outside, i.e. from users, competitors, partners or others, who belong to the same market segment. This approach is well established and widely supported globally. However, in recent years, the technological solutions proposed have tried to provide cutting-edge solutions, which are able to channel resources from disparate sources to our businesses. But Open Innovation is not only this: its challenge is to break barriers, even if located within a single organisation hierarchy or geographical locations. Our work goes in this direction, introducing the concept of the Innovation Factory, where various new collaborative features are merged together into a consistent innovation management process.

1 Introduction

In the essay "The wisdom of crowds" the journalist James Surowiecki [1] argues that, under certain conditions, the collective intelligence of a large number of people is more important than the advice of a small group of experts. The Web evolution along its first twenty years of history [2] has largely demonstrated the effectiveness of these ideas. This revolution has taken place thanks to services such as wikis, blogs and social bookmarking, and with the formation of social networks, new forms of collective intelligence became a source for the creation of new business opportunities. In recent years, social networks have redesigned the look of the Web by introducing tools that have fostered collaboration, sharing and relationships between people. Facebook, Twitter, Google+, LinkedIn, Instagram and all the online services based on these models are included in the term Web 2.0, and in fact they represent today the most advanced technologies, monopolising the ranking of the most visited Internet sites. This new frontier has been able to penetrate even within companies overcoming organisational and geographical barriers. In the old business model the research and development (R&D) department was confined within the walls of an enterprise, and was limited to a small number of people. In the modern business this scheme is finally

overcome. The principle behind this revolution lies in the possibility that each individual can make a contribution for the benefit of the whole community, be it a group of friends or a research team. In this context we introduce the notion of the *Innovation Factory*, the platform at the center of our work. In particular we point out that such a tool is not only usable in a developing economy, but it is also useful and even necessary in a context where a multinational company has outsourced some activities to a branch office in a developing country since this platform improves the communication between the main office and the subsidiaries.

The paper is organised as follow. Section 2 starts the discussion with the related work. Section 3 gives motivations and reasons for which it is useful to introduce the Innovation Factory in a commercial business. Section 4 provides a description of the main components of the platform, and provides the technological context in which the Innovation Factory stands. Section 5 recalls the outcomes of the tests performed for our initial deployment. Section 6 proposes our conclusions.

2   Related Work

Along the years many articles were published about collaborative venues, community forums, electronic meeting systems, collaborative working environments, enterprise social software, enterprise social networks. All these terms refer to the concept of collaboration platform.

Since the development of modern organisational studies, the understanding and operativeness of collaboration environments has been considered a relevant research topic [3]. Even if, most of the studies conducted fall in the area of social science [4], in the last years contributions adopting quantitative approaches are emerging in different contexts, such as multimodal support of group dynamics [5,6] or automatic recognition of social and task-oriented functional roles [7,8].

In recent years, technology triggered a large number of new products. In [9–12] the authors present the results of qualitative analyses on the impact that collaboration platforms have on organisations. In [13] commercial products and research prototypes in the domain of collaborative computing are examined.

3   Motivations

It is not surprising that a recent research involving several multi-national companies, conducted by Mimecast [14] found that on an average basis, company staff spends on average 13 h a week for managing email, each employee loses 5.3 h per week due to inefficient processes, and 67 % of the information available in the company are not found due to poor organisation of the data.

This lead us to consider that the traditional intranet model is obsolete. When then investigated an approach capable of supporting the maturation of team knowledge by (i) increasing the awareness of the ideas transiting through phases of collaboration [15], and by consequence (ii) accelerating the convergence of team members in tackling with common tasks and in adopting a shared terminology [16].

4   Structure and Components for the Innovation Factory

In this section we will present the platform with some details about the individual components. After defining the environment as a whole we will also evaluate the limits that have led us to study the new features recently introduced.

4.1   Liferay Basic Components and the Innovation Factory Customisation

We now provide a very short overview of Liferay and propose the reasons that led us to choose this tool as the basis of our project. Liferay is an open source product written in Java and consists of three basic parts: a kernel (*Liferay Portal*), which serves as the core for applications and contents, a content management system (*CMS Liferay*) and a suite of applications to achieve collaboration and social networks (*Liferay Collaboration*). Liferay is based on a service-oriented architecture (SOA). Thanks to this modularity we consider a flexible tool well suited to the integration of new features and the expansion of existing ones. The reasons why we chose Liferay can summarised in the following points. *Open source policy and Low cost*: all software within the IF is open source; this choice allows anyone to create new features or to expand existing ones starting from the experience of a very large community of developers. Also, being free of license fees Liferay is highly competitive compared to all other commercial solutions. *Integration*: thanks to its modular platform, Liferay allows integration with third party software, the Web and easily permits the introduction of new components that can enhance the product's capabilities. *Time To Market*: Liferay provides a number of built-in functionality of existing applications and templates that make it easy and fast implementing new *portlet* and the start of production of a new portal. In this way, Innovation Factory, our customisation of Liferay, provides users with a all-in-one platform where the innovative elements we added can be an advantage over competing products. Our solution is developed from *Liferay Portal*, while *Social Office* [17] is the tool that provides the basic functionalities of sharing and collaboration. Then we chose *Etherpad Lite* [18] as open source editor for the creation and the processing of documents that must be shared among multiple users. An Etherpad text is synchronised as you type, so that everyone is viewing the same text. This allows you to collaborate seamlessly on documents[1]. *Apache Stanbol* is the core of the platform: its semantic engine can analyse resources, correlate and enriche content for the users. By leveraging the capabilities of Stanbol we developed the core component of the Innovation Factory, i.e. a *Recommender System* [19], which an extended collaborative environment supporting participatory design. [20]. The RS, through a tag cloud system, provides suggestions to stimulate the collaborative process and offers all the resources correlated to a specific area of discussion. Through Stanbol, any Etherpad file written by the users is parsed and compared to the dictionary. Any

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[1] First launched in November 2008, Etherpad software was acquired by Google in December 2009 and released as open source later that month.

Fig. 1. Innovation factory (IF).

dictionary contents related to that document appear on the right hand side (for example other files with similar content, concepts and people related, etc.), as shown in Fig. 1. Documents that are linked can be either stored internally in a file system, or in the internet. In the latter case documents are retrieved by a web crawler. The open source *Crawler4j* [21] was chosen and used for parsing and managing external resources. In this way IF facilitates the handling of collaborative tasks by facilitating coordination activities and making important resources detectable. A Knowledge Base (KB) is finally created to store and manage documents. The key contributions of the IF are *(i)* the integration of the different open source modules and *(ii)* a the tag cloud system, which visualises the recommendations computed by the RS and provides team members with tags linked to relevant documents in the KB. As discussed in [22], the RS reacts to three particular kinds of inputs: *(i)* a stimulus, describing a task to be performed or a set of goals to be achieved, *(ii)* a target, defining the set of employees over which suggestions must be applied, and *(iii)* a set of local configurations defining, e.g., the type and the similarity measures. The RS computes the concept adequacy, between the targets and stimulus, and returns recommendations on concepts connected to the stimulus.

4.2 Limits of the Innovation Factory First Version and the New Features

The scenario presented in the previous paragraph is the starting point of our next updates. The Innovation Factory was already a complete, extensible environment that adapts quickly and easily to different kind of company.

However, in order to straighten its capability in accordance to the objective presented in Sect. 3, we set some new requirements for a new version of the IF, in particular we want to make the creation of the dictionary contextual with the development of the discussion. When editing a new pad users may perceive new

entities became relevant and consequently add them in the dictionary. In this way the system will track the use of that element in next interactions. Later on, users may access the administration tab of the dictionary to enrich definitions by creating relationships among entities or to attach documents and link as of these entities.

More specifically the new features extending the IF are the following:

– Fast creation of dictionary entities using hashtags directly in textual documents.
– Contextually update recommendations matching dictionary entities to data generated by interactions.

5   Tests performed on the IF features

A preliminary version of the IF is deployed during EC-funded ARISTOTELE project, which sought to raise awareness about the importance of collaboration aspects for understanding variations in team processes which, in turn, impact team outcomes. At the end of the project pre- and post-questionnaire data was gathered from 27 professionals of a medium-sized company operating in the knowledge-intensive sector of telecommunication. Test outcomes are found in [23]. Test results indicated that teams working in highly integrated computer-supported collaboration environments had higher team innovation, better agreement, better coordination, and less dominance than in traditional settings.

More recently we adopted the IF environment to test the impact of recommender systems on team processes [24]. We observed that teams using recommendations spent less effort on information handling, engaged more in communication, shared their work more equally than teams without recommendations. Finding initial supports to the idea that our tool effectively accelerate the convergence of team to common tasks.

6   Conclusion

In this article we highlighted the concepts of Open Innovation and Collaboration Platform to enhance innovation in a community through technological support. Initial experimental studies has demonstrated that our platform can develop the collaborative capacity of a team, building new relationships and accelerating the convergence of ideas. Future works will test the platform using industrial datasets and will address the issues raised in the initial test phase.[2]

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