DESIGN OF AN INNOVATION PLATFORM FOR MANUFACTURING SMES

Martin Ziarati
Centre for Factories of the Future
Design Hub
Coventry University Technology Park
Coventry, CV1 2TT, UK
martin.ziarati@c4ff.co.uk

Lakhvir Singh
Centre for Factories of the Future
Design Hub
Coventry University Technology Park
Coventry, CV1 2TT, UK
lakhvir.singh@c4ff.co.uk

Reza Ziarati
T.C. Piri Reis University
Istasyon Mah.   Hacioglu Sok.
Tuzla
Istanbul, 34940, TR
rziarati@pirireis.edu.tr

ABSTRACT

This paper reports on the conception of a collaborative, internet-based innovation platform with semantic capabilities, which implements a new methodology for the adoption of a systematic innovation process in globally-acting networked SMEs. The main objective of the innovation platform is to stimulate the generation of ideas, the selection of good ideas and their ultimate implementation. The platform will support SMEs to manage and implement the complex innovation processes arisen in a networked environment, taking into account their internal and external links, by enabling an open multi-agent focused innovation system, facilitating customer, provider, supplier and employee-focused innovation. The solution is specifically focused on the needs of manufacturing SMEs and will observe product, process and management innovation. The paper presents the key elements of the innovation model and makes references to a novel approach concerning the development of a robust and flexible Central Knowledge Repository for the innovation platform.

Keywords: Innovation Modelling, Innovation Platforms, Knowledge Repositories.

1   INTRODUCTION

Innovation is defined as 'business not as usual' by Ziarati (1995). While this 'Business not as usual' is primarily a good concept for developing new and unexpected products or services, companies often benefit from improving their products and/or services by applying existing techniques or technologies. Authors are of the view that if a development was not planned as a matter of course, then this is 'Business not as usual'.

Over the past decade, innovation has gained a unique importance in the world of business. Several studies have been carried out, which reveal that the majority of SMEs are keen to find how innovation can help them improve their products and/or services, or to develop new products or services (Herstatt, and Verworn, 2006; Bullinger, 2008). It is however argued that only a small number of efforts have been made to support SMEs in managing their innovation processes/activities. Little evidence is found that demonstrates work done in business and policy communities to systematically draw on concepts, theories and empirical evidence (Tidd, 2006). However, several pieces of academic research have already been begun in this area (Popova et al, 2007; Ziarati et al 2002). A study by Mangematin, and Baden (2008) shows that around 200 research centres all over the world produce approximately 5000 papers each year, and most of them are inclined towards innovation management. Several publications have emphasised the requirement of setting up an innovation system to accelerate the growth of SMEs (Kogut and Meitu, 2001; Hippel, 2001; Bullinger, 2008).

By realising the importance of innovation, many international companies have already introduced innovation systems in their companies. "My Star Buck Idea" is one of the most popular web based tools, which allows STARBUCKS customers to view existing ideas, comment and vote on ideas and post new ideas related to existing or new products and services.

An analysis of existing innovation systems reveals that there is no such system currently in existence that can be adopted/adapted to meet the special requirements of industrial manufacturing SMEs. Existing systems are either simple, like a "suggestion system", or don't provide the necessary tools and functionalities to fulfil the needs of manufacturing SMEs.

This paper reports on the conception of a collaborative, internet-based innovation platform with semantic capabilities which implements a new methodology for the adoption of a systematic innovation process in globally-acting networked SMEs. The main objective of the innovation platform is to stimulate the generation of ideas, the selection of good ideas and their ultimate implementation. The platform will support SMEs to manage and implement the complex innovation processes arisen in a networked environment, taking into account their internal and external links, by enabling an open multi-agent focused innovation system, facilitating customer, provider, supplier and employee-focused innovation. The solution is specifically focused on the needs of manufacturing SMEs and will observe product, process and management innovation. The paper presents the key elements of the innovation model and makes references to a novel approach concerning the development of a robust and flexible Central Knowledge Repository for the innovation platform.

2   PROPOSED INNOVATION FRAMEWORK

To overcome the short-comings of the existing models, a comprehensive and flexible, collaborative, internet-based innovation platform system is proposed. This system support SMEs to manage and implement the complex innovation processes arisen in a networked environment. The overall ICT system concept is based on a collaborative platform including functionalities to support the most commonly used Innovation Methodologies in Industry. The current system concept is presented in the figure 1 below.
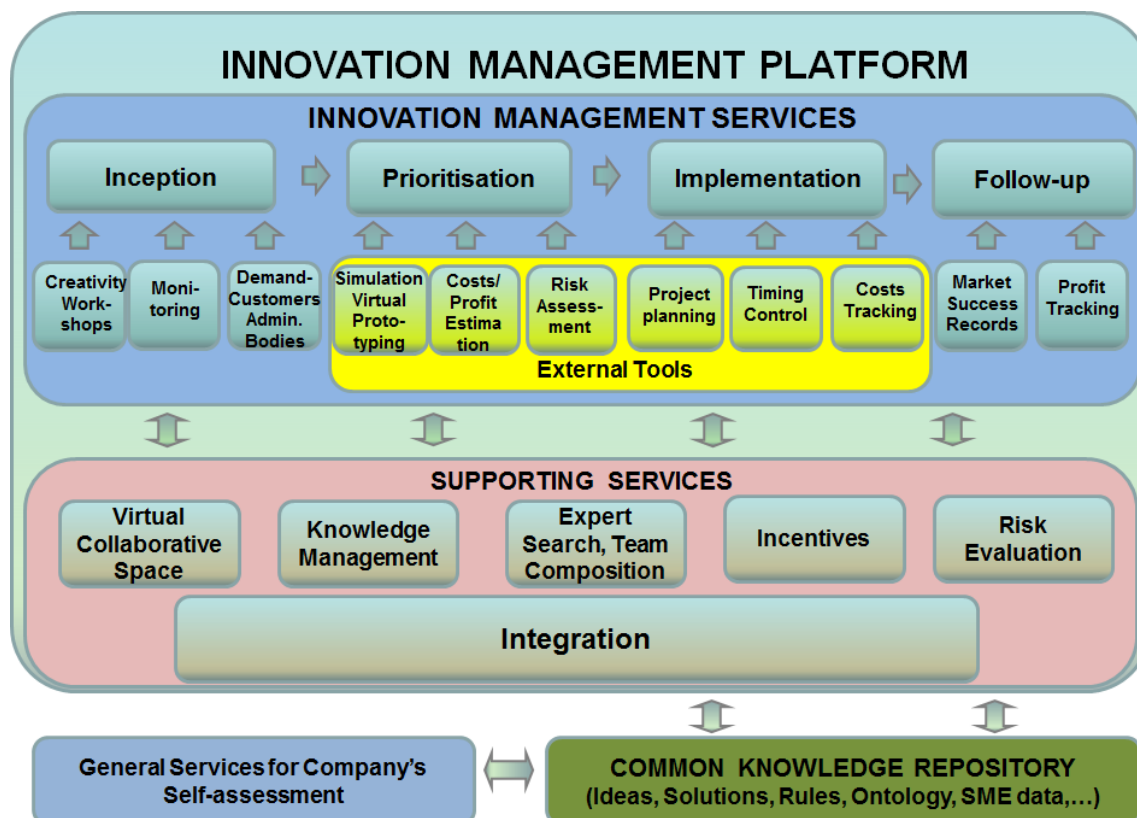

Figure 1:   Proposed Innovation Platform

As it is shown in the above figure, the innovation model has been composed of the following components:

1. Innovation Management Services
2. Supporting Services
3. Central Knowledge Repository
4. Learning Organisation

2.1 Innovation Management Services

In covering the complete innovation management life cycle, the system consist four innovation services: Inception, Prioritisation, Implementation and Follow up.

Inception Service supports the initial phase of the innovation when the innovative ideas are created and collected . It is similar to the IDEA stage of a traditional Innovation approach. It has to do with the identification of problems, generation of ideas and problem solving, creation of a repository for Innovation Projects, creation of the appropriate environmental conditions to foster Creativity, apply Classical Rule-Based Reasoning (RBR) and Case-Based Reasoning (CBR) approaches, in combination with ontology(s) for similarity matching.

Ideas Prioritisation Service enables analysis of the collected ideas and selection of the most promising ones, based on the predefined criteria. Ideas Prioritisation Services provides ICT support for the 2nd phase of the innovation process – Ideas Prioritisation. The basic concept of prioritisation is the ability to assess and select an idea. The decision support tool involves a combination of classical approaches and new approaches to prioritise ideas on products and processes innovation.

Implementation Service provides support to create the necessary conditions to favour RTD activities, to compose teams, to search financing for the implementation or to schedule manufacturing, and also to support the innovation process management, in terms of monitoring timing, financing, selection of the most appropriate materials/components, and processes.

Follow-up Services support the assessment of the success of the implementation of innovative products/processes, evaluate the effectiveness of the innovative project and keep information about all the previous stages, with all the actions and decisions taken, from the basic idea to the final result.

2.2 Supporting Services

To extend the system functionality and usability, a number of supporting services has been added into the framework as shown in Figure 1. All these services can be used according to the application specifications.

Services for the creation of a virtual collaborative space should enable a smooth common multi-tenant usage of the system functionalities by several users from single enterprises, extended enterprises and/or wider communities (open innovation), to work on innovation projects.

The group of general collaborative functionalities/servicess of the system should also comprise knowledge management functionalities, i.e. acquiring relevant knowledge, search knowledge components, tracking and tracing innovation projects, reasoning methods, etc. As a backbone of the Knowledge Management services, an ontology should be implemented. The ontology is built as a modular system, allowing for easy extension, easy handling in distributed environments (like the semantic web), and simple management.

Further collaborative services should be Experts search (external and internal), and Team composition and management from external and internal staff. This allows for composing ad hoc activity groups based on criteria such as Purpose of the team, Availability of team members, Required knowledge areas, and Personal interests.

Services for Risk Assessment should be used as appropriate for ideas prioritisation and innovation implementation. During these two phases, the risks of the innovative product/ process failing either technically or financially are to be carefully evaluated, leading to innovation process adaptation or abandonment.

In order to motivate the employees to participate in the innovation process, services for Incentives Definition should be implemented. These will be based on the number and quality of the innovative

ideas and on the preferences of the people who submit the best ideas, as they can help identify the most appropriate incentives. Some Integration Services should be implemented in order to make the aforementioned services work together.

2.3 Common Knowledge Repository

The Repository collects and manages innovation knowledge from all of the members of an extended enterprise for new and existing product and process developments. The Repository, with the support of external innovation tools and services, processes the captured ideas and knowledge; and ultimately supports product, process and/or management innovation.

Common Knowledge Repository for the whole system stores data about Ideas, including also history of all ideas posted anytime in past, Solutions, Rules, Business and Innovation models, SME specific data like plant description, processes description, list of employees with related data, Product and Process related documents, with easy access to product or service improvements, including linkages to customers and suppliers. List of employees with related data can be applied e.g. in the Incentives services as a support to selection of the most appropriate incentives for each of the innovation process participants based on the stored profiles, or within the Team Composition and Expert Search services.

The repository will contain all the knowledge required by the Innovation Platform:
- Knowledge about the innovative SMEs' context, operations and products, i.e. all the information that describes processes and products, needs, ideas and effective innovations. The repository will be modelled with a sustained structure to store the desired information, but which at the same time provides the necessary flexibility needed for its use, needed to interact among different actors, components and services and provide the information missing in manufacturing companies, e.g. interactions and relations between products parts and process steps, ideas and innovations.
- Knowledge about the Innovation Methodology, implemented as a specific ontology, which shall define a common terminology and structuring of data, which is to be maintained at the local repositories. This concept seems suited to the industrial environment, since it represents a compromise between a structured approach – needed to assure an effective sharing of knowledge – and the freedom required to address the individual needs of participants – to not restrict creativity.
- Knowledge about national and international funding opportunities to implement innovative idea(s).
- Link to all the supporting services and external tools to support the innovation activities and processes.

2.4 Learning Organisation

The concept of a learning organisation plays a vital role in the innovation process. To be a successful innovation organisation, an enterprise must first and foremost be a learning organisation (Sense, 1990). In order to avoid bad ideas being entered into the system, it is important that users should be aware of the necessary information, such as past experience, principles and policies, related to the idea domain. For example, if the idea is about the design of a product, then the idea proposer should be given the opportunity to learn about past designs and product design practices and principles. Firstly, it will avoid bad ideas being entered into the system at the initial stage. Secondly, it will boost the knowledge of the people in the organisation.

3 CONCLUSION

Innovation is a key factor in organisations surviving and gaining a competitive advantage, whilst realising sustainable growth in this hyper-competitive economic playground. The proposed innovation model will help to promote enterprise innovation. It is a stereo structure consisting of four components, which are innovation management services, support services, a Central Knowledge Repository and Learning Organisation. It will support SMEs in managing and implementing the complex innovation processes arisen in a networked environment.

ACKNOWLEDGMENTS

REFERENCES

Bullinger, A. 2008. Innovation and Ontologies. Ph.D. thesis, Technische Universität München, Arcisstraße 21, 80333 München, Germany, DOI: 10.1007/978

Herstatt, C.; Verworn, B. 2006. The "Fuzzy Front End" of Innovation, TU Hamburg, Harbourg, Working Paper, http://doku.b.tu-harburg.de/volltexte/2006/163/, last accessed May 2012.

Hippel E. V. 2001. Innovation by user communities: Learning from open-source software. MIT Sloan Management Review, 42(4), p. 82–86.

Kogut, B. and Meitu, A. 2001. Open-Source Software Development and Distributed Innovation, Oxford Review of Economic Policy, 17(2), p.248-264

Mangematin, V. and C. Baden-Fuller 2008. Global contests in the production of business Knowledge. Long Range Planning, 41 (1), 117-39.

Sense P.M. 1990. "The fifth discipline: The art and practice of the 1earning organization", New York: Doubleday Currency.

Tidd, J. 2006. Innovation Models, Discussion paper, Science and Technology Policy Research Unit University of Sussex, Imperial College London, http://www3.imperial.ac.uk/innovationstudies/publications/discussion_papers/innovation_models.pdf, last accessed April 2012

V. Popova and Treur, J. 2007. A Specification Language for Organisational Performance Indicators. *Applied Intelligence Journal*, Vol. 27(3), pp. 291-301.

Ziarati, R. 1986. "Engineering Education & Training: New Information Technologies, Multi-Skilling for Engineers", People & Technology European Conference, London.

Ziarati, R., Ziarati, M., Ucan, O. N. and Stockton, D. 2002. Design and Development of the Factory of the Future in Turkey. Proceedings of the 10th Mediterranean Conference on Control and Automation - MED2002 Lisbon, Portugal, July 9-12, 2002.