Innovation as a distributed, collaborative process of knowledge generation: open, networked innovation

Peter B. Sloep
CELSTEC, Open University of the Netherlands, Netherlands

Abstract: The last several decades, the world has witnessed the advent of a variety of 'open' movements, promoting open source code, open standards, open learning, open educational resources. These movements have all initially been underpinned by moral arguments, referring to their contribution to the common good. However, sooner or later, pragmatic arguments have always been adduced, referring to the practical benefits of openness. Open innovation is odd, in that it refers to practical benefits mostly and moral arguments are seldom heard. Yet, as I will argue in this paper, viewing open innovation from a moral stance, will reveal several other benefits. I will rely on an analogy between open learning and open innovation to substantiate this claim. I will briefly discuss a recent development in open learning, networked learning, which is interesting precisely because better than ever it blends moral and practical values. This networked view, I surmise by analogical reasoning, holds significant promises for open innovation. I will elaborate this by providing some details on what such a networked view of open innovation could look like.

1 Ideology versus pragmatism in openness

In the early days of computers, the 1970s, most software source code was open. What else could it have been, given that computer software was still very much the tool of researchers and only few companies managed to earn a profit from it. This started to change in the early 80s. Increasingly, programmers were lured away from their university environments and commercial software was being developed, for instance software that was needed to connect particular pieces of hardware such as printers. The code these programmers wrote became proprietary, as the companies felt it was their intellectual property, much like the patents they had on the printers they manufactured. Richard Stallman, an MIT researcher, experienced this when he tried to improve the software of an ill-functioning printer. To cut a long story short this experience ultimately led him to found the Free Software Foundation in 1984 (Levy, 1984, *fide* Weber, 2004).

The Foundation has a very principled view on software source code. In the words of Steven Weber (1984, p. 47), it argues that 'software represent[s] a key artefact of a community that exist[s] to solve problems together for the common good'. Indeed, 'proprietary software [runs] against the moral sentiments of a decent society'. Interestingly and in contrast with what one may expect in the first instance, companies such as IBM and SUN have realised that an open source code model makes eminent business sense. The do not really subscribe to the ideology-laden, moral view on the need for open source software, rather they argue for a more pragmatic view that focuses on the economic benefits of open sourcing software code. Sharing code freely makes for fast progress at lowered costs per participant. This is the view that, in the 90s, also characterised the Linux developers community. And apart from lowering the individual development costs, one can even make money on providing services built upon the availability of the code. Companies who create

ready-made Linux installers and provide services around them, such as Red Hat, bear witness to this. In short, what started as a principled, moral stance, turned out make good business sense too.

The open source movement is but one of many. And through the characterisations of these run the strands of moral and pragmatic arguments. For quite some time, people have argued for the necessity of open interoperability standards to create a level playing field for producers and a competitive market for consumers. This is both a moral argument for fair play and a pragmatic argument for optimizing markets and thus cutting costs for consumers and producers alike. Open attitudes towards learning have been explored from the 1970s, resulting in the foundation of 'Open Universities' in many countries. They were founded very much on the notions of social justice and equal opportunities that were widespread in those days. However, increasingly there is also an economic variant. Distributed learning is the term that is used for this model of learning, it has been embraced by various commercial distance learning institutions that we see these days (Wagner, 1999).

2 Open Learning and Open Innovation

Off-recent, I have proposed to take open learning one step further (Sloep, 2008a). One should liberate the learner from the constraints of the single educational institution, whether a traditional open university or an institution for distributed learning, and make him or her part of a learning network. Such networks are inhabited by many learners with similar interests. Their needs *qua* learners are being catered for by several institutes, not just one as is traditionally the case, and they all provide specific services to the learners. Information technologies not only connect the learners among themselves but also act as the conduit for providing such learning services. These services range from the provision of customized learning content, via recommendations on curricula and learning paths given a set of ambitions, to assessment of prior competences. Some of these services may be offered for free, other for a fee.

To the extent that services are free, learning networks offer learning opportunities to many. In that sense they emulate the old open education ideal and contribute to the common good. If for instance some content is made available as open educational resources, they lower the entry threshold for education considerably. If, however, they charge for services, one may expect that learning effectiveness or efficiency increases. After all, why bother to pay otherwise? Those to whom efficiency and effectiveness matter and who can afford to pay the fee, which could be considerable for instance in the case of one-to-one tutoring, should obviously be interested in these for-a-fee services. Thus, to the extent that a learning network provides services for a fee, it may even offer opportunities for professional development in a corporate context. Indeed, and there's the added benefit, because of the dynamics and diversity of the network, such a networked environment may offer a training environment that is superior to traditional in-company training sessions. It certainly offers a substrate for extended professional contacts. In this sense, then, a learning network also serves the practical goal of providing effective and efficient learning opportunities.

The latest offshoot to the open movement is open innovation. This term was coined by Henry Chesbrough (2003) to denote innovation attempts that would make use of the knowledge of researchers other than those in the company itself. Knowledge should be bought and patents be licensed if that makes sense from a business point of view. He coined the term to distinguish open forms of innovation

from the exclusively in-house kind. This seems an overly limited perspective on open innovation. Admittedly, it is a step forward from the situation in which everything has to be done in-house, from the creative spark to the final product. But it is a long way from a view of innovation in which contributions of many are invoked and valued, from a networked view of innovation, that is.

One could make an *a priori* argument for the benefits of a networked view of innovation. The diversity of opinions, backgrounds and ideas of the network inhabitants will feature large in such an argument. Networks dynamics will play a part in it too, presumably. Speculating further, I expect that particularly efforts to come up with novel, unexpected ideas, arrived at through out-of-the-box thinking and warping conceptual schemata, will particularly benefit from networked creativity. I am referring here Margaret Boden's transformational kind of creativity (Boden, 1990). Such efforts, furthermore, will probably be precompetitive too, thus making them interesting for companies as well. For competitive innovation, that consists of improving a product's usability, its attractiveness to particular markets, its production costs, etc., networked creativity is probably less interesting, if only because for the obvious reason that it needs to be conducted within the confines of a particular company. However, I will not pursue such a line of argument any further here. Rather, I will describe efforts to develop a platform that supports networked innovation through a particular set of services. Ultimately, once deployed, test with such a platform such provide much more convincing, *a posteriori* empirical arguments.

3 Networked innovation

Currently and in the context of the EU funded *idSpace* project[1], a team composed of experts from several universities and companies is investigating what precisely it takes to sustain and build a network for innovation. With respect to such networks, networked learning plays not only the part of analogon, used to argue for the sensibility of a networked approach as I did in the above; learning is also part and parcel of networked innovation. Indeed, networked innovation may be seen as a special case of networked learning. Using learning as its first building block, the team also considered creativity techniques and context-aware recommendations as blocks with which to build a comprehensive set of services for networked innovation.

3.1 Flow design patterns

The starting point of any innovation is a problem description, however, provisional. The description contains a written account of the problem and the contours of the solution sought; it will also contain a description of the context in which the solution is to work. This description determines the kind of approach one should follow, from which follows the kind of team one needs. Someone should start off this process of arguing from a problem description to its solution, taking into account context and team. This person I will call the moderator. The moderator thus structures the ideation process, he or she orchestrates the collaboration between the participants, provides supportive documents, decides to change course, etc. This train of actions is not unlike the actions of a teacher or tutor in a collaborative learning scenario. Such scenarios are often described in terms of design patterns, and it is such patterns,

[1] See http://www.idspace-project.org

particularly *flow design patterns*, that we propose to use for structuring ideation sessions (Georgiakis et. al., 2009).

As part of such a flow of actions, particular creativity techniques may be used. Typically, a flow design pattern encompasses more than just a single technique as it may recommend, for instance the use of evaluative, convergent techniques after the use of brainstorming techniques that promote lateral, divergent thinking. For each kind of design pattern, therefore, several creativity techniques may be fit; conversely, any creativity technique could feature in several design patterns. Also, creativity demands iterations. One could use the same technique several sessions in a row, or try a different one if the ideation process seems to slow down or come to a halt.

What technique to use, what intervention to make is, of course, determined by the situation at hand. It is the moderator who translates the situation into recommendations to make to the team. However, a recommender system that derives recommendations from for instance user profiles and process characteristics, could do so too, thus alleviating the moderator's task. Alternatively, the recommender system could provide suggestions to the moderator rather than directly to the participants. So there is ample room for a variety of services that, on the basis of an awareness of the context and predefined ontologies, provide recommendations to the ideation process.

What emerges is a picture of a flow design pattern for ideation which, once a group has been put together, consists of the iterated application of various creativity techniques, driven by recommendations by the moderator and a recommender system. The pattern takes care of the overall coordination.

3.2 Platform and topic maps

A flow design pattern may be a useful device to describe the flow of activities in ideation sessions. But this view is silent on at least two important issues. First, in a networked environment, interactions between participants need not be all synchronous. Participants could easily contribute in a sequential order, the one after the other, rather than all simultaneously. This necessitates a kind of storage of the results of each creativity session. Moreover, such results should also be annotated in order for them to keep making sense, over time and to newcomers. This is particularly true if one considers the sequential use of different creativity techniques. If bouts of ideation occur widely spaced in time, storage of results and annotations as well as their easy retrieval is an absolute necessity to avoid 'starting all over again', to make sure one builds on previous results. Data should be stored in a structured, yet easily accessible and transformable way. *Topic maps* have been chosen as the means to achieve this. They are more or less the formal equivalent of the concept maps people often draw spontaneously. Each ideation session, being an instance of a particular flow design pattern, results in its own, unique topic map. However, if at some point of time one decides to merge ideation processes, instances of topic maps may easily be merged too. Particularly in networked situations, where groups are fluent and flexible, this is an important benefit, next to the creation of a network memory.

The second aspect that a description in terms of flow design patterns is silent on is the need for a supportive infrastructure. Currently, the project team considers a portlet-like system, which offers basic functionalities for profiling, authorization and authentication in addition to which it allows for the easy integration of components. Thus one may mash-up, for instance, functionality for topic maps with a profiling service and a service that supports the input of structured and annotated ideas. Such an infrastructure has the benefit that also client-side data, for instance data that enrich

a user's profile, may be incorporated with relative ease. In networked environments with its lack of central control such a mechanism matters.

This static infrastructure of portlets and topic maps together with the dynamic infrastructure of flow design patterns we believe should adequately support distributed, collaborative, that is, networked creativity and innovation.

4 Conclusion

In our knowledge society new products and new product features follow one another in rapid succession. In order to remain competitive, creativity enhancement for innovative product design is crucial. In this paper I have tried to argue that open innovation and networked creativity are important means to this end. The argument took two forms, by showing how innovation could profit from openness in the same way that other attempts at 'openness' do; and by elaborating the contours of an environment for open innovation that is currently under construction in the *idSpace* project.

Acknowledgement

The writing of this paper was in part funded by the *idSpace* project, which is partially supported by the European Union under the Information and Communication Technologies (ICT) theme of the 7th Framework Programme for R&D. This document does not represent the opinion of the European Union, and the European Union is not responsible for any use that might be made of its content.

I am indebted to all my friends and colleagues in the *idSpace* project, who have contributed substantially to the ideas that underpin the present paper. Particularly section 3 covers ideas laid down in the various deliverables that have been produced so far. Obviously, for errors and misrepresentations I am solely responsible.

References

Boden, M. A. (2004). *The creative mind: myths and mechanisms* (2nd ed.). London: Routledge.

Chesbrough, H. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. USA: HBS Press.

Georgiakakis, P., Retalis, S., Bitter-Rijpkema, M., Pannekeet, K. Rutjens, M., Sloep, P. (2009) *Design Patterns as Guidance for Designers of Groupware Used by Team for the Development of Innovative Products E-Learning Patterns Workshop*. Knowledge Media Research Centre, May 4 - 6th.

Levy, S. (1984). *Hackers, heroes of the Computer Revolution*. N.Y. USA: Anchor Press.

Sloep, P. (2008a). *Netwerken voor lerende professionals*. [Networks for Learning Professionals] Develop, 2008(4), 84 - 91.

Sloep, P.B. (2008b). *Building a Learning Network through Ad-Hoc Transient Communities*. International Conference on Computer Mediated Social Networking (ICCMSN), Dunedin, New Zealand, June 11-13, 2008.

Wagner, E. (1999) Beyond Distance Education: Distributed Learning Systems. In: Stolovich, H.D. and E.J. Keeps (eds) *Handbook of Human Performance Technology.* Jossey-Bass Pfeiffer,San Francisco: pp.. 626 - 648.
Weber, S. (2004). *The Success of Open Source*. Cambridge Mass.: Harvard University Press.

Curriculum vitae:
Prof. Dr. Peter B. Sloep, Centre for Learning Science and Technologies, Open University of the Netherlands, NL: directs the CELSTEC Research and Technology Development Programme on Learning Networks. His current research interests include distributed learning systems, particularly the technical affordances – including specifications for interoperability - and the social aspects of learning networks that are conducive to the emergence of a viable learning and working environment for lifelong learning. He coordinates the *idSpace* project on collaborative, distributed product innovation.