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Designing an Innovation Engine Model and a Software Tool to Meet Large Organizations Challenges with SMEs Capabilities, a Pilot Study

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Abstract

Innovation models and innovation software tools are mechanisms designed to support innovation and collaboration activities. However, innovation models tend to be limited to close innovation or their implementation is not cost-effective for SMEs, while innovation software tools lack features for the collaboration of multiple organizations. Improved models and appropriate, well designed, software tools could address large organizations' challenges with SMEs capabilities, better foster innovation activities and encourage economic growth and jobs creation. This study piloted two 1.5-hour-workshops with 12 Enterprise Systems MSc students to design an innovation model and a software tool with PICTIVE participatory design technique. In the first workshop participants received a talk about innovation and were separated into three groups of four people. Each group was provided with one of three scenarios: the design of a robot exploring Mars, the design of an adrenaline auto-injector for severe allergies or the design of a new ambulance. Groups brainstormed ideas and created a diagram of the components that an innovation model should include to provide an effective collaboration between organizations. In the second workshop, groups implemented their model in an innovation software tool using participatory design. Two researchers observed the workshops and took notes of the group presentations. Three main components comprised their innovation models: Large organizations, SMEs and other institutions, and components for the management of the collaboration. Groups suggested to implement their model in a web site portal with features that support the definition of the challenge, the involvement of different stakeholders, sections to capture large organizations' needs and SMEs' capabilities, features to support the identification of the best partners, the best collaboration agreement and the management of intellectual property. Results were very insightful towards the design of an innovation engine model and for the use of this methodology with innovation-expert participants.

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1. Introduction

Innovation is one of the 12 pillars that determine the level of productivity and competitiveness of a country (World Economic Forum, 2014). However, 73% of chief technology officers (CTOs) surveyed in the 2014 Global Innovation 1000 Report, do not believe their companies have the tools to innovate successfully (Jaruzelski, Staack & Goehle, 2014). Innovation can be described as the creation of a new idea, device or process (Merriam-Webster, 2015). It can be also seen as the application of better solutions that address new market, government or social needs and requirements through new processes, services, technologies or products (Frankelius, 2009). In science and technology innovation can be represented, for example, by an original device or by original knowledge, but in economics, innovation can be represented by a novel process such as a business or a marketing model that may impact society with original ideas (Chesbrough, Vanhaverbeke & West, 2006).

Innovation is also about the use of new ideas and knowledge in something that will create social, commercial or organizational value (Porter & Kramer, 2011). Innovation can be categorized in open or closed. “Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology” (Chesbrough, Vanhaverbeke & West, 2006). Open innovation implies working with associated partners sharing risks and rewards. There is permeability between an organization and its environment, where innovations transfer inward and outward. Open innovation occurs when companies need to solve their needs with the capabilities of other organizations (in-bound innovation: buying or licensing patents or inventions or Intellectual Property (IP)) or when internal inventions are translated outside the company as licensing or spin-offs (outbound innovation) (Busarovs, 2013). Open innovation fosters cost reduction in R&D, customer-centered design and potential for better synergism between organizations (Marais & Schutte, 2009). But, in open innovation collaborations organizations may need to reveal confidential information or intellectual property, and have the challenge to manage innovation internally and externally finding the best partnership (Salter, Criscuolo & Ter Wal, 2014).

An innovation engine can be a system that creates, fosters and catalyze innovation (Dvir & Pasher, 2004). An innovation engine can be represented by a model that comprises the components and interactions involved in the creation of novel technologies, products, systems or processes. They can be mechanisms designed to help producing effective and efficient collaborations within organizations, or among large organizations (LO) and Small-to-Medium-Size-Enterprises (SMEs). In this paper we report results of a pilot study aimed to investigate the design of an open innovation engine model and a software application paper prototype designed to meet the needs of large organizations with the capabilities of SMEs. The following sections present our methodology, results of our pilot study, conclusions and future directions of research.

2. Background

Large organizations such as national healthcare services and city councils have to face many challenges that need innovative solutions. SME organizations may have the capabilities that pose answers to LO needs, but although there are examples of useful models such as (Bailetti et al., 2013; Comstock, 2007; Marais & Schutte, 2009; Sousa, 2008; Weiss, 2002) there is still limited an extended application of this types of models in order to improve, for instance, the collaboration among multiple and different organizations, the effective selection of partnerships and the effective and fair management of intellectual property (Hernandez-Munoz, Torane & Amini, 2015). Furthermore, despite the wide number of innovation management software tools available on the market, they do not seem to have enough features to fully support the complexity of open innovation dynamic interactions, *ibid*. There is then a need to design open innovation models, innovation engines and software application platforms that provide support in addressing the open innovation complexities. New open innovation models and open innovation engines should be developed keeping in mind the needs of the stakeholders to produce better collaboration and better user satisfaction, hence, their design should involve innovation stakeholders in all the stages of design and evaluation.

As a first step in the design of new open innovation engine models, we piloted the use of workshops with participatory design techniques to understand their applicability in the innovation management domain and to gain initial insights of innovation models created by Enterprise Systems students.

3. Methodology

In this pilot study we carried two workshops. Each workshop lasted one hour and a half. Twelve MSc students in Enterprise Management Systems (ages ranging from 21 to 40 years old) participated in the two workshops. Participants declared having a background on business administration, business management or economics and have previous knowledge about the design of an enterprise system model to drive innovation. In the first workshop participants received an introduction to innovation and innovation models, including academic literature and software tools, and later they were separated in three groups of four people. Each group was provided with a scenario, namely, the design of a new robot exploring Mars, the design of a new adrenaline auto-injector for severe allergies or the design of a new state-of-the-art ambulance. They were asked to discuss the components that an open innovation engine model (based on Comstock, 2007) should include in order to provide and effective collaboration between a large organization that specify the need of a new product and the capabilities of the SMEs that may be able to address the product or service requirements. Groups were asked to create a diagram of their innovation models using PICTIVE participatory design technique (Muller, 1991). Later, they presented their models to the other groups. In the second workshop, the groups were recalled about the last session and were asked to discuss the components that a software tool could include to implement their innovation engine model and to use PICTIVE technique again to create a diagram of their discussions. Later, the groups were asked to design the look and feel of a software application with the components discussed before. Each group presented their software application at the end this workshop. Observation notes were taken by two researchers.

4. Results

The model of group one (Fig. 1a) showed the relationship among the European Space Agency, which specified the need to create a new robot exploring mars, and a collaboration of SMEs that could provide engineering and financial consultancy, supply materials and to carry out the research needed to develop the robot. The model illustrated the collaboration between organizations, which included the specifications of the robot (called challenge), the evaluation of the robot capabilities and the logistic process involve to transport the robot from the SMEs premises to mars. This group suggested to have sections (in their software application) specifically designed to show SMEs' capabilities, engineering, product design, purchasing and procurement, logistics, innovation center, financial capability (Fig. 1b). Their software tool included a one page with a list of news and LO's challenges published in the center of the screen and SMEs' capabilities advertised on both sides of the screen and a logistics panel located at the bottom of the screen (Fig. 1c).

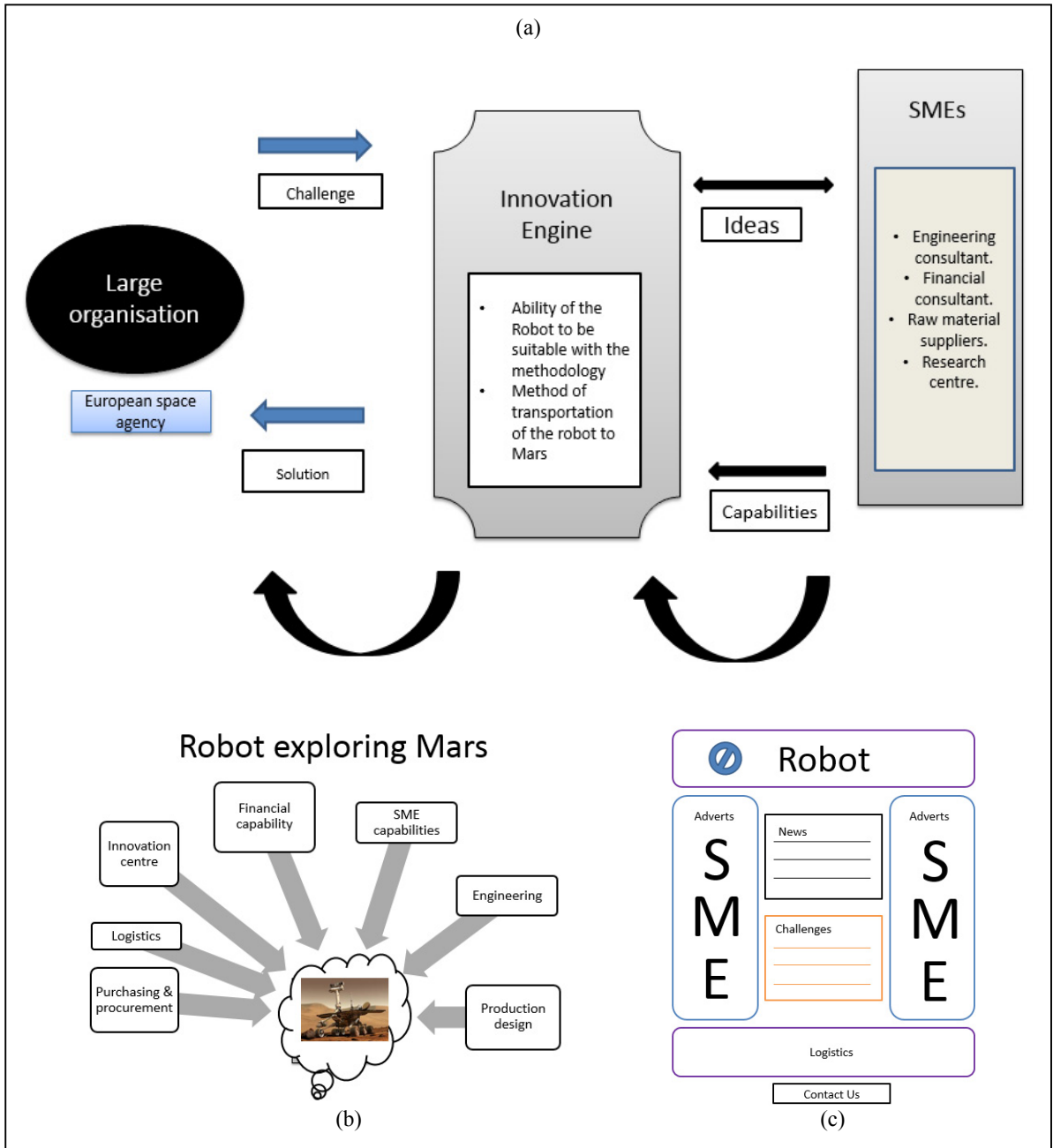


Fig. 1. (a) Robot open innovation engine model; (b) Software components; (c) Software paper prototype.

Group two illustrated in their model diagram (Fig. 2a) the collaboration among the UK National Health Service (NHS) and a series of SMEs to develop a new adrenaline auto-injector for severe allergies management. The innovation engine model included the specification of the challenge, the design and the specification of the materials

in collaboration between all the organizations involved. On the SME side of the model components included patient experiences and needs, R&D from Universities and SMEs with specific medical knowledge, level of expertise and location, finances, transportation, suppliers, and trials, certifications and medical evaluation of the new device. This group illustrated (Fig 2b) the importance of understanding the need, the collection of user requirements, the involvement of different stakeholders, finances management, and the distribution and evaluation of the device. The software tool was depicted as a web site with a login and registration. The user should be enabled to create challenges with needs and requirements, put their contact details and to manage the payment of products and services. The web site should include information about the organization managing the information provided in the tool, their contact details and the administration of the site to correctly manage the collaboration among organizations including the organizations' contact details and the projects where they are involved. The web site should also be able to manage input from clinicians and NHS organizations.

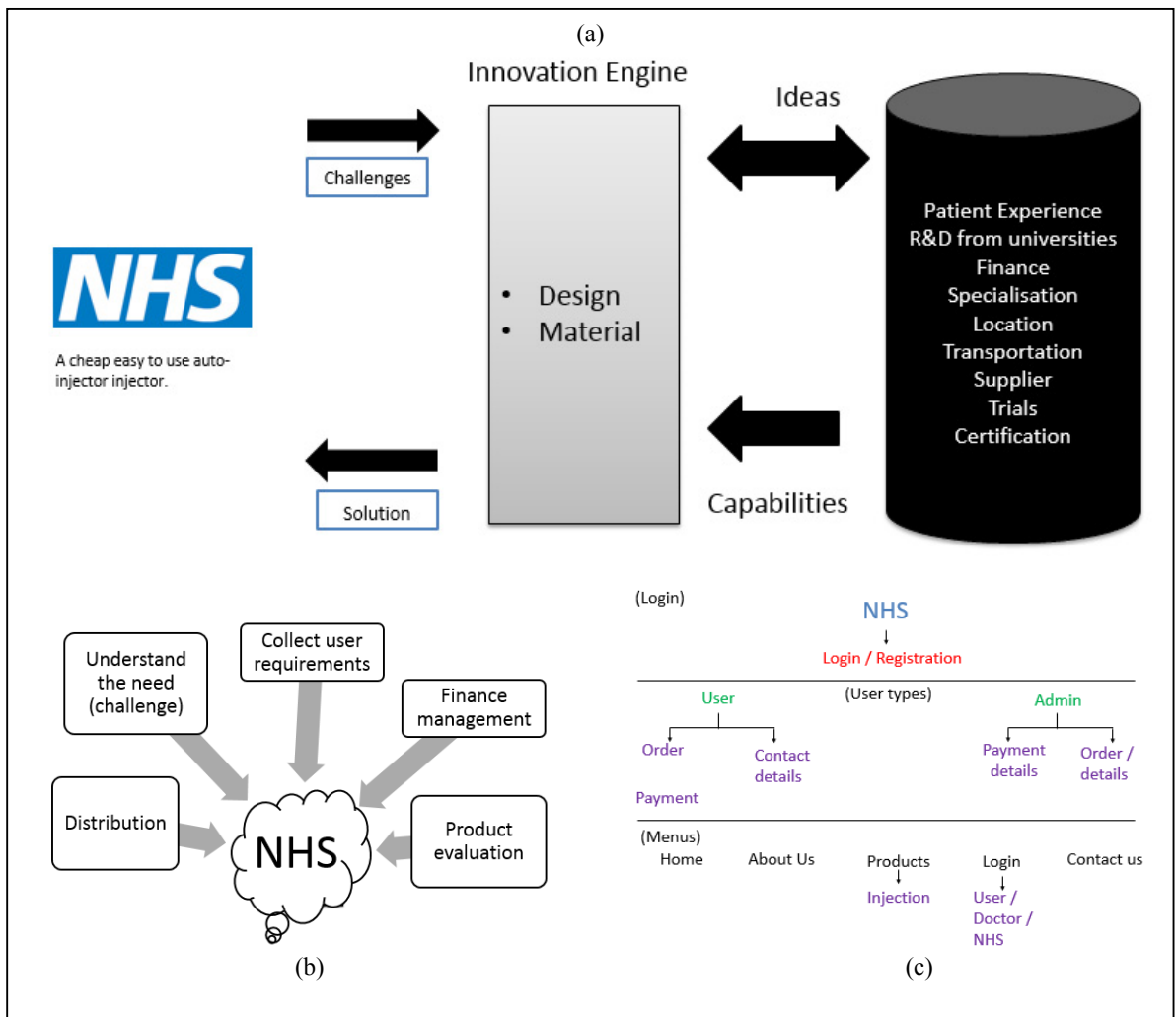


Fig. 2. (a) Adrenaline Auto-Injector model; (b) Software application components; (c) Software application design layers (Login, user types, menus).

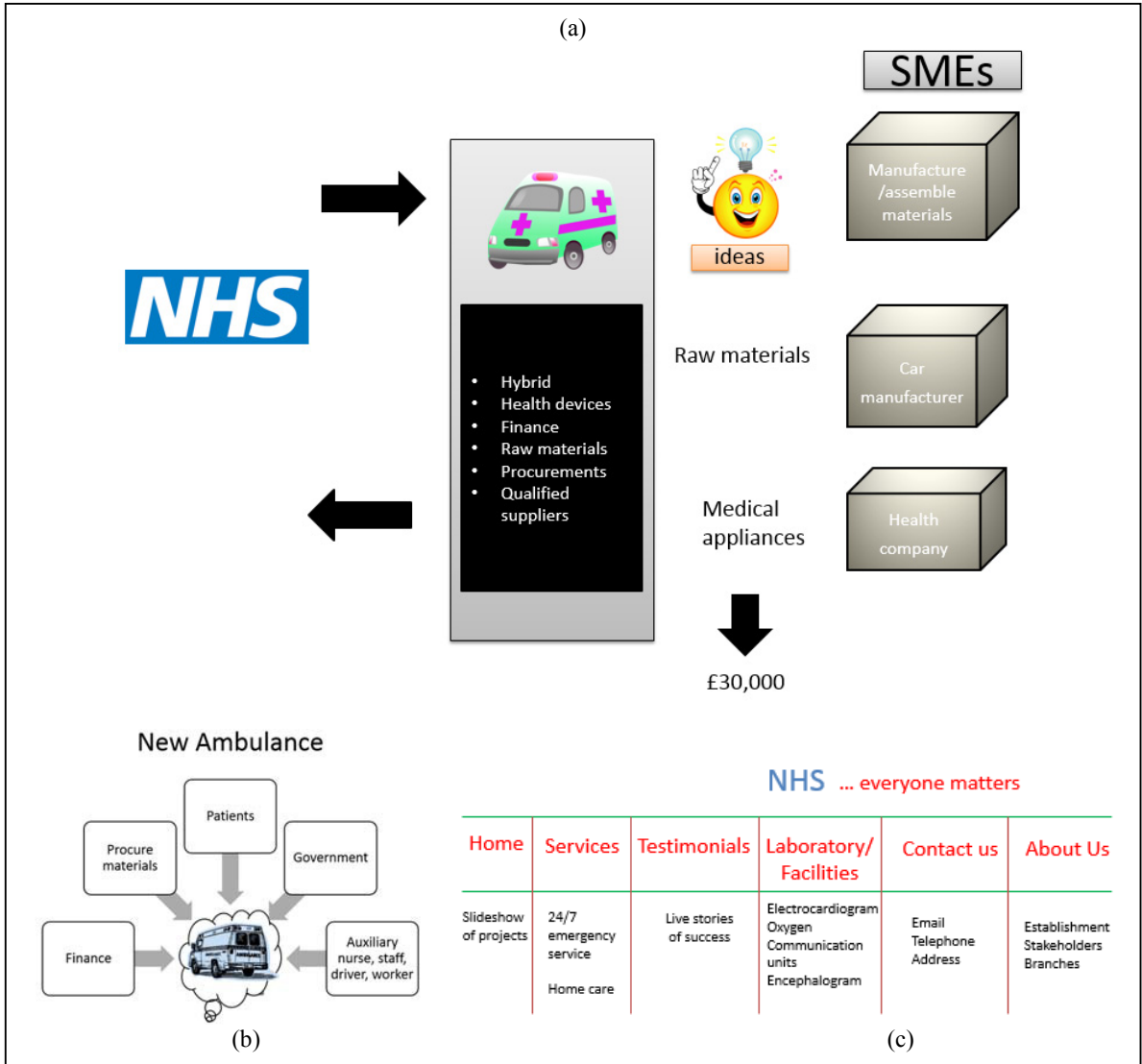


Fig. 3. (a) New ambulance innovation engine model; (b) Software application components; (c) Software paper prototype menus.

Group three illustrated three main parts in their open innovation engine model (Fig. 3a). A healthcare organization providing the specification of the required ambulance; SMEs providing the solutions that meet the requirements of the challenge, the manufacture and the assembling processes, materials, the management of medical components and appliances, and the finances; the last component of the model was the management of the collaboration among organizations, including specifications of the new product, procurement, finances, qualified suppliers, materials, health devices and intellectual property. The components of their software tool included the specification of the ambulance, the inclusion of stakeholders such as paramedics, clinicians, nurses and patients, suppliers, finances and the procurement of medical equipment and materials. The software tool (Fig. 3c) was depicted as a customized healthcare application with a series of menus with options at the top of the screen: home, services, testimonial, laboratory facilities, contact details and information about the administration of the application. The software would include a description of the projects, 24/7 emergency services and home care, live

stories of success, laboratory services such as electrocardiograms and encephalograms, and the provision of, for instance, oxygen tanks. The software application should include a list of organizations with their contact details and the description of their capabilities.

5. Conclusions

This pilot study provided useful insights about the design of open innovation engine models and about the use of workshops with participatory design techniques to understand their applicability in the innovation management domain. Three main components comprised the suggested innovation engine models: Large organizations, SMEs and other institutions, and components for the management of the collaboration. Suggestions included the implementation of innovation engines in a web site portal with features that support the definition of the challenge, the involvement of different stakeholders, sections to capture large organizations' needs and SMEs' capabilities, features to support the identification of the best partners, the best collaboration agreement and the management of intellectual property. Finally, positive results were sought towards the use of workshops and participatory design techniques to investigate the creation of innovation models and innovation software tools in future studies with innovation-experts participants. Therefore, this methodology can help collecting ideas from different stakeholders in a relaxed, friendly environment that allows participants express their ideas about innovation models and software tools. Nevertheless, future directions of research would include the implementation, validation and evaluation of new open innovation models, innovation engines and innovation software tools in real case studies.

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References

- Bailetti, T. et al. (2013). Developing an Innovation Engine to Make Canada a Global Leader in Cybersecurity. *Technology Innovation Management program*, (August), 5–14. Available at: <http://timreview.ca/>.
- Busarovs, A. (2013). Open innovation: Current trends and future perspectives. *Humanities and Social Sciences: Latvia*, 21(2), 103–119.
- Chesbrough, H., Vanhaverbeke, W. & West, J. (2006). *Open Innovation: Researching a New Paradigm*, Oxford.
- Comstock, D.A. (2007). NASA's Innovative Partnerships Program : Matching Technology Needs with Technology Capabilities. *High Frontier. The Journal for Space & Missile Professionals*, 3(3), 22–26.
- Dvir, R. & Pasher, E. (2004). Innovation engines for knowledge cities: an innovation ecology perspective. *Journal of Knowledge Management*, 8(5), 16–27.
- Frankelius, P. (2009). Questioning two myths in innovation literature. *Journal of High Technology Management Research*, 20(1), 40–51.
- Hernandez-Munoz, Torane & Amini (2005). A state-of-art- analysis of innovation models and innovation software tools. 10th European Conference on Innovation and Entrepreneurship. ECIE 2015 (In review).
- Jaruzelski, B., Staack, V. & Goehle, B. (2014). *Global Innovation 1000: Proven Paths to Innovation Success*, Available at: <http://www.strategyand.pwc.com/global/home/what-we-think/reports-white-papers/article-display/2014-global-innovation-1000-study>.
- Marais, S.J. & Schutte, C.S.L. (2009). The development of open innovation models to assist the innovation process. In 23rd Annual SAIIE Conference Proceedings.
- Merriam-Webster (2015). *Encyclopedia Britannica*. Available at: <http://www.merriam-webster.com/dictionary/innovation> [Accessed March 10, 2015].
- Muller, M. J. (1991). PICTIVE—an exploration in participatory design. In *Proceedings of the SIGCHI conference on Human factors in computing systems*, 225-231, ACM.
- Porter, M.E. & Kramer, M.R. (2011). Creating Shared Value. *Harvard Business Review*. Available at: <https://hbr.org/2011/01/the-big-idea-creating-shared-value> [Accessed March 5, 2015].
- Salter, A., Criscuolo, P. & Ter Wal, A.L. (2014). Coping with Open Innovation: Responding to the Challenges of External Engagement in R&D. *California Management Review*, 56(2).
- Sousa, M. (2008). Open innovation models and the role of knowledge brokers. *Inside Knowledge*, 11, 18–22. Available at: [http://www.openinnovatie.nl/download/LowResIKMarch08Case Study.pdf](http://www.openinnovatie.nl/download/LowResIKMarch08Case%20Study.pdf).
- Weiss, L. (2002). Developing Tangible Strategies. *Design Management Journal*, 13(617), 33–38.
- World Economic Forum (2014). The 12 pillars of competitiveness. Available at: <http://reports.weforum.org/global-competitiveness-report-2014-2015/methodology/> [Accessed March 10, 2015].