Is creativity the seed of innovation?

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Abstract

This paper explores the relationship between creativity and innovation to determine whether creativity is just the initial step of innovation or is present in all stages of an innovation process. It is shown how innovation can be performed at universities with the aid of technology transfer offices. By introducing the Three I´s Innovation Model, it is argued that creativity and particularly Creative Problem Solving, has a significant impact on every step of the innovation chain.

Keywords: Creativity, Innovation, Technology transfer, Three I´s innovation model.

Is creativity the seed of innovation?

Creativity and innovation have been tightly related as key components for the social and economic development of any country. Many authors have discussed the role of creativity as the fuel or seed of innovation (Gilmartin, 1999; Gurteen, 1998; Yusuf, 2009). Other authors present them as a mixture that can lead to new products and services (Heye, 2006). This paper opens the discussion about creativity as an initial stage of the innovation process or creativity as the core of

that process.

To understand the relationship between creativity and innovation, it is necessary to start by defining them. There are several definitions of creativity and innovation in the literature. Some authors look for a clear distinction between both concepts (Shalley, Zhou, & Oldham, 2004), and others look for defining them by putting them together (Gurteen, 1998; Heunks, 1998).

Creativity can be defined as the production of novel and appropriate ideas in any realm of human activity, from science to the arts, to education, to business, to everyday life (Amabile, 1997). Key words of this definition are *novel* and *appropriate*. A creative process should generate not only new ideas but relevant ideas according to the problem under study. This relevancy is a criterion that innovation takes as input to decide about possible markets for novel ideas.

Innovation can be viewed as a process that generates a change or as a product that has a high level of novelty (Gopalakrishnan & Damanpour, 1997). Innovation is something original and more effective and, as a consequence, new, that “breaks into“ the market or society (Frankelius, 2009). Generating a change or breaking into society both have implications in terms of the market acceptance of the novel product or process.

Joint View of Creativity and Innovation

After defining creativity and innovation separately, a better way to understand their relationship is by looking at them together. Creativity is the production of novel and useful ideas in any domain; innovation is the successful implementation of creative ideas within an organization (Amabile, 1996). Creativity is about diverging thinking; innovation is about convergent thinking (Gurteen, 1998). Creativity is the generation of novel and useful ideas and innovation is the process of bringing the best ideas to reality (Bisadi, Mozaffar, & Hosseini, 2012). Clearly, the intersection between creativity and innovation is a novel, disruptive, bizarre, and useful idea. If that idea is created, then innovation has something to work with. Therefore, the stimulation of creativity should promote and enhance innovation. Although this is a common conclusion in the literature, it cannot be generalized according to a study in Denmark from a sample of 147 companies, all of them having more than five employees (Çokpekin & Præst Knudsen, 2012). In that study, the authors found that the stimulation of creativity in the work environment positively influences product innovation, but is not associated with process innovation.

When studying the relationship between creativity and innovation, is important to understand that creativity can be seen as a system. Mel Rhodes (Rhodes, 1961) found four elements that help define creativity as a system: Person, Process, Press (or place), and Products, the four P’s of creativity. That is, the characteristics associated with a creative person, the way people can use their creativity, the environment that enhances or inhibits creativity, and the result of a creative process. Similarly and from the organizational perspective, Teresa Amabile shows that creativity has three components from the individual and one from the social environment (Amabile, 2012). The first component from the individual perspective, includes skills associated with a particular domain, such as knowledge, expertise, technical skills, intelligence, and talent. The second component includes skills associated with creative processes, such as independence,

risk-taking, disciplined work style, and skills in generating ideas. The third component from the individual perspective, is related to intrinsic motivation as the passion to solve interesting, involving, personally challenging problems.

From the social environment, there are organizations where creativity is blocked by internal political problems, low-risk attitudes, and excessive time pressure, among other factors. Fortunately and according to Teresa Amabile, there are other organizations that have a social environment that stimulates creativity by promoting the generation of new ideas, encouraging collaborative and interdisciplinary work, and providing freedom in carrying out the work.

From the systemic or organizational point of view, creativity is not only the idea seen as a product in the four P model. The environment also plays a key important role in generating conditions not only for creativity but also for innovation. Requirements for that environment are shared in terms of their impact on creativity and innovation. Similarly, a creative person has several recommended skills identified in an innovator (Dyer, Gregersen, & Christensen, 2011). A creative process also feeds several stages in the innovation process.

Creativity, Technology Transfer, and Innovation

Creativity is the seed of innovation since it starts with a creative idea. But from the systemic and organizational perspective, creativity goes further than product generation as the input for innovation. To better understand this statement, it is now shown the case of innovation triggered by research and development in universities through technology transfer offices.

Universities around the world are more willing to commit resources and researchers toward the development of potentially innovative products or services. Applied research is becoming the way to go when funding research projects through federal agencies or international foundations. The so-called “market-driven” research agenda is focused on promoting the development of projects identifying needs from society rather than well-intentioned projects coming from assumptions about those needs. The path from research to market is called technology transfer.

Technology Transfer Offices have been created as inside or outside entities associated with universities. By definition, technology transfer describes the processes by which ideas, proofs-of-concept, and prototypes move from research-related to production-related phases of product development (Bozeman, 2000). Although the technology transfer process is well defined, it is also clear that succeeding in that process depends not only on the response given to a society’s need, but also on the novelty of the solution. Here is where creativity arises. Potentially innovative solutions come from creative and novel ideas. From creative ideas as a response to a society’s need, products or services can be developed and globally commercialized (exported) by any country. As DiPietro stated, the promotion of creativity and its various components may be an effective way to enhance the country’s exports (DiPietro & Anoruo, 2006).

The Three I´s Innovation Model

Similar to creativity, innovation can be seen as a process. The innovation process or innovation chain can be depicted as

a three-phase process as it is shown in Figure **1**. In addition to the three phases of the innovation chain, it is shown that creativity is a key component across that chain. Even more specifically, Creative Problem Solving (Osborn, 1963; Treffinger, Isaksen, & Stead-Dorval, 2005) can be used to find disruptive solutions to problems that arise at every step of the innovation process.

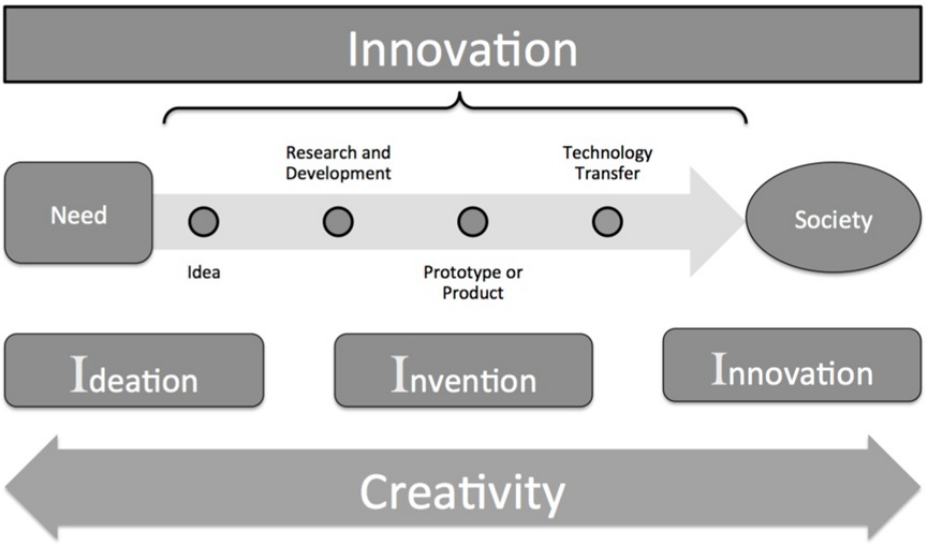

Figure 1. The Three I´s innovation model

The “Three I´s innovation model” is based on the argument that creativity is present in the Ideation, Invention, and Innovation phases of the model. *Ideation* is the phase where a society’s need is clarified, and potentially innovative ideas are generated to solve it. Looking at the FourSight Model (Puccio & Grivas, 2009) of Creative Problem Solving (CPS), this stage corresponds to the *Clarify* and *Ideate* stages.

Having an idea, research and development are performed to sketch a solution model or to build a prototype: the *Invention* phase. When creating prototypes, design aspects, and functionalities among other characteristics of the invention, can be benefited from a CPS intervention. Similarly to the *Develop* stage in the FourSight model, the *Invention* phase in the 3 I´s model looks for the development of a well-refined solution to the problem.

From a prototype, a technology transfer process is conducted to refine and commercialize the developed product, model, or service. Here is when the *Innovation* phase comes alive. It is all about giving value to the invention, protecting it, and finding the expected or new market opportunities for that invention. Here, the *Implement* stage of the FourSight model plays a part in the *Innovation* phase. It is not only formulating a plan but also executing it and making sure that the market will accept the invention and will buy it. A CPS intervention can also be useful for example when finding new market opportunities for the invention. A well-known example of an invention used for a different initial market was 3M and the Post-it Notes (3M, 2015).

Conclusions

Creativity and Innovation are essential enhancers of any country's social and economic development. Although creativity and innovation share the generation or use of novel and disruptive ideas, there are more aspects of creativity that play an important role in the innovation process. Creativity is not only about ideation. It impacts the creation of a new invention based on a creative idea and the process to put that invention into society or into a market that is willing to pay for it.

The Three I´s Innovation model shows the importance of creativity in Ideation, Invention, and Innovation. When looking at this model together with the FourSight model of Creative Problem Solving, it can be argued that innovation phases are fed by actions coming from CPS stages.

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