A novel approach for assessment of candidate technologies with respect to their innovation potentials: Quick innovation intelligence process

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ABSTRACT

Technological innovation process starts with technical discovery of new things or new ways of doing things, i.e., *invention*. With the commercialization of invention, the term, *innovation*, takes place instead of invention. The process ends with (duplicative and/or creative) *imitation* by competitors. It is expected that maximum profits can be achieved in the time interval from commercialization of invention to its imitation because of monopoly power. Therefore, assessing the emergence of invention in accordance with ability for commercialization and resistance for imitation can generate *winning innovation intelligence*. Besides, for achieving sustainability, disruptive technologies should also be taken into account through evaluation of trendiness of candidate technologies. This study presents a novel assessment process that aims to evaluate and prioritize candidate technologies according to their innovation potentials by considering *commercialization*, *imitation* and *trendiness* factors all together. According to authors' best knowledge, the technology assessment process presented in this study is the first attempt in the literature that is dedicated to *winning innovation intelligence* and takes above mentioned factors together into account. Main input resources of the process are patents, scientific publications and market research reports. While trendiness of technologies is evaluated with the help of a fuzzy inference system that combines patent data and publication data, commercial and imitation potentials are evaluated with the help of some marketing indicators and determinants in the proposed assessment process.

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1. Introduction

Numerous studies related with innovation start by using this cliché sentence; *innovation is crucial to survival*. When searched this sentence in a search engine, thousands of results can be found. We also agree with that innovation is an important issue. However, it is a fact that most new products fail to deliver on their objectives (Christensen, 1997). Raising innovation success is possible with being *efficient* and *effective* in innovation process. In the case of otherwise being an (early) imitator can be more appropriate strategy. Nevertheless, it is remarkable to state here that making and leading the *innovation wind* rather than being possessed are almost inevitable to have a large slice of market pie.

In order to be efficient and effective in innovation process, developing and providing appropriate infrastructures, support systems and *intelligent* approaches are essential. In this regard, development of a new category of tools known as Computer Aided Innovation (CAI) is an emerging domain. Management of innovation process is getting easier and providing better solutions is being possible

with computer-based applications thanks to the theoretical studies and advances in information and communication technologies (ICT). CAI aims to support the users during the innovation process. It is expected that changes in innovation paradigms will occur through the use of CAI methods and tools (Leon, 2009).

Understanding fundamentals and life cycle of innovation process is decisive for developing appropriate frameworks that aim to improve success of innovation process. Technological innovation process starts with technical discovery of new things or new ways of doing things, i.e., *invention*. With the commercialization of invention, the term, *innovation*, takes place instead of invention. The market determines whether an invention becomes an innovation (Kusiak, 2009). Porter (1990) gives a description of innovation: "Innovation is a new way of doing things that is commercialized". Therefore, an invention has first to be commercialized to be called as innovation (Lorenz, 2010). After commercialization, the process continues with adoption of introduced innovation from innovation perspective. However, the process ends with (duplicative and/or creative) *imitation* by competitors from companies' perspective.

One of definitions of *intelligence* given by Kurzweil (2000) says intelligence is the ability to use limited resources optimally to achieve goals. Innovation has its drawbacks and it is burdened by two sources of uncertainty: first, the time span between investments is realized and its financial return is obtained, and second

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because it could be easily copied without incurring in the cost of research and development (R&D) (Escribano & Giarratana, 2011). Innovation is a risky and expensive endeavor, which results in low success rates (Cormican & O'Sullivan, 2004). Therefore, robust assessment of innovation potential of technologies is essential before investment decision.

Although the literature is scarce, there have been some preliminary attempts to assess the innovation potential. Justel, Vidal, Arriaga, Franco, and Val-Jauregi (2007) proposed a method for assessing the innovation potential of product concepts and selecting those with greater probability of success. This method takes into account the degree of novelty of product concepts and their potential for success in the market. In another study, Jayanthi, Witt, and Singh (2009) presented a data envelopment analysis (DEA) based application of innovation potential evaluation to a US photovoltaic industry. They measured the potential of innovation in terms of its relative efficiency with respect to a best practices frontier. Gupta, Garg, and Maheshwari (2011) proposed a method to decide innovation potential and type of innovation in a proposed design concept of a product.

Innovation intelligence refers to intelligent approaches for assessment of technologies according to their innovation potential to make maximum profits. Innovation intelligence is about the provision of relevant information on innovations and the evaluation of their impact on the corporation (Golovatchev & Budde, 2010). The goal of innovation intelligence is to identify, qualify and evaluate technologies in order to develop a viable innovation strategy (Golovatchev & Budde, 2010). Innovation intelligence is necessary for doing the right things, i.e., effectiveness, on innovation. It is expected that performance on making money, i.e., profitability, is better during the time from commercialization of invention to imitation of innovation because of monopoly power. With the imitation, the share of innovator on the benefits obtained from innovation will be less. Therefore, innovation potential of technologies should be evaluated by considering ability for *commercialization* and resistance for *imitation*. Evaluating the innovation potential of technologies in accordance with ability for commercialization and resistance for imitation can generate *winning innovation intelligence* (see Fig. 1). For winning innovation intelligence, firstly, commercial potential and imitation potential should be evaluated. Then, the outputs of the evaluation processes should be combined (fused). Therefore, an innovation intelligence process needs determinants and/or indicators of commercialization potential and imitation potential of corresponding technologies which will be evaluated. Additionally, a data fusion methodology is needed to combine the obtained data. Computer support will also be helpful to get easier and for providing better solutions in the management of innovation intelligence process.

In this study, a novel approach for assessment of candidate technologies with respect to their innovation potentials, namely; *quick innovation intelligence process*, is proposed. According to authors' best knowledge, the technology assessment process proposed in this study is the first attempt in the literature that is dedicated to *winning innovation intelligence* and takes commercialization, imitation and trendiness factors all together into account. While trendiness of technologies is evaluated with the help of a fuzzy inference system that combines patent data and publication data, commercial and imitation potentials are evaluated with the help of some marketing indicators and determinants in the proposed assessment process. Besides, this process has been designed to be supported by computer technology. For that reason, proposed innovation intelligence process can also be considered within the scope of CAI methods. Therefore, proposed assessment process also contributes to CAI literature.

The rest of the study is organized as follows: Section 2 gives research profile of the CAI domain to capture key attributes, leading actors, and to clarify the scope of the existing studies. In Section 3, proposed quick innovation intelligence process is presented. An illustrative application of the quick innovation intelligence is given in Section 4. Conclusion and future studies are given in the last section.

2. Research profiling

CAI is an emerging domain in the array of computer aided technologies (Leon, 2009). It is explicitly known that it aims to support enterprises throughout the entire innovation process (Leon, 2009). However, definition of the term CAI is still fuzzy (Hüsig & Kohn, 2009). Understanding the structure, important variables, pertinent

Fig. 1. Winning innovation intelligence.