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Obsolescence risk in advanced technologies for retailing: A management perspective

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ABSTRACT

In recent years, a great deal of research focused on the introduction of advanced technologies for making traditional stores more appealing and attractive, with several benefits for the retail process. Since the introduction of these innovative systems involves several risks that can have a negative impact on business profitability, this paper aims at investigating to what extent it is possible to reduce these risks by proposing an explorative framework for a successful risk management strategies in retail context. Key results of this research concern the importance of the risk management also for retail sector, with emphasis on the introduction/adoption decision of innovative technologies in the points of sale, with consequences for retail-oriented industries. To achieve this task, the current study synthesizes findings from several fields such as management, marketing, and computer science.

1. Introduction

Capacity of innovating has become a critical factor for firms and organizations in order to improve competitiveness, sales growth, efficiency and productivity (Guan et al., 2006). Hence, innovation capability of the firms needs to be improved in order to adopt new advanced systems more quickly than competitors (Wang et al., 2008). For this reason, the global pressure has increased the competitive spirit of enterprises through innovating, and it has reduced the life-cycle of new technologies.

Abernathy (1985) suggested describing innovations on the basis of the impact of these on the firm's existing technological and market/business knowledge. Hence, these innovations can be *incremental* or *radical* (disruptive) according to the importance of the caused changes (Marquis, 1969; Damanpour and Wischnevsky, 2006; Sen and Ghandforoush, 2011). Radical innovations are new functionalities or new technologies that have not been previously identified and they emerge from a discontinuous process, whereas incremental innovations or adaptations are an improvement of existing functionalities by reducing cost, improving efficiency, etc. (Sen and Ghandforoush, 2011).

Due to the advantages of innovating and the consumers' expectations of novel technologies for improving their shopping experience (Pantano and Laria, 2012), also retailing may take advantages by adopting technology-based innovations for the points of sale. In fact, this sector can exploit the current advances in technology for making the points of sales more efficient and appealing by introducing innovative and interactive systems (Pantano and Laria, 2012; Pantano and Servidio, 2012; Breugelmans and Campo, 2011). These innovations provide benefits for both consumers by supporting the decision-making process and retailers by providing updated information on clients behaviours and market trends (Sorescu et al., 2011, Vieira, 2010; Shankar et al., 2011). On the one hand, these technologies allow consumers to (i) achieve information and customized contents on favourite products, services, sales, promotions, etc., (ii) compare and choose among alternatives, (iii) search for items, and (iv) calculate total purchases, by providing more convenient experiences in terms of time saving and providing entertainment (Hsiao, 2009; Yoon and Kim, 2007; Bharadwaj et al., 2009). On the other, these technologies provide constantly updated information on market segments, preferences, needs, while shopping, etc., which can be exploited for the development of more efficient (direct) marketing strategies (Pantano and Laria, 2012). Hence, they are able to improve the traditional points of sale by enriching the provided information through the most recent advances in 3D graphics, as well as to provide retailers with information on consumers' in-store behaviour.

To date, the most powerful innovative technologies are RFID (Radio Frequency IDentification) systems (reader and writer for providing additional information on products), storefront displays enriched with virtual reality elements (i.e. virtual mannequins), smart shopping trolleys capable of supporting consumers during the in-store experience, and recommendation systems for mobiles

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(Kowatsch and Maass, 2010; Reitberger et al., 2009; Breugelmans and Campo, 2011).

Since the introduction of these technologies dramatically changes the retail process, in terms of store atmosphere, client–vendor relationship, quality of service, and consumers' shopping experience, several risks can be encountered with possible negative consequences on business profitability, concerning the consumers' acceptance and effective usage, the monetary investment and late returns on investment, the risk of frequent physical damages and obsolescence of the technical components, etc.

Hence, the aim of this paper is to investigate to what extent it is possible to reduce these risks by proposing a new framework for technology risk management in retail context. The study provides an explorative and valuable analysis of obsolescence risks concerning the introduction of a new technology in the points of sale, by highlighting useful tools for scholars and practitioners for better understanding the critical role of risk management for introducing effective innovations in the points of sale. In particular, the first part of the paper investigates risk analysis with emphasis on the obsolescence from a management perspective; whereas the second focuses on the major risk issues involved in most current innovations to figure out the new framework for an efficient risk evaluation for innovations adoption in the retail context.

Key results of this research concern the importance of risk management regarding the introduction of innovative technologies in retailing, with consequences for retail-oriented industries, by synthesizing findings from different fields such as management, marketing, and computer science.

2. Theoretical background

2.1. Obsolescence risk management

Despite the benefits generated by technological innovations, innovation process is characterized by uncertainty, which affects also the processes that lead to the technological innovations, by making innovating a complex process difficult to assess accurately (Wang et al., 2008; Alkemade and Suurs, 2012).

Since rapid advances in technology imply huge investments and late possibility of returns on investments, the adoption of innovations is strictly linked to the uncertainty concerning both the nature of technological changes and the threats of further technological developments able to reduce dramatically the technology life-cycle (Fanelli and Maddalena, 2012; Hekkert et al., 2007). Similarly, uncertainty concerns the occurrence of risks that are unpredictable events able to affect firm's objectives (ANSI/PMI, 2008). In this scenario, an efficient risk management may lead to several organizational benefits including the identification of more favourable alternatives, by increasing the confidence for achieving the objectives, the chance of developing more successful strategies, the reduction of unexpected threats, risks and problems, and the more detailed estimations, with the subsequent reduction of uncertainty (Ward and Chapman, 2004). In fact, the new management strategies are devoted to reduce the risks prompted by the dynamic forces that are rapidly modifying the competitive environment such as the frequent advances in technology, the rapid growth and diffusion of technology among consumers and competitors, the increasing number of alternatives available for consumers, the increasing effort in innovation, and the increasing the reliance of providers of innovation.

In particular, efficient risk management strategies allow firms to (i) recognize potential threats of the market, (ii) identify the main consequences on resources and business profitability, and (iii) modify the subsequent behaviour (McGaughey et al., 1994; Alhawari et al., 2011). Since the business competitive battle with competitors is largely influenced by the firm ability to predict future actions and establish the best strategy to challenge ever-changing circumstances (Verona and Ravasi, 2003), efficient risk management strategies are compulsory for achieving a sustainable competitive leadership position (Holzmann and Spiegler, 2010).

In particular, the risk management process consists of three main phases: (i) risk identification, (ii) risk estimation, and (iii) risk evaluation (Rowe, 1977; Charette, 1990). Concerning risk identification, this phase includes the definition of threats occurring in a particular scenario; the risk estimation phase reduces uncertainly involved in business activities by evaluating the consequences and impact of a certain risk; whereas the last phase involves actions able to reduce risk and increase risk acceptance. Although a detailed and comprehensive list of risks is hard to understand and manage, there are some tools for supporting managers' decision-making (Hillson, 2002). For instance, the risk identification phase may exploit few fundamental practices such as Risk Breakdown Structure (RBS), which emerges as one of the most useful tools for effective risk identification. It is a hierarchical structure that splits potential source of risks into layers of increasing detail and describes sources of risks in a certain context and details each risk starting from a root node representing a general risk source to deeply understand the source in depth, thus it can also be exploited for risk assessment (Hillson, 2002, 2003). While the risk estimation phase may involve analysis tools such as probability–impact grid analysis. This represents the risks estimation through the attribution of "high", "moderate" and "low" rate. It consists of the definition of a grid with two dimensions: probability of occurrence of event (in columns) and impact of risks on the object of evaluation (in rows). The risk estimated value is calculated as follows (Ward, 1999):

$$\text{rating} = \text{probability} \times \text{impact}$$

in fact, it is possible to classify the different kind of encountered risks and rank them through multicriteria methodologies (Iazzolino et al., 2012) for reducing their negative effect on firm performance. Owing to this evaluation, the organization is able to adapt its behaviour in order to perform actions for mitigating the encountered risks, with emphasis on the risks with the "high" rating. In fact, the risks characterized by this rate have the strongest impact on the firm profitability and thus, they require more attention by the managers.

Hence, risk management strategies allow understanding and reducing the critical issues emerging from the introduction of a new technology, such as the introduction of Enterprise Resource Planning (ERP) systems (Aloini et al., 2007), with benefits for the financial activities (i.e. bank choice of risk management system) (Danielson et al., 2002; Iazzolino and Fortino, 2012).

Furthermore, the risk management is strictly linked to the "life" of a certain technology, by managing the investment decisions and the threats involved in each phase of the "life". In fact, the technological life-cycle (TLC) illustrates the evolution of technical and market characteristics (such as changes in sales) (Anderson and Tushman, 1990; Solomon et al., 2000; Narayanan, 2000). It consists of five main phases: introduction, growth, maturity, decline and *phase-out*. While each phase has peculiar characteristics, not each technology follows all phases (Solomon et al., 2000). In fact, few technologies may have a *false start* and die out. The main causes of a false start can be the sudden introduction of a superior competing technology, the improvement of a competing technology, the identification of a problem associated with the technology, failure in achieving the critical mass that enables economies of scale to be achieved, and the lack of a unique and compelling application for the technology (Solomon et al., 2000). After the decline phase, the phase out represents the *death* of a certain technology, implying that