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Determinants of silent and explicit industrial design

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ABSTRACT

This paper investigates the relationship between the use of silent or explicit design (SD or ED) and the characteristics of firms or sectors that use each of these types of design in Argentina. The findings show that SD differs from ED and that the differences have important implications for the creation of policies to support competitiveness as well as for the development of business strategies. The study contributes to the literature by identifying three groups of dimensions. (1) Structural. Neither size nor barriers to the use of design bear relation to the use of design. (2) Dynamic. SD and ED have different effects on competitiveness based on the different links each type of design has with knowledge (particularly absorptive capacity and knowledge of new technology). (3) Technological intensity. Sectors with low technological intensity are identified as high-design intensity sectors, linked to the use of new technologies coming from others sectors.

1. Introduction

Economic changes due to globalization have intensified global competition. This heightened competition has increased companies' knowledge of products and production processes and has led to organizational changes (Bianchi & Labory, 2011). In this context, knowledge-intensive business services (KIBS) are particularly important. Design, a prime example of KIBS, has a bearing on technological and non-technological innovations because of its importance in R&D (Tether, 2009; Walsh, 1996). Design is also important because of its link to product differentiation and the development of innovations (Czarnitzki & Thorwarth, 2012; Talke, Salomo, Wieringa, & Lutz, 2009). Design is a vital strategic resource for firms (Walsh & Roy, 1985). It brings together contributions from numerous fields besides aesthetics. Such fields include ergonomics, production efficiency, and the incorporation of new technologies and components (Walsh, 1996). Design creates value that transcends mere form and function. This value is linked to what the product is able to express through the holistic properties of its design (Kumar & Noble, 2016).

This study focuses on industrial (product) design, defined as the activity of designing or redesigning products. Like Ravasi, Marcotti, and Stigliani (2008), we exclude design activities linked to brand image, graphics, commercial furniture, and packaging. All firms perform some type of industrial design activity (Walsh, 1996), although this activity is not always performed by professional designers (Tether, 2005b). Gorb and Dumas (1987) labeled such activities as silent design (SD) and labeled design by professional designers as explicit design (ED).

This study contributes to our understanding of the differences in firm and sector characteristics in terms of degree of professionalization in design use. Scholars have generally studied design by focusing exclusively on design by professionals. The present study enhances our understanding of design use by establishing a distinction between two types of design: silent design (SD) and explicit design (ED). We also distinguish these two types of design from the non-use of design. This study emphasizes the idea that SD and ED differ and that these differences have major implications for public policies designed to promote competitiveness and for managers seeking to establish business strategies.

The literature on SMEs shows that businesses use design more than they use R&D (Tether, 2005a). The literature also shows that design is important for technological and non-technological innovations in R&D-intensive sectors and traditional sectors with a non-technological base. Design is relevant for differentiation strategies and cost-focused strategies, allowing firms to access to new markets and cement their presence in mature markets (Gemser & Leenders, 2001).

Thus, given the importance of the use of design, this study identifies the determinants of design use in industrial firms and explores differences in the characteristics of firms that use SD or ED in Argentina. Multinomial regression was used to analyze the empirical data.

The study's main contributions are the identification and characterization of SD and ED. The study's findings are also novel. Despite discussing the concept of SD, scholars have never performed an empirical study of SD because of the difficulty in capturing data on SD-related activities. The present study contributes to the literature by

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identifying three groups of dimensions related to the use of design: structural dimensions (related to size and barriers to use of design, particularly financial), dynamic dimensions (related to knowledge, use of new technologies, and relationships with firms in foreign markets), and dimensions related to the technological intensity within the sector.

The paper has the following structure: Section 2 presents a review of the empirical and theoretical studies used to develop the research hypotheses. Section 3 describes the data and method. Section 4 presents the results. Section 5 discusses the findings. Finally, Section 6 presents the conclusions, implications, limitations, and opportunities for future research.

2. Literature review and hypotheses

Design is increasingly viewed as a vital strategic resource for firms (Dell'Era, Marchesi, & Verganti, 2010). Firms that are oriented toward good design do not compete on price and can actually sell their products at a higher price than competitors can (Walsh & Roy, 1985). Design is used by firms with strategies focused on product differentiation as well as firms with cost-focused strategies. In many industries, new products are highly similar in terms of functionality but differ in their design (Talke et al., 2009). Therefore, product design offers a major opportunity to achieve a sustainable competitive advantage (Hertenstein, Platt, & Veryzer, 2005) in emerging or high-technology markets or in mature markets (Gemser & Leenders, 2001). From a dynamic perspective, successful firms are said to be those that continually modify and adapt their designs in response to the emergence of new technologies, new products, and changes in demand (Walsh, 1996).

The philosophy of design (principles of design and style) mediates the relationship between the firm's strategy, key capabilities, and brand image (Ravasi & Lojacono, 2005). Design is important within a radical innovation business strategy (Verganti, 2008), as well as in cases of incremental innovation, because it allows firms to compete by having a differentiated product, better efficiency in the use of materials, and the ability to redesign products to aid production (Walsh, 1996).

Design is fundamental for a system of production for several reasons. It reduces production costs by increasing overall efficiency in the production process (Hertenstein et al., 2005; Potter et al., 1991), has a positive association with labor productivity and greater total factor productivity (Haskel et al., 2005), improves financial efficiency (Hertenstein et al., 2005), and enables access to new markets and encourages import substitution (Potter et al., 1991).

The value that design can add to innovation means that design can act as a complementary asset and encourage the appropriation of returns from innovation (Tether, 2005b). This link between design and innovation explains why, despite having numerous competitors, some firms is able to become sector leaders and capture a large market share. The remainder of this section summarizes several factors discussed in the literature that explain firms' use of design services.

2.1. Size of firms and resource availability

Efficient access to KIBS may be a factor of competitiveness, particularly among SMEs (Viljamaa, 2011). KIBS make a crucial contribution to SMEs because SMEs have limited internal financial, staffing, and capability resources (Muller & Zenker, 2001; Viljamaa, 2011). Thus, a lack of resources rather than a lack of interest (Walsh & Roy, 1985) explains the limited investment in design. Regardless of size and limited resources, however, many firms that focus on innovation-driven design become world leaders (Verganti, 2008), so the way design spend affects innovation performance does not differ across different-sized firms (Marsili & Salter, 2006).

In SMEs, innovations are incremental and focus primarily on design (OECD, 2000; Walsh, 1996). Therefore, SMEs do not necessarily require the use of scientific or sophisticated engineering knowledge. Design activities are more common than R&D activities because design is a cheaper, more convenient way of innovating than R&D is (Verganti, 2008; Walsh, 1996). This situation is especially true of smaller firms (OECD, 2000; Tether, 2005a). The decision by SMEs to adopt a design-based strategy rather than a strategy based on R&D is partially because of their size and availability of resources (Freeman, 1982). Accordingly, KIBS such as industry design services are important because they enable firms to gather specialized knowledge (Viljamaa, 2011).

Other barriers to the use of design, particularly in SMEs, relate to poor design experience, a lack of design expectations, and a lack of knowledge regarding where to seek design professionals (European Commission, 2009; von Stamm, 1998). Therefore, SMEs often informally develop their own design activities, whereas larger firms use ED (Tether, 2009).

H1. Firm size influences the type of industrial design.

H2. Resource availability influences the type of industrial design.

2.2. Knowledge and services of industrial design

Knowledge is one of the principal factors that affect the feasibility of design activities. Knowledge is a fundamental resource of the firm, and it must be addressed and effectively exploited from a dynamic perspective of the firm's capabilities (Zollo & Winter, 2002) to obtain sustainable competitive advantages (Piccoli & Ives, 2005) and accumulate intangible assets (Denford, 2013). This dynamic perspective of the firm's capabilities depends on previously accumulated knowledge and involves the ability to combine internal and external knowledge sources.

The key characteristics of knowledge (transfer, aggregation, and appropriation) (Grant, 1996) and its tacit and explicit nature (Polanyi, 1966) have major implications in the way people's activities should be organized to achieve maximum benefit. The possibility of accumulating knowledge depends on the firm's knowledge base, with a large knowledge base implying a greater possibility of absorbing new knowledge. In other words, the possibility of transferring, aggregating, and appropriating new knowledge is greater when the firm already has knowledge on a particular topic (Balogun & Jenkins, 2003). Thus, a firm's knowledge can grow through the absorption of knowledge that already exists externally (Nickerson & Zenger, 2004).

In design, where a great deal of knowledge is tacit (Tether, 2005a), the role of the designer as a translator and intermediary or disseminator of knowledge helps knowledge absorption. Therefore, the existence of design knowledge within the firm helps the absorption of new design know-how (von Stamm, 1998).

H3. Knowledge absorptive capacity influences the type of industrial design service.

2.3. New technologies and internationalization

Regardless of the technological intensity of the sector, face-to-face relationships between designer and firm continue to be operationally strategic and necessary. Nevertheless, the rapid development of communication technologies obliges the firm to embrace these technologies (Vanchan, 2007). In the design co-production process, good communication and information flow between people involved in design itself and people from other related areas (production, concept, and brand) are essential. Therefore, greater knowledge content in production processes drives growth in the use of industry design services through technological change and the introduction of new ICTs (Gotsch, Hipp, Gallego, & Rubalcaba, 2011).

Designers can contribute to innovation development in at least two ways. The first way is specific to the field of design and relates to the designers' language and creative message (ICSID, 2013), which can lead to radical redefinitions of the product's meaning (innovations driven by