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Exploring the sources of design innovations: Insights from the computer, communications and audio equipment industries

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ABSTRACT

Whereas business research has focused on the impact of design innovations on market response and financial performance, the sources of design innovations, as opposed to those of technological innovations, have largely escaped investigation. In this research, we examine the organizational, financial, and environmental drivers of design innovations and how they contrast to technological innovations. Our study utilizes a unique dataset encompassing a 10-year window of innovation output drawn from the computer, communications, and audio and video equipment manufacturing industries. Our results suggest that design innovations are driven primarily by investments in research and development and slack organizational resources. Interestingly, we find that design innovations are more prevalent in smaller but fast-growing markets as opposed to technology innovations, which are prevalent in larger markets. Contrary to expectations, we find no association between marketing investments and design innovations. Our research contributes to the extant business literature by considering the sources of design innovations separately from the sources of technology innovations. We also contribute to the literature by distinguishing design and technology patents, developing a deeper understanding of design innovation, and illuminating a lesser understood source of competitive advantage for firms.

1. Introduction

“Innovation” as a field of study is a robust topic across many disciplines. It has been studied both as a product of organizational assets, culture and processes (Tellis et al., 2009; Sethi and Iqbal, 2008) and as a driver of various performance metrics (Sorescu et al., 2003). While the most common characterization of innovations is as being either incremental or radical (i.e., disruptive) (Tellis et al., 2009), an alternate and more tangible characterization is on the basis of the intellectual property which drives them.

From a patent-based perspective, innovations can either be utilitarian or technological in nature, where the innovation, typically an improvement in the underlying technology, results in a functional benefit; or a design innovation, where a change in the external appearance of the product is the source of innovation (Rubera and Droge, 2013; Eisenman, 2007; Verganti, 2006). Rubera and Droge (2013) and Verganti (2006) point out that most research has focused on technology innovations and less on design innovations. This may be because, according to United States Patent and Trademark Office (USPTO) data, there is more than a 10:1 ratio between utility and design patents

issued.¹ Interestingly, an increasingly large number of firms seem to be committing greater resources towards the pursuit of design innovations. While some firms such as Sony, Samsung, LG, and Apple have a long history of design-focused innovation, others are new to this game. Competing through design may have reached a peak with Apple Inc.’s allegations that the Samsung Galaxy 11 tablet and Galaxy Nexus smartphone had copied several of the design features from Apple’s own iPad tablet and iPhone smartphone. Following a ruling in a United States district court, Samsung had to change features and make cosmetic tweaks to release its tablet under the new name, Galaxy Tab 10.1 N, and was ordered to pay \$930 million in damages (Kendall, 2016).

A growing body of research has considered consumer reactions to product design (Bloch, 2011; 1995), the impact of product design on market share (Jindal et al., 2016), and the differential impact of technology versus design innovation on firm financial performance (Rubera and Droge, 2013). While researchers have some understanding of the outcomes of design innovation—for instance, increased positive consumer response and the resulting growth in market share and firm financial performance—we do not have a deep enough understanding of

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¹ https://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm

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the firm characteristics that lead it to being successful in the development of design innovation. In other words, while recent work has established the performance benefits of design innovations (Rubera and Droge, 2013) and the benefits of including design at many levels of the new product development process (Roper et al., 2016), we need to more deeply understand the organizational and environmental antecedents of design innovation. That is the fundamental objective of this research.

In this study we examine the antecedents of design innovations, considering the organizational resources, financial management strategies, and environmental factors that are associated with their creation. Rather than looking at design innovations in isolation, we contrast the predictors and outcomes of a design innovation emphasis against a more traditional technology (i.e., “utility”) innovation focus. Thus, the fundamental research questions explored here are: What are the organizational antecedents of a technology innovation focus versus a design innovation focus (as measured by intellectual property outputs), and how do they differ?

To answer these questions, we utilize a unique data set assembled from multiple sources, which allows us to look at a 10-year window of innovation output in the form of design and technology innovations, measured through patents. The data set includes 770 firm observations, including over 4000 design innovations and over 72,000 technology innovations in the computer, communications, and audio and video manufacturing industries. The results provide valuable insights for managers trying to strategically shape their organizations for various types of innovation outcomes.

This study contributes to the literature in several ways. First, we consider the nature and potential importance of design innovations, a distinct type of innovation of growing importance, which has not, with very few exceptions (e.g. Rubera and Droge, 2013), been considered in the literature. Understanding this phenomenon deepens our understanding of innovation in general, and how different forms may emerge from an organization and ultimately influence performance. Second, we decouple the concept of “patents,” which has been studied in the past, into its two major forms, and highlight the different forces at play in their genesis. We then consider the differential sources of those patent types, as well as how they interact with one another, a topic that has not been previously considered. Third, by developing a deeper understanding of design patents we help illuminate the source of competitive advantage for firms which base a large part of their corporate strategy on the pursuit of design excellence. Finally, this work extends existing literature that attempts to understand the nature of design-driven strategy and how it may differ from traditional approaches to marketing and innovation. It also represents a first step in understanding an increasingly important direction in innovation strategy.

2. Influences on design versus technology innovation

While both design and technology innovations can be legally protected intellectual property, a close inspection reveals the two are quite different in their nature. Design innovation places a priority on novel appearance over novel functionality (Eisenman, 2007; Rindova and Petkova, 2007). Thus, issues like form and aesthetics take precedence over core technologies and disruptive innovation (Verganti, 2006; Postrel, 2003). Despite these differences, it is likely that these two forms interact in practice, as in the use of technology innovations as a platform on which to layer multiple design innovations (Rubera and Droge, 2013). An essential component of design is its role in linking many functions of business, and while its activities overlap with R&D and technological innovations, it contributes independently of both (Moultrie and Livesey, 2014; Walsh, 1996). Thus, it is important to consider the drivers of these different innovation outcomes within the same research setting.

2.1. The roles of R&D and marketing in technology and design innovations

Strategy, and specifically marketing strategy, deals with innovating and delivering innovations to the customer through enhanced value propositions (i.e., “value creation”) and devising means to extract profits by creating transaction-based customer appeals that influence consumer choices and product comparisons (i.e., “value capture or appropriation”) (Stefan, 2014; Mizik and Jacobson, 2003). Given that firms have limited resources, they trade-off between these two activities (March, 1991), and prioritize the use of resources between the two (Mizik and Jacobson, 2003). We argue that firms primarily invest in technology innovations as a means of value creation, and primarily in design innovations as a means of value capture. We also argue that the fundamental investments required to achieve value creation versus value capture differ. In industries that are primarily design driven (for instance, furniture and homeware), design innovations could be a source of both value creation and value capture.

Creation is often about creating product offerings with profound differences in features, reliability, and other performance attributes. At the heart of this approach is a focus on technological investment which should lead to tangible outcomes in the form of technology (or “utility”) patents. While no single factor drives it, R&D spending is closely aligned with value creation (Mizik and Jacobson, 2003) and with the core technology development typically associated with the capability to build improved solutions to problems and meet customer needs (Gatignon and Xuereb, 1997).

On the other hand, we propose that firms pursuing an emphasis on value capture place more emphasis on the “moment of truth” when a consumer must choose between competing offerings in the marketplace. In this setting, more outwardly apparent differences may have greater influence on the purchase decision by communicating both functional and aesthetic information (Eisenman, 2013; Noble and Kumar, 2010; Rindova and Petkova, 2007). This is enhanced by marketing and sales efforts which can more easily highlight readily apparent, superficial differences between products. Thus, marketing/sales investments in the promotion of design-oriented advantages should be more impactful in the pursuit of value capture. This relates to the concept of a sales orientation in which a firm engages in a high level of marketing and sales spending to stimulate short-term transactions (Noble et al., 2002).

Dutta et al. (1999) also find that a significant driver of firm performance in high tech industries is the marketing efforts of the firms involved. However, marketing is more important in products where the functional benefits are not easily communicated. Correspondingly, design innovations are more easily communicated by the firm, and in turn received by the consumer. Of a firm’s marketing efforts, the effect of marketing on branding, creating differentiation and erecting barriers to entry are well documented (Aaker, 2012; Mizik and Jacobson, 2003; Golder, 2000; Bunch and Smiley, 1992). Eisenman (2013) also argues that there is a positive association between investments in “aesthetic” (design) innovation and the firm’s expectation that users will value the sensory stimulations and second order meanings their products offer. Much of the intent of marketing investments is to create such associations.

Based on this evidence, we expect that investments in marketing and sales are intended to create visual points of difference and, therefore, will be positively associated with design innovations but not with technology innovations. Conversely, we also expect that investments in research and development will be positively related to technology innovation but not to design innovations. Therefore, we propose our first two hypotheses:

H1: Efforts in marketing and sales will be positively related to design innovations.

H2: Efforts in research and development will be positively related to technology innovations.

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