Technological Forecasting & Social Change xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

journal homepage: www.elsevier.com/locate/techfore

The overlooked role of embeddedness in disruptive innovation theory

Ronny Reinhardt[a,*], Sebastian Gurtner[b]

[a] Friedrich-Schiller-University Jena, Chair of General Management and Marketing, Carl-Zeiss-Str. 3, 07743 Jena, Germany
[b] Bern University of Applied Sciences, Institute for Corporate Development, Brückenstr. 73, 3005 Bern, Switzerland

ARTICLE INFO

Keywords:
Disruptive innovation
Low-cost innovation
New product adoption
Technology acceptance
Embeddedness
Mixed-methods

ABSTRACT

Disruptive innovation theory assumes that primary and secondary performance dimensions as well as price influence adoption and use differently depending on the product category. Study 1 tests this premise using a large and heterogeneous sample of consumers. We surveyed 871 users in three traditional, high-cost product categories (business software, video games, conventional TV) and three related, potentially disruptive, low-cost product categories (mobile business apps, mobile games, internet TV). The study does not find systematic differences between the effects of more technologically-oriented performance dimensions or price on adoption. Following an explanatory mixed-methods approach, Study 2, which relies on 32 in-depth interviews with consumers, shows that product embeddedness, a more socially-oriented dimension, may play a decisive role in explaining the results. Embeddedness, defined as the degree to which a product is anchored in the social, market and technological system of the user, is an important moderator that complements extant theory and may thus help to better understand the dynamics of disruptive innovations.

1. Introduction

One of the most impactful theories in management research and practice has been the theory of disruptive innovation (Christensen, 1997; Christensen and Bower, 1996; Sood and Tellis, 2011; Tellis, 2006; Yu and Hang, 2010). Lepore (2014) argues that the existence of Chief Innovation Officers in companies, innovation agendas for public schools and university degrees in "Disruption" are all ripple effects of The Innovator's Dilemma (Christensen, 1997), one of the first of many publications on disruptive innovation theory (e.g., Anthony et al., 2008; Christensen and Raynor, 2003; Reinhardt and Gurtner, 2015; Sood and Tellis, 2011; Vecchiato, 2016; Yu and Hang, 2010). The Economist even considers disruptive innovation theory a part of the *zeitgeist* (Economist, 2015).

An essential task of academic scholars is to rigorously test and refine existing theories (Meyer, 2015; Open Science Collaboration, 2015); in particular, those theories that have an overwhelming impact as disruptive innovation theory does. However, management researchers frequently prefer building theories over testing them (Miller and Tsang, 2011), which in the case of disruptive innovation theory leads to scarce evidence about its accuracy and predictive validity. To fill this void, the first study tests core assumptions of disruptive innovation theory. In line with recent calls to go beyond traditional theory testing (Bamberger and Ang, 2016), the second study explores the anomalies found in the first study and triangulates the quantitative data with additional qualitative data. Therefore, this research takes an explanatory mixed-methods approach, which is commonly used when qualitative data are needed to provide a better understanding of the quantitative results (Harrison, 2013).

The two studies focus on the role of the consumer in disruptive innovation theory because consumers are an integral part of disruptive innovation theory (Christensen and Bower, 1996; Reinhardt and Gurtner, 2011, 2015; Tellis, 2006). In particular, disruptive innovation theory predicts that consumers use sustaining, high-cost innovations because of their superior primary performance in technical dimensions (e.g., usefulness, quality) (Christensen, 1997; Keller and Hüsig, 2009; Schmidt and Druehl, 2008). By contrast, consumers use disruptive, low-cost products because of their secondary performance in technical dimensions (e.g., ease of use, convenience) and their lower price (Adner, 2002; Christensen, 1997; Schmidt and Druehl, 2008). For example, disruptive innovation theory predicts that consumers use mobile business apps because they are easy-to-use and convenient and they use business software because it is powerful and high-quality. These assumptions are an integral anchor for the theory. The theory subsequently predicts that, at some point, consumers become saturated with the primary performance dimension offered by traditional products (e.g., the number of functions for spreadsheet software) and switch to the disruptive innovation because secondary performance dimensions provide additional value (e.g., ease of use) or the product offers a lower price (Christensen, 1997; Christensen and Bower, 1996).

The initial assumption that systematically different motivational drivers between high-cost product categories (HCPCs) and low-cost

* Corresponding author.
E-mail addresses: r.reinhardt@uni-jena.de (R. Reinhardt), sebastian.gurtner@bfh.ch (S. Gurtner).

https://doi.org/10.1016/j.techfore.2018.02.011
Received 13 February 2017; Received in revised form 10 January 2018; Accepted 11 February 2018

product categories (LCPCs) exist has important implications. First, firms align their new product development and marketing efforts accordingly by emphasizing different performance dimensions in different markets. For example, Intel launched the less powerful but cheaper Celeron microprocessor on the basis of disruptive innovation theory (Christensen, 2006). Second, Christensen and colleagues (Christensen, 1997; Christensen and Bower, 1996; Christensen and Raynor, 2003) assume that new entrants can replace incumbent firms when the importance of performance dimensions and price vary between product categories. Incumbent firms focus on improving the primary performance dimension because of their current customers' preferences for these attributes. The incumbents neglect the new product category with a different customer base, which prefers secondary performance dimensions and a lower price (Christensen, 1997; Christensen and Bower, 1996).

Therefore, the first study investigates these core assumptions by asking why some consumers adopt and use a new low-cost product category (LCPC) in contrast to those individuals that only use the existing high-cost product category (HCPC). This approach responds to recent calls to investigate adoption for existing and potentially substituting technologies simultaneously (e.g., Sriram et al., 2010). In contrast to the original definition of disruptive technology, we deliberately focus on high-cost versus low-cost, because, in a comprehensive study on the disruptive potential of new technologies, Sood and Tellis (2011) find that only those technologies that are priced below existing technologies increase the hazard of disruption. Because we are interested in technology disruption on an aggregated level (Sood and Tellis, 2011) instead of firm disruption, we focus on the product category level. Consequently, this study examines three LCPCs (i.e., mobile business apps, gaming apps and internet television) that are based on a new technology compared to existing HCPCs (i.e., business software, video games, conventional TV).

In a first step, we seek to expand the understanding of performance dimensions such as usefulness, quality and ease of use in these product categories. The first study tests specific dimensions that the literature has highlighted as prototypical exemplars of technology-oriented primary and secondary performance dimensions. To further develop extant theory, we also explore more socially-oriented aspects that are not yet reflected in the literature to facilitate a comprehensive understanding of performance dimensions and their role in low-cost innovation adoption dynamics.

The paper is structured as follows. First, the theoretical framework briefly explains the technology acceptance model that we use as a basis for our investigation, presents an overview of the literature on disruptive, low-cost innovations and derives the hypotheses from disruptive innovation theory. Second, the paper presents the methodology and results of the quantitative Study 1. Third, the article outlines the methodology for the qualitative Study 2 and discusses the results. The final part of the paper provides the general discussion including implications for managers, limitations and further research opportunities.

2. Theoretical framework

2.1. Technology acceptance model

The study uses the technology acceptance model (TAM) as a basis because it has been validated across numerous settings in different countries (e.g., Gao et al., 2013; Wang and Sun, 2016) and meta-analyses show robust results for various fields of application (King and He, 2006; Schepers and Wetzels, 2007). However, we use an extended version, which has also been validated (Bruner and Kumar, 2005; Gurtner et al., 2014) and which exhibits solid reliability and validity indicators (Gurtner et al., 2014) (see Fig. 1). Therefore, the following section only briefly discusses the general premise of this model.

In the initial TAM, usefulness and ease of use are the main determinants of adoption intention and actual use (Davis, 1989). Research has found that ease of use is a major driver of innovation adoption (Davis, 1989; Rogers, 2003; Venkatesh et al., 2003); ease of use influences intention to use and actual use of technology directly and indirectly through usefulness and enjoyment (Bruner and Kumar, 2005; Gao et al., 2013; Venkatesh and Davis, 1996). In addition, ease of use strongly influences the perceived quality of a service or product (Zeithaml et al., 2002). Usefulness is an extrinsic motivational factor that is defined as the degree to which an individual believes a product will help increase the performance of a given task (Davis, 1989). Usefulness strongly influences the tendency to use a new technology (King and He, 2006; Schepers and Wetzels, 2007).

Enjoyment describes an intrinsic motivational factor that relates to the motivation to use a technology independent from any performance expected from its use (Davis et al., 1992). This intrinsic gratification is viewed as a significant factor determining whether individuals adopt a new technology (Shin, 2007). Perceived quality is an antecedent and influential driver of usefulness and enjoyment (Davis et al., 1992). Quality is defined as “the consumer's judgment about a product's overall excellence or superiority” (Zeithaml, 1988, p. 3) and therefore relates to quality dimensions such as perceived reliability, durability and appearance rather than performance (Zeithaml, 1988). In a similar way, convenience can be an influential factor for usefulness and enjoyment. We refer to convenience as a product's ability that enables consumers to use the product when and where they want (Gilbert et al., 2004). This factor is closely related to mobility and accessibility of the technology (Wu and Wang, 2005). Being able to use a technology where and when consumers want to can lead to a higher level of usefulness. Convenience can also influence enjoyment when users are able to use traveling and waiting time more efficiently or when users are able to determine the place where they would like to accomplish the task (Mazmanian et al., 2013).

The price of a product has two effects on consumers, the sacrifice and the informational effect (Völckner, 2008). The sacrifice effect refers to the economic rationale that consumers have to give away money to purchase the product. Therefore, a lower price positively influences the intention to use a certain product because it lowers the impact on a consumer's budget (Erickson and Johansson, 1985). In addition, the informational effect refers to the phenomenon that consumers view price as an indicator of quality (Kardes et al., 2004). Finally, consumers may infer information about usefulness from prices. A higher price can lead consumers to think about the personal relevance and the potential usefulness (Wathieu and Bertini, 2007). Hence, a higher price may signal a higher level of quality as well as a higher level of usefulness.

In the theory of reasoned action and the theory of planned behavior, intention to perform a behavior is an antecedent of actual behavior (Fishbein and Ajzen, 2010). In the case of researching adoption and usage decisions, we define intention in terms of usage intention, that is, how often an individual intends to use a product category. Similar to the approach by Corrocher (2011), we go beyond the traditional binary view of adoption and define it as a continuum from not using at all to very frequent usage.

2.2. High-cost, low-cost and disruptive innovation theory

Due to high R&D spending and pioneer pricing models, researchers and practitioners often assume that most new products and services are more expensive than existing solutions (Sriram et al., 2010; Van der Rhee et al., 2012). For these types of innovation, improvements occur by enhancing the primary performance dimension at a higher price than previous product generations (Christensen, 1997; Schmidt and Druehl, 2008). For example, traditional television focuses on enhancing the primary performance dimension “image quality” (e.g., HD television, UHD television) (Reinhardt and Gurtner, 2015) and new TV models are priced higher than existing TV models. In the disruptive innovation framework, these types of innovations are characterized as sustaining innovations (Christensen and Bower, 1996) and the literature on encroachment uses the term high-end encroachment (Van der Rhee et al., 2012; Van Orden et al., 2011).