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Disruptive innovation, managerial cognition, and technology competition outcomes

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ABSTRACT

In this paper we explore why incumbent firms fail to identify new markets in the face of disruptive technologies. We cross research on disruptive innovation with research on managerial cognition and we focus on the role of managerial beliefs about customer needs in directing the search for new markets and product features. We show that a primary reason why incumbents lose their leadership is the inability to recognize either the rising 'social' market, where customers use products for fulfilling their need for friendship, or the 'esteem' market, where customers use products for fulfilling their need for achievement. We then apply our emerging conceptual framework to the case of the smartphone industry and the ongoing rivalry among operating systems. We thus try to advance the disruptive innovation theory with regard to both the explanation and the anticipation of technology competition outcomes.

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1. Introduction

Since Professor Clayton Christensen first published research on disruptive technologies in 1997, his work has had a dramatic impact on business practice: disruptive innovation is now a common term of art. This theory played a key role in reigniting debate within academia on the difficulties of incumbent firms to respond to discontinuous technological changes. Christensen's work has been cited extensively by scholars in diverse disciplines and research fields, including marketing, strategy, and technology and innovation management. However, despite the growing popularity of Christensen's work, there seems to be still a lack of understanding of the effects of disruptive technologies on firms and competition outcomes (Hang et al., 2015; Keller and Hüsigg, 2009; Walsh et al., 2005).

In this paper we explore how managerial cognition influences the market choices of organizations and thereby affects their long term performance in the face of disruptive technologies. We address the following question: *How do managerial beliefs about customer needs affect the capability of organizations to identify new markets in the face of disruptive technologies?*

This paper is based on an in-depth, multiple case study of the mobile communication and imaging (printing) industries. Based on the lessons derived, we introduce the concepts of 'social' and 'esteem' markets: we show that the incumbent firms (Motorola and Kodak) failed to identify these emerging markets, and we show the role of managerial beliefs in explaining their failure. We then apply our resulting conceptual

framework to the smartphone industry: we consider which operating system will ultimately succeed, by comparing Microsoft's recently launched Windows 10 Mobile with Apple's iOS and Google's Android. In this way we try to contribute to the disruptive innovation theory with regard to both the explanation and the anticipation of technology competition outcomes (Danneels, 2004; Linton, 2004; Kostoff et al., 2004).

2. Disruptive technologies, managerial cognition, and market choices

2.1. Disruptive technologies

Research on disruptive technologies emphasizes the influence of customer needs on industry dynamics and technology competition outcomes (Abernathy and Clark, 1985; Phillips, 2001). The concept of disruptive technologies was originally introduced by Christensen (1997) and Christensen and Bower (1996): these are technologies that enable a new set of product features from those associated with mainstream technologies, and are initially inferior to the latter ones along one or two attributes ('mainstream features') that are particularly important to mainstream customers. Thus, in the early stage of their life cycle, disruptive technologies only serve niche segments that value their new kinds of attributes. However, as subsequent developments raise the disruptive technology's performance in mainstream attributes to a level sufficient to satisfy mainstream customers, the disruptive technology eventually 'invades' mainstream markets. The most powerful analytical tool Christensen (1997) provides for identifying a disruptive technology is his diagram which jointly plots for mainstream attributes: i) the

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performance trajectory provided by the disruptive technology; ii) and the performance trajectory demanded by the mainstream market. Since the performance trajectory provided by the disruptive technology is steeper than the performance trajectory demanded by the mainstream market, technology disruption occurs when the two intersect.

2.2. Disruptive technologies and original explanations for the failure incumbents

Christensen's (1997) original explanation for the failure of leading firms draws on the resource dependence theory: he argues such failure is the result of incumbents' resource allocations processes, where incentive structures based on target product sales and margins lead them to disregard disruptive technologies and intensify their commitment to mainstream technologies.

However, later on scholars argued that the failure of incumbents may be due not to their inability to invest and adopt disruptive technologies in a timely manner, but rather to their inability to commercialize them successfully – i.e. to find new markets and provide customers with the new products and product features they actually want (Groen et al., 2008). According to Danneels (2004), many incumbents have been able to develop working prototypes of products embedding an emerging disruptive technology, thus demonstrating that they have the necessary R&D capabilities to innovate. However, these incumbents lacked what Danneels (2004: 254) calls “the customer competence” to identify new customer groups that they had not served before. As he further developed the disruptive innovation theory, Christensen himself (2000, p. 58) revised his initial arguments for explaining the failure of incumbent firms, by noting that: “Professor Rebecca Henderson pointed out to me that this tendency always to take new technologies to mainstream customers reflects a rather narrow *marketing competence* – that although many scholars tend to frame the issue as one of technological competence, such inability to find new markets for new technologies may be a firm's most serious handicap in innovation” (italics in original). Christensen and Raynor (2003) and Christensen et al. (2004) thus urged incumbents' managers to broaden their marketing scope, by looking for emerging customer needs and new markets (market niches/market segments) related to these needs. Specifically, Christensen and colleagues claimed that traditional market segmentation processes, which are based on such criteria as age, geographic regions or income, are likely to be of little use (for a review of market segmentation criteria see Dickson and Ginter, 1987). They argued instead that people have ‘jobs’ which arise regularly and which they have to get done: these jobs represent the basic needs that customers try to satisfy by means of the products they use in their everyday life. These jobs, i.e. these basic everyday needs, should constitute the cornerstone for the search for emerging markets in the face of disruptive technologies.

2.3. A new perspective on disruptive technologies and the failure of incumbents: the role of cognition

As they explore the likely reasons why incumbent firms lack the marketing competence to identify new markets for disruptive technologies, Henderson (2006) and Danneels (2004) point to the mainstream research field of managerial cognition. This research field focuses on the role of managers' mental models/beliefs in explaining organizational responses to technological discontinuities (Garud and Rappa, 1994).

Because of their bounded rationality, managers must rely on simplified representations of the business environment in order to process information about new events (Simon, 1955). These imperfect representations form the basis for the development of the mental models and strategic beliefs that drive managerial decisions. They influence the manner in which managers frame external changes and thus how

they search for responses to these changes (Tripsas and Gavetti, 2000).¹

Managerial beliefs are usually based on historical experience as opposed to current knowledge of the environment (Kaplan and Tripsas, 2008). In changing industries, the influence of prior history often increases the difficulty that decision makers face when seeking to respond to new events, and this difficulty then often results in organizational inertia and poor performance. For instance, in the transition to digital imaging, Polaroid's commercialization strategy was driven and limited by beliefs resident in the analog photography business model (Tripsas and Gavetti, 2000). Similar effects have been found in the shift from print to online newspapers (Gilbert, 2006), in pharmaceutical firms' responses to the emergence of biotechnology (Kaplan et al., 2003), and in communications technology firms' responses to fiber optics (Kaplan, 2008).

Hence, when analyzing the determinants of incumbents' behavior in response to disruptive changes, managerial cognition should have a major role (Osiyevskyy and Dewald, 2015). According to Danneels (2004) and Henderson (2006), incumbents' managers might not understand the implications of disruptive technologies because their views of the world are deeply entrenched and largely shaped by their prior experiences of technologies and markets. These scholars thereby strongly suggest to cross research on disruptive innovation with research on managerial cognition.

However, thus far we still know very little about the impact of managers' mental models on the strategic responses of incumbent firms to disruptive technologies (Osiyevskyy and Dewald, 2015). Our literature review uncovered a lack of empirical studies examining the relationship between managerial beliefs and the search processes for emerging markets. As such, there is a significant opportunity to expand our understanding of disruptive innovation and technology competition outcomes. In this paper we aim at seizing this opportunity. Our work is the first empirical study which crosses research on disruptive innovation with research on managerial cognition, by addressing the following question: *How do managerial beliefs about customer needs affect the capability of organizations to identify new markets in the face of disruptive technologies?*

Table 1 illustrates the main contribution of our work, by highlighting the novelty and uniqueness of our framework compared with previous studies of disruptive innovation.

The paper is structured as follows. In the next section we describe our research method. In the subsequent section we illustrate the market choices of Motorola and Kodak and we compare these choices with those made by their rivals, Nokia and HP. Then we outline our resulting conceptual framework on managerial belief, customer needs, and technology competition outcomes. Finally, we apply our emerging conceptual framework to the case of the smartphone industry: we aim to anticipate future competition outcomes among Microsoft Windows 10 Mobile, Google's Android, and Apple's iOS.

3. Research method

We used a multiple-case research design (Eisenhardt, 1989): given the gap in extant literature and the open-ended nature of our research questions, we felt this methodological approach would be the most useful for expanding the disruptive innovation theory (Glaser and Strauss, 1967; Yin, 2003). Multiple cases allow a replication logic in which

¹ Since the early 2000s, the concept of managerial beliefs has been developed and measured according to two dominant approaches. Based on extensive field studies, one research stream typically uses data gathered from semi-structured interviews and firm archives to retrospectively explain how managerial beliefs led to a focal event, such as bankruptcy of Polaroid Corporation (Tripsas and Gavetti, 2000). The second research stream seeks to explain variations in firms' strategies by exploring the variation of CEOs' strategic beliefs. These studies take publically available documents, such as letters to shareholders in a firm's annual reports, as the proxies for the strategic thinking of CEOs and employ content analysis to uncover themes pertaining to managerial cognition and strategy (Nadkarni and Barr, 2008; Eggers and Kaplan, 2009).

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