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Disruptive technology: How Kodak missed the digital photography revolution

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ABSTRACT

The purpose of this paper is to analyze how a firm responds to a challenge from a transformational technology that poses a threat to its historical business model. We extend Christensen's theory of disruptive technologies to undertake this analysis. The paper makes two contributions: the first is to extend theory and the second is to learn from the example of Kodak's response to digital photography. Our extensions to existing theory include considerations of organizational change, and the culture of the organization. Information technology has the potential to transform industries through the creation of new digital products and services. Kodak's middle managers, culture and rigid, bureaucratic structure hindered a fast response to new technology which dramatically changed the process of capturing and sharing images. Film is a physical, chemical product, and despite a succession of new CEOs, Kodak's middle managers were unable to make a transition to think digitally. Kodak has experienced a nearly 80% decline in its workforce, loss of market share, a tumbling stock price, and significant internal turmoil as a result of its failure to take advantage of this new technology.

1. Introduction

The purpose of this paper is to explore how firms respond to challenges from rare transformational technology that threatens a traditional, successful business model. We propose an extension of Christensen's theory of disruptive technologies and illustrate the extensions with a longitudinal case study of Kodak. Kodak is unique in that it developed and patented many of the components of digital photography, yet this new form of photography has had a serious, negative impact on the firm. The two main contributions of the paper are the extension to Christensen's theory and the lessons from Kodak's unsuccessful response to a major technological discontinuity.

The digital camera combined with information and communications technologies (ICT), specifically the capabilities of the computer to store and display photographs, and the Internet to transmit them, *transformed the major customer processes associated with photography*. The consumer could take many photos at virtually no cost, and delete unwanted ones by pushing a button. Rather than waiting to develop a photo and then sending it by mail to another person, the customer uploads the picture to a PC and sends it as an email attachment to multiple recipients. If the customer wants a hard copy, she can print a picture locally on an inexpensive color printer on a PC, send it to an Internet photo service, or go to a store that had a developing kiosk.

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1.1. Past research: Christensen's theory of disruptive technologies

Christensen's theory of disruptive technologies is one of the most popular for explaining the plight of the incumbent firm facing a significant new technology. He proposes a theory of response to disruptive technologies in two books about innovation (Christensen, 1997; Christensen and Raynor, 2003). He argues that investing in disruptive technologies is not a rational financial decision for senior managers to make because, for the most part, disruptive technologies are initially of interest to the least profitable customers in a market (Christensen, 1997). The highest-performing companies have systems for eliminating ideas that customers do not ask for, making it difficult for them to invest resources in disruptive technologies. By the time lead customers request innovative products, it is too late to compete in the new market. The root cause of the failure to adapt to disruptive technologies is that the company practiced good management. The decision-making and resource-allocation processes that make established companies successful cause them to reject disruptive technologies.

Christensen and Overdorf (2000) present a framework for dealing with disruptive change that focuses on resources, processes and values. Resources include people, equipment, technologies, cash, product designs and relationships. Processes are the procedures and operational patterns of the firm, and values are the standards employees use to set priorities for making decisions. Managers design processes so that employees perform tasks in a consistent way every time; they are not meant to change. The most important processes when coping with a disruptive technology are those in the background such as how the company does market research and translate it into financial projections, and how the company negotiates plans and budgets. Employees exhibit their values every day as they decide which orders are more important, what customers have priority and whether an idea for a new product is attractive. The exercise of these values constitutes the culture of the organization. Culture defines what the organization does, but it also defines what it cannot do, and in this respect can be a disability when confronting a new innovation.

1.2. Extending Christensen's theory

When a firm is confronted with a discontinuous, highly disruptive technology, senior management has to bring about significant changes in the organization at all levels. Our first extension to Christensen is to emphasize the change process required to adopt a disruptive technology. Senior management has to convince others of the need to move in a new direction. Specifically we are interested in how middle managers change themselves and also bring about change in the organization (see Rouleau, 2005; Balogun, 2006).

Christensen argues that the firm is not ready to adapt a disruptive technology because it does not see a demand from its customers for the new innovation. He maintains that high-performing companies have systems in place that tend to kill ideas that customers are not asking for. We propose to extend this part of his theory to encompass the culture of the organization, by which we mean the beliefs of employees, the way the firm organizes itself and the nature of the interactions among employees (Schein, 1983).

1.3. A first extension: the struggle for change

In confronting a technological disruption, a firm faces a struggle between employees who seek to use dynamic capabilities to bring about change, and employees for whom core capabilities have become core rigidities. Management propensities for change drive the process (see Fig. 1). We describe this ongoing struggle using concepts from dynamic capabilities, core rigidities and management propensities.

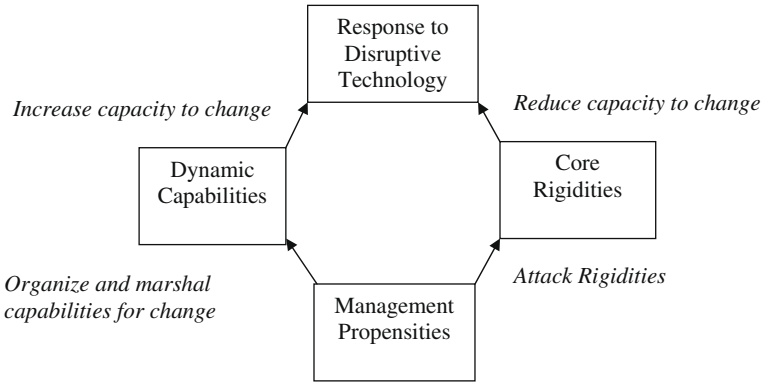

Fig. 1. A framework for responding to disruptive change.