



# Crossing the chasm with beacon products in the portable music player industry



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## ARTICLE INFO

Available online 18 October 2013

### Keywords:

Technology evolution  
Design convergence  
Dominant design  
Takeoff  
Beacon product  
Crossing the chasm

## ABSTRACT

Firms competing in new product categories face great technical and market uncertainty as they try to move from early adopters to mainstream markets (Mahajan and Muller, 1998; Muller and Yogev, 2006; Rogers, 2003). While the management literature identified several factors that may contribute to adoption, the role of specific product models has been understudied. To address this gap, we studied portable digital music players (MP3 players) from 1987–2006 and tested the role of specific product models in market takeoff, convergence and product category evolution. We introduced the concept of *beacon product*, defined as a specific product model that has great appeal to customers and sends a strong signal about what they want.

We found that Apple's first iPod model triggered market takeoff and that many competitors tried to emulate the original iPod design, leading to convergence around its key design features. But it took the iPod/iTunes store combination, a new ecosystem for the legal download of digital music, to bridge the gap between early MP3 adopters, primarily young people, to mainstream markets. The iPod/iTunes ecosystem proved more difficult for competitors to copy and many of the firms that had pioneered the MP3 category exited the industry or were relegated to small niches. By subsequently introducing new models with smaller form factors at lower prices and expanding iTunes Store offerings, Apple effectively preempted competitors from gaining share in this growing market.

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## 1. Introduction

Firms trying to compete in the early stages of a new product category are often faced with uncertainty about which technical avenue will prove most fruitful or what product features customers will actually prefer. That uncertainty leads to the exploration of a great number of technical approaches and many different product variants. In this paper we examine the earliest phases of the development of a product category by studying the introduction of MP3 portable audio hardware players. We examine the role of individual product models in market takeoff and investigate whether or not there is convergence over time as suggested by dominant design theory. We introduce *beacon product*, a new construct that emphasizes the role of an outstanding product model in the evolution of a product category. We believe that a beacon product may be a precursor to the development of a dominant design, a predominant theory in many management studies (Abernathy and Utterback, 1978; Clark, 1985; Dougherty, 1990; O'Connor and Veryzer, 2001;

Reid and de Brentani, 2010; Utterback, 1994). We show that while startup firms like Diamond and Rio pioneered MP3 music hardware players, Apple's iPod led to market takeoff. But it was the iPod/iTunes combination that allowed the MP3 category to crossover to mainstream markets, displacing music incumbents Sony and Philips, as well as MP3 pioneers.

The organization of the paper is as follows. We first explore the literature on the evolution of product categories with a primary focus on market takeoff, convergence and dominant design. We then present our conceptual model and methodology. We follow with a brief history of MP3 technology and the development of early MP3 hardware players. We examine the impact of Apple's iPod on market takeoff, convergence and the development of a dominant design. We analyze the role of the iPod/iTunes ecosystem in moving the MP3 category from a niche to mainstream market and conclude with a summary of our findings and observations.

## 2. Role of product design in takeoff, convergence and cross-over to mainstream markets

Management scholars have a long tradition of studying technology and innovation, most notably from two primary traditions: one perspective emphasizes the evolution of technology and

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market adoption and the other how technologies affect competitive advantage and the firm. While each of these perspectives have yielded important insights, their findings have not been well integrated with each other leading to confusion as to how technologies evolve and the impact of firm strategies on markets. In an article celebrating the 50th Anniversary of *Management Science*, Gavetti and Levinthal (2004, p. 1310) suggested that “analyses of firm performance differences are increasingly being placed more centrally in a market context, where questions of consumer demand and market competition are now more salient than had been the case for earlier, more purely firm-centered accounts.” This paper tries to bridge a gap in the literature on the evolution of markets and firm strategies. We focus on how specific product models can trigger market takeoff, how dominant designs emerge and how product categories can move from niche to mainstream markets.

Innovation, embodied in products, has received scholarly attention both directly and indirectly. For evolutionary economists the path of an innovation is thought to be the interplay between innovations (mutation) and the market (selection). Danneels (2002) studied how product innovation contributes to firm renewal and suggested that firms faced distinct challenges based on whether a new product can draw on existing competences, or whether it requires competences the firm does not yet have. Orihata and Watanabe (2000) showed that as an innovation goes through different stages of its life cycle, the companies learn, interpret, and implement what they learned from the market to facilitate the creation of innovative product models. Innovative product models can create new markets (O’Connor and Rice, 2013) and may also set the path for the development of an innovation category (Sahal, 1981, 1985).

Sahal (1981) introduced the concept of technological guideposts based on the observation that some product models are more important than others in providing a foundation for the gradual evolution of product categories. These guidepost models, according to Sahal, leave a distinct mark on a category and become the foundation for improvements (Sahal, 1981: 33). He observed that technological guideposts result from prior advances and are seldom a matter of radical breakthrough (Sahal, 1981: 36, 309). Further, he observed, that the greater the variety of tasks to which a design is adaptable, the more likely it is to guide the general direction of future technical advances (Sahal, 1981: 36, 309–310). Later Sahal (1985) described technological guideposts as an “innovation avenue”.

While the relationship between product innovations and the market takeoff has not been well studied, a few scholars have suggested a possible relationship between product innovations, market takeoff and the formation of a dominant design. Geroski (2000) provided an example of how competition between two variants of an innovation, variant A and B, could lead to the market’s eventual convergence onto one variant. He pointed out that a “sudden burst of adoption will occur” when one variant becomes the winner and the subsequent reduction in variants can result in the formation of a dominant design.

The idea of a “burst of adoption” is also similar to the concept of market takeoff described by various scholars (Agarwal and Bayus, 2002; Golder and Tellis, 1997, 2004). Some scholars define market takeoff as the transition between the early commercialization and growth stages (Golder and Tellis, 1997) or the point in time when the sales of a product class experiences a surge in adoption, often resembling a hockey-stick (Agarwal and Bayus, 2002). Factors contributing to market takeoff are thought to be price drops (Golder and Tellis, 1997), and firm entry, as a proxy for product performance improvement (Agarwal and Bayus, 2002). Golder and Tellis (2004) suggested that information cascades—increased benefits and decreased risks to adoption for users as others adopt the same products, and good economic conditions may also contribute to takeoff.

Abernathy and Utterback (1978) noticed that as “industries” evolve they tend to converge on a few solutions—narrowing technological approaches. They called this concept dominant design. Murmann and Frenken (2006) published a meta-analysis summarizing how various scholars have applied dominant design at different levels of analysis ranging from the concrete product to the level of a whole industry. Originally, dominant design was mainly thought of as a product level phenomenon (Abernathy and Utterback, 1978; Utterback and Abernathy, 1975) but more recently some scholars have used it to describe convergence at the firm and industry levels. Following up on his earlier analysis with Abernathy, Utterback (1994) used dominant design to refer to a collection of previous innovations. Christensen et al. (1998) expanded the concept to encompass architectural design. Because dominant design has been used to describe product, firm and industry level phenomenon, there is considerable confusion over what is meant by dominant design, whether there is design convergence and what implication it has for the evolution of the product category.

*From niche to mainstream markets.* From a market perspective, an important stream of research focusing on the diffusion of new technologies began with Rogers’ (1962) introduction of the S shaped curve to reflect the stages before an innovation reaches critical mass (from a niche to mainstream). Foster (1986) used the S curve concept to suggest that, unencumbered by existing technology, new entrants are most likely to innovate in a new technology arena. Moore (1991) argued that whether an innovation is developed by an incumbent or a new firm, there is a *chasm* between the expectations of early adopters (technology enthusiasts and visionaries) and the early majority (the pragmatists) and pioneering firms often struggle to make products with widespread appeal. The role of innovative products in reaching mainstream consumers is not well understood nor is how markets move from a niche to a mainstream market.

Levinthal (1998) suggests that while an initial technology form may not differ substantially from its predecessor, separation, and a distinct selection environment, may trigger divergent evolutionary paths (Levinthal, 1998: 218). From this application area (niche), a technology may be able to penetrate other niches and may even out-compete prior technologies. The process of “creative destruction” may occur when a technology that emerges from one speciation event (or niche) is successfully able to invade another niche. When these niche technologies cross into mainstream markets they may seriously affect incumbent companies, with some incumbents able to adapt and others not.

Finally, an important stream of literature concerns how incumbents miss opportunities. Explanations range from the nature of the technology itself (Abernathy and Clark, 1985; Tushman and Anderson, 1986), organizational issues (Abernathy and Clark, 1985; Henderson and Clark, 1990; McDermott and O’Connor, 2002) failures to understand market shifts (Christensen, 1997; Christensen and Raynor, 2003; Christensen and Rosenbloom, 1995; Danneels, 2004; Henderson, 2006; Liefer et al., 2000; Tripsas and Gavetti, 2000), and the need to develop market capabilities.

### 3. Conceptual model

Building on the insights of these scholars we propose a model of market takeoff, design convergence and crossover to mainstream markets highlighting the role of outstanding products (illustrated in Fig. 1). In our model, a company initiates a project to design a product (model) that it introduces into the market. Customers react to the model, and based on observations about how specific models fare, the original company (or another firm) produces a new model that reflects these insights. As Sanderson and Uzumeri (1997) illustrated in the case of the evolution of the

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