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Fusion of Disruptive Technologies: Lessons from the Skype Case

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In this paper, we study the effects of integration of one or more disruptive innovations and ask if the resultant (new) innovation can have a dramatic impact on new and existing markets, and the resultant technology paradigm. We describe the evolution and dynamics of this process using Skype as a case in point. Skype successfully fused peer-to-peer computing (P2P) techniques and voice-over-Internet-protocol (VoIP) to create a new standard and operating model. We discuss whether such integration of disruptive technologies may lead to a ''marriage of equals'' or whether it leads to dominance by a single technology – and if so, in what circumstances.

Keywords: Disruptive innovation, Fusion, Integration, Skype, VoIP, P2P, Standards, Peer-to-peer, Telephony, Communications

Introduction

Previous research in technology management has addressed the issue of disruptive innovation as it relates to a single technology. One novel question which can now be considered is the potential impact of a merger or integration of two or more disruptive technologies and their resultant pattern of innovation. In this paper, we use the case of Skype to examine what happens when two or more disruptive technologies combine to offer a potentially new value proposition.

Skype, a European-based startup, had launched a host of services by fusing VoIP (voice over internet protocol) and P2P (peer-to-peer) computing. It sought to offer a challenging alternative to existing voice communication solutions. While each of these technologies (VoIP and P2P) was inherently new and potentially disruptive, a unique combination of the two as offered by Skype promised to radically change the telecommunications landscape. Using the disruptive innovation literature as a theoretical background, we develop a framework that examines the potential impact of a merger of multiple disruptive technologies.

Background

Over the past decade, the telecommunications industry has witnessed rapid changes in the way people and organizations communicate. Many of these changes sprang from the explosive growth of the Internet and from IP (Internet Protocol) based applications. The Internet became a truly ubiquitous means of communication, and this is reflected in the amount of data exchanged and commerce transacted over this medium. Today, the total amount of packet-based network traffic surpasses traditional voice network traffic. Interestingly, even on the packet based network, the amount of bandwidth taken up by Internet surfing is much lower than that taken up by various file sharing services like BitTorrent (which uses P2P technology, a feature described later in this paper). In the wake of these technology advancements, it became clear to entrepreneurs that voice

traffic and services would be one of the next major applications to take full advantage of IP. This expectation was based on the impact of a new set of technologies generally referred to as Voice over IP (VoIP) and IP telephony. VoIP had the potential of creating many unique capabilities for carriers and customers who depended on IP or other packet-based networks. In parallel, innovations in the area of peer-to-peer computing meant that data could be efficiently distributed over a vast network with little or no centralized control.

Disruptive Innovations

The role of disruptive innovations in creating new market value has been an important area of study in technology management (Christensen, 1997; Hamel, 2000, Tushman & Anderson, 1986). These disruptive technologies and innovations often create new market value in unexpected ways, both independently and through combination with existing standards and protocols (Bower & Christensen, 1995; Christensen, 1997; Hamel, 2000, Tushman & Anderson, 1986, Tushman & Nadler, 1986; Ahuja & Lampert, 2001). While sustaining technologies serve the needs of most customers, and are improved along the trajectory valued by mainstream customers, disruptive technologies take on a different trajectory as they diffuse in the marketplace. Typically, such technologies are often cheaper and inferior in performance, yet they involve features that may provide competitive advantage in the future. As Paap and Katz (2004) point out, the disruption in the term ''disruptive technologies'' is the effect some technology based innovations appear to have on markets affected by technology-based innovation. However, we argue that disruptive innovation need not necessarily be inferior in quality. Although not as common as the bottom-up variety, top-down disruptive innovation aimed at high-end (and least price-sensitive) customers can actually outperform existing products and will sell for a premium price rather than at a discount [1]. In addition, technological convergence is yet another example of how disruptive innovations can occur, but in this case, it is the combination of incremental innovations that becomes disruptive (Hacklin *et al*., 2004). Before the notion of technological convergence as a precursor to disruption, technology fusion was described as being nonlinear, complimentary, cooperative, and market revolutionizing (Kodama, 1992). On the other hand, Markides (1998) and Hamel (2000) acknowledged the existence of disruptive opportunities not only in the process of the evolution of technologies, but also in the evolution of business models. Using the above perspective, we find that both VoIP as well as the peer-to-peer mode of distribution represent disruptive phenomena. In addition, they thrive in a networked environment where the growth patterns can be extremely rapid depending on initial acceptance of such solutions.

The Rise of VoIP and P2P: Two Distinct Disruptive Technologies

The Rise of VoIP

VoIP was developed as an IP based application in order to provide convenient communication between users using a variety of device types. VoIP essentially referred to the delivery of voice communications over an IP network, specifically the traffic management mechanism but not necessarily the layered applications or services. IP telephony is described as the basic voice communication services delivered using IP network, and enabling asynchronous and real-time voice communications. In the user environment, examples of IP telephony included dial tone, voice messaging, call management, caller ID and other functions considered common or traditional telephony features. Examples in the carrier domain included feature management and billing/performance measurement. The underlying technology also enabled another category of integrated voice applications (advanced communication applications) that would be delivered to users over an IP network. These applications would have been impossible, or prohibitively expensive, for implementation in a traditional telecommunications environment (e.g. TDM). Examples of these applications would include presence-awareness phone features, find-me-follow-me services integrated with collaboration tools such as calendar/scheduling programs, screen-pop provisioning beyond the call center environment, and similar applications. A number of these applications could also be custom-built to deliver advanced location based services to users in a context-specific and time-sensitive fashion (Rao and Minakakis, 2002). Given these various application types and potential revenue streams derived from them, there were a host of VoIP providers operating in the marketplace. As an illustrative example, we describe the key players in the US market at the time of Skype's launch (see Table 1).

As can be seen from the exhibit, the competitive landscape was diversified, with firms approaching the same market through very different routes. Typical competitors included cable companies, traditional telcos, a number of pure-play VoIP firms, and other challengers like IM (instant messaging) platforms and SIP (Session Initiation Protocol) phones. Typically, the cable companies and telcos offered VoIP services as an additional service offering to their existing portfolio of audio, video, and content programming. On the other side, the major drawback considering VoIP service included reliability of the calls and vulnerability to security threats:

''Administrators may mistakenly assume that since digitized voice travels in packets, they can simply plug VoIP components into their already-secured networks and remain secure... [2]

– Security Report by the National Institute for Standards and Technology.