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Editorial

Preface to "The chilling effects of network externalities"

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1. Introduction

Academic journals in marketing should publish more truly controversial papers, i.e., papers that challenge conventional wisdom. The paper co-authored by Goldenberg, Libai, and Muller (2009a) challenges that network effects drive market growth. The paper is among the first in the literature to try to separate the word-of-mouth process from network effects in the diffusion of new products. Moreover, it uses a novel methodology, cellular automata, introduced by the same authors in the marketing literature (also see, Goldenberg, Libai, & Muller, 2002).

The intersection of challenging conventional wisdom, being among the first to separate two important processes previously thought of as inseparable, and the usage of a novel methodology can be hard to accept for scholars who seek conclusive results and who are more comfortable with careful but modest extensions of existing paradigms. Still, scientific advance hinges at least as much on the publication of interesting and novel ideas, even if they lack conclusiveness, as on the publication of studies that fine-tune and perfect previously introduced ideas or that identify limitations or errors in previously reported findings. However, in most, if not all, academic journals the latter two types of articles far outnumber the former type.

The International Journal of Research in Marketing aims to be a journal at the forefront of academic knowledge on marketing research. Therefore, it hopes to also publish controversial papers, and on occasion supplement them with commentaries of other experts in the field of inquiry to offer readers the full scope of opinions on the areas of controversy. In that spirit, we are happy to publish the paper by Goldenberg et al. (2009a), and commentaries on it by Gatignon (2009), Tellis (2009) and Rust (2009), followed by a rejoinder of Goldenberg, Libai, and Muller (2009b).

2. Network externalities and new product growth

The study of the new product growth process is well-established in marketing research (for original contributions, see Bass, 1969; Golder & Tellis, 1997; Goldenberg et al., 2002). Network externalities—sometimes referred to as network effects—may play a profound role in new product growth.

There are plenty of case examples for which network externalities are claimed to have influenced the new product growth process, and thereby ultimately the success of the companies involved. For example, when launching the Compact Disc in 1983, Philips and Sony allied with music studios to provide a rich catalog of titles and thereby trigger a fast takeoff of their new technology, which occurred in 1985 just 2 years after its launch (Stremersch, Tellis, Franses, & Binken, 2007). Tellis (2009) cites the example of the word processor MS Word and how prior adoption among a small fraction of the population may have enhanced the utility of said software and thereby triggered future diffusion.

At the same time, notorious failures are often cited, such as quad sound and the CD-I which lacked platform support of complementors. Goldenberg et al. (2009a) also point out that standard battles—such as the VCR wars between VHS and Beta, or the DVD wars between HD-DVD and Blue-Ray—may constrain a new product's early growth (e.g., as captured by the parameter p in the Bass diffusion model). Given the widely varying results, academics have begun to investigate this phenomenon more thoroughly (for a recent literature review on indirect network effects[1] in new product growth and a detailed study of historical cases, see Stremersch et al., 2007).

3. Goldenberg, Libai, and Muller (2009a)

Goldenberg et al. (2009a) show that network externalities may have "chilling" effects on the new product growth process, especially early on, which can account for long incubation times (also see Kohli, Lehmann, & Pae, 1999). Though this slow process might be followed by an accelerated growth later on in the diffusion process, in terms of NPV it is not compensated by this faster growth. This finding complements those by Van den Bulte and Stremersch (2004), who showed that competing standards—one element underlying the theoretical reasoning of Goldenberg et al. (2009a)—inflate the q/p ratio, thus creating longer left tails of the diffusion curve but a steeper growth slope later on. Goldenberg et al. (2009a) show that this chilling effect is ubiquitous in the product categories they study.

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[1] In markets with indirect network effects, the utility of the primary product, e.g., a CD player, and thus its sales, increases as more complements become available. In turn, this availability of complements depends on the installed base of the primary product (Stremersch et al., 2007). Direct network effects refer to the increase in a consumer's utility from a product when the number of other users of that product increases (Tellis, Yin, & Niraj, 2009).

The authors also show that the social contagion process can be isolated from network effects in new product growth. The identification comes from assuming that the contagion process operates on a local basis, while network effects are assumed to be global (system-wide). While one can certainly debate, as the authors concede, whether this is true in all cases, economists have also assumed in theoretical models that network effects depend on the total size of the installed base (e.g., by definition in the case of indirect network effects), while at least one way in which social contagion may occur is through local social contact.

The evidence that Goldenberg et al. (2009a) offer is grounded in an agent-based cellular automata model. Using this model, the authors simulate people's adoption behavior under different conditions to assess the aggregate diffusion pattern. They complement their simulation results with results from both aggregate-level analyses and cases.

4. Limitations and future research

Intelligent readers, as well as the leading experts who wrote the commentaries, can certainly identify several limitations of this paper. As is typical of a controversial, truly novel paper, Goldenberg et al. (2009a) probably raise more questions than they provide answers.

First, while Goldenberg et al. (2009a) assumptions on the global nature of network effects versus the local nature of social contagion may seem reasonable, imposing the existence of a threshold on the network externalities process—which the authors aim to validate through theoretical reasoning—clearly affects the outcome of the model, as well as loads the dice in favor of finding chilling effects (also see Gatignon, 2009; Rust, 2009). Also the assumption of social contagion having predominantly local effects seems more valid when contagion occurs through in-person word-of-mouth rather than through social status considerations (see Van den Bulte & Stremersch, 2004).

Second, the core evidence the authors present lies in the cellular automata simulation. Like any simulation, the outcomes are only as realistic as the underlying individual process that is defined (assumed) ex ante by the researcher. Given the typical complexity of the behaviors underlying these models, simplifications may lead to erroneous outcomes (also see Gatignon, 2009).

This paper shows that more research is needed on both the substance—the role of network effects in the new product growth process—as well as on the methodology—agent-based simulation models. Fortunately, these suggest several fruitful research directions.

The separation of social contagion and network effects is certainly worthy of more attention. However, how this can be applied to a diffusion model on aggregate-level data is unclear. Goldenberg et al. (2009a,b) recognize that they exclude social status considerations in their approach. However, given that social status considerations may very well be a social contagion mechanism that is at least as important as word-of-mouth (Van den Bulte & Stremersch, 2004), future research should focus on disentangling network effects, word-of-mouth, and social status considerations in new product growth. Separating the underlying mechanisms is important as they all have very different implications for firms' optimal marketing policies.

Goldenberg et al. (2009a), in line with most economic and marketing research, model network effects through the quantity of prior adopters (global effect). A promising line of research, however, is moving beyond the characterization of network effects along the mere size of the network (e.g., see Binken & Stremersch, 2009; Tucker, 2008). Especially in new product growth, given local contagion influences, incorporating network effects in all their dimensions (e.g., size, quality, and content type) may generate more accurate insights that are more relevant for firms. For example, if one considers video game consoles, catalog size is a relatively minor concern to video console manufacturers like Sony, Microsoft, and Nintendo compared to content quality and type (Binken & Stremersch, 2009).

Tellis (2009) raises the issue of omitted variable bias in new product growth models (also previously raised by, for example, Van den Bulte and Lilien (2001)) such as the one presented in Goldenberg et al. (2009a). As the number of potential covariates in new product growth models easily inflates beyond estimation capabilities, e.g., because of multicollinearity, complex model structure, or poor or limited data, the field needs stronger methods to deal with the variable selection problem. In addition, time dynamics underlie the discussion between Goldenberg et al. (2009a,b) and Tellis (2009). Time-varying parameter diffusion models may not provide closure on this debate. Managers understand that optimality of decisions (e.g., lower price) is time-dependent but their mind works in periods (discrete time) rather than continuous time. Earlier papers have contrasted drivers of early growth versus late growth (e.g., see Tellis, Stremersch, & Yin, 2003; Stremersch & Tellis, 2004; Golder & Tellis, 2004). When one studies contagion mechanisms and network externalities, contrasting different growth stages in a contingency framework may lead to novel and valuable recommendations for managers in network markets.

Agent-based model simulations in marketing are in their infancy. Goldenberg, Libai and Muller (2001, 2002, 2004, 2009a, 2009b) need to be credited for their pioneering role in this area. On the other hand, every radical scholarly breakthrough should be followed by a process of improvement. An important improvement that would greatly benefit agent-based models and its application to network effects in new product growth specifically is validation of the theory underlying the simulation (Rust, 2009). As Tellis (2009) argues, earlier research (Tellis et al., 2009) shows that network effects may accelerate the rate at which a higher-quality product takes over from a lower-quality predecessor, thus challenging the theoretical rationale underlying the model by Goldenberg et al. (2009a). Prior theoretical literature has predominantly argued that network effects cause inefficiency—embedded in the ubiquitous use of the term network externalities, which is a term with negative valence (Liebowitz & Margolis, 1999), rather than network effects—while empirical analyses have shown such that inefficiencies rarely occur (e.g., Liebowitz & Margolis, 1999; Stremersch et al., 2007; Tellis et al., 2009). Thus, the time is right for a greater number of empirical analyses that test network effect theories.

5. Afterthought

Markets are increasingly influenced by network effects, partly because of interdependencies among technologies—often paraphrased by managers as “the ecology” around a technology. Such interdependencies are more prominent than ever because of technology itself (e.g., modularity) and because firms increasingly specialize in different parts of a technology platform (e.g., the evolution of IT from integrated hardware & software firms, to specialized software firms, to firms specialized in certain software application areas).

At the same time, social contagion becomes more apparent. The vast increase in social and professional networking services has made connections between people not only more visible, but people “network” more than ever through a diversity of media. In sum, the customer is increasingly “connected” (see Wuyts, Dekimpe, Gijbrechts, & Pieters, 2010).

Given its relevance, we hope you enjoy these papers and either adopt the concepts and/or methods of Goldenberg et al. (2009a) or develop a competing technology which you contrast with them on theoretical and empirical grounds and, in doing so, increase our understanding of new product diffusion in network markets.

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