Asymmetric Upgrading of Mobile Services: A Demand-Side Explanation

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ABSTRACT

Despite the accelerated pace at which progress in wireless technologies occurs, it is not uncommon to observe that some Mobile Operators (MOs) do not upgrade their mobile services, while their competitors adopt the newest technological standards. This paper proposes an explanation for this apparent paradox by means of a formal theoretical model that acknowledges demand heterogeneity in a quality upgrading game between horizontally differentiated and competing MOs. Demand heterogeneity stems from the co-existence of both conservative and quality-seeking users in the mobile services market. The author derives both symmetric and asymmetric upgrading outcomes depending on (1) the ratio of quality-seeking and conservative users, (2) the upgrading cost, (3) the extra-value conservative users attribute to upgraded services, and (4) the degree of differentiation between competing MOs. Results reveal under which conditions demand heterogeneity leads to higher profits for non-upgrading MOs than for upgrading MOs, constituting the rationale for asymmetric upgrading outcomes to arise.

Keywords: Conservative and Quality-Seeking Users, Demand Heterogeneity, Electronic Commerce, Mobile Services, Mobile Technology Adoption, Quality Upgrading Game, Vertical and Horizontal Differentiation

INTRODUCTION

We live in the revolutionary information technology era, an era characterized by improvements of existing technologies made at ever-increasing speeds.

Wireless communications technologies, also used in electronic commerce are not different from other information-based technologies with respect to the challenges that the industry and its users face in such a fast evolving information society. On the supply-side, competing Mobile Operators (MOs) are continuously confronted with the decision of whether to upgrade their services to align their provision to the newest technological standards. On the demand-side, users need to decide whether to switch their mobile consumption from older to more enhanced services. However, despite the accelerated pace at which progress in wireless technologies occurs, it is not uncommon to observe that some MOs do not upgrade their mobile services, while their competitors adopt the newest technological standards.

Supply and demand sides are important to understand incentives to adopt new technolo-
gies; but, despite the richness and the merit of studies that focus on a myriad of different supply and demand factors in what is by now a very extensive literature on upgrading, most existing studies fail to characterize scenarios for asymmetric upgrading among rivals arising in equilibrium.

Typical supply-side factors considered in those studies are, for example, the technological costs associated with the upgrading decision, the degree of competition between MOs operating in a given market, the feasibility of adoption of new technologies and their backward and forward compatibility to existing standards or subsequent generations of technologies, products and services, over time. Demand-side factors are, for example, the existence of users’ and networks’ externalities, whether positive (e.g. networks effects for fellow users of the same network) or negative (e.g. congestion issues due to users’ excessive traffic within a network, or between networks), and rigidities in technology adoption by users due to switching costs, search costs, or simply difficulties to assess the value of new products and services prior to their effective usage due to their nature (durable or experience products and service) or due to the uncertain knowledge or expectations about the degree of their compatibility with existing standards or subsequent generations of technologies, products and services, over time. For an overview, see among other studies Katz and Shapiro (1986), Church and Gandal (2005), and, Farrell and Klemperer (2007). Other studies have stressed the need for interconnection across networks and users of services such as telephony, or Internet based services, and emphasized the importance of network effects in those scenarios. For an overview, see Laffont and Tirole (2000), Crémer, Rey, and Tirole (2000), Armstrong (2002), Laffont, Marcus, Rey, and Tirole (2003), and Gans, King, and Wright (2005).

None of the above-mentioned studies is able to explain asymmetric upgrading decisions by mobile operators. To fill this gap in the literature, I propose a demand-side explanation that utilizes the heterogeneity of users’ appreciation for new versus old mobile services in the MOs’ upgrading game. I analyze the interplay between the often-neglected demand heterogeneity and other supply-side factors in the upgrading game. Exceptions are Adner and Levinthal (2001) that uses a formal computer simulation model to explicitly consider the influence of heterogeneity in market demand to examine the dynamics of product and process innovation; Tripsas (2008) that looks at incremental values of technological innovations when customers’ valuations evolve over time too; and Fabrizi (2010) that allows for technological adoption and demand heterogeneity in the mobile Internet. Modeling demand heterogeneity enables me to rationalize those diverse upgrading behaviors that would otherwise remain unexplained.

In order to isolate the impact of demand heterogeneity on the MOs’ incentives to upgrade, I build a model abstracting from compatibility, standardization, or network externalities issues. Instead, I focus on demand heterogeneity stemming from differences across users in their appreciation for upgraded services. While I assume that better services bring higher utility to all users, and, thus, that all users agree in assigning a higher value to their consumption, not all users attribute the same extra value to those enhanced services, that is some users do not value services sufficiently to cover the cost of their upgrading. A possible source of this type of demand heterogeneity could be that users are diverse, by nature, with respect to their ability to adapt to using new, complex services. More sophisticated users can be thought of as having to incur lower costs for adapting to use their full potential; while conservative users can be identified as the ones having to face higher adaptation costs to use them to their full potential. The demand heterogeneity is taken as given both by MOs and users. Nature only decides on the extent of heterogeneity between sophisticated or quality-seeking and conservative users, that is the gap between their appreciation for new and old services respectively, as well as on the composition and population of sophisticated and conservative users in a given market and at any point in time. Thus, the demand heterogeneity is
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