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# Demand forecasting for new technology with a short history in a competitive environment: the case of the home networking market in South Korea

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**Abstract**

In the rapidly growing, competitive information and communications technology market, demand forecasting for new technologies is difficult, yet important. Our study describes a forecasting methodology designed for newly introduced technology for which limited data is available that uses algebraic estimation, Bayesian updating, and conjoint analysis. In the estimation procedure of diffusion model, initial information is derived through expert judgment, then updated using Bayes' theorem with available sales data. A conjoint analysis based on separate surveys of multilevel decision makers is used to derive a description of a competitive environment among multiple alternatives. The model is applied to the home networking (HN) market for new construction in South Korea, for which there exists various alternative technologies. The forecast shows that among HN technologies wireless LAN will command the highest market share at any time during the forecasted period. Based on simulation experiments, important factors affecting demand for HN technologies are identified—both consumer preference and the development of technological standards have a significant impact on the diffusion of HN technologies.


*Keywords:* Forecasting; Diffusion; Bayesian updating; Conjoint; Expert judgment; Home networking

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## 1. Introduction

Researchers have often used the Bass model [1] and the logistic model [2] to analyze demand and diffusion in the fields of management, policy, economics, and marketing, among others. Those models have been improved upon to reflect supply restriction [3], repeat purchase [4], and the effect of the economic situation [5]. On the other hand, diffusion models combined with a discrete choice model (choice-based diffusion models) have been developed to accommodate the effects of substitution and competition among technologies in demand forecasting, and such models have been used to forecast demand for new technologies such as low-Earth-orbit mobile satellite service [6], next-generation large-screen television [7], and DRAM (dynamic random access memory) generations [8].

Heretofore, however, some choice-based diffusion models have suffered from some limitations in their endeavor to forecast demand for new technologies because they have usually depended on historical sales data or adopter data, and thus explaining the diffusion of newly introduced technology with a limited number of data observations is difficult. To overcome the limitations of meager market data, previous researchers such as Bayus [9] and Jun et al. [6] used data associated with products that are analogous to the new products in their estimations. However, some technologies such as the home networking (HN) system have no analogous technologies or markets that can serve as a good reference for estimation because they are only now evolving technologically and as a business.

In this study we employ a new estimation procedure of a diffusion model applicable in this environment that uses Bayes's theorem and the algebraic estimation process proposed by Mahajan and Sharma [10]. The proposed estimation procedure is applied to South Korea's HN market. We arrive at a prior distribution with the help of information from HN experts and using algebraic estimation and bootstrapping, and we then update that prior distribution with available early-stage HN market data using Bayes' theorem.

Moreover, based on the framework of choice-based diffusion models we have developed a framework by which to analyze the peculiar preference (decision) structure at work in the installation of HN systems in new construction in South Korea. In South Korea, as construction companies take the initiative in the deployment of HN systems in new housing, the builders become the main decision makers. In choosing among HN technologies, they make decisions regarding consumer preferences as well as level of technological attributes. This nested preference structure can be analyzed by combining the preference results from two separate conjoint surveys of individual consumers and construction companies. Although decision makers consider consumer preferences in making their determinations, most previous research associated with technology demand has neglected nested preference. We believe the framework our study employs can be applied to various fields where nested preference structures are at work.

In the final part of this study, we run simulation experiments that hypothetically change the attributes of the HN technologies, and thus identify important factors that affect the demand for such technologies and suggest implications for policymaking that would remove impediments to the diffusion of HN systems. The study results may be relevant for practitioners who manage a marketing strategy and researchers who design forecasting methodologies for new technologies.

The following section presents background on the subject and introduces the specific HN technologies focused on in the study. Section 3 of the paper presents the conceptual and analytical underpinning of the study's model, which is followed in Section 4 by an empirical analysis of the diffusion of HN systems in South Korea. The paper concludes with observations about the contributions, limitations, and further extensions of the model.