Chapter XX
Developing a Dynamic View of Broadband Adoption

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ABSTRACT

The widespread domestic use of broadband Internet technology has been recognized to have a positive influence on national economies and improve the life of citizens. Despite substantial investment to develop the infrastructure, many countries have experienced slow adoption rates for broadband. This chapter develops a view of UK broadband adoption using dynamic modeling techniques based on an existing statistical study. The contrasting approaches to modeling are compared. Principles of a dynamic modeling system are introduced and an appropriate form for broadband adoption chosen. The process of building a dynamic model based on an existing static model of broadband adoption is presented. Finally, the new perspective of the dynamic model is explored using the causal loop analysis technique.

INTRODUCTION

The growth of the domestic use of broadband Internet access in the United Kingdom (UK) is a topic of interest for both government and the private sector. At the European level the widespread use of broadband is seen as a key to promoting economic activity, outlined in the 2000 Lisbon Agenda, as well as supporting civil projects and rural development (COM, 2006).

This focus of interest has led to research into the spread of broadband technology, including the domestic take-up of broadband services in various countries (Choudrie & Dwivedi, 2005; Heejin, O'Keefe, & Kyounglim, 2003; Stanton, 2004). Typically these studies explore the current state of national broadband penetration and usage. A structured approach is applied, using data collection and statistical analysis to identify the critical factors affecting change.

By contrast, other studies focus on predicting the effects of future demand for broadband including penetration and usage. For example BSG & ANALYSYS (2006), commissioned by the UK government advisory body the Broadband Stakeholder Group, attempts to predict domestic bandwidth requirements for the years 2008 and 2012. The method described for obtaining the projections is fairly unstructured: user profiles are estimated, and developments in network applications and bandwidth usage are projected on that basis.

While both approaches clearly provide useful results, they are affected by the limitations that result from the methods they apply. Both provide snapshot views of the situations they describe, one in the present, one in the future. Neither provides much insight into the processes that eventually led to those states or where they might lead to in the future.

Studies such as Choudrie and Dwivedi (2005), Stanton (2004), and Aron and Burnstein (2003) contain a great deal of structure but require a sufficient quantity, and quality, of data in order to apply statistical measures. The rigorous structured approach provides little room for speculation except by using hypothesis testing. The BSG & ANALYSYS (2006) study, by contrast, provides no traceable structure to understand how the future predictions are made. Although undoubtedly formed by experienced professionals, it is speculative and includes caveats to that effect.

A dynamic modeling approach provides a compromise between these two extremes. Using all available resources, a structure for the problem is developed and used to examine how change may affect it over time. This chapter aims to demonstrate what dynamic models offer researchers investigating the issue of broadband adoption. An example of an existing static model that may be used as the basis of a dynamic model is also described. The System Dynamics (SD) technique of causal loop analysis is used to investigate the resulting dynamic model and analyzes the implications of the structure.

STATIC AND DYNAMIC MODELING: COMPARING CONCEPTS

Static models provide a snapshot view of the state of a problem, as it is currently or as it may be in the future. Techniques may be applied to examine the static state, for example revealing the driver mechanisms for future change; however, they can provide no indication whether these same mechanisms were active in the past or will remain so in the future. Dynamic models are able to represent issues of change over time in more detail.

There are many methods available to build static or dynamic models, and the issue of comparing different styles of mathematical model can be far reaching. In order to provide a brief example of comparing approaches, we refer to Meadows (1985) which reviews a number of models created, using different approaches, to understand the effects of policy on social and environmental problems.

Reviewing Approaches

The static or dynamic properties of a model are by no means definitive in determining the model's form. Meadows (1985) considers forms to be separate schools or even paradigms of modeling. The