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# The dynamics of local and interactive effects on innovation adoption: The case of electronic commerce

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### ABSTRACT

Innovation adoption is determined not only by the opportunities and constraints resulting from organizations' characteristics (local effects), but also by reaction to the adoption of their interdependent and referable others (interactive effects). This study examines the dynamics of innovation adoption by considering both local and interactive effects in early adopters relative to later adopters, and then investigates the electronic commerce adoption as an empirical example. Analysis results show that the crucial stimulating effects in the early market are focused on the nature of innovations, while those in the later market are concentrated on the practical implementation issues of innovations.

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### Introduction

Adopting electronic commerce (EC) in business represents an innovative move for an organization, based on Schumpeter's (1934) argument that an innovation is something that reduces costs and increases quality and performance. Brynjolfsson and Saunders (2009) reviewed literature on productivity for the period 1995–2008 and confirmed that information technology played an important role in productivity increases and was an important driver for economic growth. Substantial evidence confirms that enterprises can benefit from EC. However, most of the numerous studies of EC adoption by organizations have been concerned with whether their characteristics affect the decision to adopt EC (Al-Qirim, 2007; Corrocher, 2006; Daniel and Grimshaw, 2002; Dinlersoz and Pereira, 2007; Grandon and Pearson, 2004; Hong and Zhu, 2006; Joo and Kim, 2004; Lai and Ong, 2010;

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Mustaffa and Beaumont, 2004). Comparatively few studies have considered the external driving mechanisms which embed organizations within networks of interdependencies (Dos Santos and Peffers, 1998; Shih, 2008). Many mechanisms may be responsible for accelerating or slowing the adoption process and identifying which mechanisms dominate this process is likely to make an important contribution to the assessment of a particular innovation's prospects (Mansell and Steinmueller, 2000). Hence, there is a need to examine both organizations' characteristics and the externally interactive mechanisms that affect the diffusion of corporate EC adoption, in order to identify the crucial factors that cause organizations to adopt EC.

Additionally, most prior studies have determined particular factors that influence corporate EC adoption at a certain point in time. However, Rogers (1995) argued that, in terms of the time of adoption, different groups of adopters have distinguishing characteristics regarding their adoption of innovations, so that individuals can be classified into adopter categories, based on when they first begin to adopt innovations. The important differences between these groups of adopters suggest that the factors explaining the reasons for the adoption of innovations change over time, as the level of innovation diffusion increases. This implies that the empirical results from research based on the groups of early adopters and later adopters should be different, and that a longitudinal study of the factors affecting innovation adoption, in terms of the time of adoption, is essential. In spite of the fact that numerous studies have tried to identify the factors affecting corporate EC adoption, at a certain point in time, remarkably few research studies have focused on the substance of these shifts, at the different stages of the EC adoption life cycle.

On the basis of these two considerations, this study investigates the diffusion of corporate EC adoption by considering the factors that are associated with corporate characteristics, as well as the external driving mechanisms which embed organizations within networks of business interdependencies, and by comparing the crucial factors that influence corporate EC adoption for early and later groups of adopters. Given these two approaches, the objectives of this study are: (1) to identify the corporate characteristics and the externally interactive mechanisms that affect the diffusion of corporate EC adoption, (2) to demonstrate that the effects that influence EC adoption change significantly along the adoption life cycle, and (3) to investigate the substance of these shifts for a number of specified driving forces in the field of corporate EC adoption.

To achieve these objectives, this study uses a network autocorrelation model to develop a research framework for corporate EC adoption. In this model, egotistical opinions and behaviors are determined not only by reaction to various constraints and opportunities granted by the conditions of the ego (local effects), but also by the opinions and behaviors of others (interactive effects) (Leenders, 2002). With regard to local effects on the influence of corporate EC adoption, this study identifies the significant factors that affect EC adoption, which were cited in prior EC-adoption-related research. With regard to interactive effects, this study follows the approach used by Shih (2008) to investigate corporate EC adoption using two different social network models; the cohesion model and the structural equivalence model. The models examine the contagion effects of two actors that render them socially proximate, so that adoption of an innovation by one actor triggers adoption by another actor. This study then formulates specific hypotheses regarding expected changes in local and interactive effects during the EC diffusion process. To test the models and hypotheses, this study makes use of a sample of industry-level corporate EC adoptions, based on the data from input–output tables and industrial census data for Taiwan during the years 2001 and 2006. The data from different years enables explicit examination of shifts in the local and interactive effects on corporate EC adoption between two points in time.

Subramanian (1996) reviewed literature related to innovativeness and classified it into two major categories. The focus of the first category of research, named 'innovation process research', examines the process of innovation diffusion in a market. Research in this field views those who adopt innovations earlier as innovators and labels later adopters as imitators (Gatignon and Robertson, 1989). This research field uses the assumption that categories of adopters consist of individuals with similar characteristics and similar degrees of innovativeness, at their time of adoption (Rogers, 1995). The characteristics of early adopters are distinguished from those of later adopters, in order to understand the different emphasis on R&D and marketing activities along the processes of adoption life cycle. The second category is described as 'innovation variance research'. This field of research

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