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Diffusing wireless applications in a mobile world

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Abstract

Technology diffusion is an important area of academic research. Diffusion studies are valuable in shedding light on success factors, and provide learning points for businesses seeking to launch products or services into an uncertain market. This paper reviews the recent diffusion literature and highlights the limitations associated with retrospective population models of diffusion that tend to emphasize success and innovation whilst ignoring diffusion failure or 're-invention'. The paper argues that the focus on single artifacts or products rather than a bundle of technologies or services is unhelpful, particularly where complex products and services are concerned. Key variables are drawn from the literature to assess the diffusion of new technologies and services, and three cases are presented which illustrate the effectiveness of these variables in wireless technology applications: in agriculture, mobile payments, and telecare.

Keywords: Diffusion; Wireless technology; Mobile applications; Telehealth; Telecare; M-Payments; Agriculture

1. Introduction

Diffusion studies shed light on success factors, and serve as learning points for businesses seeking to launch products or services into an uncertain market. This paper reviews the recent diffusion literature and highlights the limitations associated with retrospective population models with their distorting emphasis on success and innovation [1]. We argue that diffusion studies tend to measure the diffusion of single artifacts or products rather than a bundle of technologies or services. Our review identifies key variables with which to assess the diffusion of new technologies and services. These variables are then used to assess

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the potential for three innovative mobile wireless applications: in agriculture, mobile payments, and telecare.

2. Diffusion patterns

Geroski [2] identifies two kinds of demand-side diffusion model used to explain the 'S-curve' patterns of technology adoption. The most visible is the econometric epidemic model, as well as its derivative, the *probit* or rank model (which embraces concepts such as goals, needs and abilities of firms). Rogers argues that econometric models are largely based on inappropriate and misleading assumptions and are methodologically unsatisfactory in their focus on success and innovation [1]. This section examines the various diffusion models and some of their recent applications with a view to applying them in the context of mobile commerce applications.

2.1. Adoption, innovation, and diffusion

Rogers defines adoption as "a decision to make full use of an innovation as the best course of action available…" [1, p. 21]. An innovation, moreover, "… is an idea, practice or object that is perceived as new by an individual or other unit of adoption…. The perceived newness of the innovation for an individual determines his or her reaction to it. If the idea seems new to the individual, it is an innovation" [1, p. 11]. Diffusion is less self-contained. For Rogers, "[D]iffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas" [1, p. 5].

As will be discussed below, successful diffusion of ideas and technologies depends largely on their merits being communicated between users and potential users. Rogers captures this effectively when he highlights the iterative, interactive nature of the communication process [1]. In this process, participants (identified as users, 'communities of practice' [3], and organizations) may seek a shared understanding of an innovation, its potential, and how it might integrate into or replace existing systems, behaviors, and ways of doing things.

2.2. S-curves

The S-curve is a key 'stylized fact' that defines the work of scholars of demand-side diffusion [4]. The S-curve demonstrates, in an easily accessible way, the life cycle of a successful product, from its slow take-up at launch (primarily by the 'innovators' who are attracted by novelty and then by 'early adopters' often introduced to the product or service by the 'innovators') through its rapid diffusion when it is taken by the 'early and late majority.' The curve flattens off when only the 'laggards' remain [5] (see Fig. 1).

The S-curve is also useful for comparing the product against alternative or 'disruptive' ('invading') technologies [6]. As Andersson and Jacobsson [7] showed (see Fig. 2), competition between gasoline, steam, and electric-powered cars was a characteristic of the automobile industry ($T_0 - T_1$) before the gasoline-driven vehicle became dominant ($T_1 - T_2$). Only when dominance has been achieved does the market settle down