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Broadband Internet adoption and utilization in the inner city: A comparison of competing theories ☆

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ABSTRACT

Factors influencing the adoption and utilization of technology have been extensively studied within a variety of theoretical paradigms but questions about their parsimony and their integrations with and contributions to overarching models of human behavior have been questioned. The present research employed a mail survey of inner city residents of a Midwestern state to analyze the sufficiency of the social cognitive theory (SCT) model of broadband adoption by testing it against variables drawn from the Model of Adoption of Technology in Households, Diffusion of Innovations, and the Unified Theory of the Acceptance and Utilization of Technology-2. The variables tested explained little additional variance in broadband intentions after accounting for SCT and demographic variables, arguing for the superior parsimony of the SCT model. Price sensitivity, often overlooked in adoption research, was a significant predictor of broadband intentions and its effect was interpreted through the SCT framework.

1. Introduction

Evidence of the economic benefits of broadband access is fairly unambiguous and, while more contested, there is also a widespread belief in its social benefits (Genachowski, 2013; Gillett, Lehr, Osorio, & Sirbu, 2006; Holt & Jamison, 2009; Horrigan, 2009; ICF, 2012; LaRose, Gregg, Strover, Straubhaar, & Carpenter, 2007; Smith, 2010). For the past decade, researchers have been examining the key factors influencing broadband adoption so as to increase adoption rates. Various theories have been applied to understand the adoption and utilization of new technologies which are relevant to understanding broadband adoption and utilization. These include the Technology Acceptance Model (TAM, Davis, 1986; Davis, Bagozzi, & Warshaw, 1989), the Unified Theory of the Acceptance and Use of Technology (UTAUT, Venkatesh, Morris, Davis, & Davis, 2003), Diffusion of Innovations (DoI, Rogers, 2003), the Model of Adoption of Technology in Households (MATH, Brown & Venkatesh, 2005; Venkatesh & Brown, 2001), and social cognitive theory (SCT, LaRose et al., 2007, 2012). Although previous studies have compared the effectiveness of TAM, UTAUT, MATH, and the theory of planned behaviors (e.g., Brown, Venkatesh, & Hoehle, 2014; Chen & Chao, 2011; Lee, 2009; Terzis & Economides, 2011; Venkatesh et al., 2003; Yousafzai, Foxall, & Pallister, 2010), this area of research has evolved into a patchwork of competing theories and variables lacking conceptual integration. The present research attempts to restore conceptual order by re-examining technology adoption from the perspective of a seminal theory of human behavior, SCT, that integrates foundational concepts of diffusion of innovation research (Rogers, 2003). The focus of the research is on an important issue confronting society, the adoption of broadband Internet service by inner city populations.

2. Theoretical advances in technology adoption and utilization research

When developing technology adoption models, a common practice among researchers is to add or borrow variables from competing theories. This approach may add to the variance explained, making an argument for model sufficiency. However, while adding variables may increase the variance explained, the price for that is the sacrifice of parsimony (Bagozzi, 2007). There is also the risk of introducing multi-collinearity and statistical suppression (Conger, 1974; Weber & Monarchi, 1977) among redundant variables plucked from competing theoretical paradigms. Above all, the admixture of variables without integration into an overarching theoretical paradigm does little to advance

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social science, since an internally consistent theory is desired to make and test predictions that advance broader scientific understanding of social phenomena (Rosenberg, 2008). Paradigms lacking in this quality run the risk of being branded mid-level theories, a criticism that might be leveled against diffusion of innovation research, TAM, UTAUT, and MATH.

This study draws from two models focusing on consumer adoption and utilization of technology – a social-cognitive model of broadband adoption and MATH – to examine the additional variance that can be explained by integrating the two models. SCT is an overarching model of human behavior and so the SCT model of broadband adoption (LaRose et al., 2007, 2012) provides the initial basis for comparison to others that have been assembled from multiple sources. The present research will consider whether adding variables to the SCT model contributes to our theoretical understanding of broadband adoption and utilization. The present research focuses on a relatively under-studied population of inner city residents, filling a gap in previous research on broadband adoption that has focused on general populations or rural residents (Gillett et al., 2006; Holt & Jamison, 2009; LaRose et al., 2007; Rosston, Savage, & Waldman, 2010; Zickuhr & Smith, 2013).

The present research aims to overcome a curious shortcoming in the extant theoretical models of technology adoption and utilization: they have either not included price sensitivity as understood by policy makers (e.g., Brown & Venkatesh, 2005) or else have found it not to be a significant factor in predicting adoption (LaRose et al., 2012).

3. Toward sustainable broadband adoption

Recognizing the transformative potential of broadband Internet, the U.S. Federal Communications Commission (FCC) has adopted measures to make affordable broadband available to every citizen. The agency formulated a set of ambitious goals in the National Broadband Plan of 2010 (FCC, 2010). One of the plan's goals is to make affordable 100 Mbps download speeds available to 100 million homes by 2020. Based on this overarching vision, the agency expanded universal service policy to broadband service in its Connect America Fund (CAF), adopted in 2011. Prior to the National Broadband Plan, in response to the economic crisis of 2008, U.S. Congress enacted the American Recovery and Reinvestment Act (ARRA) of 2009 (Pub. L. No. 111-5, Sec. 6001, 2009). It provided $7.2 billion to support upgrades of the broadband infrastructure. To improve broadband and wireless Internet access in unserved and underserved communities (minorities and low income communities), the Broadband Technology Opportunities Program (BTOP) was established. The research upon with the current study is based was funded by the Sustainable Broadband Adoption (SBA) program, which was part of the BTOP project. Initial assessments seem to indicate some progress toward these targets. For example, the number of Americans living in areas unserved by broadband Internet decreased from 26 million in 2011 to 19 million in 2012 (FCC, 2012).

However, broadband availability is not the same as broadband adoption and effective use by ordinary citizens. Both adoption and effective utilization in ways that can improve the lives of citizens must be achieved to realize the economic and social benefits so often attributed to broadband Internet technology. Areas with full access to broadband may still have relatively low rates of adoption. In a recent survey conducted by the Pew Internet Center, still 30% of urban households did not have broadband at home (Zickuhr, 2013). Although the delivery of broadband to unserved and underserved areas is progressing, the gap between availability and adoption still exists. Understanding why adoption has not kept pace with broadband availability thus emerges as the next policy challenge.

4. Models of broadband adoption and utilization

The present analysis begins by examining five competing models of technology adoption and utilization for their applicability to broadband adoption and use. These are the SCT model of broadband adoption (LaRose et al., 2007, 2012), DoI (Rogers, 2003), TAM (Davis et al., 1989), and UTAUT (Venkatesh et al., 2003), and MATH (Brown & Venkatesh, 2005).

4.1. The social-cognitive model of broadband adoption

Following Bandura's (1994) analysis of communication processes within the overarching theory of SCT, LaRose et al. (2007, 2012) proposed and tested a broadband adoption and utilization model that re-construes the attributes of innovations (i.e., relative advantage, complexity, trialability, observability, and compatibility) found in DoI research (shown in Fig. 1). Distinct from DoI research and consistent with social cognitive theory, this approach conceptualizes those qualities in terms of the SCT mechanisms that explain them rather than properties of the innovations.

In this model, expected outcomes, self-efficacy, habit strength, observational learning, and enactive learning predicted broadband intentions. Expected outcomes (corresponding to relative advantage in DoI) are the predicted results of a behavior, here, the results of using broadband (Bandura, 1986; LaRose et al., 2007). Self-efficacy is defined as "people's judgment of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391), or Internet self-efficacy in the current context (corresponding to complexity in DoI). Habit strength is defined as "a form of automaticity in media consumption that develops as people repeat media consumption behavior in stable circumstances" (LaRose, 2010, p. 194) and can be understood through the self-regulatory mechanism in SCT. Internet habits, including those acquired through previous Internet use outside the home or with dial-up connections within it, are thought to account for compatibility in DoI. Observational learning (a parallel to observability) refers to what people learn from watching, hearing, or reading about others' experiences, while enactive learning (trialability) is what people learn from their own experiences (LaRose et al., 2007). The model in Fig. 1 also incorporated demographic characteristics as well social-cognitive variables to predict broadband intentions. For the present research only social cognitive variables directly related to broadband intentions are considered:

H1. Expected outcomes will be positively related to broadband intentions.

H2. Self-efficacy will be positively related to broadband intentions.

H3. Habit strength will be positively related to broadband intentions.

H4. Observational learning will be positively related to broadband intentions.

H5. Enactive learning will be positively related to broadband intentions.

4.2. Contributions from the Model of Adoption of Technology in Households (MATH)

Brown and Venkatesh (2005) extended the concepts from the Theory of Panned Behavior (TPB, Ajzen, 1985, 1988, 1991) to