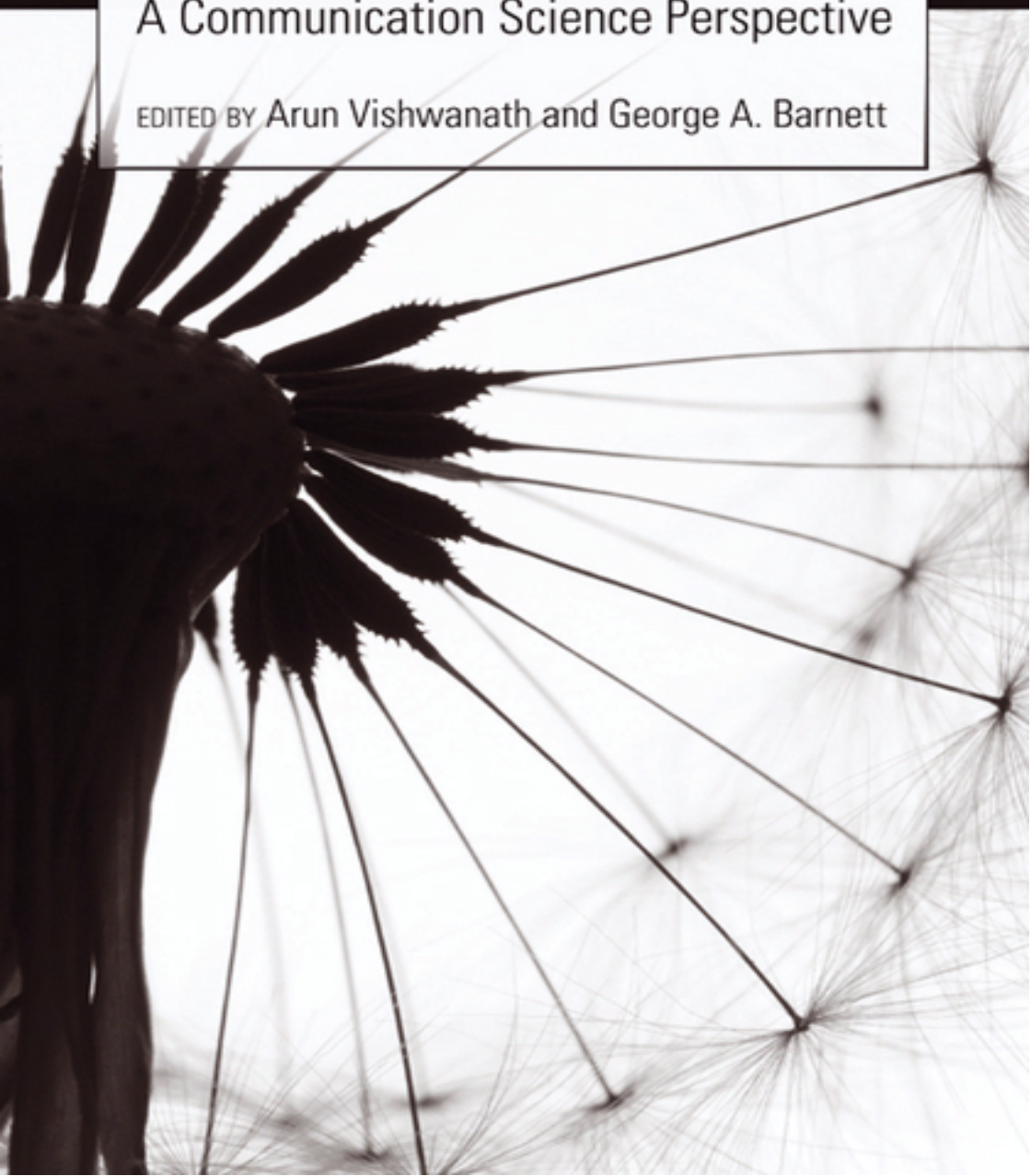# The Diffusion of Innovations

## A Communication Science Perspective

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# Introduction

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Everett Rogers's (2003) diffusion of innovation theory details the process by which a new innovation—a product, practice, or idea—diffuses through a social system. It is a middle-range theory (Merton, 1968), one that provides empirically derived and testable propositions about the generic diffusion process, its constituents, antecedents, and consequences, all of which can be easily adapted to advance the study of the diffusion of any innovation.

In diffusion theory, new innovations are thought to create uncertainty among individuals because the outcomes of adopting the innovation are unknown to its potential adopters. This uncertainty motivates individuals to seek subjective information about the innovation from near peers and others in their social network (Valente, 1994). A socially constructed meaning of the innovation emerges as individuals exchange information and converge on a shared understanding of the innovation (Barnett & Siegel, 1988; Fulk, 1993; Rogers & Kincaid, 1981). Hence, the process of information exchanged through communication is central to the diffusion of innovations.

In the last few years, diffusion scholarship has focused less on the process of diffusion and the processes that influence adoption and more on factors outside of communication, such as the attributes of the innovation, that influence adoption. Another important change is in the topic of study. Early research on

the dissemination of news, ideas, information, culture, networks, and health behavior is no longer the focus of diffusion research. Rather, the current focus is generally limited to the diffusion of new technologies. Another change has been in how communication scholars approach the study of adoption. Today's diffusion scholars draw heavily from the Management Information Science (MIS) perspective, utilizing MIS models such as the Technology Acceptance Model (Davis, Bagozzi & Warshaw, 1989), relying on a-priori measures and scales and focusing on the individual's likelihood to adopt the innovation. Moreover, diffusion research continues to focus on the likelihood of adoption of often a single innovation instead of technology clusters or competing innovations (Vishwanath & Chen, 2006). Finally, most research ignores the possibility of the rejection of innovations and discounts the dis-adoption process. In short, diffusion scholarship continues to suffer from a pro-innovation bias, an issue Rogers belabored for over two decades.

The pro-innovation bias is the implication that an innovation should be diffused and adopted by all members of society, that it should be diffused more rapidly, and that it should be neither re-invented nor rejected or its use discontinued (Rogers, 2003). Diffusion research has often been funded by government agencies or private corporations with a vested interest in successfully marketing their innovation in as short a time frame as possible either to maximize profits or to achieve policy objectives. Further, diffusion scholars recognize that innovations are reinvented, changed, and modified by users during the process of adoption or implementation. Rice and Rogers (1980) provide many examples of such reinventions of innovations. These changes and modifications take place because the meanings of innovations are negotiated by adopters through their interactions with the interpersonal and mass-mediated messages about the innovation. These messages result in a collective frame that emerges and influences the subsequent adopters of the innovation as well as their ultimate experience with the innovation (Vishwanath, 2009).

In his preface to the last edition of the *Diffusion of Innovations*, Rogers (2003) called for less of the same in diffusion research and a move away from simple models of explanation. The challenge for diffusion scholars, he noted, was to move beyond the proven methods and models of the past, recognize the limitation of prior approaches, and broaden the conceptions of the diffusion of innovations.

This book is an answer to that call. The book brings together some of the most noted scholars from the field of communication, many of whom directly or indirectly worked with Everett Rogers, and who have over the years con-

tributed to our broader understanding of the diffusion process.

In the first chapter Arun Vishwanath and Hao Chen critically examine the extant use of linear models to predict the intent to adopt a singular innovation using just a handful of predictor variables. In this chapter, the authors present a relational model of adoption that compares an adopter's relative choice among multiple innovations. The model is built on an associational framework of cognition, a concept that has been around since the time of Aristotle, where concepts are seen as related to each other through associative chains. The relational model is empirically tested using a metric multidimensional scaling system that is particularly well suited for such measurement. When compared with the traditional approaches, the relational model of choice provides the probabilities associated with the choice of an innovation from a basket of other innovations, along with the attributes that drive this choice. In doing so the model provides a much more comprehensive and accurate assessment of the innovation-decision process.

In the second chapter, Oscar Peters compares three generally accepted models in the field of communication science: the expectancy-value perspective on uses and gratifications, the social cognitive perspective on communication technology adoption, and the unified theory of acceptance and use of technology. The convergence between the three perspectives is examined in terms of how useful they are in their ability to explain adoption. The chapter argues that the choice of a model to understand a particular technology adoption behavior should be determined foremost by the stage of development and diffusion the particular technology is in.

In the third chapter, Veronika Karnowski, Thilo von Pape, and Werner Wirth examine the shortcomings in diffusion research, particularly its views of adopters and what they do with innovations. Their chapter responds to this shortcoming on several levels: by describing how mainstream diffusion theory, from its earliest days, has considered adoption from a binary perspective; by explaining the methodological and theoretical reasons for this approach; by showing how the phenomenon of re-invention has always challenged this view, even more so today with the increasing complexity of innovations; and finally by outlining approaches that may lead to a new and broader perspective on what users do with innovations in the course of the diffusion process.

In the fourth chapter, Lidwien van de Wijngaert and Harry Bouwman argue for the need to take a user perspective in diffusion research and study the interaction between the emergence of needs and the use of services along with the influence of time on this process. The authors provide a process model of

technology adoption and demonstrate an alternative research approach to test their model. The research approach draws from factorial surveys, policy capturing, and vignette studies on the idea of presenting individuals with hypothetical technology adoption and use situations. These scenarios, vignettes, or cases are developed by combining characteristics of different possible situations that vary in contextual, situational, and technical factors. Tracking user perceptions and potential reactions to different vignettes provides a richer, more detailed understanding of the user acceptance process.

In the fifth chapter, George Barnett challenges scholars who study the diffusion of innovation over time to move beyond the S-shaped curve. This traditional conceptualization of the diffusion process is an oversimplification and is based on a number of assumptions about the adopting population, the channels through which information is disseminated, and the characteristics of the innovation. The chapter reviews various mathematical models that have been used to describe the diffusion process and discusses the assumptions on which they are based. It then suggests alternative models that make different assumptions and which may provide better descriptions of the diffusion process such as what channels are used to diffuse the innovation and whether or not the use of the innovation is discontinued.

In the sixth chapter, James Danowski, Julia Gluesing, and Ken Riopelle also question the S-shaped diffusion curve that is a consequence of interpersonal discussions among adopters during the spread of an innovation. The chapter argues that with new media come a different set of assumptions about the key variables that grounded the old S-shaped curve. A new form of curve emerges, the convex curve, one shaped similarly to the trajectory of a rocket launched into low-earth orbit. This chapter presents the rationale underlying the revolution in diffusion theory wrought by new media technologies. The more slowly growing S-shaped curves still explain certain types of innovation diffusion, but they are increasingly relegated to a more circumscribed position in the theoretical space.

In the seventh chapter, Frank Tutzauer, Kyounghee Hazel Kwon, and Benjamine Elbirt demonstrate the utility of exploring social network effects on the diffusion of innovations using agent-based modeling (ABM). Because of the difficulty in collecting and tracking influence information from all pairs of individuals within large systems over time, social network research on diffusion that uses empirical data is often limited to cross-sectional studies of small-sized networks. ABM is an alternative to the empirical approach and allows researchers to simulate agents' behaviors and observe how these micro behav-

iors influence the system as a whole. Using ABM, the authors compare the influence of opinion leadership, structural equivalence, and time since latest adoption on the diffusion of two competing ideas within three different types of real-life social networks, a Facebook friendship network, an advice network, and a network of jazz bands.

In the eighth chapter, Carolyn Lin examines the phenomenon of media substitution and provides a theoretical foundation for a more accurate forecasting of the phenomenon. The chapter argues that the media substitution phenomenon is neither simple nor straightforward, as the phenomenon contains a content, technical, and social dimension. Fundamentally, the popularity of cotemporary entertainment and communication media technologies is now determined by how well the functions and applications of the technology can accommodate a user-centered design, where the user interfaces with the technology and the content it delivers needs to reflect strong user satisfaction in terms of technical usability and content usefulness. The technology that provides the best match between desirable media content and an efficient delivery modality in an economic manner will typically survive.

In the ninth chapter, Arvind Singhal presents an alternative conceptualization of diffusing innovations termed as the Positive Deviance (PD) approach. The PD approach expands the theoretical space of solutions for diffusing innovations by working with a different set of principles, questions, and mindsets, believing that often the wisdom to solve intractable social problems lies within the community. Diffusion in the PD approach is an inside-out process in contrast to the classical dominant framework of outside-in diffusion. The chapter describes the Positive Deviance approach, including its key tenets and principles, by analyzing its historical origins in Vietnam to combat endemic malnutrition. Through the experience of this pioneering real-life application of PD in Vietnam, and drawing upon dozens of other applications that have followed, the author argues for an alternative conceptualization of diffusion of innovations—one that turns upside-down our cherished conceptualizations of expert and outside change agents, the notion of filling knowledge-attitude-practice (KAP) gaps, and the traditional role of opinion leaders.

In the tenth chapter, James Dearing and Gary Meyer make a case for a user-centric understanding of personal agency or adopter activity during the diffusion process within the domain of translational research. They argue that adopters of innovations are by no means passive receivers of innovations. Rather, they are extremely active in testing, manipulating, and doing what it takes to negotiate and create an innovation that precisely addresses the require-

ments of a local problem. If the goal of successful diffusion is to heighten the utility of a given innovation and hence transform it from something that one will not adopt or use into something that suits a felt need well enough to cause both adoption and implementation, then understanding adopter activity is vital. The chapter therefore argues for a decentralized view of the diffusion process—one that accounts for the heterogeneity of adopter activity, influence, and choices throughout the process of diffusion.

In many ways, the chapters in this book expose what is missing in diffusion research and open new theoretical and methodological frontiers for research in diffusion. The book is a call to future diffusion scholars to rethink the fundamental assumptions of the theory and reconsider the limitations of present approaches. Future diffusion scholars are hence an audience for this book, as are marketers of ideas and products, communication and management consultants, policy makers, and individuals and organizations working on changing the status quo within social systems. The book is also an indispensible resource for anyone wishing to study the current trends in the study of the diffusion of innovations since the publication the fifth edition of Rogers's (2003) diffusion book. The book is therefore recommended as a supplementary text for upper-level undergraduate and graduate courses in communication, business and management, sociology, information science, and sociology.

In summary, each chapter advances our understanding of the diffusion process. Using approaches ranging from multidimensional scaling to agent-based modeling, each chapter critically examines the extant theoretical and methodological approaches and perspectives in diffusion research and presents compelling new ways to understand the process of diffusion. In doing so, each chapter expands the scope of diffusion theory and lays the groundwork for the next generation of scholarship in the field of communication.

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