Chapter 16

Media Adoption and Diffusion

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Users have lately been confronted with an increasing number of new media for both interpersonal and mass communication, namely in the context of the World Wide Web and mobile communication devices and services. To investigate why users choose a specific new medium for the first time, how these choices spread within a social system, and which choices follow in the course the implementation process, this chapter draws on *Diffusion of Innovations Theory.*

After an introductory overview of this approach's historical evolution, central elements of diffusion research are explained, and their strengths and drawbacks are discussed. The critique leads to three recent advances, namely 1) the integration of *Social Network Analysis* (*SNA*) to describe diffusion, 2) the complementation by social-psychological behavior theories on individual adoption decisions, and 3) the complementation by *Uses-and-Gratifications Approach* (*UGA*), *Cultural Studies* and *Sociology of Technology* as analytic responses to the discovery that users actively reinvent innovations. The following empirical overview gives insights into relevance and findings on the adoption and diffusion processes involving media choice. Finally, prospects on the approach's further development will be outlined.

Evolution of an Approach

The evolution of diffusion theory so far can be described in three partially overlapping stages:

1. arising from various sources from the end of the nineteenth century on until the 1960s,
2. consolidation into one comprehensive research tradition from the 1960s to the 1980s, and
3. theoretical and methodological deepening of specific elements also beginning in the 1960s, but still gaining momentum today.

Arising From Various Sources (1890–1960s)

Rogers (2003, pp. 44–45) lists nine independent origins of diffusion research, from anthropology (Wissler, 1914) and rural sociology (Ryan & Gross, 1943) to public health and medical sociology (Menzel & Katz, 1955), most of which originated between 1900 and 1950 (cf. Katz, Levin, & Hamilton, 1963). Two initiatives stand out among these equals.

The French sociologist Gabriel de Tarde (1843–1894) was the first to consider innovation as a general phenomenon over a wide spectrum of domains. Using data from public and economic statistics as well as observations ranging from Parisian street life to ancient art, Tarde (1962 [1890]; 1902) already evoked some of the phenomena constitutive of diffusion research up to today such as, for example, the role of opinion leaders and the S-shaped course of the diffusion curve. Also, he considered media as objects of diffusion, such as telegraphs, printing, and the Phoenician alphabet.

The agricultural sociologists Ryan and Gross (1943) largely shaped diffusion methodology with their study of the diffusion of hybrid corn among Iowa farmers (Rogers, 2003; Meyer, 2004; Lowery & deFleur, 1995). Meyer (2004, p. 59) resumes this methodology in five points: "1. quantitative data, 2. concerning a single innovation, 3. collected from adopters, 4. at a single point in time, 5. after widespread diffusion had already taken place."

A Comprehensive Research Tradition (1960s–1980s)

Everett Rogers (1931–2004) consolidated the diverse threads of diffusion theory in his seminal work *Diffusion of Innovations* (1962), giving an overview of more than 400 diffusion publications he found at the time. Rogers positioned his book with four subsequent editions (Rogers & Shoemaker, 1971; Rogers, 1983; 1995; 2003) not only as a "summary of past results," but also as a "research map for future studies" (Rogers & Shoemaker, 1971, p. 131). Thus, studies kept accumulating up to the number of 5,200 taken into account in the 2003 edition (Rogers, 2003, p. xviii). While media were considered primarily as channels for the communication of innovations (Rogers, 2003, p. 18), they also played a role as objects of diffusion. Studies have traced the diffusion of the Greek alphabet (Cook & Woodhead, 1959; McCarter, 1974; Warner, 1980), printing (Eisenstein, 1969), early radio technology (Lochte, 2000), the landline telephone (Fischer & Carroll, 1988), television (Brown, Malecki, Gross, Shrestha, & Semple, 1974; Loboda, 1974; Gurevitch & Loevy, 1972; Singhal, Doshi, Rogers, & Rahman, 1988), video cassette recorders (Ohashi, 2003; Ironmonger, Lloyd-Smith, & Soupourmas, 2000), and the fax machine (Straub, 1994; Weerahandi & Dalal, 1992; Holmlöv & Warneryd 1990). Also, specific media contents and formats have been the object of diffusion studies, such as telenovelas (Singhal, Rogers, & Brown, 1993).

The core assumptions of this "traditional diffusion theory" (Dearing & Meyer, 2006, p. 30) will be presented in the respective section below.

Deepening of Specific Elements (1960s to present)

From about the 1960s on, specific questions have been deepened through concepts from outside diffusion theory:

- Through which channels do innovations spread within interpersonal networks? This question was addressed by *Social Network Analysis* (*SNA*, Coleman, Katz, & Menzel, 1957, cf. Valente, 2006).
- Which factors determine the individual adoption decision? *Behavioral theories* from social psychology such as the *Theory of Reasoned Action* (*TRA*, cf. Fishbein & Ajzen, 1975), and the *Theory of Planned Behavior* (*TPB*, cf. Ajzen, 1985) have brought up models for this question.
- In which ways do users modify innovations in the course of their implementation? While the concept of *reinvention* (Rogers, 1983) is a first response to this question from within diffusion theory, various external approaches such as *Uses-and-Gratifications (UGA)*, *Cultural Studies* and *Sociology of Technology* have come up with further concepts.

Core Assumptions of Traditional Diffusion Theory

The classical theoretical corpus of *Diffusion of Innovations Theory* as it was laid down by Rogers can be considered as a bundle of elements containing hypotheses, heuristics and methods from two sources: One is the rather inductive generalization of existing approaches, and the other is the theoretical foundation of the Lasswell formula from communication theory (Lasswell 1948), which Rogers adapted as for structuring the findings.

Rogers describes his proceeding to generalize findings as a "meta- research," i.e. "the synthesis of empirical research results into more general conclusions at a theoretical level" (1983, p. 130). A maximum number of studies is revised in content analysis, focusing exclusively on the question of whether they have significant evidence to support specific generalizations, such as, for example, "Earlier adopters have higher social status than later adopters" (Rogers & Shoemaker, 1971, p. 357). As a result of this analysis, the 1971 edition of "Diffusion of Innovations" contains a "propositional inventory" of 103 generalizations in terms of bivariate correlations, listing for each generalization the number of studies supporting and not supporting it. A high number of empirical evidence combined with a high proportion of support permit us to judge this generalization as "valid" and eventually to consider it as a "principle" or even a "law" (Rogers & Shoemaker, 1971, p. 130).

In addition, Rogers and Shoemaker borrow from communication studies to structure their generalizations: They consider diffusion as a parallel to the

communication process as expressed in the Lasswell formula (1948) and the corresponding "SMCRE"—model (Source → Message → Channel → Receiver → Effect): The inventor replaces the "source," the innovation the "message," diffusion channels the "channels," the adopter the "receiver" and adoption the "effects" (Rogers & Shoemaker, 1971, p. 20).

Combining literature review and communication theory, Rogers proposes a definition of diffusion structuring the core elements of diffusion theory: "Diffusion is the process in which an *innovation* is communicated through certain *channels* over *time* among the members of *a social system*" (Rogers, 2003, p. 5). The central dependent variable to most diffusion studies is *time*, i.e. the rapidity in which an innovation is adopted. The *innovation*'s characteristics, the *communication channels* applied and the characteristics of potential *adopters*[1] as well as the overall *social system* are primarily considered as factors influencing the time passing until adoption.

Time

Rogers reflects on "time" both on an individual and on a system's level, applying two heuristics to describe the process on each level.

The evolution leading to individual adoption—the *innovation decision process*—is considered as a consecution of five stages: *knowledge* of an innovation's existence and of its characteristics, *persuasion* about the adoption decision, the *decision* to adopt or reject, *implementation* as the process of putting the innovation into use, and *confirmation* through reinforcement of the adoption decision or—in case of discontent—discontinuity (Rogers, 2003, pp. 168–218).

The *diffusion* of a successful innovation in a social system is a process which Rogers describes in terms of the number and the consecutive segments of adopters (Figure 16.1). For successful innovations, the number of adopters can be described in terms of a bell curve, with the cumulative number of adopters representing an S-shaped diffusion curve. Thus, Rogers (2003, p. 280) characterizes the evolution of adoption decisions as a series of individual adoption decisions determined by a normal distribution of the potential adopters' determining characteristics. On this basis, Rogers (2003, pp. 267–299) discriminates five categories of adopters, characterizing each one of them through one dominant general value: *innovators* (venturesome), *early adopters* (respectful), *early majority* (deliberate), *late majority* (skeptical), and *laggards* (traditional). The partition is made on a purely statistical basis, by marking standard deviations (sd) from the average time of adoption ($\bar{x}$) (Figure 16.1).

Rogers acknowledges that other factors may influence adoption decisions beyond what is modeled in the normal distribution—by making an innovation more observable, more usable through direct network effects (as is the case for telecommunications innovations; cf. Gurbaxani, 1990; Rice, Grant,

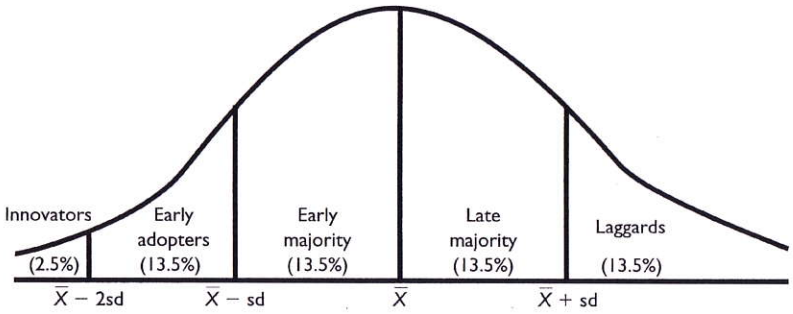

Figure 16.1 Adoption curve (Rogers, 2003, p. 281).

Schmitz, & Torobin, 1990; Allen, 1988) or more affordable through indirect network effects such as scaling effects permitting the producer to reduce the innovation's price (cf. Rogers, 2003, pp. 343–362; Mahler & Rogers, 1999). However, he does not present mathematical models for this dynamic.[2]

To identify factors influencing both the individual innovation decision process and the diffusion, Rogers (2003) proposes to analyze characteristics of the *innovation*, the *communication channels*, the *social system, and* the *adopters.*

Innovation

Five perceived attributes of innovations influence the rate of adoption: *relative advantage* compared to the status quo, *compatibility* with existing values, past experiences and needs, *trialability* as the degree to which the innovation can be tested without further engagement to use, *observability* and *complexity*, the latter having a negative influence on the adoption decision (Rogers, 2003, pp. 219–266).

Communication Channels

While mass media transmit awareness of the existence of an innovation, interpersonal communication is more relevant for the decision to adopt or reject it (Rogers, 2003, pp. 168–175). Corresponding to this generalization, Rogers also states that cosmopolite communication (interpersonal communication with others strange to the local network) rather influences the knowledge of an innovation while localite communication affects the decision itself (Rogers, 2003, pp. 207–208).

Adopter Attributes

The "innovativeness" is "the degree to which [a] unit of adoption is relatively earlier in adopting" (Rogers, 2003, p. 22). Thus, "early adopters" are, by definition, more innovative than "laggards." Rogers (2003, pp. 267–299) proposes 22 generalizations on social and personal characteristics correlating with innovativeness, such as a "high socioeconomic status" and a "more active and diverse communication behavior."

Social System

Finally, the social system as the context to adoption determines the paths of diffusion through its structure. A structural factor influencing diffusion is the degree of *homophily* within a social system, i.e. the tendency to communicate among actors with similar characteristics (cf. McCroskey, McCroskey, & Richmond, 2006): innovations are likely to spread within homophilous networks. Meanwhile, a certain degree of *heterophily* is necessary to permit innovations to enter into these networks: While people resembling each other usually don't offer each other anything new, contact with persons outside homophilous networks—also denoted as *weak ties* (Granovetter, 1973)—makes contact with innovation more likely. Overall, it is the socially more established *opinion leaders* who influence others on their adoption decision (Rogers, 2003, pp. 300–364).

The concepts outlined above make up a large part of traditional diffusion theory. Its current state can be summarized in the following words by Katz (1999, p. 147), indicating at the same time the need for further research: "I think that the best we can say about the state of diffusion theory today is that there is a more or less agreed paradigm—better, an accounting scheme—that allows for the classification of the wide variety of available case studies. True, there is the general S curve in the adoption of innovations and its more sophisticated elaborations; there is the general rule of trickle-down from higher to lower status; and there is the apparent need for reinforcement from peers prior to adoption. But the serious work of theorizing is still undone."

Critique and Recent Advances

Critique has addressed normative issues, theoretical and methodological issues and the very meta-theoretical approach with which Rogers has consolidated the diffusion tradition.

Normative Bias for Innovation and Diffusion

The normative critique is most emphasized by Rogers himself. He denounces a too optimistic view of innovations ("pro-innovation bias," Rogers, 2003,

pp. 106–118) throughout many studies. Rogers (2003, pp. 130–133) also reproaches that many studies neglect the risks of social divides. These biases may be due to the fact that diffusion studies are often realized on behalf of organizations trying to promote diffusion of "their" innovation.

Theoretical and Methodological Stagnation

Moreover, critics denounce that "the number of diffusion studies continues at a high rate while the growth of appropriate theory is at an apparent standstill" (Katz, 1999, p. 145). Rogers himself notes in the preface of his standard work's last edition (2003, p. xxi): "we do not need more-of-the-same diffusion research." Specifically, the low degree of elaboration of diffusion theory's generalizations is criticized, which are almost completely restricted to two-variable correlations and omit considering interrelations and moderating effects between variables (Schmidt, 1976).

As a further symptom of stagnation, Meyer (2004) diagnoses that the methods are still confined to what Ryan and Gross had done in 1943. Also, the degree of standardization is very low. A lack of established scales for such constructs as "observability"—as an innovation attribute—or "social status"—as an adopter's characteristic—thus prevents comparison of different studies' outcomes. Meyer (2004, p. 69) resumes: "One cannot help but wonder whether the research questions asked over time have limited the methods selected, or rather if the methods established early on have restricted the research questions asked." The origin of both shortcomings may lie on a deeper level in the very epistemological proceeding which Rogers had chosen to integrate the various approaches into one comprehensive diffusion theory.

Inductive Epistemology

Rogers describes his proceeding to review a maximum number of studies in order to gain generalizations about innovation as a whole as "meta-research" (Rogers & Shoemaker, 1971). This approach has been contested for both the way data are accumulated and the interpretation of these accumulations.

Rogers collects evidence by a simple "vote taking" (Glass, 1976, p. 6) among existing findings, i.e. counting how many studies show significant support for a certain assertion and how many do not. This may be biased because neither sample size nor the size of effects nor the actual operationalization of constructs are considered in this method (Glass, 1976; Downs & Mohr, 1976). Also the *publication bias*—i.e., a tendency to prefer publications with significant outcomes in submission and acceptance—may cause an overestimation of hypotheses' confirmations. In sum, you cannot tell if a certain quota of confirmation is due to variance in respect to the theoretical generalization or in respect to differences between studies in operationalization, sample size or other methodological artifacts (Downs & Mohr, 1976).

Moreover, Rogers interprets the number and proportion of confirmative findings as indicators for a theoretical assumption's degree of "validity," insisting that 70 percent confirmation represents satisfactory validity (Rogers, 19831, p. 132). From a critical rationalist point of view, such an interpretation is problematic: If studies show that a general assumption does not account for all innovations, this assumption cannot be held up at all, but needs to be revised, confined in its range, or replaced by alternative assumptions. Attributing this importance to falsification of hypotheses would—according to Popper (1975)—have furthered the diffusion paradigm's evolution both theoretically and methodologically. As the following sections show, such an evolution seems to be on the way today due to the integration of new elements from outside diffusion theory.

Recent Theoretical and Methodological Advances in the Approach

As conceptual advances in diffusion theory, the integration of elements from social-psychological theories of behavior and from *SNA* will be presented, as well as the discovery of reinvention and potential approaches to enhance research on this phenomenon.

Social Network Analysis (SNA)

The concept of social networks was latent in the very first diffusion studies, insisting on the interpersonal influence between adopters (Ryan & Gross, 1943), but was only explicated and differentiated as *SNA* matured. Valente (2006) describes the evolution in four steps: First, interpersonal influence was discovered as an important factor influencing the adoption decision, notably by Coleman, Katz, and Menzel (1957) in their groundbreaking study on the diffusion of innovations among physicians. As a second step, structural models were integrated during the 1970s, permitting researchers to determine which channels transmit innovations in a network, and affirming the role of opinion leaders, but also the importance of weak ties as bridges for innovation (Granovetter, 1973). These efforts were soon appreciated by Rogers (Rogers and Kincaid, 1981) and accounted for in traditional diffusion research (Rogers, 1983). The third step is marked by a focus on critical points in the diffusion process such as the take-off of an innovation, when it has been adopted by a critical mass of members of a social system (Markus, 1987, cf. Schelling, 1978, Mahler & Rogers, 1999) or simply reached a threshold value within the personal network of a specific adopter (Valente, 1996). As a fourth step, the dynamic evolution of diffusion within networks is analyzed over time through event history analysis (Marsden & Podolny, 1990). This approach enables consideration of the specific distribution of influential actors and of those susceptible to adopt a behavior at any given point in time (Myers, 2000).

In general, the major contribution of *SNA* to diffusion theory is that this framework offers an extremely sharp set of empirical and analytical instruments permitting to differentiate, measure and predict interpersonal influence in the diffusion process.

Social-psychological Theories of Behavior

To better describe individual adoption decisions from a potential user's point of view, diffusion theory has been complemented by behavioral theories considering beliefs and evaluations towards adoption. While *TRA* by Fishbein and Ajzen (1975) was the first approach applying this concept to explain behavior, most empirical studies today rely on the enhanced *TPB* (Ajzen, 1985), presented in detail in Hartmann (this volume). Other related concepts are the *Technology Acceptance Model* (*TAM*, Davis, 1989) and, as the latest, the *Unified Theory of Adoption and Use of Technology* (*UTAUT*, Venkatesh, Morris, Davis, & Davis, 2003). These approaches have also explicitly integrated elements from *Diffusion of Innovations* theory, especially innovation attributes (Moore & Benbasat, 1991; Venkatesh, Morris, Davis, & Davis, 2003).

Thus came studies on the adoption and diffusion of home computers (Dickerson & Gentry, 1983; Davis, Bagozzi, & Warshaw, 1989; Lin, 1998; Dutton, Rogers, & Suk-Ho, 1987; Moore & Benbasat, 1991; 1996), videotext (Mayer, 1998; Bolton, 1981), e-mail (Gefen & Straub, 1997; Straub, 1994; Dimmick, Kline, & Stafford, 2000), the Internet with its different services such as e-learning (Lu, Liu, Yuan, & Liao, 2005), e-commerce (Pavlou & Chai, 2002) and instant messaging (Strader, Ramaswani, Sridhar, & Houle, 2007), mobile telephones and handheld devices (Ling, 1999, 2000; Schenk, Dahm, & Sonje, 1997; Leung & Wei, 1999; Davis & Venkatesh, 1996; Kshetri & Cheung, 2002; Sarker & Wells, 2003) and the different services accessible through these devices (Pedersen, Nysveen, & Thorbjornsen, 2002; Hung, Ku, & Chan, 2003).

These studies' contribution to diffusion theory is twofold: They have brought elaborated models on the causes of adoption, allowing differentiation between factors, and interrelations beyond simple two-variable-generalizations to be empirically identified. They have also led to standardization of empirical instruments, permitting competition and evolution of models.

Cultural Studies, Uses-and-gratifications, Sociology of Technology

A third element of diffusion theory that has been deepened recently is the question of how innovations are being actively implemented. Evidence has shown that users do not simply adopt innovations, but often reinvent them in the course of their implementation (Charters & Pellegrin, 1972; cf. Rice & Rogers, 1980). Rogers (1983) has only partially responded to this evidence by underlining that communication of innovations is not a one-way process, by conceding that innovations can be reinvented by users in the course of their implementation, and by including four generalizations on reinvention. However, the large majority of generalizations remain focused on the binary adoption decision and a linear diffusion process. Thus, diffusion theory is still bound to the linear logic of the Lasswell formula with a relatively clear allocation of roles between a limited number of very active people who design innovations, and the large majority whose role is to take the binary adoption decision later (Dearing & Meyer, 2006).

Meanwhile, both cultural studies and mass communication theory have replaced this communication model by evoking the more creative activities of media users in "decoding" (Hall 1980) and seeking gratifications (Katz, Blumler, & Gurevitch, 1973).

In *Cultural Studies*, Silverstone established the *Domestication* approach, analyzing how users "tame" the "wild" communication technology in their everyday life (Silverstone & Haddon, 1996). This approach has since been applied to a number of media such as personal computers (Lehtonen, 2003; Venkatesh, 2001), Internet (Bakardjieva, 2005), mobile telephones (Haddon, 2003; Lehtonen, 2003), and "video on demand" (Ling, Nilsen, & Granhaug, 1999) (for an overview, see Berker, Harmann, Punie, & Ward, 2006).

The analysis of new media uses has also led to a "revival" of *UGA* (Ruggiero 2000, p. 20). Coming from innovations in television such as the remote control (Walker & Bellamy, 1991), cable TV (Atkin, 1993; Heeter & Greenberg, 1985; Jacobs, 1995), video recorders (Lin, 1993) and video text (Cowles, 1989), the approach was extended to personal computers (Perse & Dunn, 1998), computer games (Sherry, Lucas, Greenberg, & Lachlan, 2006), electronic bulletin boards (James, Wotring, & Forrest, 1995), websites (Eighmey & McCord, 1998), e-mail (Dimmick, Kline, & Stafford, 2000) and chat (Leung, 2001) as well as mobile telephones, personal digital assistants (Trepte, Ranné, & Becker, 2003; Peters & ben Allouch, 2005), mp3 players (Ferguson, Greer, & Reardon, 2007) and mobile multimedia applications (Wei, 2008).

Other approaches mainly from the *Sociology of Technology* describe how innovations are "framed" (Goffman, 1974; Taylor & Harper, 2003; Ling, 2004), "socially constructed" (Pinch & Bijker, 1984) or "socially shaped" (MacKenzie & Wajman, 1985).

These perspectives have contributed to the understanding that the adoption of a new medium is not a single decision to use a clearly defined object but rather a process of consecutive choices concerning the meaning and the functions attributed to an innovation by users—which may change the very face of the innovation in the course of the diffusion process (Wirth, von Pape, & Karnowski, 2008). This idea can be traced back to Tarde (1962,

1902), who describes the diffusion of innovations as a radiance of waves which may interfere and refract when entering different users' "lifeworlds" and thus change the innovations' character.

Conclusion and Future Directions

Diffusion of Innovations Theory is today a well established research perspective offering a large spectrum of heuristics and generalizations to understand and predict the choice to first use a new medium. Although centennial in age, it is undergoing major theoretical and methodological evolutions. These are driven by influences from *SNA*—as the complementary approach most considered within *Diffusion of Innovations Theory* so far—but also from social psychological behavior theories, *Cultural Studies*, *Uses-and-Gratifications* and *Sociology of Technology*.

Whether the choice to use a specific medium can be sufficiently explained by traditional diffusion theory or only with the additional support of one of the advances outlined above, depends largely on the medium in question. This can be illustrated by one concluding example: Apple's "iPhone" is on first sight a very clearly defined innovation, materialized in a specific artifact which is distributed in a linear way from licensed agents to consumers—a process clearly accounted for in the producer's sales figures. In this case, traditional diffusion theory holds many helpful concepts in store. For example, a high rate of adoption can be explained by the product's relatively low complexity and its high observability as a status symbol (Rogers, 2003, p. 266). Further, the fact that Apple cut prices by 33 percent after only six weeks on the market seems like a logical move to keep the innovation affordable as the adoption curve moves onwards from the innovators to less pecunious segments—just as described by classical diffusion theory (Rogers, 2003, p. 298). In terms of diffusion, this move also gave momentum to the technology, which is important in order to achieve network effects critical to this innovation (cf. Markus, 1987). However, both the individual users' preferences and the network effects can only roughly be considered on the basis of diffusion theory's bivariate generalizations, while behavioral theory and *SNA* permit considering these factors in much more detail: Studies on the diffusion of software and mobile Internet services show that different innovation attributes are salient for different adopters (Venkatesh, Morris, Davis, & Davis 2003; Hsu, Lu, & Hsu 2007). *SNA* shows that network effects occur—for some innovations—rather in the immediate personal network than in the overall social system (Valente, 1996), and it helps identify centrally positioned actors who influence diffusion within their networks (Valente & Davis, 1999).

Finally, when looking beyond the simple media devices, the question of what consumers do with them becomes more relevant: Apple gains not only through selling stylish devices, but also through various services available from these devices ranging from entertainment to Internet and telephony

(Fraser, 2007). The question thus becomes critical which services adopters will choose to use in the course of implementation. Also, Apple proposes a developer kit with which technologically sophisticated users can themselves create new services. Finally, hackers are busy developing entirely new applications undesired by the producer (e.g. bypassing commitments to providers). But which services will users—legally or illegally—develop and institutionalize? To respond to these questions, the formerly clear line between developers and users, conception and implementation needs to be lifted.

Potential users will always be confronted with media innovations of varying dynamic and complexity. Consequently, diffusion theory needs to propose a comprehensive toolkit from which researchers can pick the instruments which best apply to the adoption and implementation choices in question. To provide this option, two integrative steps seem necessary for the progress of diffusion research:

- Integration of *TPB* and *SNA* to describe diffusion: It seems evident that social norms, which play a determining role in *TPB*, are distributed along specific network structures that could be analyzed via *SNA*. On the other hand, individual actors' perspectives may permit us to understand factors critical to *SNA* such as individual adoption thresholds, which are arguably related to factors such as "attitude" and "subjective norm."
- Integration of approaches on implementation. This demands that we question the linear structure of diffusion and adoption processes, and emphasizes the users' creative contribution to the construction of innovations (Meyer, 2004). Here, *UGA*, Cultural Studies and Sociology of Technology are promising approaches (Wirth et al., in press).

Notes

1. While Rogers considers adopter characteristics as a part of the element "time," we will treat them independently here, to underline that they are a factor potentially influencing "time," as are "innovation," "the social system," and "communication"; (see also Katz et al., 1963, who discriminate between seven elements).
2. The most popular and most comprehensive alternative is the "Bass"-curve, comprising in its function both a logistic model and an exponential model of diffusion and any combination of both (Bass, 1969, for an overview, see Meade & Islam, 2006).

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