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# 3

# Innovation Diffusion: Implications for Evaluation

*Shena R. Ashley*

**Abstract**

*Whether looking at the spread and adoption of an intervention across a community, across multiple units, or within a single unit, an understanding of diffusion theory can help evaluators uncover patterns and impacts that might otherwise be overlooked. The theory alerts evaluators to examine why uptake of an intervention appeared different in different sites, according to the characteristics of the people involved, the social systems involved (for example, neighborhoods, states, or organizations), or the communications channels used. Insights might explain intervention intensity across sites and consequent differential effects. It also yields useful information to assist with subsequent replication of the intervention by practitioners and policymakers.* © Wiley Periodicals, Inc., and the American Evaluation Association.

Diffusion theory can be value-added to evaluators. An understanding of the diffusion process can deepen and broaden the scope of an evaluation to reveal the factors determining the adoption of an intervention, the patterns underlying the spread of an intervention, and the determinants influencing the adaptation of an intervention to a local context. This broadened perspective has the potential to influence the evaluation process and the ultimate determination of the merit or worth of an

intervention. This is especially true when specific groups within the target population selectively adopt the intervention. An example is a poverty alleviation program that is mainly adopted by the transient poor rather than the long-term poor. Such selective uptake may render different conclusions about the program's success.

The diffusion process is not an unfamiliar concept in the evaluation field. In numerous cases, evaluators have used diffusion theory to guide the formulation of research questions and the design of measurement instruments (Guba, 1967; Bozeman, 1988). Pankratz, Hallfors, and Cho (2002) applied diffusion theory in the evaluation of the U.S. Department of Education's principle of effectiveness by school districts. Hubbard, Huang, and Mulvey (2003) used diffusion theory to evaluate the spread of treatment improvement protocols throughout the substance abuse treatment system. In each case, the theory drew attention to how attributes of the intervention and factors in the environment influenced intervention effects.

For the evaluator, the diffusion process provides a unique set of focal points for an understanding of change. The components of the diffusion process are described in this chapter with particular attention to the applicability of the process to evaluation practice.

## The Diffusion Process: Defined and Dissected

Since Ryan and Gross's hybrid corn study in 1943, the diffusion process has been the focus of scholarly research in a wide range of disciplines, including agriculture, sociology, psychology, communications, anthropology, marketing, epidemiology, systems analysis, public policy, education, public health, geography, economics, and organization science (Wolfe, 1994). The result is tens of thousands of articles on the topic (Nutley, Davies, & Walter, 2002) and a complex model of change that explains and predicts the spread of innovations.

Like other theories of change processes (knowledge utilization, transfer, implementation, and knowledge translation), diffusion draws from a wide range of fields. Unlike these theories, however, it has had both a synthesizer and a champion to meld the ideas into a coherent, evolving, and sustainable model. Everett Rogers played this central role in diffusion theory, which resulted in his seminal text, now in its fifth edition, *Diffusion of Innovations* (2003). While other diffusion models exist (Mahajan & Peterson, 1985), the dominance and comprehensiveness of Roger's efforts legitimate using his work as a basis for understanding and critiquing diffusion theory as applied to evaluation.

Diffusion is defined as "the process by which an *innovation* is *communicated* through certain *channels* over *time* among the members of a *social system*" (Rogers, 2003, p. 7). This is the standard definition of diffusion in the field (Tornatzky & Fleischer, 1990). Diffusion is a model of change that focuses on individual decision making, although it has been applied to organizations. Simply

stated, diffusion is concerned with the spread and adoption (or rejection) of products, practices, programs, policies, or ideas. The key lever of change in the diffusion process is the adoption of an innovation. The major components of the diffusion process are the innovation, the social system through which the innovation moves, the communication channels of that system, the time it takes for an innovation to spread through the social system, and the adoption of the innovation by the intended recipients. Each component is described next with particular focus on its relevance and implications for evaluation practice.

**The Innovation.** The innovation (or *intervention* in evaluation terminology) is central to the diffusion process. As defined in diffusion theory, innovation is a slight variant of the general concept of innovation. In general, an innovation is any new idea, method, or object. In diffusion theory, an innovation is "an idea, practice, or object *perceived as new* by an individual or other unit of adoption" (Rogers, 2003, p. 43). The focus on the perception of newness in diffusion theory signifies the relevance of the diffusion process not only when an idea, practice, or object moves from invention to first use, but also in the movement of that idea, practice, or object through different contexts over time. For example, a middle school reform with a long history of practice would be an innovation to the school district considering adopting it for the first time.

Adaptability is a quality of the innovation that differentiates diffusion theory from other theories of change processes. In early diffusion studies, adoption was recognized only as the exact replication of an innovation. That was later changed. The current accepted wisdom is that an innovation that has been changed or modified can still be recognized as having been adopted (Charters & Pellegrin, 1972). Describing the importance of allowing adaptation in the diffusion process, Rogers (2003, p. 115) states, "We should remember that an innovation is not necessarily invariant and adopting an innovation is not necessarily a passive role of just implementing a standard template of the new idea." Diffusion theory anticipates modifications to interventions and purports that adaptability of the intervention to fit the context is critical to its adoption and maintenance over time. In evaluation, adaptability makes valuing challenging, especially when fidelity to the program model is a priority.

In addition to adaptability, the perceived characteristics of an innovation can influence adoption. Diffusion theory highlights five innovation characteristics that determine whether an innovation is appealing to the potential adopter (Rogers, 2003):

- *Relative advantage* is the extent to which the innovation is perceived to have significant advantages over current alternatives. Adoption is more prevalent when the innovation is considered superior to current practice.
- *Compatibility* refers to the degree to which the innovation is seen as being consistent with past practices, current values, and existing needs. Innovations that fit within the current context are more likely to be adopted.

- *Complexity* expresses the level at which the innovation can be readily understood and implemented. The more complex the innovation is, the less likely it is to be adopted.
- *Trialability* refers to the extent to which portions of the innovation can be tried out before full adoption. This allows potential adopters to have early exposure to the innovation and increases the likelihood of adoption.
- *Observability* of the innovation is the degree to which its use and benefits are visible to others. Adoption is more prevalent when the benefits of adoption are exposed.

Diffusion theory's focus on understanding the innovation is consistent with the component of the Shadish, Cook, and Leviton (1991) framework that calls for a thorough understanding of the evaluand. Diffusion theory emphasizes the important role of understanding the evaluand since characteristics of the evaluand can have a direct impact on its adoption. The five characteristics of innovations in diffusion theory can be helpful to evaluators who are looking to understand the selective uptake of an intervention. Furthermore, an evaluation of the diffusion of a program, product, or idea should be aware that the evaluand may have been adapted to fit the local context when adopted and a strict focus on fidelity to the original model may limit the scope of adopting units.

**Social System.** The social system is the contextual space within which the innovation is diffused—for example, organizations, neighborhoods, and states. Within the social system are individual, institutional, political, and environmental factors that determine how and if an innovation reaches its intended audience (Damanpour, 1991; Kimberly & Evanisko, 1981; Tornatzky & Fleischer, 1990). Factors highlighted in diffusion theory include prior conditions, characteristics of the adopter, and the influence of change agents and opinion leaders in promoting the innovation (Wolfe, 1994). Prior conditions of adopters include previous practice, the felt needs or problems experienced by the potential adopter, the potential adopter's level of innovativeness, and the norms of the social system in which the potential adopter is embedded. When the potential adopter is an individual, the characteristics that influence adoption include socioeconomic characteristics, especially the ability to afford an innovation, personality variables, and the individual's communication behavior (Brown, 1981). When the adopting unit is an organization, structural characteristics tend to influence the adoption process. Structural characteristics of the organization that affect the rate of adoption include the degree to which power and control in an organization are concentrated in the hands of a few individuals, the availability of persons in the organization with a high degree of knowledge and expertise, the degree to which an organization stresses following rules and procedures, the interconnectedness of the organization in a social system, and the availability of slack resources to invest in the innovation (Mohr, 1969; Moch & Morse, 1977; Kimberly & Evanisko, 1981; Abrahamson, 1991).

In addition to the influence of prior and current conditions, intermediaries can influence adoption. Diffusion theory emphasizes two types of intermediaries: the change agent and the opinion leader. The change agent creates or enhances demand for an innovation by reducing barriers and convincing potential adopters that the innovation is a sufficient fit. In this role, the change agent serves as the bridge between the technical experts or group that created the innovation and the target audience. Opinion leaders are early adopters of an innovation who, by their own adoption, improve the likelihood of adoption among their peers and work in the process to persuade the middle and late adopters of an innovation. Identification of the conditions of the intended adopters, the broader contextual factors, and the role of intermediaries can direct the evaluator to the types of variables that shape the adoption of the intervention (Gray & Scheirer, 1988). This type of analysis is consistent with the systems approach to evaluation (Cabrera & Trochim, 2006).

**Communication Channel.** The communication channel refers to the process by which messages move from one individual to another. Drawing heavily on communications theory, diffusion theory highlights mass media channels and interpersonal networks as effective types of communication channels (Brown, 1968). The process of diffusion is complex, sequential, and interactive (Van de Ven, Polley, Garud, & Venkatarum, 1999). In general, an innovation enters a social setting from an external source; it is then spread throughout that setting by interpersonal contact networks and either adopted or rejected by the target population (Wejnert, 2002). Interpersonal networks facilitate exposure to the innovation. Early perceptions of the innovation, shared within an interpersonal network, can influence whether an innovation is adopted (Valente, 1995). Diffusion theory draws the evaluator's attention to network effects and their potential impact on intervention adoption. The theory also proposes an examination of the media used to communicate the intervention since media design can also influence adoption (Brink et al., 1995).

**Time.** Time is central to the diffusion process. According to diffusion theory, immediate take-up of a program is not to be expected. Rogers (2003) theorized that the rate of adoption of innovations would spread in the shape of an S curve as the cumulative number of adopters increases over time. This S-shaped pattern has been confirmed in studies across a variety of innovations (Damanpour, 1991; Wright & Charlett, 1995; Backer & Rogers, 1998; Scheirer, 1990). The shape of the curve is significant; it holds that a small set of the intended audience will adopt early in the diffusion process and that adoption will continue at a faster pace as more individuals are exposed to the innovation until the saturation point is met.

Diffusion theory also classifies adopters according to the time of adoption. The five categories, with the proportion estimated to fall into each category, are innovators (2.5%), early adopters (the next 13.5%), early majority (34%), late majority (34%), and laggards (16%) (Mahajan & Peterson, 1985; Nutley et al., 2002; Rogers, 2003). This has direct implications for the

timing of an evaluation. An evaluation of an intervention in its early stages of adoption might yield different results than an evaluation that includes both early and late adopters. Individuals adopting early are more likely to be social leaders, educated, and connected to an expansive network compared to individuals who adopt at later stages, tend to be more skeptical, have a lower socioeconomic status, and have a smaller network. To assess the appropriate time to evaluate a program, an evaluator might examine the diversity of adopters prior to conducting the evaluation. Diversity of adopters is an indicator of a highly developed diffusion process.

**Adoption.** Change in the diffusion process occurs through the adoption of an innovation. Diffusion theory anticipates different responses to the innovation. Some people adopt an idea or practice right away, some wait to see how successful it is before deciding to adopt, and others never adopt the innovation at all. Those who adopt the innovation might also adapt the intervention to fit their context, such that the innovation might not look the same from one place to the next.

Diffusion theory focuses on adoption as a process. It holds that each individual passes through a five-stage process when deciding whether to adopt an innovation (Davies, 1979; Brown, 1981; Rogers, 2003). First stage is the knowledge stage, when the individual or organization is first exposed to the innovation's existence. Next is the persuasion stage, when the individual or organization forms a favorable or unfavorable attitude toward the innovation. The third stage is about making the decision to adopt or reject the innovation. The fourth stage is implementation: the individual or organization puts the adopted innovation to use. And the final stage is confirmation, where the individual or organization seeks reinforcement for the decision made and may reverse the decision if exposed to conflicted messages about the innovation.

This stage model is similar to the transtheoretical model of change (Prochaska & Velicer, 1997) made popular in health behavior research. The stages in the diffusion process highlight for the evaluator the decision-making process that individuals experience when adopting an innovation. The distinction between the implementation and confirmation stages is especially important in the evaluation context, since judgments of success that end at implementation could overstate the level of adoption given that individuals may reverse their adoption decision during confirmation.

## Distinguishing Diffusion From Dissemination

*Dissemination* and *diffusion* are terms often used synonymously in the evaluation literature, although there are no agreed-on boundaries for delineating the two concepts. Greenhalgh, Robert, MacFarlane, Bate, and Kyriakidou (2004) distinguish between diffusion and dissemination based on the level of intention behind the spread. They suggest that diffusion refers to passive spread, while dissemination is relevant to active and planned efforts to persuade target groups to adopt an innovation. This distinction is not supported

by the diffusion literature, which recognizes planned efforts to spread innovations as part of the diffusion process and identifies the change agents and opinion leaders as individuals in the process responsible for persuasion toward adoption (Brown, 1981; Rogers, 2003).

Graham and others (2006) offer another perspective on the distinctions between diffusion and dissemination—one where the focus is the type of innovation being spread as the delineating factor. They consider diffusion to be a broad category representing the spread of a range of innovations; however, when that innovation is knowledge or research, the spread process for them becomes dissemination.

An alternative view proposed here is that the distinction between diffusion and dissemination be based on the continuum from distribution to receipt. Dissemination is conceptually preoccupied with the process of sending out innovations; by contrast, diffusion begins with the initial sending out of innovations and then continues to examine the spread and adoption of the innovation.

In evaluation literature, the term *dissemination* is often used when fidelity is important. Dissemination is prevalent in the literature regarding the spread of evidence-based interventions from the testing space to the public space (Langberg & Smith, 2006). The issue of fidelity to the original design is of primary concern in this setting (Henggeler, Melton, Brondino, Scherer, & Hanley, 1997), which might explain the focus on the term *dissemination* rather than diffusion. Evaluators might look to dissemination instead of diffusion theory when the evaluation context requires fidelity throughout the spreading process.

**Summary of Implications for Evaluation.** For the evaluator, the components of the diffusion process—the innovation, social system, communication channel, time, and adoption—provide focal points for an understanding of change. The focus of the evaluation is not only an idea or object, but also one that is perceived as an innovation. Newness counts as a value. The innovativeness is determined by a social system, which means that context shapes innovation value. Fundamental to the theory is that the diffusion of an innovation takes place over an extended period of time. Characteristics of time, especially speed, shape value from a diffusion perspective. The message most clearly relevant from diffusion theory to the evaluator is that selective uptake is inevitable. The theory challenges the evaluator to explore factors associated with selectivity and suggests a set of factors to explore: the nature of the intervention itself, the interpersonal communication networks, the media used in communication of the intervention, and the social, cultural, and institutional factors that impact adoption. Evaluators might use these questions when applying perspectives from diffusion theory in evaluation:

1. Who are the opinion leaders among the intended audience, and what role do they play in diffusing the intervention?
2. How are the actors in the social system interconnected?

3. Which communication channels were most effective at different times in the diffusion process or with different categories of potential adopters?
4. What were the attributes of the intervention that facilitated or impeded adoption?
5. In what ways do the adopters of the innovation differ from the non-adopters?
6. What contextual factors contributed to adoption of the intervention?
7. Were potential adopters given enough time to process their decision to adopt the intervention?

## Methods Used in Tracing Diffusion

In the diffusion literature, methods for understanding and tracing the spread of innovations include surveys, experiments, network analysis, and episodic communication channels in organization (ECCO) analysis. Of these methods, evaluators may be least familiar with ECCO analysis. ECCO analysis is a technique for mapping exchange relationships where questionnaires are used that ask respondents to indicate whether they have been informed about a message, the source of their information, and the channel through which they heard it (Downs & Adrian, 2004). Logistic regression is often used in diffusion studies to analyze the factors associated with the variations in the adoption of innovations (Kimberly & Evanisko, 1981).

### Case Study Application: Evaluating the Gatehouse Project With a Diffusion Lens

The Gatehouse Project was a successful multilevel, school-based intervention aimed at promoting the emotional well-being of young people by increasing students' connectedness to school (Patton et al., 2000, 2006; Patton, Bond, Butler, & Glover, 2003).

The intervention included a curriculum component focused on increasing students' skills and knowledge for dealing with everyday life challenges and a whole-school component that sought to make changes to the schools' social and learning environment to enhance security, communication, and positive regard through valued participation. A member of the research team facilitated the project implementation process. Key elements were the establishment of a school-based health action team, the use of local data to review the school environment and drive change, targeted professional development, and opportunities for reflective practice (Glover & Butler, 2004; Patton et al., 2003; Patton et al., 2006). This process resulted in schools' identifying and implementing activities and strategies appropriate to their local context; thus, what was done varied from school to school.

A diffusion perspective could help an evaluator understand the factors associated with the varied uptake of strategies by the different schools. These might be factors associated with the intervention itself, the adopting individuals, communication effects, and contextual effects. To describe the spread and distribution of the intervention strategies, the evaluator would first have to compile a list of the intervention elements he or she wished to trace, such as adherence to and delivery of all curriculum recommendations, adoption of policies to welcome new students, or new activities to connect parents with the school. A survey tool could then be used to trace the uptake and distribution of these elements across time and across sites quantitatively (and prospectively if possible). A series of qualitative interviews could then be conducted to help explain the spread. This would be an opportunity to explore, for example, whether the presence of prior existing programs made it easier for some sites to develop Gatehouse activities faster than others or whether high teacher turnover in some sites mitigated against sustained activities. These data would be important not simply for illuminating the intensity of effects in the Gatehouse trial; they would help others who are seeking to replicate the project elsewhere to appreciate adjustment to context.

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*SHENA R. ASHLEY is an assistant professor in the Maxwell School of Citizenship and Public Affairs at Syracuse University.*