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Applying Diffusion of Innovation Theory to Intervention Development

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Abstract

Few social science theories have a history of conceptual and empirical study as long as does the diffusion of innovations. The robustness of this theory derives from the many disciplines and fields of study in which diffusion has been studied, from the international richness of these studies, and from the variety of new ideas, practices, programs, and technologies that have been the objects of diffusion research. Early theorizing from the beginning of the 20th century was gradually displaced by post hoc empirical research that described and explained diffusion processes. By the 1950s, diffusion researchers had begun to apply the collective knowledge learned about naturalistic diffusion in tests of process interventions to affect the spread of innovations. Now, this purposive objective has given form to a science of dissemination in which evidence-based practices are designed a priori not just to result in internal validity but to increase the likelihood that external validity and diffusion both are more likely to result. Here, I review diffusion theory and focus on seven concepts—intervention attributes, intervention clusters, demonstration projects, societal sectors, reinforcing contextual conditions, opinion leadership, and intervention adaptation—with potential for accelerating the spread of evidence-based practices, programs, and policies in the field of social work.

Keywords

diffusion of innovations; dissemination; translational research; implementation

Diffusion really includes three fairly distinct processes: Presentation of the new culture element or elements to the society, acceptance by the society, and the integration of the accepted element or elements into the preexisting culture.

- Ralph Linton, 1936, p. 334.

Diffusion is a natural social phenomenon that happens with or without any particular theory to explain it. In fact, whether the innovation involves a new idea, new pattern of behavior, or a new technology, it is also a natural physical phenomenon as well, one that describes the spread of an object in space and time.

- D. Lawrence Kincaid, 2004, p. 38.

Diffusion theory does not lead to the conclusion that one must wait for the diffusion of a new product or practice to reach the poorest people In fact, one can accelerate the rate of adoption in any segment of the population through more intensive and more appropriate communication and outreach.

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- Lawrence W. Green, Nell H. Gottlieb, and Guy S. Parcel,
1991, p. 114.

I once asked a worker at a crematorium, who had a curiously contented look on his face, what he found so satisfying about his work. He replied that what fascinated him was the way in which so much went in and so little came out.

- A. L. Cochrane, 1972, p. 12.

Innovations, the new practices, programs, and policies that we try and test and try again, enter the social work profession and social work academic training and research communities from all directions and sources. We are acculturated early to welcome innovations and to believe that the new should replace the old. In college, the student who wishes to learn how to design and test new social work programs has hundreds of academic units from which to choose. Yet, what of the student who wishes to learn how to replicate effective social work programs? She is alone. For example, in the U.S., not one American school of social work has translation, diffusion, or dissemination of effective practices, programs, or policies as its forte. Not *one*. When a social work student takes a Master's level course in the evaluation of social work programs, the emphasis is on the establishment of internal validity, the answering of the important question, "Does the program work, and if so, why?" The emphasis is never on how to design programs so that they will be robust and thus exhibit external validity, or broadly be adopted by many social work organizations. So while some analysts may characterize our professions and academic training systems as percolating with potential with a thousand blooming flowers, a sober analysis based in the realities of imperfect communication, information overload, and bounded rationality is more suggestive of systems where innovations rapidly blossom and die in an insidious redundant cycle without much accumulated system-level learning. Much goes in, but little comes out.

Ironically, Archie Cochrane contributed to this structural imbalance with publication of his influential monograph, *Effectiveness and Efficiency*. His was an eloquent and timely call for better evidence of intervention effect to improve the British National Health Service, an objective interpreted by his many followers to require rigorous study of intervention efficacy. The subsequent focus on establishing the effects of new treatments, protocols, and programs meant that questions of how to spread the relatively few effective health services interventions were not the object of much study.

Tests of our ability to purposively diffuse evidence-based practices, programs, and policies by expanding them or multiplying them has been identified as the single most valuable contribution that change agencies such as private foundations and government agencies can make to society (Porter & Kramer, 1999). The topic is one of increasing dedicated interest by social science researchers. And while we do need to know more about how to use diffusion concepts—the sometimes idiosyncratic “tricks of the trade”—collectively we have been amassing a treasure trove of strategic uses of these concepts from empirical studies of such interventions over 40 years conducted in a number of countries concerning a variety of innovations (Rogers, 1973).

The present task is to clarify, albeit in brief form, diffusion of innovation concepts that have been used to affect rates of adoption of voluntary-choice interventions, along with those concepts that have not been the object of many tests but which I believe to be promising for intervention development. This challenge is not one of basic science, nor applied science, but of dissemination science.

Defining Dissemination Science

A worldwide science of dissemination is emerging, driven by new communication technologies, the interests of philanthropies and the needs of government agencies, and the persistent and growing applied problems that have been addressed but not solved by the dominant research paradigms in disciplines such as psychology, sociology, and political science. Dissemination science is being shaped by researchers in the professional and applied fields of study, including public health, health services, communication, marketing, resource development, forestry and fisheries, education, criminal justice, and social work. *Nursing Research*, the *American Journal of Preventive Medicine*, *AIDS Education and Prevention*, the *Journal of Health Communication*, and *Metropolitan Universities* have since 2005 devoted entire issues to the topic of dissemination of evidence-based practices.

Research about dissemination is a response to a general acknowledgment that successful, effective practices, programs, and policies resulting from clinical and community trials, demonstration projects, and community-based research as conducted by academicians very often do not affect the services that clinical staff, community service providers, and other practitioners fashion and provide to residents, clients, patients, and populations at risk. In any one societal sector (populated, for example, by food-based micro-entrepreneurs, or city-level transportation and parkway planners, or nursing home owners and staff), the state of the science (what researchers collectively know) and the state of the art (what practitioners collectively do) coexist more or less autonomously, each realm of activity having little effect on the other. In the United States, this situation has been referred to as a “quality chasm” by the U.S. Institute of Medicine.

Dissemination science is the study of how evidence-based practices, programs, and policies can best be communicated to an interorganizational societal sector of potential adopters and implementers to produce effective results. This definition means that dissemination embeds the objectives of both *external validity*, the replication of positive effects across dissimilar settings and conditions, and *scale-up*, the replication of positive effects across similar settings and conditions (Moffitt, 2007). A *potential adopter* is someone targeted for making a decision about whether to invest resources in an innovation. An *implementer* is someone who will actually change his or her behavior to put an innovation into use. Often in complex organizations, the users are not the choosers of innovations. Implementers often subvert or contradict the intentions of adopters. Moreover, in complex organizations for the consideration of consequential innovations, adopters are usually higher than implementers in formal authority and thus not very accurate in knowing about the extent or quality of implementation or of the response by clients or constituents to what is implemented. Thus for dissemination, unlike for diffusion in which broad-based adoption is the main dependent variable, the extent and quality of implementation and client or constituent responses to it become additional dependent variables of study just as important as adoption. Dissemination science merges the study and objectives of diffusion intervention with implementation intervention. Many adopters are targeted, with implementation quality a key objective. It can be argued that dissemination science represents the most important type of diffusion study.

The concepts featured in this article are the cumulative result of the classical diffusion research paradigm (Rogers, 2003) and of attendant work in organizational studies of implementation (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Yin, Heald, & Vogel, 1977). Intellectual creativity of this type represents paradigm development in Thomas Kuhn’s terms (Kuhn, 1962) as applied to diffusion theory, a historical process of scientific “dwarves standing on the shoulders of giants” to see further paradigmatic insights (Merton, 1965). It is a way of not forgetting our roots.

The Classical Diffusion Paradigm

Diffusion is the process through which an innovation is communicated through certain channels over-time among the members of a social system (Rogers, 2003). For example, Barker (2004) reports on three international development efforts in relation to diffusion concepts. In Haiti, a United States Agency for International Development effort to conduct HIV prevention education in rural villages identified and recruited village voodoo practitioners, who are almost always considered credible and trusted sources of advice by Haiti villagers, to encourage villagers to participate in village meetings with USAID change agents. Meeting attendance exceeded campaign objectives by 124%. In Nepal, where vitamin A deficiency contributes to very high rates of infant and maternal mortality, the innovation of kitchen gardens was diffused among households through neighbor social modeling, resulting in heightened knowledge, positive attitudes, increased vegetable and fruit growing and consumption, and improvements in vitamin A nutrition. In Mali in 1999, a study of 500 Malian youth evaluated their information-seeking behavior and perceptions of source credibility concerning reproductive health. A lack of accurate knowledge among youth was attributed to their most trusted sources of information being friends and siblings; youth did not consider credible information sources including health agents and teachers to be accessible enough or trustworthy.

Diffusion studies have demonstrated a mathematically consistent sigmoid pattern (the S-shaped curve) of over-time adoption for innovations that are perceived to be consequential by potential adopters, when the decisions to adopt are voluntary, and with attendant logically-related propositions, qualifying this literature as a theory of social change (Green, Gottlieb, & Parcel, 1991). Many studies have shown a predictable over-time pattern when an innovation spreads, the now familiar S-shaped cumulative adoption curve. The “S” shape is due to the engagement of informal opinion leaders in talking about and modeling the innovation for others to hear about and see (see Figure 1).

Key components of diffusion theory are

1. The *innovation*, and especially potential adopter perceptions of its *attributes* of relative advantage (effectiveness and cost efficiency relative to alternatives), complexity (how simple the innovation is to understand), compatibility (the fit of the innovation to established ways of accomplishing the same goal), observability (the extent to which outcomes can be seen), and trialability (the extent to which the adopter must commit to full adoption);
2. The *adopter*, especially each adopter’s degree of *innovativeness* (earliness relative to others in adopting the innovation);
3. The *social system*, especially in terms of the *structure* of the system, its local informal *opinion leaders*, and potential adopter perception of *social pressure* to adopt;
4. The *individual adoption-process*, a stage-ordered model of awareness, persuasion, decision, implementation, and continuation;
5. The *diffusion system*, especially an external *change agency* and its paid *change agents* who, if well trained, correctly seek out and intervene with the client system’s opinion leaders, paraprofessional aides, and innovation champions.

When social work practitioners themselves are targeted for behavior change, such as to adopt new evidence-based interventions to in turn offer them to populations at risk, then they are potential adopters within a client system.

Diffusion occurs through a combination of (a) the need for individuals to reduce personal uncertainty when presented with new information, and (b) the need for individuals to respond

to their perceptions of what specific credible others are thinking and doing, and (c) to general felt social pressure to do as others have done. Uncertainty in response to an innovation typically leads to a search for information and, if the potential adopter believes the innovation to be interesting and with the potential for benefits, a search for evaluative judgments of trusted and respected others (informal opinion leaders). This advice-seeking behavior is a heuristic that allows the decision maker to avoid comprehensive information-seeking, reflecting Herbert Simon's seminal insight about the importance of everyday constraints in "bounding" the rationality of our decision making (Gigerenzer & Selten, 2001).

Needs or motivations differ among people according to their degree of innovativeness (earliness in adoption): The first to adopt (*innovators*) tend to do so because of novelty and having little to lose; the next to adopt (*early adopters*, including the subset of opinion leaders) do so because of an appraisal of the innovation's attributes; and the subsequent large majority adopts because others have done so and they come to believe that it is the right thing to do (an imitative effect). These motivations and time of adoption are related to and can be predicted by each adopter's structural position in the network of relations that tie the social system together (Kerckhoff, Back, & Miller, 1965).

Diffusion approaches to spread effective social work programs can focus on the tailoring of messages according to each individual's stage in the individual-decision process (now more commonly termed the individual's *degree of readiness* or *stage of change*), legitimization by high status persons as a cue to attention for others, employment of change agents to interact with potential adopters, advocacy by organizational champions, or the cooperation of informal opinion leaders. When all is said, the promise of the history of diffusion scholarship and diffusion practice is a promise of *efficiency* in intervention: Communicating an innovation to a special small subset of potential adopters so that they, in turn, will influence the vast majority of other potential adopters to attend to, consider, adopt, implement, and maintain the use of worthy innovations. Our interventions must be high in reach but low in cost in order to most persuasively demonstrate worth in intervention (Dearing, Maibach, & Buller, 2006).

Diffusion paradigm concepts are not new. The French judge cum sociologist Gabriel Tarde explained diffusion as a societal-level phenomenon of social change in his 1902 book, *The Laws of Imitation*, including the identification of an S-shaped curve in cumulative adoptions over time and the importance of opinion leadership in promulgating that distribution. As a judge, Tarde had taken note of the way people coming before the bench used new slang and wore new clothing fashions as if on cue. In Germany at the same time, Georg Simmel, a political philosopher, was writing about how individual thought and action was structured by the set of interpersonal relations to which a person was subject. Tarde's perspective was the forerunner for the macro, social system perspective on diffusion as the means by which cultures and societies changed and progressed. Simmel's contribution explicated in his book, *Conflict: The Web of Group Affiliations*, was the forerunner for understanding how social network position affects what individuals do in reaction to innovations, and when. Together, these perspectives provided the micro-macro explanation for much about diffusion processes: How system-level effects pressured the individual to adopt new things; and how individuals, linked in social networks, contributed to (and mostly resisted) system change.

Following Tarde and Simmel, European anthropologists seized on diffusion theory as a means to explain the continental drift of people, ideas, means of social organization, and primitive technologies. American anthropologists also conducted historical studies but they confined their analyses to more discrete innovations in smaller social systems such as a community or a region of the country. The studies of these early diffusionists encouraged sociologists to take up diffusion work in contemporary 1920s and 1930s society, focusing on informal communication in friendship or social support networks as an explanation for rural-to-urban

migration, the city-to-rural spread of innovations in fashion and language and products, the importance of jurisdictions as barriers to diffusion, and the importance of proximity to the spread of ideas (Katz, Levin, & Hamilton, 1963).

The dam broke in 1943 with publication of an article by Bryce Ryan and Neil C. Gross reporting on the diffusion of hybrid seed corn in two American farming communities (Ryan & Gross, 1943). This seminal article set the paradigm for many hundreds of future diffusion studies by emphasizing individuals as the locus of decision, adoption as the key dependent variable, the key role of a centralized change agency that employed change agents, and the importance of different communication channels for different purposes at different times in the individual innovation-decision process. The Ryan and Gross article propelled diffusion study to center stage among rural sociologists and made the practice of diffusion a primary toolbox in the day-to-day work of agricultural extension agents. Soon, many scholars in general sociology, medical sociology, organizational studies, education, journalism, communication, and public health began diffusion research.

The hottest intellectual concept studied was innovativeness (time of adoption relative to others) and its correlates. These studies often focused on sociodemographics and beliefs, both abiding scholarly interests in larger sociology and marketing research paradigms. Unfortunately, this emphasis steered diffusion scholarship away from the study of interpersonal, group, and relational influence on adoption behavior. This development became most clear in the fascination with innovativeness as a means to understand organization-level diffusion. Many management and organizational scholars conducted correlational studies of organizational innovativeness and a variety of organization-level characteristics (size, market share, bureaucratic structure, industry type, centralization, etcetera), a paradigmatic burst of activity that contributed little to an understanding of diffusion of innovations across organizations. One positive development of this organization-level focus on adoption as a dependent variable of study was general agreement that adoption could mean very little given the political and social machinations inside organizations. Implementation, not the decision to adopt, was the more important process of study, and innovation and reinvention rather than innovativeness of the whole organization the more revealing research focus.

Mathematical modelers who studied diffusion sought to contrast external-to-the-community “broadcast” models of diffusion in which mass media and change agents from afar introduced ideas into communities, with internal-to-the-community “contagion” models of diffusion in which strong friendship ties, weak acquaintance ties, structural equivalence (similarity in network position as a basis for expecting similar adoption behaviors and timing), or proximity accounted for diffusion (Strang & Soule, 1998).

Trained as a rural sociologist, Everett Rogers, too, conceptualized rural communities as the social systems of study (Rogers grew up on an Iowa farm watching his father *not* adopt innovations, so trying to explain this regressive behavior and in turn perhaps helping to improve farming conditions among poverty-stricken farmers came naturally). Rural sociologists focused on community-level phenomena, on interpersonal networks, and on the boundedness of such social systems. The reference groups of community members functioned as very effective filters and gatekeepers, what the prominent sociologist and early diffusion scholar Elihu Katz (1980) labeled *interpersonal selectivity*. If diffusion is about change and destruction and uncertainty, then interpersonal networks and opinion leaders were about stability, normative influence, and the measured appraisal of new ideas. Understanding the social dynamics of community-level systems was a main objective. The diffusion paradigm offered insight into strategies for community capacity building just as it also illustrated the divisive cumulative process by which the haves increasingly left the have-nots behind (Dearing &

Meyer, 2006), a product of repeated S-shaped “curves” of innovation diffusion among the haves, a social process akin to Robert K. Merton’s (1968) concept of *cumulative advantage*.

To spread agricultural, public health, and educational innovations—and many innovations were a combination of the three—diffusion systems had to be put into place to interact with rural communities. The 1950s, 1960s, and 1970s were decades of huge growth in U.S. federal capacity and expansionism. Thus the diffusion systems were centralized in both administrative control and substantive expertise. Knowledge flowed from this core to the periphery with the objective of lessening the problems of farmers, social workers, public health officers, and teachers. The main model for these systems was the agricultural Cooperative Extension Service that at the time was heralded for its international successes in crop production increases (the so-called Green Revolution). But the extension service model was expensive. There was not enough money to send change agents to regularly meet with all public health officers and teachers. The agricultural rural sociology lesson about finding and using opinion leaders to influence the decisions of their near-peers got lost at the same time that new information technologies promised so much. Accordingly, some of the dissemination systems that were created looked a lot like clearinghouses of published reports (Hutchinson & Huberman, 1993).

So the classical diffusion paradigm found widespread application both among academicians interested in different types of innovations and among practitioners who perceived the paradigm as a means for spreading solutions to real-world problems, yet it was also changed as it was adapted from agriculture to public health and education and as more efficient dissemination possibilities arose. Backlashes against these large investments, partly based in knowledge utilization studies showing little effect on the decisions of practitioners, focused on what seemed to be the advocacy of innovations that were the products of commercial firms. This criticism became particularly acute concerning international development, where the unintended and undesirable consequences of using the new “evidence-based” innovations were at times devastating to human health and the natural environment (McAnany, 1984; Rogers, 2003). This broadcast model of diffusion was also put into place without attendant strategy on interpersonal influence, implementation support, or behavioral or organizational maintenance.

Application by government agencies of diffusion concepts was pursued on a large scale but usually only concerned one or two concepts. A support network of change agents would be created, or innovation attributes would be used in the creation of message content, or peer-to-peer communication would be encouraged, or message content would be tailored to a type of individual’s readiness to change, or implementation support would be provided. A notable exception has been the U. S. Cooperative Extension Service which has long applied multiple diffusion concepts in concert to affect change. A contemporary and exceptional example is the Centers for Disease Control and Prevention’s new effort in HIV prevention, the Diffusion of Effective Behavioral Interventions (DEBI) project. This centrally-coordinated federal partnership with state health departments concerns a cluster of evidence-based HIV prevention interventions which 21 are communicated to potential adopters in community-based organizations both in terms of their underlying principles and their manifest components, and which is comprehensively supported throughout the process of organizational implementation through the provision of trainers, capacity-building assistance, marketing assistance, behavioral scientists, and evaluation consultants (Collins, Harshbarger, Sawyer, & Hamdallah, 2006).

For every commendable application of diffusion theory concepts that accurately operationalizes certain of the empirical results from the collective of diffusion research, there are many examples of the diffusion literature being operationalized in ways that a diffusion scholar might not recognize. Two examples in this regard are the World Health Organization’s

strategy for spreading effective HIV/AIDS treatment and care (World Health Organization [WHO], 2004), and the Institute for Healthcare Improvement's model for system-wide change (Massoud et al., 2006). Both of these commendable efforts developed clear change models that the authors identify as being based in diffusion of innovation theory, yet they do not obviously use prior knowledge from diffusion research about why innovations spread in ways that reflect diffusion research results. Efforts such as these may suggest that there are more ways to affect change than is represented in the diffusion literature; they may also suggest the ease with which the translation of generalized lessons can result in misunderstanding and misapplication. Based solely on my working with the diffusion literature and with organizations that seek to spread evidence-based practices, I list in Table 1 common ways in which what is done in practice can work against diffusion.

Diffusion Concepts for Intervention Development

Diffusion concepts can be operationalized in projects to affect the rate of adoption of innovations by slowing spread or, more commonly, by accelerating it (Dearing, 2004; Rogers, 1973; Valente & Davis, 1999). Such strategic application need not only affect adoption rate; strategies can be differentially applied to segments of target adopters so that those persons or organizations that would typically adopt innovations late in a diffusion process become early adopters, thus working to close inequities and inequalities in a societal sector, bringing the have-nots closer to the haves (see Figure 2). For example, entertainment-education strategies, which partly hail from the diffusion concepts of establishing perceived homophily, of learning self-efficacy through social modeling, and of subjecting the individual to interpersonal social pressure have been used successfully in a number of cases of international development and education (Singhal, Cody, Rogers, & Sabido, 2004).

Here, I discuss seven concepts based in the prior empirical results of diffusion and innovation research that have utility for social work intervention development. The utility of diffusion concepts can be increased by applying them in concert (Anderson & Jay, 1985) and early in the formative process of intervention design (Dearing, 2004). The decisions made during intervention development often radically affect scale-up outcomes (Conley & Wolcott, 2007).

I do not review all the concepts from this literature with applicability to intervention development. The concept of innovativeness has, for example, contributed to the creation of many behavioral interventions that rely on stage models of readiness for change by tailoring messages to the time-dependent receptivity of potential adopters. Here, I focus on less-used concepts with high potential for affecting rates of diffusion.

Innovation Attributes

An *attribute* is a perceived characteristic of an innovation. From Linton (1936) onward, scholars have attempted to understand the real and perceived attributes or characteristics of new ideas, new products, and new processes in terms of schematic categories (Tornatzky & Klein, 1982; Yin, Heald, & Vogel, 1977). Rogers (2003), in his synthesis of diffusion studies, suggests that in particular, *relative advantage*, *simplicity*, and an innovation's *compatibility* with a potential adopter's or organization's norms and procedures, account for considerable variance in explaining adoption decisions. The other two attribute categories he distinguishes, *observability* and *trialability*, are not as consistently important across innovation types for producing adoption, though it is reasonable to assume that for high-risk, expensive, and obtrusive innovations, trialability should be especially important, while for complex innovations with many process steps and those innovations that embed high degrees of ambiguity or tacit knowledge in their operation, *visibility* of the innovation in process and observability of outcomes should be especially important. Depending on the innovations of

study, investigators have added attributes if, for example, the innovation is especially high in perceived *risk*, *uncertainty*, *liability*, *status*, etc (Dearing, Meyer, & Kazmierczak, 1994). Considerable attribute research has been conducted by marketing scientists to explain consumer perception and purchase intention (Agarwal & Prasad, 1997; Manning, Bearden, & Madden, 1995).

Other diffusion researchers have identified similar attributes. Katz (1963) proposed that diffusion occurs more readily when the characteristics of the innovation “matched” the characteristics of the pensive adopter in terms of the four dimensions of *communicability* (the degree to which an innovation’s utility is easily explained), *pervasiveness* (the degree to which the innovation’s ramifications are readily apparent), *risk* (the degree to which an innovation is dissimilar to what it replaces), and *profitability* (the degree to which an innovation is perceived as more efficient or cost effective than alternatives). Katz conceptualized these dimensions to collectively constitute an innovation’s compatibility to an adopter context, an emphasis commensurate with that of Cohen and Ball (2007) on *accommodation* between innovation and context.

Attribute categories can be applied in the design of interventions, for example, so that they are not too complex or too costly. They can also be used in the design of communication messages and images about interventions, so that viewers or readers will be more likely to perceive that one can readily see the results of using the intervention, or to communicate to readers that an intervention, while sophisticated, is not difficult to understand. Attribute categories can be used as a basis for training demonstration hosts who will tour visitors around an intervention site so that they do not, for example, overly emphasize data about effectiveness while underplaying cost-effectiveness and the ease of implementing the intervention. Attribute categories can be used as a basis for structuring formative evaluation questionnaires to measure potential adopter perceptions about an intervention so that the intervention, and the materials describing it and portraying it, can be altered prior to introduction to heighten its likelihood of a positive reception.

Intervention Clusters

Rather than communicating and advocating adoption of a single intervention, a change organization can group interventions together. A *cluster* is a logically-related set of interventions that are constructed either on the basis of the interventions being complementary to one another, or being logical alternatives to one another, and whose grouping increases adoption. Adopters may eventually select and implement all of the interventions in a complementary intervention cluster; in an alternative intervention cluster, they are unlikely to ever adopt more than one intervention except in cases of displacement. Yet, for either type of cluster, choice should positively affect implementation quality. Adopters are more likely to select an intervention that is readily compatible with their organizational context and thus needs fewer adaptations of less magnitude to successfully implement.

Introducing innovations as a logically-related set of complementary innovations—an “interrelated bundle of new ideas”—can elicit more adoption decisions (Rogers, 2003, p. 249). Rogers argues that using a “package approach” makes sense intuitively (p. 249). Cognitively, once an individual’s threshold is reached by her adoption of one innovation, her adoption threshold will be lower for subsequent or related innovations. One decision begets another, and another. In effect, the first decision embeds a number of sunk costs that then make subsequent decisions about related interventions relatively easy. Psychology reactance theory offers another rationale for why clustering innovations makes sense. Individuals cherish their ability and consider it a right to choose. When deprived of choice, they react negatively (Brehm, 1966; Eagly and Chaiken, 1993). But in the construction of choice options or menus, the

objective is the likely right amount of choice rather than unlimited selection. Having a delimited set of choices—a few logical alternatives—as a basis for decision making is cognitively appealing. Too many choices, and people often will not decide anything; not having a ready comparison similarly decreases the likelihood of making a selection (Schwartz, 2004). The relationship between adoption and choice is curvilinear.

From the perspective of a change agency, communicating a cluster of effective innovations does not put it in the position of “picking a winner” and run the risk of seemingly advocating one program at the expense of other effective solutions.

Demonstration Projects

A *demonstration* is the fielding of an intervention under real-world conditions (Baer, Johnson, & Merrow, 1977). Nonprofit organizations and commercial businesses rely heavily on demonstrations. Yet, it is federal governments that have the most impressive histories of support for the demonstration of new technologies, programs, and practices, partly because what is demonstrated often represents radical new ways to conceive of providing a service that requires risks too large for single firms or single nonprofit organizations to assume.

Demonstrations of innovations exist for one of two reasons. A demonstration is either an experiment of a promising intervention, or a showcase of a proven intervention (Myers, 1978). Being clear about demonstration purpose is important.

An *experimental demonstration* is a field test carried out for the purpose of assessing the external validity of an intervention by varying the setting, the participants, resource availability, implementation protocol, or the methods by which outcomes are measured. The purpose of an experimental demonstration is data collection. Experimental demonstrations address the question, “Does this model work under real-world conditions?” This prediffusion activity is key not just for the formative improvement of an intervention, but more fundamentally to the determination of whether a particular innovation should be diffused, or not. Experimental demonstrations help intervention developers reduce their own operational uncertainty—a necessary precursor to reducing potential adopters’ operational uncertainty. Once this type of external validity (an acceptable degree of innovation robustness) has been established, a second type of demonstration is warranted.

An *exemplary demonstration* is a persuasive event calculated to influence adoption decisions and thus increase the likelihood of diffusion. An exemplary demonstration is not staged for the purpose of merely disseminating information; rather, the objective is to showcase an intervention in a convincing manner (Baer et al., 1977; Magill & Rogers, 1981). Exemplary demonstrations increase the likelihood of diffusion partly by making a costly, worrisome, and complex intervention more understandable through visibility of its processes and observability of its outcomes.

Lack of clarity about the purposes of demonstration is a frequent culprit in the nondiffusion of effective interventions (Macey & Brown, 1990). A disconfirmed hypothesis that leads to a design improvement is a positive result in an experimental demonstration; in an exemplary demonstration, such an outcome is noise that will lead to perceptions of higher, not lower, uncertainty among potential adopters. In a study of the effect of composite experimental and exemplary demonstrations in the diffusion of evidence-based counseling programs, mixed-purpose demonstrations led to heightened interest in the innovations but not adoption (Turner, Martin, & Cunningham, 1998). Diffusion is facilitated by exemplary demonstrations that apply what we know about innovation attributes, innovation clusters, opinion leadership, and guided adaptation, in which interventions are conducted at full-scale, with optimistic staff, and where cost effectiveness data are presented to visitors (Magill & Rogers, 1981).

Societal Sectors

A *societal sector* is a collection of focal organizations operating in the same domain without respect to proximity, as identified by the similarity of their services, products, or functions, together with those organizations that critically influence the performance of the focal organizations. City social work agencies can be conceptualized as constituting a societal sector. I emphasize a targeting of societal sectors as the social systems for change because of the reach and organizational identification they make possible through professional associations that often tie them together, job mobility that often leads to people across organizations knowing one another, and common attendance at professional conferences. These factors, in turn, reinforce each organization's similarities with the others. For intervention purposes, this means that common messages can be developed and communicated with desired effect among organizational representatives. All these factors contribute to the creation and maintenance of dense social networks. Organizational members share useful (and valuable) information among themselves across organizations to solve problems (Carter, 1989; Galaskiewicz & Bielefeld, 1998). Where a social network exists, an intervention developer or change organization can learn of it and tap into it. These efficiencies, together with the related concept of opinion leadership, are at the heart of applying diffusion of innovation concepts for the spread of effective social work innovations.

Sometimes the types of organizational employees who one wants to affect will not be integrated by informal communication. Knowledge transfer can still occur through other mechanisms (Argote & Ingram, 2000). The focal organizations in a societal sector may exhibit mere functional similarity with an absence of direct or indirect ties, or occasional integration via one or more professional associations, to regular integration via direct ties such that representatives of focal organizations know one another via their communication together in a social network. The more integrated, the faster the rates of decision about innovations. Understanding the degree to which a societal sector is integrated is a key to subsequent dissemination intervention to know whether influence flows through relational ties or through mediated specialty channels on the basis of structural similarity of potential adopters (Burt, 1999). This knowledge can then be used in intervention development to inform potential adopters about one or more innovations.

Reinforcing Contextual Conditions

In the United States, arguably the greatest public health success has been the decrease in smoking of tobacco since the 1970s. The California experience, in particular, is illustrative of a multipronged dissemination system of mutually-reinforcing messages, opportunities, regulations, incentives, and social pressure for normative, attitude, and behavior change (Green et al., 2006; Pierce, Emery, & Gilpin, 2002). This approach to change, while not a priori managed as a coordinated strategy, exhibits the holistic combination of centralized technical expertise, distribution and access, and decentralized participation and community incentives that private foundations have supported in communities. The experience in California also demonstrates system interdependency; California and its residents, while early relative to others, were not alone in smoking behavior change. Federal efforts, mass media messages, and a broader normative readiness for change likely affected and were affected by what happened in California.

The lessons for dissemination science are two. First, dissemination effort can be effective via a complex mutually-reinforcing intervention system even when that intervention is not strategically designed and coordinated by a centralized source. Complexity and, hence, indeterminacy, in intervention may be precisely the point with causal attribution not the scholarly objective (Hornik, 2002). Diffusion, after all, is about spread. In a push-pull-capacity

model (Green et al., 2006), consumers, businesses, intermediaries, even change agency personnel do not perceive and react against strong control or overt political interest. There is none, at least, that is apparent. This complex process is exactly what many analysts refer to as naturalistic diffusion. The change “just seems” to occur when, in fact, the effect is the result of a complex interplay of reinforcing factors. Mass media are key to this cumulative effect, providing what Harold D. Lasswell (1948) referred to as a *correlational function* in helping to suggest what issues are deserving of attention and when. Social work researchers can monitor media and policy attention to reinforcing and competing issues to best time the introduction of clusters of social work interventions to potential adopters. When issues affecting social work are high on the agendas of potential adopters, the resulting *monopolization* of the total information environment can trigger behavioral change more easily than would otherwise be the case (Dearing & Rogers, 1996; Lazarsfeld & Merton, 1948).

The second lesson for dissemination science is one of timing. Change in California, just as in other states, did not occur randomly in time. In relation to smoking, California changed within a specific time-frame and exhibited considerable over-time grouping with what happened in other states. Adoption decisions at national and state levels, just as with individuals, cluster together across time (Dearing & Rogers, 1996; Downs, 1972; Walker, 1977). Dissemination science intervention planners can either prepare for and then wait for windows of opportunity when the larger media or policy environment is attentive to or at least does not contradict the types of change advocated by the intervention, as can be tracked and assessed through media content analysis, or more proactively, seek to create a unified advocacy front of like-minded organizations to set the public, media, and policy agendas for an issue or group of related and consonant issues, such as through the presentation of a call to action or national action plan (Wallack, Woodruff, Dorfman, & Diaz, 1999).

The evolving science of dissemination also breaks from the classic diffusion model in a newfound recognition by community change scholars of the worth of ideas at the practitioner level—successful indigenous programs (Miller & Shinn, 2005)—that can be studied by dissemination scholars and “uploaded” for spread to other communities. This approach of identifying what works in real-world contexts as created by practitioners, then delineating the program’s causal determinants of observed outcomes, is not just an example of decentralized diffusion; it is an example of practice-based learning and, more particularly, an example of how social work researchers might learn from social work practitioners. Such infusion of practice-based learning into eventual diffusion efforts will be especially effective if the successful indigenous programs are not only internally valid (producing desired change at one site) but also externally valid (replicating the desired change at subsequent sites), since certain factors that explain external validity such as apparent similarity and causal explication (Shadish, Cook, & Campbell, 2003) are also positively related to diffusion. There may always remain a role for centralization of certain knowledge in planned change for the purpose of efficiency (Stetler et al., 2006), but that does not preclude its combination with local practitioner and application wisdom.

Opinion Leadership

The diffusion of consequential innovations always has been understood to be a social process. Although knowledge is often gained through the largely one-way communication of information especially with the increased information search capabilities of new communication technologies, persuasion occurs through the two-way communication of social influence, most commonly in the form of local informal opinion leaders who are embedded in social networks. For innovations perceived to be high in risk or uncertainty, information alone in one-on-one counseling, training workshop, practice guideline, presentation, Web site, brochure, etc., is typically insufficient to move the individual toward a positive decision or

even serious contemplation of innovation costs and benefits (Bero et al., 1998; Lomas et al., 1991; Thompson, Estabrooks, & Degner, 2006). What is required is a dual-process intervention that activates both information channels and influence channels (Bandura, 1997) to support both carefully considered reasoned judgments and heuristic decision making (Sladek, Phillips, & Bond, 2006).

Opinion leaders are the reason why diffusion can be a very efficient process to jump-start: An innovation source or sponsor can concentrate on identifying and convincing a special small subset of all possible adopters (Castro et al., 1995; Puska et al., 1986). Existing influence and the extent to which followers monitor the attitudes and behaviors of opinion leaders can do the rest as long as (a) opinion leader attitudes are favorable toward the new practice, and (b) others positively identify the opinion leader with the innovation, and (c) the larger environment supports change of that type at that time (Wejnert, 2002). Opinion leaders tend to be nearby those they influence (Coleman, Katz, & Menzel, 1966; Feder & Savastano, 2004; Greer, 1988), and perceived as influential (Hiss, MacDonald, & Davis, 1978; Weimann, 1994), credible (Lam & Schaubroeck, 2000), popular (Kelly et al., 1991), a near-peer friend (Booth & Knox, 1967), and accessible. Opinion leadership tends to be stable across time (O'Brien, Raedeke, & Hassinger, 1998), operates consistently across social systems such as hospitals (Soumerai et al., 1998), schools (Valente et al., 2003), and towns (Sen, 1969), as well as national level policy networks (Song & Miskel, 2005).

The concept of opinion leadership, when translated for use to spread interventions, is often misoperationalized. Influence is often conflated with authority so that the consequent identified persons are not “authentic” informal opinion leaders but rather positional authorities (Collins, Hawks, & David, 2000). The concept is also operationalized too broadly as earliness in adoption. Although it is true that opinion leaders, whether operationalized as individuals or aggregates thereof, do make decisions about innovations early relative to others, it is also true that not all early adopters are opinion leaders. So while time of adoption can be used as an indicator of state leadership relative to other states, it should not be a sole indicator. The broader diffusion literature demonstrates that the motives for adoption differ, in general, according to time of adoption. The very first to adopt (*innovators* in Rogers' model) often do so for reasons of curiosity and general propensity to try new things. The next to adopt (*early adopters* in Rogers' model, a time-based category that includes opinion leaders), tend to adopt innovations for reasons related to the advantages (attributes) of the innovation. Subsequent adopters (Rogers' *early majority*) tend to adopt because opinion leaders have already adopted (social influence). The last to convert (Rogers' *late majority*) do so because of perceived social pressure to fall in line (an imitative effect).

A key determinant of the likely success in intervention development is the sophistication of *change agents* who work on behalf of a *change agency*. If a change agent correctly identifies which organizational leaders serve as sources of example, modeling, and advice for the leaders of other organizations in a societal sector, change agent time can be spent interacting with that subset of opinion leaders who will in turn affect other leaders in the course of their normal conversations with those peer-followers (Rogers, 2003). The change agent's role is one of advocacy, information, and implementation support. Sometimes, a voracious supporter of an innovation may take on a similar and complementary function, becoming an innovation *champion* within the adopting organization, by answering questions and overcoming implementation hurdles (Howell & Higgins, 1990). These functions of advocacy and support—the change agent and champion's roles—are not typically within the sphere of action of an opinion leader. In dissemination intervention, opinion leaders are especially effective when they are not asked to do too much. Asking opinion leaders to advocate, persuade, promote, or educate in ways they normally would not with their colleagues is asking them to risk their status within the system in question by formalizing what is an informal role (Pereles et al.,

2003). Opinion leaders are perceived as expert and trustworthy precisely because of their relative objectivity regarding innovations. Indeed, most of their judgments about innovations are negative. One implication of this tendency is that innovations perceived as radical are especially likely to be rejected by opinion leaders and, thus, are better targeted first to *innovators* who are sources of information for the opinion leaders in question.

Intervention Adaptation

With the increasing interest and activity to diffuse innovations into complex organizations has come the realization that what goes on in adopting organizations can make all the difference in the likelihood of observing positive and intended outcomes as a result of organizational adoption of an innovation (Cohen & Ball, 2007; Fixsen et al., 2005; Szulanski, 2003). In organizations, the choosers of innovations are often not users. What it is that organizational implementers do with innovations has been viewed as a dichotomy. Either they put the innovation into practice as is, or they change it in the belief that the new iteration will better fit their current workplace or client conditions. For decades in discussions of how to best diffuse or “scale-up” effective educational programs by emphasizing either model specificity or local decision making, researchers have kept to this framing of the translational problem (Hutchinson & Huberman, 1993; McPartland, Balfanz, & Legters, 2007). Adherents of program fidelity believe that working to insure that adopters make as few modifications as possible is key to retaining the success of the original program. If the program is changed, how does one know if it is still effective? On the other hand, adherents of the program adaptation perspective counter that it is only through allowing adopters to change a program to suit their needs that the likelihood of sustainability is increased. If adopters do not feel ownership of the program, how can we insure its persistence in practice? Currently, the same debate is alive and well in disease prevention circles (Backer, 1995; Elliott & Mihalic, 2004).

There is great incentive, often well-intended, at the individual or single organizational level to customize, to partly adopt, and to combine innovation components from multiple sources to create a best fit in the user context. For every adopting organization, truth be told, is unique (von Hippel, 2005). Studies of the creation and implementation of interventions suggest that user involvement is positively related to adoption, implementation, and sustainability of change (Douthwaite, 2002). Reinvention of innovations is more norm than exception, especially with wider availability of technology such that more and more adopters can participate in the creation of innovations themselves (von Hippel, 2005). So while strict fidelity to an established process of implementation can make good sense in very complex behavioral interventions such as substance abuse treatment and recovery programs (Fixsen et al., 2005), it also goes against the natural tendencies of most implementers. This tendency is complicated by the fact that more than an innovation can be adapted during implementation. The organizational context, too, can change. And with process innovations, prior context can become indistinguishable from that which was new. If one only changes an adopted program and not the work environment—or visa versa—technical, delivery system, and performance criteria misalignments are more likely to characterize implementation. Overtime and incremental adjustments to both an innovation and a work environment characterize successful cases of one-to-many diffusion (Berman & McLaughlin, 1975) and one-to-one technology transfer (Leonard-Barton, 1988). “Mutual adaptation” of both a new program and of its user environment implies that an awful lot of the action of successful diffusion occurs not with the change agency nor with the end-user such as a patient or resident of a community, but in intermediary organizations such as a public health clinic. How practitioners interpret the purpose and promise of a new program will interact with how they choose to make accommodation for it in the workplace.

A key to successful implementation is to communicate why an innovation works, not just what it is. *Guided adaptation* through explicating both the underlying causal components of a program as well as examples for operationalizing those causal components in practice, and clarifying to implementers which aspects of a demonstrated program are central to its observed effect and which components are peripheral and more likely changeable without deleterious effects is a sensible approach to implementation that can recast adaptation as a property of implementation process and fidelity as a property of outcomes. Conceptualized this way, adaptation and fidelity can be positively, not negatively, related (Dearing & Meyer, 2006). Practitioners should be encouraged to customize by making additions rather than just modifying an innovation. Adding local supplemental components is less likely to dilute effectiveness than is modification that includes the deletion of or alteration to core components (Blakely et al., 1987). The pursuit of process adaptations to achieve positive outcomes is especially likely when both conceptual knowledge and examples are codified so that they are explicit rather than remaining tacit for subsequent implementers. Implementation of innovations is more consistent and positive when knowledge about them is clearly communicated (Edmondson, Winslow, Bohmer, & Pisano, 2003).

Implementation research has also shown that internal “sponsors” or high-ranking members of the organization—formal leaders—have a role to play in dissemination apart from the importance accorded to informal opinion leaders or champions (frequent users and problem solvers) in the classic diffusion model. In organizations, resources in the form of staff time are often required for an innovation to be implemented. If senior management is not onboard, health care practitioners often cannot risk implementation (Bradley et al., 2004).

Conclusion

As it has increasingly been applied to agricultural, international development, public health, and educational interventions, classical diffusion of innovation theory is evolving into a science of dissemination. I have highlighted seven concepts from the diffusion literature that have been used or have the potential to be used to affect the rate at which social work interventions spread:

1. The perceptions of social work interventions can be shaped through formative evaluation assessments of *attribute categories* that in turn can be used to design and redesign interventions and communication messages about them.
2. Effective interventions can be combined and communicated to potential adopters in delimited *clusters* to encourage choice and responsible adaptation.
3. Effective interventions can be *demonstrated* to heighten their visibility and observability, with both demonstration hosts and visitors sociometrically chosen to enhance diffusion.
4. Potential adopters and implementers can be conceptualized interorganizationally as members of *societal sectors*, which leads to efficiencies in communication and the potential for broad spread.
5. The framing and timing of intervention efforts can be matched to *reinforcing contextual conditions* to increase the likelihood that potential adopters will perceive social work interventions as relevant and opportune.
6. *Opinion leaders* among potential adopters can be identified and recruited to help in dissemination efforts by being encouraged to know about the interventions, talk about them with their colleagues, and know where to send followers for more information.
7. Interventions can be designed to invite productive process *adaptations* so that fidelity of outcomes is heightened, not lessened.

Social work interventions range from innovations in human resource management to client counseling to technology deployment. The field exhibits a varied terrain for which narrow prescriptions for change may prove inadequate. Diffusion theory, with validated concepts that concern different aspects of personal, organizational, and social change, offers social work researchers a menu of concept combinations that may be quite adaptive to different social work innovations, different types of service providers and clients, and varied settings.

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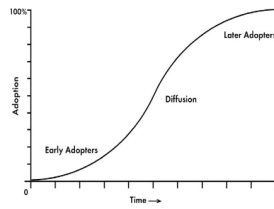


Figure 1.

The generalized cumulative curve that describes the curvilinear process of the diffusion of innovations. For any given consequential innovation, the rate of adoption tends to begin slow, accelerate because of the activation of positive word of mouth communication and social modeling by the 5%–7% of social system members who are sources of advice (i.e., opinion leaders) for subsequent other adopters, and then slow as system potential is approached.

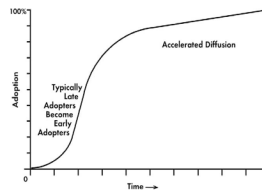


Figure 2.

The over-time process of diffusion can be accelerated by using validated concepts from the diffusion of innovation literature to heighten the likelihood that an innovation and messages about it will be positively perceived by potential adopters, and by identifying and recruiting influential potential adopters to help in communicating the innovation to other potential adopters. Disadvantaged population service providers who would typically be late adopters of an innovation can also be proactively targeted for early adoption of an innovation, thus addressing inequities within social systems.

Table 1

TOP 10 DISSEMINATION MISTAKES

1	<p>We assume that evidence matters in the decision making of potential adopters.</p> <p>Interventions of unknown effectiveness and of known ineffectiveness often spread while effective interventions do not. Evidence is most important to only a subset of early adopters and is most often used by them to reject interventions. <i>Solution:</i> Emphasize other variables in the communication of innovations such as compatibility, cost, and simplicity.</p>
2	<p>We substitute our perceptions for those of potential adopters.</p> <p>Inadequate and poorly performed formative evaluation is common as experts in the intervention topical domain engage in dissemination. <i>Solution:</i> Seek out and listen to representative potential adopters to learn wants, information sources, advice-seeking behaviors, and reactions to prototype interventions.</p>
3	<p>We use intervention creators as intervention communicators.</p> <p>While the creators of interventions are sometimes effective communicators, the opposite condition is much more common. <i>Solution:</i> Enable access to the experts, but rely on others whom we know will elicit attention and information-seeking by potential adopters.</p>
4	<p>We introduce interventions before they are ready.</p> <p>Interventions are often shown as they are created and tested. Viewers often perceive uncertainty and complexity as a result. <i>Solution:</i> Publicize interventions only after clear results and the preparation of messages that elicit positive reactions from potential adopters.</p>
5	<p>We assume that information will influence decision making.</p> <p>Information is necessary and can be sufficient for adoption decisions about inconsequential innovations, but for consequential interventions that imply changes in organizational routines or individual behaviors, influence is typically required. <i>Solution:</i> Pair information resources with social influence in an overall dissemination strategy.</p>
6	<p>We confuse authority with influence.</p> <p>Persons high in positional or formal authority may also be regarded as influential by others, but often this is not the case. <i>Solution:</i> Gather data about who among potential adopters is sought out for advice and intervene with them to propel dissemination.</p>
7	<p>We allow the first to adopt (innovators) to self-select into our dissemination efforts.</p> <p>The first to adopt often do so for counter-normative reasons and their low social status can become associated with an intervention. <i>Solution:</i> Learn the relational structure that ties together potential adopters so that influential members can be identified and recruited.</p>
8	<p>We fail to distinguish among change agents, authority figures, opinion leaders, and innovation champions.</p> <p>It is unusual for the same persons to effectively play multiple roles in dissemination into and within communities and complex organizations. <i>Solution:</i> Use formative evaluation to determine the functions that different persons are able to fulfill.</p>
9	<p>We select demonstration sites on criteria of motivation and capacity.</p> <p>Criteria of interest and ability make sense when effective implementation is the only objective. But spread relies on the perceptions by others of initial adopters. <i>Solution:</i> Consider which sites will positively influence other sites when selecting demonstration sites.</p>
10	<p>We advocate single interventions as the solution to a problem.</p> <p>Potential adopters differ by clientele, setting, resources, etc., so one intervention is unlikely to fit all. <i>Solution:</i> Communicate a cluster of evidence-based practices so that potential adopters can get closer to a best fit of intervention to organization prior to adaptation.</p>
