INTRODUCTION

A worldwide science of dissemination and implementation is emerging, driven by new media, 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. The U.S. Centers for Disease Control and Prevention has formed an implementation science working group tying together program officers and staff across disparate centers and divisions. The Bill & Melinda Gates Foundation has founded a cross-cutting diffusion and dissemination work group in its global health program and hosted, in 2011, a convening about diffusion of innovations and developing countries. At least 10 peer-reviewed journals have since 2004 devoted special issues/sections to the topic of dissemination or implementation of evidence-based practices.

Research about dissemination and implementation (D&I) 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 planners for health care delivery, or city-level transportation and parkway planners), the state of the science (what researchers collectively know) and the state of the art (what practitioners collectively do) co-exist 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 uptake and effective use. For example, public middle school nurses in U.S. southern states can comprise a societal sector. 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. A potential adopter is someone who is targeted by a change agency.
to make a decision about whether to try an innovation, an idea, practice, program, policy, or technology that is perceived to be new. In public health or health care delivery, the innovation may be an evidence-based intervention that shows the potential to improve the well-being of a population.

Whereas dissemination concerns what the sources or sponsors of innovations do to reach and affect the decisions of potential adopters, implementation concerns the response of those targeted. Implementation science is the study of what happens after adoption occurs, especially in organizational settings. Implementation is one stage (after awareness and adoption, and before sustained use) in the over-time process of diffusion. An implementer is someone who will actually change his or her behavior to use an innovation in practice. In organizations, the people who make the decision to adopt an innovation are often not the users of innovations. The extent and quality of implementation and client or constituent responses to it have become dependent variables of study just as important, and sometimes more important, than initial adoption. Implementation researchers have not studied sustainability much, which may be even more important than implementation, though this is beginning to change. So dissemination science and implementation science merge the study and objectives of marketing and diffusion with those of organizational change. For example, public health researchers or practitioners can conduct combined D&I studies that target many county departments of public health with a new disease prevention program (a dissemination study objective) and then focus on understanding what is done with the program in a purposively derived sample of all adopting departments (an implementation study objective). The questions by public health researchers and practitioners about dissemination and implementation can lead to rather different but perhaps equally fascinating projects, including questions such as:

- For a given public health program, does the change agency target types of organizations that are the most logical adopters serving the most needy clients or populations, or does the change agency simply target convenient or familiar organizations that they can easily contact because of a preexisting database or established relationships?
- Does the change agency develop messages about the new program based on systematic formative evaluation?
- To what extent does the change agency strategically consider when to introduce the new program, or do they just disseminate information as it becomes available?
- What is the competition for attention from the proponents of other similar programs and how does this change over time?
- What proportion of organizations targeted with dissemination messages respond by contacting the change agency for more information?
- How many try the new program (which might qualify them as adopters) of all those targeted (a measure of reach)?
- Was the program truly new conceptually to decision makers in the adopting organizations, or were they already experimenting with similar programs?
- Do some organizations invest resources in adoption (taking the time to learn about the program, pay licensing fees, attend trainings, order booklets and
train-the-trainer materials, become certified as coaches, etc.) but then never implement the program?

- What proportion of adopting organizations actually offers the program but then discontinues it?
- How many organizations stay in a holding pattern of adopting/not implementing/not discontinuing?
- What proportion of implementers offer the program as its designers intended with the same content, same number of modules, same behavior stimuli, same support and checks on enrollee or client performance?
- What types of adaptations to the program are made by implementers? Do they offer all the program’s core components? Are they true to the program’s theory of behavior change? Do they drop some components, customize others, and/or create their own to better suit their organization and their clients?
- Does the implementing organization change in ways unanticipated by the program designers? Does learning the one program serve as a trigger or precipitating event for organizational decision makers to adopt other, consonant or complementary public health programs?
- Do implementers think they are offering the program as the designers intended but, in practice, do something quite different?
- What is the client or enrollee yield? How many individuals sign up? How many complete all modules or classes? How many people actually do the variety of behavior changes—wearing pedometers, meeting in groups, writing in diaries, coming to class, completing their workbook, monitoring their progress—as suggested (and tested in efficacy trials) by the program designers?
- Is the public health program sustained by the organization? Do clients or enrollees continue their participation, too? Is fidelity or adaptation a better predictor of sustainability?
- What are the individual outcomes (weight loss, muscle tone, etc.) and public health impacts (for example, proportion of obese people in intervention communities)?

Given this range of dissemination science and implementation science questions that can be studied, it can be argued that these foci represent a most important type of diffusion of innovations study. The key, we suggest, is the stimulation of or tapping into intrinsic motivation of the staff in public health organizations and among their clients and program enrollees in communities. Certain innovations are met with enthusiasm, open arms, and eager learners who go on to champion new programs and advocate them to others. Innovations spread rapidly when people want them and can access them.

Where does the current emphasis on dissemination and implementation science come from? How are new media altering the diffusion of new practices, programs, and beliefs? We turn to the diffusion of innovations paradigm to address these questions.

### 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. For example,
Barker reports on three international development efforts in relation to diffusion concepts. In Haiti, a United States Agency for International Development (USAID) 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 information sources such as health agents and teachers to be accessible enough or trustworthy. In all three cases, the innovations of HIV prevention education, kitchen gardens, and reproductive health information are unlikely to impact Haitian villagers, Nepali infants and mothers, and Malian youths if the diffusion process is not stimulated by accessing trusted, informal opinion leaders.

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 as opposed to them being compulsory, and with attendant logically related propositions, qualifying this literature as a theory of social change. 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 (as in Barker’s study reported above) in talking about and modeling the innovation for others to hear about and see in action (Figure 3–1). For any given consequential innovation, the rate of adoption tends to begin slow, accelerate because of

![Figure 3-1](image-url). The generalized cumulative curve that describes the curvilinear process of the diffusion of innovations.
the activation of positive word-of-mouth communication and social modeling by the 5–8% 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.

Key components of diffusion theory are:

1. The innovation, and especially potential adopter perceptions of its attributes of cost, effectiveness, compatibility, simplicity, observability, and trialability (see Table 3–1);
2. The adopter, especially each adopter’s degree of innovativeness (earliness relative to others in adopting the innovation);
3. The social system, such as a geographic community, a distributed network of collaborators, a professional association, or a province or state, especially in terms of the structure of the system, its 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; 18
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 and paraprofessional aides, and support the enthusiasm of unpaid emergent innovation champions.

Diffusion occurs through a combination of (1) the need for individuals to reduce personal uncertainty when presented with information about an innovation, (2)

<table>
<thead>
<tr>
<th>Innovation Attributes</th>
<th>Definitions</th>
<th>Application to Public Health and Health Care Delivery</th>
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<tbody>
<tr>
<td>Cost</td>
<td>Perceived cost of adopting and implementing an innovation</td>
<td>How much time and effort are required to learn to use the innovation and routinize its use? How long does recouping of costs take?</td>
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<tr>
<td>Effectiveness</td>
<td>The extent to which the innovation works better than that which it will displace</td>
<td>Does a gain in performance outweigh the downsides of cost? Do different stakeholders agree on the superiority of the innovation? What is the scientific evidence of effect?</td>
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<tr>
<td>Simplicity</td>
<td>How simple the innovation is to understand</td>
<td>How easy is an evidence-based program for adopters/implementers to understand? How easy is it to use?</td>
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<tr>
<td>Compatibility</td>
<td>The fit of the innovation to established ways of accomplishing the same goal</td>
<td>How much/little would an evidence-based program disrupt the existing routine and/or workflow of the adopting/implementing organization? To what extent is the innovation and the context adaptable to achieve a best fit?</td>
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<tr>
<td>Observability</td>
<td>The extent to which outcomes can be seen</td>
<td>How much and/or how quickly will the results of an evidence-based program become visible to an implementing organization, its clients, funders, and peer organizations?</td>
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<tr>
<td>Trialability</td>
<td>The extent to which the adopter must commit to full adoption</td>
<td>Can the innovation be implemented first at small scale? Is investment necessarily sunk and thus lost if the implementer decides to discontinue use?</td>
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the need for individuals to respond to their perceptions of what specific credible others are thinking and doing, and (3) 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.\textsuperscript{19}

Needs or motivations differ among people according to their degree of innovativeness (earliness in adoption relative to others): The first 2.5% to adopt (innovators) tend to do so because of novelty and having little to lose; the next 13.5% to adopt (early adopters, including the subset of about 5–7% informal opinion leaders) do so because of an appraisal of the innovation's attributes; the subsequent 34% of early majority adopters and 34% of late majority adopters do so because others have done so. They come to believe that adoption is the right thing to do (an imitative effect rather than a carefully reasoned rational judgment). The last 16% to adopt do so grudgingly with reservations. Their recalcitrance is sometimes later proven to be well justified since new programs can have undesirable consequences.

One's orientation to an innovation and time of adoption are related to and can be predicted by each adopter's structural position in the network of relations that tie a social system such as a school, community, or even a far-flung professional network together. When viewed sociometrically (especially who-seeks-advice-from-whom within a social network) in two-dimensional space as in Figure 3–2, the pattern of diffusion begins on the periphery of a network as the first to try the innovation experiment with it; central members of the network—in informal opinion leaders who are a special subset of early adopters—then adopt if they judge the innovation to have important advantages over current practices; the many others then follow, who pay attention to what these sociometrically central and highly connected network members do and advise.\textsuperscript{20}

This outside-inside-outward progression of adoption, when graphed as the cumulative number of adopters over time, can reflect an S-shaped diffusion curve (as seen previously in Figure 3–1).

**Forefathers of the Diffusion Model**

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, the role of conversation in producing mimicry, and the importance of informal opinion leaders in jump-starting the S-shaped curve. 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
Figure 3-2. A sociogram of reported advice-seeking by judges and probation officers in Pennsylvania in 2006 in response to the question: "Whom do you look to for new ideas in juvenile justice?"

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 an explanation for how system-level effects pressured the individual to adopt new things, and how individuals can affect change through their relationships in social networks.

Following Tarde and Simmel, European anthropologists seized on diffusion as a means to explain the continental drift of people, ideas, means of social organization, and primitive technologies. American anthropologists such as Alfred Kroeber in the 1920s also conducted historical studies, but they confined their analyses—for the first time called diffusion study—to more discrete innovations in smaller social systems such as a community or a region of the country. Anthropologists studying diffusion focused not only on spread of innovations but also on how cultures in turn shaped those innovations by giving them new purposes and by adapting them to suit local needs—the beginnings of what we now call implementation science. The studies of these early diffusion researchers 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 the city-to-rural
spread of innovations, the importance of jurisdictions as barriers to diffusion, and
the importance of proximity to the spread of ideas.²² And diffusion was not only
understood as a one-way process: The American sociologist Pitirim Sorokin saw
diffusion as inherently recursive. More developed countries extract raw materials
from developing countries and sent back finished goods; classical music composers,
for example, absorb ideas from folk tunes into the creation of symphonies.²⁰ Public
health and health care can be interpreted recursively, too: Epidemiologic data about
communities and practice-based research results are "diffused" to researchers who
develop new public health and health care interventions and seek to disseminate
them back to those same practitioner systems and communities.²³

A landmark event for diffusion science occurred in 1943 with a report on the
diffusion of hybrid seed corn in two Iowa communities.²⁴ This seminal article set
the paradigm for many hundreds of future diffusion studies by emphasizing indi­
viduals as the locus of decision, adoption as the key dependent variable, a central­
ized innovation 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. It also made the applica­
tion of diffusion concepts a key set of tools in the work of agricultural extension
agents. Rural sociologists were closely wedded to the extension services for funding
and for providing the distribution system by which diffusion study ideas could be
tested. The academics were practice oriented. From 1954 to 1969, key faculty in the
Iowa State University Department of Sociology gave an estimated 600 presenta­
tions about the diffusion process, many to extension service groups. In 1958 alone,
there were 35 publications reporting diffusion data collected in the United States by
rural sociologists. Six years later, rural sociology publications about diffusion in less
developed countries reached a peak of 20.²⁵ Diffusion studies by rural sociologists
began to wane in 1969, but by that time scholars in sociology, medical sociology,
education, communication, and public health had begun diffusion research, such as
Coleman, Katz, and Menzel's classic study of physician's drug-prescribing behavior
as a result of social network ties.²⁶

**Synthesizing the Diffusion Paradigm**

The diffusion of innovations paradigm began to synthesize its approaches, central
challenges, and lessons learned beginning in the 1960s. Internationally, an "invisi­
ble college" of rural sociologists had formed based in the American Midwest, drawn
together both by intellectual questions and funding opportunities for research into
a coauthorship, collaborative, and competitive network.²⁷ As these questions were
answered by rural sociologists, diffusion research became fashionable to scholars in
other disciplines and fields who conceptualized somewhat different problems, espe­
cially concerning policymakers as adopters and the conditions of innovation and
spread in complex organizations. Yet diversification did not limit the centrality of
diffusion scholarship as it importantly related to the growing paradigms of knowl­
edge utilization and technology transfer studies and then to the evidence-based
medicine movement.²⁸
Everett M. Rogers, trained as a rural sociologist at Iowa State University, defended his dissertation in 1957 after growing up poor on an Iowa farm. While the dissertation was ostensibly about the diffusion of 2-4-D weed spray among farmers, Rogers's real interest was in drawing generalizations that he believed were warranted on the basis of commonalities he had discovered by reading diffusion studies being published in different fields. The authors of the studies were not aware that other researchers were studying diffusion in fields different from theirs. Rogers expanded his Chapter 2 literature review into the 1962 seminal book, *Diffusion of Innovations*, which synthesized what was known about diffusion in general terms. His modeling of diffusion as an over-time social process and, at the individual level, as a series of stages that a person passes through in relation to an innovation would soon come to be recognized across fields of study as the diffusion-of-innovations paradigm. Though Rogers would remain for decades the single most recognizable name associated with the diffusion of innovations, many other scholars were studying diffusion. And many diffusion scholars took a slightly different approach than Rogers. Many of these scholars were former students and colleagues of his; their contributions continue to push the paradigm forward and outward. In particular, some working in the paradigm took a macrostructural perspective on diffusion, especially those in population planning, demography, economics, and international relations. Anthropologists studying the spread of culture and linguists studying the spread of language also preferred a structural perspective on diffusion, which conceptualized waves of innovations washing over societies. To these structuralists, the study of diffusion was the study of social change writ large. For them, units of adoption are countries or cultures.

This macroorientation to diffusion was highly enticing to scholars because of its deductive and parsimonious potential based in a simple mathematical law of nature that describes a logistic (S-shaped or exponential) growth curve. Marketing scientists, epidemiologists, demographers, and political scientists instantly appreciated the predictive potential and eloquence of the population perspective on diffusion. Mathematical modeling formed the basis of this work, most of which continues today in fields such as family planning apart from more qualitatively informed microlevel studies of diffusion.

So a major part of Rogers's contribution was in persuasively showing how macrolevel processes of system change could be linked to microlevel behavior. These ideas harkened back to Simmel and Tarde that individuals were influenced by system norms, and system structure and rules were the cumulative results of individual actions. Diffusion was one of the very few social theories that persuasively linked macro- with microlevel phenomena.
closely related bodies of research. *Knowledge utilization* has been a robust paradigm for 40 years; its central problem was not how a new practice came to be voluntarily adopted by many people, but rather how knowledge in the form of prior results of a social program (the effectiveness of school busing, or of curbside recycling, or of business enterprise zones in cities) affected the subsequent decisions of elected representatives and policy staff in government. This is another route to social change, one that relies more on policy action by formal authorities followed by the compulsory adoptions of others than the traditional diffusion attention to informal influence. Were ineffective programs phased out by policymakers while effective programs were replicated and expanded? Did the social and education programs that managed to spread across the American states deserve to spread? The key intellectual contributor to this paradigm was the education scholar, Carol H. Weiss.\(^{33}\) Weiss's studies of policy decision making showed that rational expectations between evidence and program continuation/expansion were not supported by social science study. And beyond the expectation of a rational outcomes-to-funding relationship, Weiss and other knowledge utilization researchers of the policy-making process showed that any direct program evaluation-to-policy decision link was rare; rather, policy making was inherently political.\(^{34}\) Many more factors besides evidence of program effectiveness factored into decision making.\(^{35}\) When program evidence did affect subsequent decisions by policymakers, it did so through circuitous cumulative learning by policymakers and staff as they became "enlightened" over time in terms of general programming lessons. In a gradual, accretionary way, indirect and partial knowledge diffusion did occur.

From the perspective of knowledge utilization, Blake and Ottoson\(^{36}\) maintain that dissemination is the process of moving information from one source to another (as from program evaluators to policymakers), and the ultimate purpose of dissemination should be utilization by users. When utilization by users is achieved, information/knowledge has impact. This perspective has evolved with the field of knowledge utilization studies, through "waves" of research from the empirical studies in the 1940s by rural sociologists to studies of international development and family planning in the 1970s, to research in the 1990s about how research could improve human services in health and education.\(^{37,38}\)

Researchers studying technology transfer identified a different problem. Beginning with Mansfield in the 1960s, scholars such as Leonard-Barton and von Hippel focused on the firm, especially complex organizations such as multinational corporations that partly by virtue of their size exhibited problems of coordination, knowledge sharing, and even knowing what was going on across its many divisions let alone having a managerial system for knowing which practices were more effective than others.\(^{39}\) Whereas diffusion was about innovations that usually began with a single source and then spread broadly, technology transfer was one-to-one or "point-to-point." How can an innovative workflow redesign or unit-based team approach to scheduling that produces huge productivity gains in Argentina be applied to improve the same company's productivity in Canada? What sorts of adaptation might be necessary?\(^{40}\)

Contrary to the technology transfer label, Dunn, Holzener, and Zaltman\(^{41(6,130)}\) argued that "Knowledge use is transactive. Although one may use the analogy of
transfer,' knowledge is never truly marketed, transferred or exchanged. Knowledge is really negotiated between the parties involved." Similarly, Estabrooks and colleagues\(^4\)(p,28) clarify that the Canadian Institutes of Health Research defines knowledge translation as the "exchange, synthesis and ethically sound application of knowledge—within a complex system of interactions among researchers and users." In other words, the notions of transaction, negotiation, interactions, and synthesis are key to the conceptualization of transfer (and dissemination/diffusion) of information/knowledge from producers to users. In health research and organizational technology transfer, one needs to understand what is being transferred, by whom, to which targets, through what process, and with what outcomes.\(^4^3\) So effective transfer has knowledge utilization at its core.\(^3^5\)

### EVIDENCE-BASED MEDICINE AND EVIDENCE-BASED PUBLIC HEALTH

Literatures about diffusion of innovations, knowledge utilization, and technology transfer have found new application and expansion in the fields of medicine and public health. Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research.\(^4^4\)

Evidence-based medicine is an approach to medical practice that emphasizes the role of research literature (new information, latest knowledge) usually in the form of clinical practice or medical guidelines (increasingly based on comparative effectiveness research) over prior training and clinical experiences such that each becomes an input in decision making about each particular patient’s health. Although evidence-based medicine has been controversial among some medical professionals\(^4^5\) and somewhat misunderstood as a movement to displace traditional practices in medicine, advocates\(^4^6\) argue for augmentation rather than displacement. Clinical epidemiology, for example, has become infused with evidence-based knowledge generation, rapid critical appraisal of evidence, efficient storage and retrieval, and evidence synthesis.\(^4^7\) When all four components are effectively practiced, the quality of patient care increases.

The desire for valid and generalizable evidence to inform decisions also has been applied to the domain of public health. Brownson and colleagues\(^4^8\) proposed the following attributes as key to defining evidence-based public health: (1) Decisions are guided by best available peer-reviewed evidence and literature from a range of methodologies, (2) evidence-based public health approaches systematically make use of data and information systems, (3) its practice frameworks for program planning come from theories rooted in behavioral science, (4) the community of users are involved in processes of decision making and assessment, (5) evidence-based public health approaches carry out sound evaluation of programs, and (6) lessons learned are shared with stakeholder groups and decision makers. Glasgow and Emmons\(^4^9\) additionally emphasize contextual factors as key in matching practice refinements to local conditions.

During the dissemination of evidence-based practices, we believe that it is useful to consider the interplay between the technical rationalities of knowledge producers or change agencies, and users’ narrative rationalities, whether those users are
patients and community members or health care providers and public health professionals. Technical rationalities are based on logics that are predictive, instructive, and technocratic while narrative rationalities are stories of experiences that are interpretive, contextual, and dynamic. Narratives can be illuminating to program planners as well as inform ongoing attempts to improve care and public health practice. New media and emerging technologies can facilitate the access to and use of both technical rationalities (guideline content) and narrative rationalities (for example, clinical practitioners' perspectives about how they have implemented such guidance given the realities of their practices).

NEW (AND NEWER) MEDIA

What are the effects of new information and communication technologies on dissemination activities by change agencies, the social diffusion processes that may result as potential adopters consider an innovation, and how implementation in organizations unfolds?

Collective knowledge of the diffusion-of-innovations paradigm has given way to a focus on those paradigmatic concepts that can be operationalized in purposive tests of how to best disseminate and implement evidence-based health practices, programs, and policies. This has long been an objective in trying to spread effective innovations for improved global health as well as for domestic health care and public health. New media, in the ways in which they affect the dissemination of information by change agencies, the subsequent diffusion process among targeted adopters, and the resultant critical stage of implementation of evidence-based practices in organizations, are iteratively changing how we work and how targeted adopters respond to change initiatives. D&I researchers and practitioners are well advised to be agile.

The traditional notion of an innovation as predesigned by centralized change agents is increasingly inaccurate. Increasingly, innovations are malleable and coproduced by researchers, practitioners, and those persons who adopt them, whether the researchers in question have this intention or not. Such a perspective on change has the advantage of enabling learning from those persons who are best positioned to make insightful and applicable real-time improvements to an innovation: users themselves. This shift in emphasis to utilization by users would wed source perspectives on change with those of innovation users-as-creators. Utilization properly involves both the logics of innovation producers and the experiential expertise of users who are sensitized to issues of context and compatibility.

Technologies can facilitate information access and knowledge creation in the context of dissemination. In terms of information access, it is clear that information technologies and certain new media accelerate our ability to disseminate information worldwide. Do they also accelerate diffusion (that is, resultant decision making) among those health care and public health practitioners whom we sometimes try to reach and affect? Technologies increase the dissemination of knowledge about innovations and expand reach in terms of health promotion, disease prevention, health compliance, telehealth, and cybermedicine. Technologies allow easy access to new information and latest knowledge via specialized knowledge management systems (such as medical literature databases) that health care
providers can use to inform their medical practice, and general knowledge management systems (such as public Web-based search engines) to help patients make better health-related choices in life.64

Furthermore, technologies may intensify the diffusion process among connected adopters whom change agents may target for change.65 Traditionally and still today, diffusion is facilitated by mass media and interpersonal networks among people. In today's wired societies and more specifically in our networked market segments that are organized by common interests and professions, new media create new online social communities that are critical to the facilitation of information knowledge dissemination beyond geographically/temporally bound communities of the past. Technologies intensify the dissemination process by elevating social media platforms and their amateur broadcasters as well as new networks among people who do not know each other except through online communities66 to an emerging position of intermediary, thus giving information/knowledge another push for dissemination throughout social systems.67

In terms of knowledge creation, technologies are enabling new and expanded professional networks among health care providers and public health professionals, leading to interorganizational sharing and cross-fertilization of information and knowledge about common challenges.68 New media make coproduction of knowledge between producers and users easier to achieve because of the low cost and high speed for feedback and ongoing communication.69 Technologies support automatic and cumulative data acquisition (including electronic medical records in health care organizations and online data mining) for computations and analyses that, in turn, can produce more knowledge. In this way, the use of technologies demonstrates Sorokin's view that diffusion is inherently recursive. We surmise that if potential adopters of innovations feel that they have been involved in the creation of or refinement of an innovation, their adoption and implementation is more likely. If new media lead to the experience of broader participation in knowledge creation, then those media will stimulate not only dissemination but diffusion, too.

We have tried to show the evolution of the diffusion-of-innovations theory, and how concepts from that paradigm as well as knowledge utilization and technology transfer research have contributed to the evidence-based medicine and evidence-based public health emphases in dissemination and implementation. We suggest that D&I researchers and practitioners will continue to find relevance and applicability in these former research traditions as they seek ways to study and apply new information and communication technologies to the challenges of dissemination activity by innovation proponents, diffusion responses by adopters, and then subsequent implementation and sustained use.

SUGGESTED READINGS


Dearing describes changes in diffusion of innovations research and suggests applying what is known about diffusion to design more effective dissemination interventions. He also discusses the need to consider the impact of contextual factors on implementation efforts.

This article is a bibliographic analysis of the knowledge utilization field between World War II and the present and how it has evolved in that time. The authors cite the emergence of evidence-based medicine during this time period, a major advance with significant influences on models of evidence-based practice in other fields, including public health.


Green et al. provide a rigorous review of the public health implications of diffusion, dissemination, and implementation to improve public health practice and guide the design of future research. The article suggests a decentralized approach to dissemination and implementation, as well as ways diffusion may be combined with other theories.


Rogers’s classic text on how new ideas, beliefs, practices and technologies diffuse over time through various communication channels and networks. Because many new ideas involve taking a risk, people seek out others whom they know and trust for advice. Propositions about a generalized process of diffusion are included.

SELECTED WEBSITES
www.research-practice.org. This site lists hundreds of recent publications in dissemination and implementation, and catalogues a variety of tools that can help practitioners and researchers with the challenges of dissemination in order to elicit diffusion.

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