

Evolution of Diffusion and Dissemination Theory

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The article provides a review and considers how the diffusion of innovations research paradigm has changed, and offers suggestions for the further development of this theory of social change. Main emphases of diffusion research studies are compared over time, with special attention to applications of diffusion theory-based concepts as types of dissemination science. A considerable degree of paradigmatic evolution is observed. The classical diffusion model focused on adopter innovativeness, individuals as the locus of decision, communication channels, and adoption as the primary outcome measures in post hoc observational study designs. The diffusion systems in question were centralized, with fidelity of implementation often assumed. Current dissemination research and practice is better characterized by tests of interventions that operationalize one or more diffusion theory-based concepts and concepts from other change approaches, involve complex organizations as the units of adoption, and focus on implementation issues. Foment characterizes dissemination and implementation research, reflecting both its interdisciplinary roots and the imperative of spreading evidence-based innovations as a basis for a new paradigm of translational studies of dissemination science.

KEY WORDS: diffusion of innovations, dissemination, implementation, translational research

Theorizing about the diffusion of new ideas, beliefs, knowledge, practices, programs, and technologies—collectively termed *innovations*—has a 110-year history. Scholars and practitioners with quite diverse topical interests have studied diffusion. Sometimes, the problem is framed as one of explaining why an innovation diffused among many adopters; at other times, our interest is in studying the replication of a program from

one community to another or the transfer of a practice among organizational divisions. Increasingly, we are also interested in using what we know about diffusion processes to accelerate the pace of adoption, increase the number of adoptions, enhance the quality of innovation implementation, sustain the use of worthy innovations, and, as ultimate outcomes, demonstrate innovation effectiveness at individual client and client system levels.¹ These latter objectives, especially when they concern the translation of evidence-based public health practices and programs, constitute *dissemination* research and practice. Thus, the game afoot is one of using what we know about how and why innovations diffuse to design and conduct dissemination interventions. But what do we collectively know in 2008 about the diffusion of innovations that we did not know in 1950 or 1975? How can dissemination efforts today improve upon what was done in the past to affect diffusion? Where should we go—together as interested practitioners and researchers—to best move this research paradigm forward?

● The Classical Paradigm

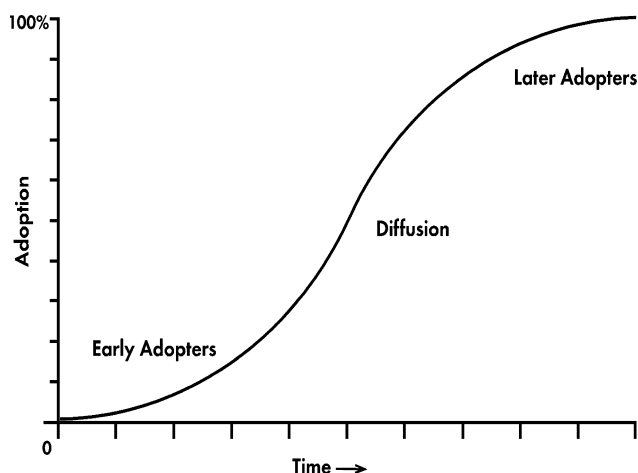
Diffusion is the process through which an innovation is communicated through certain channels over time among the members of a social system.² For example, in an interview-based study of why interventional radiologists in Michigan began to use a women's health innovation, uterine fibroid embolization that avoids surgery while preserving the uterus, Kalyani Ankem³ found that while physician awareness of the procedure occurred through patients, journals, and conferences, it

The author is indebted to the insightful and thoughtful suggestions of three anonymous reviewers.

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FIGURE 1 ● Innovations spread through a social system or social sector after positive adoption decisions and/or social modeling of the innovation by local, informal opinion leaders who comprise a subset of all early adopters.



was subsequent interactions with colleagues and especially opinion-leading radiologists at two hospitals that led to procedure use and continuation.³

Diffusion studies have demonstrated a mathematically consistent sigmoid pattern (the S-shaped curve) of adoption for consequential innovations over time when the decisions to adopt are voluntary, with attendant logically related propositions, qualifying this literature as a theory of social change.⁴ Many studies have shown a predictable pattern over time when an innovation spreads, the now familiar S-shaped cumulative adoption curve. The “S” shape is due to the engagement of opinion leaders in talking about and modeling the innovation for others to hear and see (Figure 1).

Key components of diffusion theory are:

- 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);
- the *adopter*, especially each adopter’s degree of *innovativeness* (earliness relative to others in adopting the innovation);
- 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;
- the *individual adoption process*, a stage-ordered model of awareness, persuasion, decision, implementation, and continuation; and

- 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.

Prevention scientists and other creators of new public health practices and programs are often members of external change agencies; the same is often the case for public health practitioners who target interventions to community residents. When public health practitioners are themselves targeted for behavior change, such as to adopt new evidence-based interventions to then offer to populations at risk, then they are potential adopters within a client system.

Diffusion occurs through a combination of (1) the need for individuals to reduce personal uncertainty when presented with new information, (2) the need for individuals to respond to their perceptions of what specific credible others are thinking and doing, and (3) 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 innovation is perceived to be important in terms of having consequences for a potential adopter, a search for evaluative judgments of trusted and respected others. This advice-seeking behavior is a heuristic that allows the decision maker to avoid comprehensive information seeking, reflecting Herbert Simon’s seminal insight⁵ about the importance of everyday constraints in “bounding” the rationality of our decision making.⁶

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.⁷

Diffusion approaches in public health programs focus on the tailoring of messages according to each individual’s stage in the individual innovation-decision process (now more commonly termed as 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 to whom others look for advice or example to create a multiplier effect on the rate of adoption. 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. Using what we know about diffusion processes to improve dissemination interventions fits well with the practical necessities of moving research to practice: Our interventions must be high in reach but low in cost to most persuasively demonstrate worth in public health intervention.⁸

The French judge cum sociologist Gabriel Tarde⁹ 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,¹⁰ 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, *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 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 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 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.¹¹

The damn broke in 1943 with publication of the article of Bryce Ryan and Neil C. Gross reporting on the diffusion of hybrid seed corn in two Iowa communities.¹²

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, a centralized 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 article of Ryan and Gross propelled diffusion study to center stage among rural sociologists. It also made the application 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 presentations about the diffusion process, mostly 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 with 20.¹³ 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.

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, etc), 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 rather than innovativeness the more revealing research focus.

The formulation of the social system in the classical model of diffusion, while informed by the earlier macro-level perspectives of anthropologists, was also

set by the activity of rural sociologists who naturally conceived of the geographically defined community as the primary social system of interest. 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.¹⁴

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, interpersonal networks, and the boundedness of such social systems. They were open systems to be sure—how could not that be acknowledged in the era of television and satellites—but their strength, their resilience to keep out the many worthless innovations, and to adapt the few good ones, rested in interpersonal relationships that functioned as very effective filters and gatekeepers, what the prominent sociologist and early diffusion scholar Elihu Katz labeled *interpersonal selectivity*.¹⁵ 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,¹⁶ a product of repeated S-shaped “curves” of innovation diffusion among the haves, a social process akin to the great sociologist Robert K. Merton’s concept of *cumulative advantage*.¹⁷

To spread agricultural, public health, and educational innovations—and many innovations that 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 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, public health officers, and teachers. The main model for these systems was the agricultural 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. Not enough money was then available 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.¹⁸

Thus, 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 because it was adapted from agriculture to public health and education and because 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.^{2,19} This broadcast model of diffusion was also put into place without attendant strategy on interpersonal influence, implementation support, or behavioral or organizational maintenance.

In summary, the history of the classical study of the diffusion of innovations has shown us that:

- several diffusion of innovation concepts have explained the spread of innovations;
- practitioner use of diffusion concepts of innovation attributes, opinion leadership, and, in particular, change agents was widespread and effective, especially as demonstrated in the agricultural extension service;
- concept application in large-scale diffusion efforts by the US government has been piecemeal and tending more toward advertising and marketing than social influence;
- the concept of innovativeness was useful for understanding the adoption of innovations by individuals but not for understanding diffusion among organizations; and
- when our intended adopters of innovations work in complex organizations, attention and follow-through concerning implementation are at least as important as is attention on the initial decision to adopt.

● From Classical Diffusion Theory to Dissemination Science

Classical diffusion of innovation theory has evolved in several important aspects that bear on the creation and operation of dissemination science interventions. An example is the somewhat common use of adopter readiness to change being used as a basis for the tailoring of messages in new communication media such as personal digital assistants and cell phones. Following are three general advances that can be applied singly or in combination to improve the dissemination of public health innovations.

Societal sectors and social networks

A key advance of dissemination science over classical diffusion studies is the conceptualization and operationalization of the societal sector as the social system of interest rather than just the proximate community. A *societal sector* is a collection of focal organizations operating in the same topical domain (such as elementary schools or rural health clinics) 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.²⁰ The advantages of planning to intervene across a societal sector are several. First, organizations rather than individuals are the units of adoption since organizational resources are required for providing many of the services such as disease prevention programs that may affect public health. Societal sector organizations are homophilous relative to the organizations that comprise proximate living communities. In a place-based community, members can exhibit similarities due to shared values and experiences. Yet, they play a full range of functional roles. The units of a societal sector are members of that sector because they are engaged in the provision of the same type of service or activity. Because they are functionally similar, the organizations in a sector are represented by the same trade or professional associations and thus bridged via the same specialty publications and the same trade conferences. They are often subject to the same regulations and the same oversight agencies. They often have the same set of suppliers and distributors. These conditions of homophilous organizations mean that efficient communication with the focal organizations in a sector is possible and, sometimes, convenient. Representatives of the organizations in a sector tend to know the same success stories and hold the same organizations and people in high regard. Moreover, because sector members often compete, they closely monitor what each other do even when they are not in direct interpersonal contact.

To a marketing scientist, a societal sector is a market segment,²¹ though societal sectors and their members are “upstream” of the typical marketing or social marketing focus on individual consumers. The strategy and management of a change effort in dissemination science is quite the same as in social marketing,²² with heavy emphases on (1) formative *preproduction research* to learn the information-seeking behaviors of potential target adopters, their wants and needs, and their sources of advice for the type of innovation in question, (2) formative *pretesting research* to beta-test prototype versions of the intervention and make improvements before intervention launch, (3) close management of *innovation distribution* to ensure that potential adopters can learn about, try, and adopt the innovation, and (4) *implementation and maintenance* support and technical assistance. Yet, there can be considerable divergence in dissemination science that applies diffusion theory concepts when compared with a marketing-based dissemination approach. Applying the concept of opinion leadership implies a different influence process in comparison with the one typically implemented in social marketing in which mediated images of social models are used to affect consumer decisions as in advertising. Moreover, the innovation attributes of effectiveness, cost-efficiency, simplicity, compatibility, observability, and trailability overlap with but are distinct from the measures that marketing scientists often use to study consumers.

Dissemination strategy based in a societal sector perspective identifies and activates existing influence in advice-seeking networks within a sector. Advice networks that tie homophilous organizations together as a sector provide real advantages for both the organizations and the individuals concerned. Board members involved in interlocking directorates share strategic information and advice; technical staff and specialists engage in know-how trading to solve on-the-job problems even if it means sharing proprietary information across direct competitors in the same city. Leaders also decrease organizational risk and personal uncertainty when confronted with innovations from outside the organization by seeking out the opinions and experiences of other leaders in functionally similar organizations to resolve cognitive dissonance. Increasingly, the social network perspective, its set of analytic tools, and network analysis programs are being seen as useful for the planning, monitoring, and assessment of public health and community development interventions.^{23–25} Network analysis is especially useful at pretest to understand who influences whom, and thus whom to recruit into a opinion leader-based intervention. For example, in a World Bank-funded study, opinion-leading farmers were identified and recruited in Indonesian villages to attend workshops about integrated pest

management. A higher rate of adoption for integrated pest management was observed among their followers than among the followers of opinion leaders who did not attend the workshops.²⁶

A key determinant of the likely success in strategic dissemination based in a societal sector perspective 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, the change agent's time can be spent interacting with that subset of opinion leaders who will, in turn, affect other adopters in the course of their normal conversations with those peer followers.² 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.²⁷

These functions of advocacy and support are not typically within the domain of action of an opinion leader. Opinion leaders are perceived as credible and trustworthy precisely because of their relative objectivity regarding innovations. Indeed, most of their judgments about innovations are negative, they act somewhat conservatively, they act within the normative bounds of their network of near-peers, and they act for the betterment not just of their organization but also for the network or sector as a whole. One implication of this tendency is that innovations perceived to be radical departures from present practices are especially likely to be rejected by opinion leaders and are better targeted first to innovators who are sources of information for the opinion leaders in question.

The same sorts of advice-seeking networks that tie together functionally similar but far-flung organizations into a sector also operate among policy makers and policy analysts in state governments. Networks have been used to explain adoptions of a variety of policy innovations concerning seat belts, education, welfare, and civil rights, lotteries, child abuse reporting, crime victim compensation, and public campaign funding, schools of choice, enterprise zones, senior prescription drug programs, medical savings accounts, individual development accounts, and elected office term limits.²⁸

A societal sector may not be integrated by patterns of informal communication or cooperation across organizations. Knowledge transfer can still occur through other mechanisms.²⁹ 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 or regular integration via direct ties such that represen-

tatives 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 for knowing whether influence flows through relational ties or through mediated specialty channels because of structural similarity of potential adopters.³⁰ This knowledge can then be used in a dissemination science intervention to inform potential adopters about an innovation and to subsequently influence their decision making via intervention with opinion leaders.³¹

Nature of the diffusion system

In the United States, arguably the greatest public health success has been the decrease in smoking of tobacco in some states. The California experience, in particular, is illustrative of a multipronged dissemination system of mutually reinforcing messages, opportunities, policies, incentives, and social pressure for normative, attitude, and behavior changes.^{32,33} This approach to change exhibits the combination of centralized technical expertise, distribution and access, and decentralized participation and community incentives that private foundations have supported in communities as the "art" of dissemination has moved ahead of the "science" of dissemination.³⁴ 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.

Currently, there are two lessons available for dissemination science. 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. At the same time, considerable messiness can be present in such an approach of fielding many consistent or reinforcing interventions within the same geographic location. Attributing causation to any one component of such an approach is often inconclusive. But messiness in intervention may be precisely the point and thus causal attribution not the scholarly objective.³⁵ In a push-pull-capacity model,³² consumers, businesses, intermediaries, even change agency personnel do not perceive and react against strong control or overt political interest. There is none. The sources of change and motivation are many and not closely coordinating their efforts. Yet, efforts can be consonant and thus mutually reinforcing. The result can be widespread appreciation of a normative shift, which leads individuals to change

attitudes and behaviors, resulting in system-level public health change.³⁶ 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 referred to as a *correlational function*³⁷ for communities in helping to suggest what issues are deserving of attention such as physical activity promotion and chronic disease prevention. When these issues are also the topics of everyday discussion among residents, the resulting effect of *monopolization* of the total information environment can trigger behavioral change.³⁸

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 grouping over time with what happened in other states. Adoption decisions at national and state levels, just as with individuals, cluster together across time.^{39–41} 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.⁴²

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 programs⁴³—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 public healthcare researchers might learn from public healthcare 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), because certain factors that explain external validity such as apparent similarity and causal explication⁴⁴ 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,⁴⁵ but that does not preclude its combination with local practitioner wisdom⁴⁶ and participant preferences for involvement in planned change.⁴⁷ These insights into the recursive redesign of dissemination systems characterize education literature about dissemination just as they do public health literature.⁴⁸

Organizational implementation and 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. Theorists of classic diffusion in focusing on individuals as the units of adoption did not doubt that an individual who adopted would implement too even if the observed outcomes of use were often unanticipated and sometimes undesirable. But in organizations, the choosers of innovations are often not users. Thus, a very considerable degree of attention in contemporary dissemination science rightly concerns the subprocess of implementation.

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, researchers have kept to this framing of the translational problem.¹⁸ Adherents of program fidelity believe that working to ensure 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 whether 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 ensure its persistence in practice? Currently, the same debate is alive and well in disease prevention circles.^{49,50}

Great incentive, often well intended, exists at the individual or single organizational level to customize, partly adopt, and combine innovation components from multiple sources to create a best fit in the user context. For every adopting organization, truth be told, is unique.⁵¹

Adaptations, additions, and subtractions to an adopted public health program are more often observed than not.⁵² Yet, this perspective on adaptation is incomplete, for more than an innovation can be altered

to achieve a best fit between a program and one's work context. The context too can change. With process innovations also, 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 criterion 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 diffusion⁵³ and one-to-one technology transfer.⁵⁴ “Mutual adaptation” of both a new program and its user environment implies that an awful lot of the action of successful diffusion occurs not only with the change agency, nor with the end user such as a patient or a resident of a community, but also 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. The meanings we make of a new program will contribute to what changes in the workplace we deem useful to best exploit the innovation. Virtually all such user activities would be considered moderating factors in the process of diffusion; in translational research, however, these moderating variables assume center stage and should be given more importance in research designs as outcomes of dissemination.⁵⁵

Although practitioners often pick and choose which components of a given program they will implement, there is evidence that they should be encouraged to customize by making additions to a program rather than just modifying it. Adding local supplemental components to a proven program is less likely to dilute its effectiveness in comparison with modification that includes the deletion of or alteration to core components.⁵⁶

Another key to successful implementation is to communicate why an innovation works, not just what it is.² “Guided adaptation” through explicating 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.¹⁶ This perspective also encourages pursuit of the very real possibility that new iterations of the practice or program can outperform the original test that demonstrated external validity. The pursuit of process adaptations to achieve outcome fidelity should be especially likely when both concep-

tual 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.⁵⁷

The new focus of implementation research on organizational processes has also led to the realization 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, healthcare practitioners often cannot risk implementation.⁵⁸

It is the intricacies of complex organizations that make dissemination into them and within them difficult. Political motivations, jealousies, employees jockeying for position and advancement, and existing practices and their proponents all are potential barriers to implementation of the newly adopted program. Limited resources, partial knowledge, risk aversion, and uncertainty are all common outcomes. In some ways, the classical diffusion model accounts for these factors, especially when it comes to the perceptions of potential adopters in organizations and the attributes of innovations.⁵⁹ But diffusion theory never explicated organizational receptivity in the depth that is now being done by management, organization, and community development scholars.

● Conclusions

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 concentrated on changes in how we conceive of (1) social systems from a perspective on physical communities to one on societal sectors and social networks, (2) the nature of the diffusion systems we create to interface with social systems where we want to intervene, which have become more decentralized, multifaceted in some instances, and yet retained elements of centralized efficiency, and (3) the strong relevance for public health innovation dissemination of attending to what goes on inside organizations where we may want to intervene upstream to affect change. Thus, the findings can be summarized as follows:

- Public health efforts at intervention should apply what we know about the diffusion concepts of innovation attributes, opinion leadership, and change

agents in combinations that follow target adopter information-seeking behaviors and their sources of influence.

- The societal sector perspective has promise in dissemination science because of its basis in organizational homophily and subsequent efficiency in communicating interventions to sector members.
- Formative learning about advice networks—a form of baseline research—allows for sophisticated social influence strategies that have been shown to work in practice.
- Increasing evidence in conjunction with long theorizing suggests that voluntary social change occurs as a result of the cumulative effects of multisource, co-occurring messages and interventions, including those that work at different levels of intervention.
- Timing is important in social change, and can be strategically addressed through media monitoring and/or coordinated action by like-directed organizations.
- Dissemination science, especially when focused on practitioners as adopters, needs to focus on implementation as a process that is subject to a variety of organizational and organizational environment variables.
- With sufficient guidance, the adaptation-fidelity dichotomy that defines program implementation strategy can be recast to study how adaptation during implementation can be positively related to fidelity of outcomes.

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