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New directions for diffusion of innovations research: Dissemination, implementation, and positive deviance

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Abstract

In the present article, we highlight three new directions for scholars interested in diffusion research. While other scholars are actively pursuing diffusion research with different emphases including large-scale randomized trials in international development, policy diffusion, and the diffusion of beliefs through social media, here we focus on dissemination science, implementation science, and positive deviance research. Each of these new directions fills a void in the traditional diffusion of innovation research and practice paradigm, while sharing a focus on improving public health and healthcare.

KEYWORDS

diffusion of innovations, dissemination science, electronic word of mouth, engagement, human behavior, human social behavior, implementation science, positive deviance, social comparison, social influence, social networking

> 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.
> —Cochrane (1972, p. 12)

The diffusion of innovation research and practice paradigm has never had the problem that the physician and early advocate of evidence-based medicine Archie Cochrane lamented about the relationship between medical research and clinical practice. So much research activity takes place in universities and medical research centers, but precious little practical application results in clinics and hospitals. There are, of course, challenges with diffusion scholarship just as there has been with medical research, but practical use of the diffusion paradigm's key research-based concepts is not one of them. In this article, we highlight some new areas of research—dissemination and implementation science and the positive deviance (PD) approach—that take diffusion scholarship in new directions and strike us as promising for making a difference in society. That our thinking appears here, in this issue of *Human Behavior & Emerging Technologies*, is especially apropos, since the state of the art as well as the state of the science will continue to depend on the behavior of individuals and their collectivities and the technologies that we continue to create and use.

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1 | THE LONG TAIL OF THE DIFFUSION OF INNOVATIONS

There are neat and tidy theories in the social sciences. Diffusion is not one of them. As Larry Kincaid (2004) summed up 16 years ago:

> The comprehensive nature of the model is one of its strengths and perhaps it[sic] primary weakness, leading to considerable confusion and criticism from those who use it as well as those who use alternative frameworks. Part of the problem is that the DOI is not a single theory but, rather, a model, framework, or paradigm large enough to drive a truckload of supporting theories through, including all existing

> theories of persuasion, knowledge acquisition, social learning, interpersonal communication and influence, social change, utilization of knowledge, and so forth (p. 37).

The expansiveness of the diffusion paradigm—in the Kuhnian sense of providing model solutions to model problems—is a reason for its continued use for both conceptual and pragmatic challenges (Dearing & Cox, 2018). Expansiveness is not necessarily a positive attribute, as Kincaid suggests, but it can contribute to paradigmatic persistence. One can conduct a study of opinion leaders, or assess the stage of readiness of organizations as potential implementing sites, or seek out exemplar performers within a social system as a way to demonstrate to others how effective implementation can take place, or focus attention on typically late (but high-need) adopters or compare alternative launch strategies of innovations to assess reach and speed of uptake. Purposive redesigns of innovations can be disseminated in order to compare the gain in adoption—if any—when maximizing low cost versus high compatibility versus simplicity. Personal influence and impersonal influence, injunctive norms and descriptive norms, narratives and statistics, trust and expertise. And lest we forget the methodological pluralism that has accompanied the many years of the diffusion paradigm in allowing for data from observation, archival sources from sales receipts to the scraping of twitter accounts, interviews and surveys. So yes. It is a truckload.

Another explanation for why people continue to draw on this paradigm is its utility for practitioners of many types. Not all the concepts in the diffusion literature are actionable, but some are and readily so. For example, the function and activities of effective change agents and paraprofessional aides can be implemented right away in many outreach programs and by community-based organizations, such as the UnidosUS program *Comprando Rico y Sano*, which has enjoyed considerable success in training volunteers to act as *promotores de salud*—community health outreach workers. Diffusion concepts stay alive partly because of the interest and work of practitioners.

Interestingly, Everett M. Rogers, the preeminent scholar of *diffusion of innovations*—who wrote five editions of a book by the same title—spent the last three decades of his life teaching and writing about diffusion in departments of communication (Rogers, 2003). After all, he had been in academic departments of rural sociology and of public health. Perhaps he felt at home in communication because communication scholars contribute to and use a variety of concepts and methods, characteristics that well describe the diffusion paradigm, too. However, we think communication as a field suited Rogers because as a base for his work communication refers to the process of diffusion without necessitating a focus on a particular content area. In a department of communication, a diffusion scholar can study innovations in global health, engineering, religion, transportation, climate change, sports, cancer survivorship—anything. We find this to be the case in our careers, too, perhaps because we were both mentored by him and were among his closest collaborators (Singhal, 2012; Singhal & Dearing, 2006).

2 | WHAT IS THE DIFFUSION OF INNOVATIONS?

Diffusion is the process through which an innovation is communicated through certain channels overtime among the members of a social system. Diffusion studies have demonstrated a mathematically consistent sigmoid pattern (the S-shaped curve) of over time adoption for consequential innovations when the decisions to adopt are voluntary, with attendant logically related propositions, qualifying this literature as a theory of social change. Many studies have shown a predictable overtime pattern 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 use of the innovation for others to hear and see, and perhaps try for themselves.

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;
- 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 in order to affect the adoption decisions of the vast majority of others in the social system such as a corporation, a rural town, a farming cooperative, or the participants in an online community.

Diffusion occurs through a combination of (a) the need for individuals to reduce personal uncertainty when presented with new information about an innovation, and (b) the need for individuals to respond to their perceptions of what specific credible others are thinking and doing in reaction to learning about the innovation, 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 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 insight about the importance of everyday constraints in "bounding" the rationality of our decision-making.

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.

Those advocates or proponents who seek to diffuse an innovation often focus on the tailoring of messages according to each target audience segment's *degree of readiness* or *stage of change*, with communication carried out 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 recruitment and cooperation of informal opinion leaders to whom others look for advice or example in order to create a multiplier effect on the rate of adoption. When all is said and done, 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 objectives and strategies fits well with the practical necessities of moving research to practice: Interventions must reach large proportions of potential adopters and be perceived as high in benefit, easy to implement and low in cost in order to spread more rapidly than they otherwise would if no campaign were conducted.

3 | DISSEMINATION TO AND IMPLEMENTATION IN ORGANIZATIONS

Driven by the interests of funders and the needs of government agencies, and the persistent and growing applied problems that have been addressed but not solved by dominant scholarly paradigms in psychology, sociology, and political science, dissemination of innovations to and among organizations as well as implementation and sustained use within those organizations have become major topics of applied study, especially in health services and public health research (Dearing, Kee, & Peng, 2018). Research about "D&I science" 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, just as Archie Cochrane lamented in 1972.

Dissemination science is the study of how evidence-based practices, programs, and policies can best be communicated to an inter-organizational societal sector of potential adopters and implementers to produce uptake and effective use, such as among clinics on behalf of patients or among elementary schools on behalf of children. Dissemination science applies concepts from diffusion, marketing, and other research traditions to heighten the likelihood that individuals and organizations will notice and consider trying evidence-based innovations. When information about effective innovations is framed in ways meaningful to potential adopting organizations, packaged, and presented back to them as informational products, and then targeted first to influential organizations in a sector and met with a positive opinion leader response, knowledge is translated. Networks of similarly trained specialists, professional societies, and trade associations are particularly useful partners in the conduct of dissemination research (Cranley et al., 2019; Dearing et al., 2017; LaJeunesse, Heiny, Evenson, Fiedler, & Cooper, 2019) which relies on formative evaluation to identify best-suited nodes in peer networks to influence adoption decisions (Donohue et al., 2018). Research about how to best disseminate or scale up innovations from management and marketing as well as health services includes identification and management of barriers to diffusion (Talke & Hultink, 2010), seeding of innovations with policy entrepreneurs who bridge vertical boundaries sector to sector (Faling, Biesbroek, Karlsson-Vinkhuyzen, & Termeer, 2019), diffusion path dependence (Greve & Seidel, 2015), and product launch timing (Calantone, Benedetto, & Rubera, 2012).

Implementation science is the study of what happens prior to, and after, adoption occurs, especially in organizational settings. Many studies of implementation focus on field-based tests to understand the extent to which an evidence-based program or practice will still be effective when subjected to realistic practice conditions, and the extent to which knowledge of practice conditions in organizations should inform innovation design and, failing that, reinvention (Balas & Chapmen, 2018). A smaller proportion of implementation research concerns post-adoption behavior among practitioners under actual practice conditions, when implementation and sustainability traditionally have gone unobserved. The extent and quality of implementation as a result of the factors that affect what happens to innovations in organizations are primary dependent variables in implementation studies (Yin, Heald, & Vogel, 1977).

The later-stage study of sustainability of innovations in organizations is an important aspect of implementation science and may be considered its most important focus for if a new practice or program does not sustain, how much good can it do? *Sustainability* is the continued use of program components and activities for the continued achievement of desirable program and population outcomes. Other terms that have been used by prior researchers in this domain include continuation, confirmation, maintenance, durability, continuance, and institutionalization (Century, Rudnick, & Freeman, 2010; Damschroder et al., 2009). There are some nuanced differences among these terms, but they all usually refer to the continued use of program components and activities beyond their initial funding period, and sometimes to desired intended outcomes, that are sustained in practice-based organizations (Stirman & Dearing, 2019). Generally speaking, the likelihood of sustainability is heightened when there is an alignment, compatibility, or convergence of (a) problem recognition in the external organizational environment or community, with (b) the program in question, and (c) internal organizational objectives and capacities (Altman, 1995; Gruen et al., 2008; Katz, 1963; Yin et al., 1977). Compatibility of an innovation with its new contextual conditions has long been of central interest in diffusion research. This orientation implies a multilevel system of health

innovations being implemented by individuals, embedded in an organization, that operates within a community context or inter-organizational network over time (Schensul, 2009). Therefore, research about sustainability can require several layers of data collection, in order to capture the multiple components of the systems involved in such continuation.

Taken together, dissemination and implementation science can be thought of as a next generation application of the diffusion paradigm. However, there are differences, too:

1. Whereas diffusion is broadly construed to refer to any type of innovation, dissemination science only concerns efficacious (internally valid) *and* effective (externally valid) innovations;
2. Whereas diffusion studies often are designed to describe or explain diffusion, dissemination studies are designed as tests of which diffusion concepts most affect adoption and implementation, and why;
3. Whereas diffusion investigations are often conducted post hoc after adoption, dissemination science investigations are a priori interventions to affect adoption.
4. Whereas diffusion study has focused on adoption by end-users or beneficiaries of services or products, dissemination efforts target service or product providers; that is, intermediaries between change agencies and end-users;
5. Whereas diffusion research has most often focused on individuals as the units of adoption, dissemination focuses on organizations as the units of adoption;
6. Whereas diffusion studies have often been conducted in geographically-proximate communities, dissemination studies have the potential to focus on the societal sector, composed of organizations that offer similar services but often spanning many geographic areas; and
7. Whereas adoption has been the primary dependent variable of study in diffusion research, the study of implementation and maintenance becomes more critical in dissemination science.

So there is a distinctiveness to dissemination and implementation science. Its normative orientation toward solving societal problems—long a basis for a minority of diffusion studies—means that dissemination science pairs strategies to achieve innovation adoption with strategies to achieve effective use. The dissemination and implementation scientist does not necessarily engage in the creation and efficacy testing nor even in the limited-site effectiveness testing of innovations themselves; for purposes of reducing bias in dissemination research projects a lack of involvement may be preferred. The D&I scientist focuses on affecting the processes by which those innovations spread and are used. In this way, a D&I scientist applies certain concepts from the diffusion paradigm as process intervention strategy. These concepts are the cumulative result of the classical diffusion research paradigm and of attendant work in organizational studies of implementation.

Dissemination science and implementation science have largely played out in the health domain, both in terms of public health research and health services research in clinical settings. Another new research direction that has taken off in the health domain and that also shares a normative orientation toward improving health and wellbeing is PD.

4 | PD: INSIDE-OUT DIFFUSION

> It [positive deviance] is the most fascinating idea anyone has had to solve the problem [of hospital-acquired infections] in a century.
> Gawande (2007, p. 27)

We believe that our understanding of diffusion research and D&I science can be greatly enhanced by scrutinizing the PD approach to solving societal and organization problems. A relative newcomer to the diffusion realm, PD represents a data-driven approach to solving complex social problems through identifying efficacious innovations in low resource settings, and then disseminating and implementing them from the inside-out for wider societal adoption (Singhal, 2010; Singhal & Svenkerud, 2019). PD is premised on the belief that in every community there exist individuals or groups whose uncommon behaviors and strategies enable them to find better solutions to problems relative to their peers against all odds and without extra resources (Pascale, Sternin, & Sternin, ; Singhal, Buscell, & Lindberg, 2010, 2014; Singhal & Dura, 2009, 2017). While PDs exist in every organization or community, social science scholars usually dismiss them as statistical anomalies, and overlook or reject them on account of their "bounded rationality," "inattentional blindness," and "trained incapacities" (Czarniawska, 2004; March & Simon, 1958; Singhal & Bjurström, 2015). For instance, diffusion, dissemination, and implementation scholars are trained to infer and deduce from a normal curve that valorizes "mediocrity" (mean values), ignoring the potentiality vested in positive outliers that lie several *SD* away.

Let us illustrate the attributes of the PD approach with an example. In 1990, the husband-and-wife team of Jerry and Monique Sternin, director and assistant director, respectively, with Save the Children, arrived in Vietnam to address a huge problem: some 65% of all Vietnamese children under the age of five were malnourished. The Vietnamese officials tasked them to demonstrate sustainable results in 6 months. Pressed for time, occupied by sustainability concerns, and with no capacity to import efficacious nutrition innovations from the outside and mobilize an army of change agents, opinion leaders, and aides from the inside, the Sternins wondered if the concept of "PD," codified previously by Tufts University nutrition Prof Marian Zeitlin, might hold promise. Zeitlin et al. were investigating why some children in poor households in developing countries were better nourished than others (Zeitlin, Ghassemi, & Mansour, 1990). What were they doing right that others were not (Singhal, 2010)?

The Sternins began by selecting four village communities in Quong Xuong District, south of Hanoi, for a nutrition survey. Some 2,000 children under the age of five were weighed, their growth charts plotted, and their socio-demographic characteristics mapped. The PD question was posed: *are there any well-nourished children who come from very, very poor families* (Pascale et al., 2010)? The data showed that there were a handful of children (about 1%) from very poor families who were well-nourished—the positive deviants. They were "deviants" for they were statistical outliers, and "positive" as they had avoided malnutrition against all odds. Through a process of community-led self-discovery, it became apparent that the PD families were practicing a few simple, efficacious uncommon behaviors: Family members collected tiny shrimps

and crabs from paddy fields, and greens of sweet potato plants from their gardens, and added them to their children's meals. These foods are rich in protein and minerals. Further, PD caregivers fed their children smaller meals three to four times a day, rather than the customary two big meals twice a day, leading to better assimilation and absorption of nutrients. Additionally, they practiced hand hygiene and actively fed their children, rather than the normative practice of placing food in front of them, thereby avoiding spillage and wastage (Pascale et al., 2010).

Once these efficacious "hidden" practices were identified, the next step was disseminating and implementing these practices among mothers whose children were malnourished. Interestingly, even though the wisdom to solve the problem was local and was self-discovered by the community members, and the resources required were accessible to all, just telling people about these PD practices and persuading them to adopt, led to disappointing results. Perceptions matter: most people considered the small shrimps and crabs to be found in paddy fields to be duck and/or chicken food, and not suitable for their child's consumption. Old habits die hard: many were skeptical about feeding their children four smaller meals, when the norm was two big meals. In diffusion parlance, telling and persuading people about efficacious indigenous practices did not substantially move potential adopters on their innovation-decision continuum—from knowledge-to-attitude change-to-practice-to-confirmation-maintenance-and continuance. After some trial and error, the Sternins flipped their dissemination and implementation strategy. Instead of pursuing the traditional knowledge–attitude–practice route, they decided to go the practice–attitude–knowledge route (Singhal & Svenkerud, 2019).

A 2-week nutrition program was designed in each of the four intervention villages. Caregivers whose children were malnourished were asked to forage for shrimps, crabs, and sweet potato greens. The focus was not on information-transfer, but on action, practice, and more practice (Pascale et al., 2010). Non-PD caregivers of malnourished children learned how to cook new recipes using the foraged ingredients. Before feeding their children, mothers weighed them. No food was wasted as the children were actively fed. Upon returning home, the non-PD caregivers were encouraged to feed their children three or four small meals a day instead of the traditional two meals. Such feeding and monitoring continued throughout the two-week program. Caregivers could see their children becoming noticeably healthier. Practicing the PD behaviors repeatedly, and in a community of peers, changed negative attitudes. Then the project was first expanded to another 10 adjacent communities. Again, the dissemination process was not simply telling people and blindly importing solutions from the four original communities. Rather, self-selected members from these 10 communities engaged in a process of self-discovering the PD behaviors in their own communities. Even though, some of the PD behaviors had been previously identified, the process of self-discovery was found to be as important as the actual behaviors that were uncovered (Singhal & Svenkerud, 2018).

Research showed that malnutrition decreased by an amazing 85% in the first 14 PD communities (Pascale et al., 2010). The program was scaled up by building a "living university" around these 14 PD communities. Teams from other communities with high rates of malnutrition spent up to 2 weeks directly experiencing the essential elements of the PD process. Upon returning home, they implemented the PD nutrition program in a few neighboring communities. Through this lateral expansion, spread over the next 7 years, the PD intervention spread nationally, helping over 2.2 million people improve their nutritional status, including over 500,000 children (Pascale et al., 2010). A later study, conducted 4 years after the program ended, showed that older children and their younger siblings in PD communities continued to be better nourished, demonstrating the acceptability, affordability, and sustainability of the PD intervention (Mackintosh, Marsh, & Schroeder, 2002).

Post-Vietnam, the PD approach to identifying, disseminating, and implementing efficacious innovative practices from the inside-out has been employed in over 50 countries to address a wide variety of complex social problems, including decreasing neonatal and maternal mortality (Pascale et al., 2010), reintegrating returned child soldiers (Singhal & Dura, 2009), reducing school dropouts (Singhal, 2013); cutting down the spread of hospital-acquired infections (Cohen, Gesser-Edelsburg, Singhal, Benenson, & Moses, 2019; Singhal et al., 2010, 2014); enhancing female entrepreneurship in rural areas (Jain, Sachdev, Singhal, Svenkerud, & Agrawal, 2019), decreasing childhood obesity (Foster, Aquino, Mejia, Turner, & Singhal, 2018) and reducing female genital cutting, sex trafficking, and other intractable issues (Pascale et al., 2010).

How does the PD approach contribute to a richer and deeper understanding of diffusion of innovations in general, and dissemination and implementation science in particular?

1. Whereas the diffusion paradigm is often criticized for its pro-innovation bias and pushing innovations from the outside-in, the PD approach begins by asking what is already working within the community. It uses data to identify those who have solved the problem against all odds, discovers their uncommon, replicable, and efficacious practices, and then disseminates and implements them by designing an intervention program that enables people to practice the new desired behaviors (Singhal, 2011).
2. Whereas diffusion, dissemination, and implementation science are premised on a known and validated *evidence-based practice*, the starting point in the PD approach is to discover *practice-based evidence*, that is, identifying the variation in practice (the deviant behaviors) that makes the difference (Singhal & Svenkerud, 2018).
3. Whereas diffusion, dissemination, and implementation science are heavily driven by subject matter experts and trained change agents, in the PD approach the expert and change agent begin by relinquishing their expertise, acknowledging a priori that they do not know the answers, but strongly believing that there already exist individuals and groups within the community—hidden from plain view—who have already solved the problem. The expert's role in PD is more of a facilitator, a trustworthy coach, who works with the community so they can self-discover the positive deviants, identify their uncommon but effective practices, and then design an actionable and practice-driven community intervention.
4. Whereas diffusion, dissemination, and implementation science often involve a lengthy and expensive process to spread new behaviors and practices, in the PD approach, by definition, the solutions can be implemented without delay as someone is already doing them, and making it work. Further, the PD process, by definition, does not need

access to expensive investments of outside resources given that positive deviant solutions emanate from resource-poor individuals. For this reason, a PD-centered approach to diffusion, dissemination, and implementation is inherently sustainable—the solutions are local, accessible to all, and at low cost.

5 | CONCLUSIONS

We have reviewed three new research directions springing forth at least in part from the diffusion of innovation research and practice paradigm. While many researchers and practitioners continue to use and contribute to time-tested diffusion concepts and ideas such as innovativeness and innovation attributes, we draw attention to new work that exploits paths not taken by many diffusion scholars. These three directions of dissemination, implementation, and PD share an emphasis on making a difference—a *positive* difference—which people working in the diffusion of innovation tradition have long shared but not always put into action. We encourage readers of *Human Behavior & Emerging Technologies* to explore this potential utility for their own work.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

PEER REVIEW

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