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Adoption and Diffusion

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Diffusion is the communication process through which an innovation travels or spreads through certain channels from a person, an organization, or any unit of adoption to another within a social system over time. An *innovation* can be an object, technology, behavior, practice, program, idea, and/or meme perceived as new to potential adopters. *Adoption* is the decision (i.e., acceptance or rejection) and the subsequent implementation, discontinuance, and/or modification by an individual or an organization. Therefore, adoption is an individual or organizational process that leads to diffusion as a systemic process. Studies of adoption tend to focus on the perspective of the adopters while studies of diffusion usually examine the perspectives of the market and society as a whole. Although diffusion and adoption are commonly used together in the literature, the two are different levels of processes.

In addition to adoption, another term that is commonly used in conjunction with diffusion is dissemination. *Dissemination* is the active push and promotion of an innovation toward members of a social system. Diffusion is the organic spread of an innovation from one member to another. A key distinction is that a dissemination effort often employs mass communication strategies, while diffusion usually takes place through interpersonal communication. An analogy for diffusion is the ripple effect after a pebble is thrown into a pond. Another visual image for diffusion is the spreading of a drop of colored dye as it slowly disperses and eventually changes the color of water in a beaker. However, some studies use diffusion as the umbrella term to include both the active push and the organic spread of an innovation.

History of diffusion research

The historical root of diffusion research can be traced back more than 200 years. In the early 18th century, French judge and sociologist Tarde wrote *The Law of Imitation* (1903). He saw diffusion of an innovation as the result of conscious and unconscious social imitations among individuals. He developed important diffusion concepts such as the diffusion S-curve, opinion leaders, and perceived compatibility. Subsequently, German political philosopher and sociologist Simmel published *Conflict and the Web of Group Affiliations* (1922). In this book, he articulated how the relationships in which individuals are embedded influence the way they react to innovations. He also suggested that members outside a social system can introduce new ideas into the system. In the 1920s, American cultural anthropologist Kroeber studied both the spread of innovations and how cultures recursively shape the innovations. This is the first time the

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research in this area was called a *diffusion study* to explain the spreading process of an innovation within a small region of a country. These early works then led to more diffusion research in the 1920s and 1930s in sociology.

The landmark diffusion study appeared in the 1940s. Rural sociologists Ryan and Gross (1943) studied the diffusion of hybrid corn seed in two Iowa farming communities. Their article provided the classic framework for studying individuals as the unit of decision making and adoption as the key dependent variable in diffusion research. This study sparked a series of diffusion research and presentations by sociologists at Iowa State University in the 1950s and 1960s. Toward the end of the 1960s, diffusion as a research paradigm spread from rural sociology to communication, education, public health, and other fields. A noted piece of diffusion research from the 1960s was the medical innovation adoption study by Coleman, Katz, and Menzel (1966). They found that doctors' communication with other doctors influenced the individual doctors' adoption of the antibiotic tetracycline as an innovation. This study highlighted the role of interpersonal influence in social networks during the process of innovation adoption and diffusion.

The key publication that turned scattered diffusion research in various disciplines into a systematic body of work and an invisible college of scholars was Rogers's first edition of *Diffusion of Innovations* (1962). This book was based on the literature review in Rogers's dissertation in rural sociology completed at Iowa State University in 1957. While diffusion researchers in different fields were unaware of what each other were studying, Rogers synthesized the common themes and general patterns of diffusion research across different fields. In his seminal book, he explicitly defined diffusion as a communication process and the diffusion of innovations theory as a communication theory. Over the decades, the diffusion of innovations theory (hereafter referred to simply as "diffusion theory") has been widely adopted and is used across disciplines such as management, marketing, geography, public health, political science, education, and many others.

Rogers updated the book in 1971 with Shoemaker, but the title of the book was changed to *Communication of Innovations: A Cross-Cultural Approach*. In 1983, the third edition of the book was published under the original title of *Diffusion of Innovations*. Subsequently, the original title remained in the fourth edition published in 1995, and the fifth and final edition in 2003. Rogers passed away in 2004, but he left a legacy of diffusion research behind. Two years after his passing, Singhal and Dearing published *Communication of Innovations: A Journey with Ev Rogers* (2006), in which several key diffusion scholars contributed chapters on contemporary topics related to diffusion research. Diffusion theory is the most cited communication theory and the second most cited social science theory to date (Rice, 2009).

Adopter categories and the diffusion S-curve

Rogers classified five types of adopters based on their timing of adoption. Their usual distributions are indicated by the percentages after the categories, based on the percentages associated with standard deviations of the normal curve of innovation adoption:

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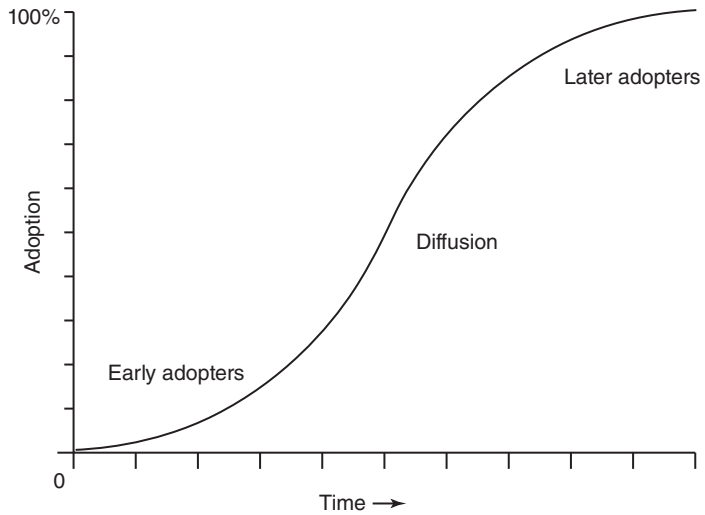

Figure 1 The cumulative adoption curve over time forms what is known as the S-shaped diffusion curve with a sigmoid pattern (from Dearing & Kee, 2012, published with permission from Oxford University Press)

innovators (2.5%), early adopters (13.5%), early majority (34.0%), late majority (34.0%), and laggards (16.0%). The cumulative version of this curve for adoption over time forms what is known as the S-shaped curve (sigmoid pattern: see Figure 1).

Innovators are usually venturesome. They have the ability to understand and apply complex technical knowledge. They are able to cope with a high degree of uncertainty. They have also been referred to as technology enthusiasts. *Early adopters* usually accept an innovation after a careful evaluation of its attributes. After adoption, they put a stamp of approval on the innovation, and others like to seek out their opinions and evaluations. A key characteristic is the respect they have from their peers. They have also been called visionaries. The *early majority* adopts the innovation right before the average member of a system does. However, they may deliberate for some time before completely adopting a new idea. Therefore, they are also termed pragmatists in the literature. The *late majority* is usually cautious about the innovation. Adoption may be both an economic necessity for them and the result of peer pressure. They are the conservatives. *Laggards* tend to be suspicious of innovations and change agents. They are also usually lagging far behind awareness knowledge of a new idea. They are labeled as skeptics. In addition to these five categories, a related concept introduced in later research was the notion of the *lead users*. These are users who contribute to product design during the innovation development phase. Because they themselves are users of the product, their design concepts can foreshadow the needs and interests of the marketplace.

Once a new product attracts a substantial number of adopters, a condition to spark a takeoff of the product is referred to as achieving critical mass. Achieving critical mass refers to attracting the number of users necessary to influence and trigger a rapid and wide adoption by other members within a social system. The concept of critical mass implies that adopters have varying network thresholds which prevent individual adopters from acting until the thresholds are met, at which point adoption occurs.

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When more people in a social system adopt, more nonadopters' thresholds are met, triggering a domino effect of adoption.

Following the first publication of Rogers's diffusion theory, Bass (1969) introduced what became known as the Bass diffusion model. Building on Rogers's work, Bass introduced mathematical equations to help predict the pattern of sales growth and the time when sales would peak after the introduction of a new product, taking into consideration the often unrealistically optimistic extrapolation of sales by an industry. The Bass diffusion model allows store managers and industry practitioners to predict the peak and decline of a product in the diffusion process, and to assess the optimal pricing for new products. The Bass diffusion model was validated in a study with data about 11 products, such as electric refrigerators between 1920 and 1940, home freezers between 1946 and 1964, and other products with market data.

Innovation attributes and measurements

In addition to describing the five adopter categories, Rogers presented five key attributes of an innovation that influence its likelihood of adoption. These attributes are relative advantage, perceived compatibility, complexity, observability, and trialability.

For an innovation to attract new users with its *relative advantage*, it should be perceived as better than its predecessor. This advantage can be financial profitability, social prestige, or other perceived gains by potential users. Relative advantage has a displacement assumption in the construct. Similar to the notion of perceived relative advantage, Davis, Bagozzi, and Warshaw (1989) proposed that the key predictor of computer technology adoption in organizational setting is perceived usefulness. Perceived usefulness can be understood as a potential user's assessment of the likelihood that adopting a new technology will improve his or her job performance within a workplace setting, resulting in extrinsic rewards such as pay increases and promotions. Both constructs suggest that a potential adopter will likely adopt an innovation if it is perceived as relatively useful and more advantageous than an existing one at bringing some forms of gain in a social and organizational context.

Another key attribute is *perceived compatibility*, defined as the degree to which a target innovation is perceived by potential adopters to be consistent with their existing values, past experiences, and current needs. In other words, for an innovation to diffuse successfully, it should be in alignment with the cultural norms of a social system. Social values and cultural beliefs, information and ideas presently held by potential adopters, and the current needs and situations influence perceived compatibility. However, the sequence of need and awareness knowledge of a new idea is inconclusive in research to date. An adopter's sense of need could be the result of awareness knowledge. On the other hand, the notion of need also may come before adoption.

In contrast to relative advantage and perceived compatibility, complexity suggests that when an innovation is viewed as difficult to understand and use, the likelihood of adoption is compromised. A high degree of complexity can lead to a high degree of frustration among potential and new adopters, in addition to rejection, discontinuance, and misuse of the innovation. In a recent update of diffusion theory, Dearing (2009)

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modified the notion of complexity and used the reversed term of simplicity. Similar to the notion of simplicity, Davis, Bagozzi, and Warshaw (1989) proposed the factor of perceived ease of use, defined as the degree to which a potential adopter anticipates the technology to be free of effort and frustration during use. All these constructs suggest that the simplicity and high usability of an innovation increase the likelihood of adoption.

Furthermore, *observability* refers to how visible the positive results of an innovation are to others in the social system. Based on research prior to the Internet and web 2.0 era, Rogers maintained that equipment (i.e., computer hardware) tended to get adopted faster than programs (i.e., computer software) because equipment was usually more visible and observable than programs. Rice (2009) paired observability and communicability together, emphasizing the notion that the degree to which the results of an innovation are communicable to potential adopters increases the likelihood of adoption. Collectively, these constructs suggest that the more observable, visible, and communicable an innovation, the higher the likelihood of adoption.

The notion of *trialability* means the extent to which an innovation may be experimented with by potential adopters on a limited basis. Trialability is an important factor because when a potential adopter tries out an innovation, he or she gives meaning to it in the process of figuring out how it works. More importantly, trialability allows a potential adopter to try an innovation and return to the pre-existing situation without much cost. In other words, trialability reduces uncertainty and risks, increasing the likelihood of trial adoption.

In a scale development effort by Canadian researchers Moore and Benbasat (1991), they put Rogers's five classic innovation attributes to empirical testing. They added two new attributes to the list: voluntariness and image. Voluntariness suggests that a potential adopter can exercise his or her free will to adopt the innovation. They argued that voluntariness is not a binary variable; rather, members of an organization often perceive different degrees of voluntariness in adopting a workplace innovation.

Second, they maintained potential adopters also assess if the use of an innovation can enhance their personal image or social status in the organization. Although some may argue that the attribute of image can be subsumed under the attribute of relative advantage, the Canadian researchers believed that image more accurately captured the essence of social approval, which was different from other aspects of relative advantage. In fact, they further complicated the attribute of relative advantage. In their factor analysis, neither relative advantage nor compatibility emerged as statistically distinct. They explained that the relative advantages of using a workplace innovation cannot be derived from an innovation that lacked compatibility with an organization's norms, values, and needs. However, they kept the two attributes as separate scales in the final instrument because there was evidence during initial sorting that the two attributes were conceptually distinct, although they were empirically collapsed in the last phase of the study.

Finally, Moore and Benbasat (1991) empirically separated the attribute of observability into visibility and result demonstrability, defined respectively as prominence of an innovation's advantages and an innovation being amenable to demonstration. In

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other words, the prominence of an innovation's advantages is different from an innovation's ability to demonstrate results. Their final instrument for measuring the perceived attributes of innovations included these eight attributes: voluntariness, relative advantage, compatibility, image, ease of use, result demonstrability, visibility, and trialability.

Fidler (1997) posited bridges of familiarity as another important innovation attribute. Bridges of familiarity serve as an innovation's links to potential adopters' familiar past, making the innovation more likely to be adopted. For example, photography was adopted because this innovation was introduced during a time when itinerant artists were traveling from town to town in order to paint portraits for people. Subsequently, the diffusion of silent films took advantage of their familiar links to photography and vaudeville acts of burlesque comedy, song, and dance. Fidler highlighted the use of metaphors as a specific strategy to build a bridge of familiarity for an innovation. His argument echoed the argument Moore and Benbasat advanced in their scale development study that it is not the actual attributes of an innovation that promote (or impede) its adoption, but the perception of its attributes by potential adopters.

Diffusion networks and opinion leadership

Another important area in the paradigm is diffusion network studies. Network analysis visually represents members in a social system as nodes, and relationships between nodes as linkages in a social network. In this sense, linkages are pipes through which innovation and information about innovation can spread from one member to another. Diffusion researchers have used network analysis to identify opinion leaders (about 5–8% of the population, and usually found in the early adopter category) in a social system. Their opinion can be either for or against an innovation. If they are for an innovation, their opinions can help spread the innovation at a faster rate. Opinion leaders are powerful because they informally influence opinion about an innovation within their social system. Their informal influence comes from the respect and trust that they have with members of their community, as they are also members of the same community. In other words, they represent the norms and belief system of a given community.

Feick and Price (1987) introduced market mavens as a related concept. Market mavens are consumers who possess a great amount of information about products in the market and knowledge about shopping and looking for these products. Regarded as an important information source, they influence other consumers' purchase decisions informally. Mavens possess product information in a range of categories, including categories and/or products they do not personally use. Whether we call these socially influential individuals opinion leaders or market mavens, they play a critical role in the ways innovations and information about innovations diffuse within a given social system.

Valente and Pumpuang (2007) performed a comprehensive literature review and categorized 10 different techniques for identifying opinion leaders. The most commonly used technique is the sociometric approach. For example, a sociometric technique uses degree centrality to identify opinion leaders. Degree centrality can be measured by the number of ties an individual has with others in their community. In practice, diffusion

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researchers recommend partnering with opinion leaders so a change agent can promote the adoption and diffusion of an innovation through these leaders' influence and ties. Moreover, when the change agent leaves the community, opinion leaders can help sustain the diffusion of the innovation over the long term. A practical challenge of the sociometric approach is its time consuming nature, in that it requires comprehensive detailing of the social network in a community.

One of the least utilized methods according to Valente and Pumpuang (2007) is self-identification. However, a recent scale development and validation effort by Boster et al. (2011) attempted to advance this technique. They proposed connectivity, persuasiveness, and domain knowledge expertise as the three main attributes of what they call *superdiffusers*. They argued that opinion leaders and market mavens are closely related categories of diffusers, and that such superdiffusers score high on connectivity, persuasiveness, and domain-specific expertise or maven scales. The self-identification technique using Boster and colleagues' scale is a time efficient method to identify superdiffusers and opinion leaders.

In order to examine how an innovation is introduced into a social system through social networks, diffusion researchers have also studied the construct of tie strength. Granovetter (1973) advanced the idea that weak ties are relationships with acquaintances, and the strength of weak ties (also known as the weak ties hypothesis) is acquaintances' unique ability to diffuse information about an innovation from one fragmented portion of a network to another. Individuals who bridge fragmented networks occupy important network positions to help the diffusion of an innovation throughout the entire social system. Because opinion leaders tend to know a lot of people within their organizations or community (and may be regarded as acquaintances and weak ties by many), they tend to play such a bridging role. Thus, they are poised to introduce innovations into their social networks through their many weak ties.

In contrast to the weak ties hypothesis, Kee et al. (2016) introduced the simplicial model of social aggregation. They proposed the use of strong ties to promote the spread of new information in social media. The basis of their strong tie hypothesis is that social media users have become desensitized to new posts online due to information overload. Therefore, users are more likely to pay attention to, adopt, and/or pass along information they receive from their strong ties due to repeated and prolonged exposure through online and offline interactions, a convergence communication climate, a shared identity, a narrative history, and an anticipated future of still being together. They showed in a computer simulation that strong ties can facilitate faster information diffusion on social media under certain network configurations.

Organizational adoption

Even though many diffusion studies focus on individuals as the unit of adoption, organizational communication researchers are also interested in organizations as the unit of adoption. Diffusion researchers often use the term "organizations" loosely to refer to departments within organizations, independent organizations, cultural communities, geographical states, and even countries. One reason to focus on organizations instead

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of individual workers as the units of adoption is the concept of contingent adoption decision (Rice, 2009): individual workers often adopt (either by choice or by requirement) after the organization has adopted an innovation. Individual workers often do not have access to or cannot fully adopt an innovation for work without the adoption by their organizations.

Organizations usually adopt an innovation based on observing the practices of other organizations and the trends in their industries. Once an organization has identified an innovation for potential adoption, the organization usually goes through the stages of agenda setting, matching, redefining, structuring, and interconnecting. Agenda setting is the stage where an organization defines the general problems it faces. This stage can also be imposed by new regulations, so concerns for the problems are generally shared by its members. Matching is the stage during which a problem from the agenda setting phase is paired with a possible solution. Redefining occurs when members of the organization actively define the main attributes of an innovation in the goals and context of the organization. Structuring is the stage during which organizational members implement the innovation within the organizational structure. Finally, interconnecting is the stage during which the structure supporting the innovation and the organization is connected with the rest of the organization and external forces. When the innovation has become routinized, the organizational innovation process concludes.

Another model of organizational adoption and implementation highlights a different set of stages. First, an organization examines the pre-existing context of the organization and environment. Second, an organization assesses the technology and innovation. Third, the organization engages in planning and making the adoption decision. Fourth, usage of the innovation and internal diffusion begin. Finally, technology adoption and implementation lead to organizational change. Both models suggest that the organizational adoption process involves multiple stages and careful planning. In reality, these stages are nonlinear. Decisions made at one stage may take organizations back to an earlier stage. A critique of these models is that they are overly rational. They tend to assume that ideas come first and then some process of distributing them around systems. They leave out the concurrence of multiple "innovating" (among multiple influencers) and then some "decision processes" of adoption.

Drawing upon institutional theory, Zorn, Flanagin, and Shoham (2011) found that organizational adoption of new technologies can be explained by isomorphic pressure. Isomorphism refers to the organizational trend of conforming to industry norms or the perceived need for organizations to achieve power derived from institutional and social legitimacy. They further explained that institutional isomorphic pressure manifests in three forms. First, *coercive* pressure refers to the demands to conform to new legal, governmental, and regulatory requirements. Furthermore, coercive pressure can come from an organization's need to be accountable to its funder, especially in the case of nonprofit organizations. Second, *normative* pressure comes from professional standardization of a field. Organizations adopt new technologies or practices through standardized training, education, and protocols produced by their professional associations and distributed through conferences and publications. Finally, *mimetic* pressure stems from peer organization imitation. This last form of isomorphic pressure is especially common when an organization experiences uncertainty. When an organization is unsure about a

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new technology, it tends to make adoption decisions based on the practices expected of its perceived peer organizations in the industry. Zorn and colleagues found that isomorphic pressures were most predictive of organizational adoption of new technologies, stronger than organizational factors such as budget and company size, although both isomorphic pressure and organizational factors are predictors of adoption.

Adaptation, modification, and reinvention

Rice and Rogers (1980) acknowledged that adopters are creative and they do not always use an innovation as intended by the original designers. They termed the adaptation, modification, and repurposing of an innovation the reinvention of an innovation by its users. Reinvention happens partly because innovations are sometimes packages or bundles of discrete components. Therefore, users can adopt some components and modify or ignore others that come in the same package. Reinvention may involve both the technical aspects of an innovation as a tool and its use during implementation.

For a long time, reinvention was treated as noise in the diffusion process, and was thus often ignored in early diffusion studies. From the perspective of research and development departments, reinvention is perceived as a distortion of the original design and research project. From the perspective of promotion and change agents, reinvention is considered the improper or incorrect use of an innovation. Furthermore, when an innovation is being adapted by creative users, it complicates a change agent or a diffusion researcher's measurement of successful adoption of an innovation. Such a measurement often serves as a performance metric of a change agent, or the definition of adoption of an innovation as defined in a research study.

Despite the reasons why reinvention was treated as noise, Rice and Rogers (1980) pointed out that the recognition of reinvention highlights an important aspect of adoption behavior, in that users do not simply accept or reject an innovation but may actively adapt it as they struggle to give it meaning based on their existing problems and local contexts. In fact, diffusion studies that include both the simple adoption and the reinvention of an innovation better capture the full picture of innovation adoption and diffusion.

According to Rice and Rogers, several conditions promote reinvention. First, when an innovation is complex, abstract, and/or irreversible, reinvention is likely to occur. Second, when a change agent or an external consultant takes a less active role in the innovation process, reinvention is more likely to take place. Third, reinvention may occur among users simply due to a lack of user knowledge or accompanying details about an innovation presented with the innovation. Fourth, reasons of status and local pride of ownership may also promote reinvention. Fifth, when an innovation does not fully match the problems the innovation was adopted to solve, reinvention is likely to occur. Sixth, reinvention may be a move to secure the political survival of an innovation with a heavy investment, although a mismatch is realized later. Seventh, an organization's limited budget for an innovation may also encourage reinvention. Finally, reinvention may simply be the natural outcome of an innovation during the later diffusion cycles.

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Based on a recent review by Rice and Leonardi (2014), five categories of communication factors that influence use and reinvention of new technologies can be summarized. First, managerial factors, such as agendas, support, incentives, and voluntariness, can influence users' implementation and alteration. Second, organizational factors – such as pre-existing norms that encourage maintaining current practices despite the introduction of a new technology, existing networks at the workplace, and organizational interventions using internal and external experts – can influence how a new technology may be adapted in an organization. Third, learning factors, such as formal training, informal learning from near peers, and the autonomy to experiment with features and expand new uses can also prompt reinvention. Fourth, individual factors, such as perceptions of innovation attributes, needs and abilities, expectancies, organizational position, demographics, and cognitive style can lead to creative adaptation of an innovation. Finally, technological factors, such as media characteristics and supplementing channels, can allow users' modification.

Related to the idea of adoption and reinvention is organizational change. When an innovation is introduced to an organization, change often occurs. Most organizations and their members are resistant to change, although some feel pressured to change for change's sake. Instead of simply looking at change as a reaction to an innovation, Lewis (2014) offered the insight that there are usually many simultaneous processes that involve mutually influential internal and environmental sensemaking. In other words, the adoption, implementation, and change within an organization are interrelated with the spread of the change in the external environment. This insight is important because it reveals the complex relationship between sensemaking, communication, and interaction during implementation, discontinuance, and environmental diffusion, especially reinvention.

Criticisms and future opportunities

Over the decades since its introduction, diffusion theory has attracted various criticisms. Three of the most cited criticisms are the pro-innovation bias, the individual blame bias, and the knowledge gap bias.

The *pro-innovation bias* assumes that an innovation introduced to a social system should be adopted. This bias negates the negative consequences of adopting an innovation. For example, the adoption of flexible work arrangements as an innovation is assumed to be good because it allows employees to work from home. However, it overlooks the ways working from home can also create problems in work–life balance, since these stay-at-home employees are expected to carry out work and home duties concurrently. They are also expected to respond to work demands after hours and during the weekends.

The *individual blame* bias puts an emphasis on the individual employee when he or she does not correctly adopt and implement a new workplace technology as prescribed. The literature is full of examples of how new technology integration is often full of challenges, and the causes of implementation problems are usually the innovation's complex design and/or the management's ineffective facilitation. However, the individual blame

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bias may lead the organization to overlook these technical and managerial challenges, and blame the employees for the failures of and struggles in technology adoption.

At the societal level, the *knowledge gap bias* explains how, as media and information technologies diffuse within a social system, individuals with higher education and socioeconomic status tend to adopt these innovations earlier than others with lower status. Therefore, this segment of adopters tends to benefit from the information they receive from their early adoption, further increasing and maintaining their social status. The same can be argued about innovation adoption within organizations. Employees with higher status (perhaps due to higher educational backgrounds, specialized skills, and general socioeconomic status) tend to be exposed to and given access to an innovation within the workplace. They are also likely the early beneficiaries of the innovation, further giving them an advantage in upward mobility. Therefore, innovation adoption can further widen the divide between the "haves" and the "have-nots" within large organizations, reinforcing inequality and power differentials at the workplace.

Despite these three criticisms, researchers in diffusion theory will likely continue extending the theory, applying the theory in new and emerging contexts and developing more robust methodologies. Theoretically, as technologies are becoming more mixed and integrated, such as in the examples of smartphones and (enterprise) social media, there is an opportunity to examine how an innovation is adopted in the context of a cluster of other related innovations, challenging the *displacement* assumption in the attribute of relative advantage. On the other hand, the *complementary* assumption in the attribute of perceived compatibility may receive new attention for theoretical extension.

Furthermore, most diffusion studies to date treat each innovation examined as simply a new technology, practice, or idea. However, today's innovations are complex, often involving the adoption of new behaviors and beliefs associated with the new technology. The diffusion of environmentally conscious innovations to create a green workplace is a case in point. Therefore, future research has the opportunity to examine multidimensional innovations that involve the adoption of a new technology along with its associated practices and ideologies, and the relationships among its various dimensions.

In order to overcome the individual blame bias and the knowledge gap bias, diffusion researchers can examine the role of organizational capacity as an adoption factor, and capacity building as a diffusion strategy. Such studies have the potential to increase the adoption capacity of individuals and organizations that tend to lag behind the diffusion process. Such studies will have the potential to narrow the gaps between the "haves" and the "have-nots" at the individual and organizational levels.

In addition, today's web 2.0 and open source innovations are increasingly participatory in nature. Diffusion researchers have the opportunity to study the adoption of dynamic innovations that are user driven, custom made, produced on demand, and permanently beta. Studies examining innovations with these emerging characteristics will add to the current body of diffusion knowledge built on early innovations that were mostly predesigned, mass produced, bought off the shelf, and used as instructed. Furthermore, with the expanded view of dynamic innovation, diffusion can be conceptualized as encompassing the interrelated processes of design, development, adoption, integration, use, implementation, reinvention, and/or discontinuance.

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Methodologically, Meyer (2004) stated that the bulk of diffusion studies to date have employed survey methodology, gathered data only from adopters, and focused on a single innovation, at a single point in time, and usually after widespread adoption had already been achieved. Even though there are practical reasons why diffusion studies have traditionally focused on the quantitative approach with cross-sectional data, existing knowledge of innovation adoption and diffusion is also constrained by this dominant methodology. Future research could expand the methodological repertoire.

One exciting opportunity is the development of big data, as they allow diffusion researchers to accurately trace the adoption, implementation, discontinuation, and reinvention of digital innovations in longitudinal studies. The use of big data to study diffusion will overcome the recall problem in traditional social science research which relies on cross-sectional surveys, localized interviews, and other methods that collect data retrospectively. In a recent model theorizing the diffusion of memes in the age of big data, Spitzberg (2014) argued for a multilevel approach, including looking at factors at the levels of meme, individual, network, society, and geotechnicality. Future research may move beyond studying innovation diffusion at a single level.

Furthermore, diffusion research can conduct quasi-experimental studies carried out in naturalistic environments. This approach would allow researchers to establish time ordering to make causal claims, moving diffusion research beyond correlational studies. Finally, qualitative methods, which involve data collection through in-depth interviews, journals, or logs, and digitally recorded conversations between informants, can be independent investigations or simply integrated into quasi-experimental studies. The open ended nature of qualitative methods can allow new explanations, factors, and variables not previously considered in the literature to emerge. In other words, qualitative methods can stimulate new research directions in diffusion studies in the 21st century.

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SEE ALSO: Change, Organizational Change; Information and Communication Technologies in Organizations; Innovation; Networks; Social Construction of Communication Technology; Technology–Organization Relationship

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Abstract

The diffusion of innovations theory is the most cited communication theory and the second most cited social science theory to date. This entry defines diffusion as the communication process underlying the natural spreading of an innovation (i.e., a new technology, behavior, or meme) over time within a social system. On the other hand, adoption is an individual or organizational decision to accept or reject an innovation, along with its subsequent implementation, discontinuance, and/or modification. Therefore, adoption is an individual or organizational process that leads to diffusion as a systemic process. The entry reviews the historical development of diffusion as a research paradigm, and the emergence of the diffusion of innovations theory, including its core concepts such as adopter categories, innovation attributes, diffusion networks, opinion leadership, organizational adoption, and users' reinvention. The entry concludes with some criticisms of diffusion theory as well as future theoretical and methodological opportunities for diffusion research.

Keywords

adoption; diffusion; information and communication technology; innovation; organizational communication