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2004

# Grassroots Diffusion: A Research Agenda and Propositional Inventory

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**Abstract**

As information and communication technologies become increasingly enmeshed in our personal lives, individuals have greater exposure to innovations that may be adaptable to work-related tasks. While innovations have traditionally been introduced into and diffused through organizations in a top-down manner, some innovations spread through grassroots diffusion. We define grassroots diffusion as the process by which the use of an innovation spreads throughout an organization through informal means and without organizational sanction or support. In this paper we describe the grassroots diffusion process and pose a number of research questions that may help guide our investigation of this phenomenon. In addition, we provide theory-based discussions of a number of relevant issues. Further, we present theoretically-derived propositions that may provide guidance for future research. Taken together, these elements form a research agenda that may be useful in moving research into grassroots diffusion forward.

# Grassroots Diffusion: A Research Agenda and Propositional Inventory

## Introduction

> *Researchers have overemphasized management's role in innovation design, implementation and adoption processes. Users have been treated as passive recipients of innovation introduction strategy rather than active agents of intraorganizational implementation and adoption (Lewis & Seibold, 1993, p.324).*

Lewis and Seibold's (1993) point, made over a decade ago, remains a valid issue. The role of individual adopters in intra-organizational diffusion of innovations remains a critical, but under-represented area of research consideration.

As information and communication technologies (ICT) become more ingrained in our personal lives, individual adopters become increasingly important to intra-organizational diffusion. Greater interaction with ICT innovations affords greater opportunity to recognize the applicability of personal ICT tools to work tasks. For example, instant messaging (IM) began as a personal communication tool, but has rapidly migrated into organizations. In this case, individual users are of critical importance to the diffusion of IM.

We call the process by which the use of an innovation spreads throughout an organization through informal means and without organizational sanction or support "grassroots diffusion." This is the theoretical focus of diffusion utilized in this paper. Although there have been few formal studies of grassroots diffusion, the phenomenon is a potentially rich area of research. In this paper, we propose a research agenda by posing research questions related to grassroots diffusion, and by stating theoretically-based propositions related to these questions. Our goal is to put forth some interesting and potentially fruitful avenues of research. By stating propositions, we attempt to provide starting points for research into grassroots diffusion. Our objective is to provide a broad, rather than deep, treatment of the topic in order to demonstrate the range of potential research activities that can focus on grassroots diffusion.

## Grassroots Diffusion

Organizations often direct considerable resources toward identifying, acquiring and promoting the use of emerging technologies. Sometimes, however, innovations are introduced into an organization though informal means. Individual workers learn of an innovation that may help them perform work tasks. These individuals take it upon themselves to acquire, learn and

implement these technologies without organizational support or sanction. Other workers learn of the innovation through informal means, and some are convinced to also adopt. Understanding such social contagion forces is important to moving diffusion research forward (Fichman, 2004)

**A Multi-Level, Boundary-spanning Diffusion Process**

Grassroots diffusion typically follows a series of steps, in which a knowledgeable individual (call this person a "maven") brings technology into an organization introduces colleagues to the technology. The colleagues then serve as individual components in a diffusion network. Each individual, having been introduced to and tutored in the innovation by the maven, then becomes a source of further diffusion; you might call these individuals "missionaries" in the diffusion processes (e.g., Sturdy and Gabriel, 2000). As more individuals in an organization are influenced by the grassroots process of maven/missionary diffusion and tutelage, a technological innovation may well come to the formal attention of the leadership of the firm. By this time, as visually depicted in Figure 1, missionaries may have begun the process of spanning organizational boundaries with extra-organizational contacts with other weak-ties colleagues in associated firms, and the diffusion process spreads gradually from individual to individual within the firm, then across firms, eventually becoming firmly established.

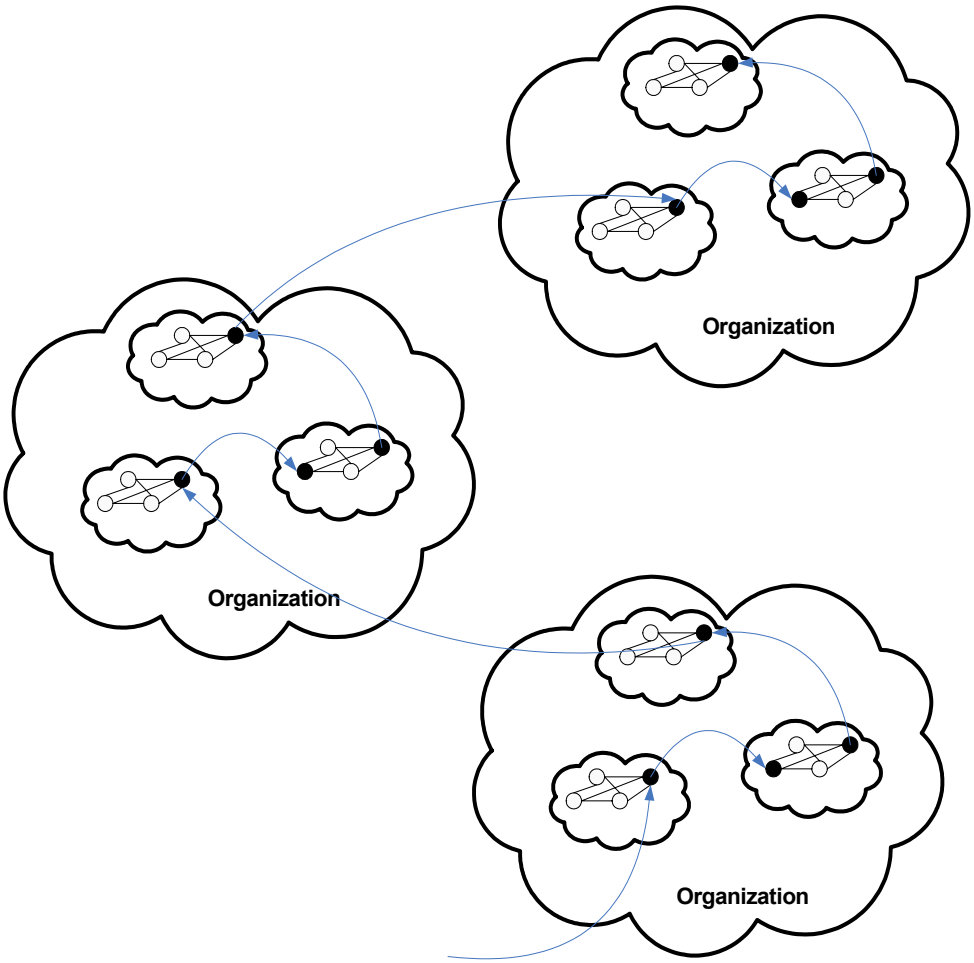
Grassroots diffusion begins when one or more individuals introduce the innovation into the organization. These "initiators" promote the diffusion of the innovation to people in their work groups and ego networks. Individual group members may then diffuse the innovation to other work groups within the firm, and when these networks interlink with other social networks in the organization, use spreads from network to network. Often, these networks are connected across subunits of the organization, leading to organization-wide diffusion (even though this diffusion may be incomplete).

When higher management becomes aware of the diffusion, they may in some cases take steps to stop the diffusion if they feel that the innovation is harmful to the organization (for example, by compromising security, or violating documentation requirements). In other cases, management sees value in the innovation, leading to formal organizational adoption of some form of the innovation. This is often accompanied by standardization on a particular form of the innovation, which may differ from that which had originally diffused.

Adoption of the innovation may also spread across organizations. Social networks that cross organizations may communicate the utility of adoption. Also, mass communication through

press articles, etc. diffuse the innovation to organizations that had not experienced grassroots diffusion. Thus, we can see how a few key individuals adopting an innovation may lead first to diffusion throughout their particular organizations, then to other organizations.

**FIGURE 1: Grassroots Diffusion Processes**




**An Informal Diffusion Process**

There are several generic examples of IT innovations diffusing at least partially through grassroots. For example, in some organizations personal computers were introduced to the organization by individual users who acquired a personal computer and spreadsheet software by using personal funds. Similarly, desktop publishing was introduced to many organizations through individuals using their personally-owned Macintosh computers for work purposes. More recently, Web browsing was introduced to many organizations by individual users who took it upon themselves to acquire Mosaic and use it for work tasks.

When management is unaware of the grassroots diffusion of an innovation, they may find it difficult to gain control over the innovation's use. Lack of standards, inappropriate use, and lack of compliance with organization and regulatory requirements may result. This is well illustrated by a recent example of an innovation whose use has spread in many organizations through grassroots diffusion; instant messaging (IM).

The recent IT press is replete with articles discussing the sudden emergence of IM within organizations (e.g. Kontzer, 2003). Originally intended for recreational use, individuals recognized the potential of applying IM to work tasks and brought IM into organizations. While there are many positive outcomes of this, IM often causes a number of serious problems for organizations. For example, personal-level IM software is notorious for opening security holes into organizational networks. In addition, personal-level IM tools do not have the functionality to comply with records retention requirements present in some industries.

## Emerging Research on Emergent Organizational Structures

A grassroots diffusion network is an example of an emergent structure (Monge & Contractor, 2003). The network does not come about because of organizational mandate, nor does management dictate the organizing structure of the network. This structure emerges spontaneously because of the interests and needs of interconnected individuals. Like other complex systems, grassroots diffusion networks are self-organizing and self-managing.

If organizations were more knowledgeable of grassroots diffusion, they might be able to recognize the phenomenon early on. This may allow management to take appropriate steps to gain better control of the innovation's use. In the example of IM, management may have been able to more easily standardize on an enterprise-level IM system that includes proper security and recording tools. In addition, organizational resources might be devoted to spreading IM to users who are not linked to the informal grassroots diffusion networks.

Although grassroots diffusion has been occurring with some frequency, few studies have investigated this phenomenon. As a starting point for overcoming this gap, in the next section we pose a number of research questions related to grassroots diffusion. In addition, we discuss relevant theory that may shed light on these questions. Further, we state propositions derived from these theories. To organize our discussion, we modify a framework proposed by Wejnert (2002), which consists of actors, the innovation and the environment. Due to space limitations, we omit the environment from our discussion. However, because of their importance, we add

communication networks and processes to the framework. In each section, we present relevant research question(s), followed by a set of propositions that are discussed in the section.

## Actors: Initiators

For grassroots diffusion to occur, certain innovative, influential individuals must introduce the innovation to others in the organization. Drawing on Strodthoff, et al. (1987), we call these individuals diffusion initiators. To focus our discussion of the actors involved in grassroots diffusion, we limit our discussion to these critical actors. Potential adopters are also worthy of study in the grassroots diffusion context. However, space limitations preclude discussion of these actors. Our interest, here, is on the initiator as the actor, who is necessary to *begin* the grassroots diffusion process in the firm. Therefore we chose to offer extended discussion of initiators at the cost of omitting potential adopters from our discussion.

Initiators are the individuals who take it upon themselves to introduce the innovation to the organization and to promotes its diffusion; these can be characterized as mavens or missionaries, depending on whether their formative role is to bring an innovation to an organization, or to further diffuse it (even if in boundary-spanning roles) once it has already arrived. Mavens serve to first bring an innovation into a firm to which they belong, but those initiators who act as "mini-mavens" across intra and inter-organizational social and work groups, once an innovation has been introduced to a firm, can be thought of as missionaries, as they *further* the grassroots processes initiated by mavens.

It is important to understand what key characteristics initiators display, so that a maven or missionary might be differentiated from regular technology users. Initiators (taking the analogy of opinion leaders) enjoy sharing their knowledge of innovations with others (Rogers, 1995). In this sense, initiators are similar to market mavens. Mavens enjoy their position as market experts, so they seek opportunities to solidify their social position as mavens through sharing information (Walsh et al., 2004). Likewise, initiators are likely to have a reputation for being innovative. To reinforce and live up to this reputation, initiators feel an obligation to make others aware of useful innovations. There are other formative characteristics; initiators may also like so span social boundaries and carry their personal knowledge beyond the limited confines of their immediate social circle, hence the concept of missionary as an initiator category. Research Question 1 concerns the differentiating characteristics of initiators. Table 1 provides propositions

related to this question. Note that we consider grassroots diffusion to be successful and effective if the innovation diffuses to a substantial portion of the organization.

*RQ1: What are the characteristics of effective initiators?*

| |
|---|
| P1a: Initiators have high levels of interest in the focal innovation. |
| P1b: Initiators have access to resources pertinent to the focal innovation. |
| P1c: Initiators are members of a large number of social networks. |
| P1d: Initiators hold central positions in communication networks. |
| P1e: Initiators have relatively low adoption thresholds. |
| P1g: Initiators gain pleasure from sharing information about innovations. |

**Table 1: Propositions related to Initiators' Characteristics**

**Initiators and Opinion Leadership in Social Networks**

Critical mass theory (Oliver et al., 1985; Markus, 1987) provides insights into the importance of initiators in grassroots diffusion networks. Oliver et al. (1985) point out that a small segment of a population may make a large contribution to collective action. Initiators contribute considerable resources to the diffusion of the focal innovation. This is of critical importance because organizational resources are not formally devoted to diffusing the innovation; individuals must make up for the lack of organizational resources. If these individuals are not present, lack sufficient resources or do not put forth sufficient effort, the innovation is unlikely to reach critical mass and is relegated to the proverbial trash heap of failed innovations.

For grassroots diffusion to succeed, initiators must combine high interest (P1a) in the successful diffusion of the innovation with access to relevant resources (P2b) (e.g. the innovation and specialized information about it). Initiators must have both; interests without resources or resources without interest will not lead to successful diffusion (Markus, 1987).

The literature on opinion leaders provides some insights into initiators. Opinion leaders influence adopter attitudes and behaviors regarding an innovation (Rogers, 1995), and tend to get their information from specialized media that the main group of adopters do not attend to, such as innovation-specific magazines or Web sites. Individuals who lead in the diffusion process by opinion leadership exhibit a number of characteristics setting them apart from others in a diffusion network: opinion leaders tend to be better connected to the environment, and attend to

more specific information about it through consumption of specialty media, which leads to greater awareness of innovations (Rogers, 1995). In addition, opinion leaders typically are members of more social networks than are normal adopters (P2c). This affords greater opportunity to communicate with sources of information about innovations (Rogers, 1995), which enhances their capability of spreading information about new innovations across different, but slightly related groups, in the manner described by Grannovetter (1973).

Being a member of multiple networks not only exposes initiators to more sources of information, it allows these individuals to act as boundary spanners who carry knowledge of the innovation from network to network. Of course, it is possible for others to serve as boundary spanners, but effective grassroots diffusion is more likely when the highly-motivated initiator spans boundaries across communication networks. Initiators are also relatively well-connected to external networks, which affords them the opportunity to gain exposure to and knowledge of innovations. Further, opinion leaders with good social connections simply have a better opportunity to come into contact with a wider range of potential followers.

Initiators tend to be more central to the communication networks of which they are members (P1d). Because they are more central, they have the ability to reach more members of the network directly, without having to go through intermediaries. Being more directly connected to potential adopters not only eases the task of spreading awareness, it also increases the initiator's ability to exert social influence. Social influence is more effective when the influencing party is more closely connected to those s/he is trying to influence (Fulk, 1993).

**Initiators and Critical Mass Effects**

Adoption decisions are based largely on the utility of adoption. When the benefits of adoption outweigh the costs, adoption occurs (Kraut et al., 2000). In grassroots diffusion, early adopters can suffer relatively high adoption costs, because they adopt on faith with little or no external validation of their adoption. Further, for communication innovations, earlier adopters are able to gain relatively few benefits due to having relatively fewer individuals with whom to communicate using the innovation. Thus, initiators must derive other, less obvious benefits from adoption. Otherwise, there may not be sufficient utility to warrant adoption. So, the utility in performance that an innovation brings is more readily discerned or greatly prized by early adopters.

Later adopters need to know their decision is well considered, and they tend to derive this evidence from the behavior of others. For this reason, adoption thresholds are important to consider when examining the diffusion of communication innovations. Put simply, an adoption threshold is the number of individuals who must adopt an innovation in order for the focal individual to consider adoption, personally (Granovetter, 1978). Early adopters, such as initiators, have relatively low adoption thresholds, and adopt for reasons unique to their category membership (P1e); Rogers (1995) notes that innovators typically enjoy the process of learning new things, which serves as a motivational basis for the behavior. In grassroots diffusion, an initiator may be self-motivated, but potential adopters typically require external validation for their decision. When an organization promotes the diffusion of an innovation, the organization typically provides incentives and/or exerts pressure to promote adoption. These forces are absent in grassroots diffusion. As a result, for grassroots adoption to transpire, it is critical to have some individuals with low adoption thresholds who will serve to introduce an innovation into a firm for little or no reason other than their own interest in innovations These early adopters influence closely associated others within a firm, using interpersonal suasion, and those immediately influenced by the initiator of an innovations can then serve through their own social connections to further diffuse the innovation. When enough potential adopters have been influenced by the initiators, the increased level of adoption that entails eventually pushes the total number of adopters within a firm over the thresholds of "visible acceptability." Subsequent adopters perceive that there is external validation; if not in the form of organizational sanction, then in the form of interpersonal familiarity, such that the diffusion reaches critical mass by achieving a level of visibility that serves to [informally] legitimate the nature of the innovation.

Initiators' derive genuine pleasure from passing information to others (P1f). It is in their very nature, part of their personality, and this is a distinguishing characteristic of opinion leadership (Rogers, 1995). This stems in part from a desire to help others. Initiators experience a desire to help others. When initiators become aware of an innovation that might make life easier for others, they actively seek ways to communicate awareness of the innovation, thus satisfying their sense of obligation and providing enjoyment.

**Initiators and Their Behaviors and Roles in the Firm**

Understanding grassroots diffusion requires understanding the roles that initiators serve. With grassroots diffusion, the organization does not expend resources to support diffusion. Other

entities must provide these resources. This leads us to Research Question 2, which is shown below. Propositions related to this question are given in Table 2.

*RQ2: What roles do initiators play in grassroots diffusion?*

| |
|---|
| P2a: Initiators build awareness of the existence of the focal innovation. |
| P2b: Initiators build awareness of the benefits of using the focal innovation. |
| P2c: Initiators influence the attitudes of later adopters. |
| P2d: Initiators establish usage of the innovation as a behavioral norm. |
| P2e: Initiators provide expertise in the use of the innovation. |
| P2f: Initiators establish norms for acceptable use of the innovation. |
| P2g: Later adopters learn vicariously from initiators use of the innovation. |
| P2h: Vicarious learning lowers the risk of adoption for later adopters. |

**Table 2: Propositions related to Initiators' Roles**

A key role of initiators is to build awareness of the innovation. When organizationally-sanctioned innovations diffuse, management often holds training sessions and seminars, sends memos etc. in order to build awareness of the innovation. In grassroots diffusion, initiators promote must take steps to promote awareness.

When building awareness, initiators must have multiple goals. Of course, simply communicating awareness of the existence of the innovation is important (P2a). Simply calling attention to the adoption of an innovation by others may increase the salience of the adoption (Fulk, 1993). However, it is not enough to simply make others aware that the innovation exists; initiators also must effectively communicate awareness of the benefits of using the innovation (P2b). This is critical to the success of the innovation. Later adopters may have lower levels of interest in the innovation. For example, later adopters may not be as innovative as initiators and therefore may not derive the same benefits from simply trying something new (Rogers, 1995). To offset lower interest levels, initiators must clearly and effectively communicate the benefits of using the innovation.

It is important to realize that the attitudes of later adopters may be, in part, modeled on the attitudes of initiators (P2c). Attitudes are subject to modeling, and thus may be acquired through social learning (Fulk, 1993). By putting forth the considerable effort required to adopt

and promote an innovation, initiators signal that they have positive attitudes towards adopting the innovation. Through social learning processes, these attitudes are communicated to potential adopters.

Initiators serve to increase the benefits of adoption in other ways. For example, the mere fact that the initiators have already adopted the innovation adds benefits to later adopters. This is especially true in the case of communication innovations. In the case of communication innovations, initiators increase the benefits of later adoption simply by adopting; later adopters know that, at a minimum, they may use the innovation to communicate with initiators. This further illustrates the importance of initiators belonging to a large number of networks. When an initiator belongs to many networks, this single individual adds value to adoption of every person in each of these networks. Of course, only being able to communicate with the initiator may not be sufficient to bring about adoption, particularly given that later adopters typically have higher adoption thresholds.

Because initiators typically have high social status, adoption by these important individuals may have a great influence on how others perceive the benefits of adoption. One way in which this influence occurs is through establishing the use of the innovation as a norm (Kraut, Rice, Cool & Fish, 2000) (P2d). When high status individuals engage in a behavior, that behavior is more likely to become established as a behavioral norm; in effect this is a symbolic endorsement of the innovation (Kraut, et al, 2000). Being in compliance with norms is a benefit of engaging in a behavior, so establishing the use of the innovation as a norm increases the benefits of adoption.

Initiators also help lower the costs of adoption. One way in which this occurs is through initiators providing their expertise to support the implementation and use of the innovation (P2e). In grassroots diffusion, initiators, in effect, act as technical support departments for IT-based innovations. This lowers the complexity of adoption for later adopters. Later adopters know that they can turn to the initiator for help in installing and using the innovation.

Initiators also lower the cost of adoption by helping establish norms for how the innovation should be used (P2f). Early in the diffusion process, use norms are not well established (Kraut et al, 2000), yet such norms are necessary for effective interaction. By communicating use norms, initiators provide standards by which the appropriateness of actions related to the innovation may be judged. This is a form of social information processing (Fulk,

1993). For communication innovations in particular, it is important to establish what methods of use are and are not acceptable. Often these norms of use emerge over time. Initiators facilitate adoption by helping to establish and communicate these norms early in the diffusion process,.

Initiators communicate use norms through example. In effect, use by initiators acts as a vicarious trial (P2g). Vicarious learning is one method of social influence (Fulk, 1993; Lewis & Seibold, 1993). Initiators demonstrate acceptable behavior in terms of the innovation's use. Others observe these behaviors, which may lead to social influence through behavior modeling.

Vicarious learning not only eases the transition into the innovation's use, it also lowers the risk of adoption (P2h) for later adopters. Adopting an innovation is inherently risky (Rogers, 1995); the adopter cannot be certain that the benefits of adoption will be sufficient to offset the costs. By serving as an example, initiators provide evidence of the benefits of adoption, lowering the level of uncertainty associated with adoption. Initiators also lower the technical risks of adoption. By using the innovation, initiators demonstrate 1) that the innovation fits within the organization's technological framework, and 2) that certain organizational processes may be adapted to make effective use of the innovation. Finally, initiators lower the social risks of adoption by demonstrating that its use is acceptable, and by establishing norms related to use.

## Communication Networks and Grassroots Diffusion

As is the case with any innovation diffusion, communication networks are important to grassroots diffusion. In grassroots diffusion, however, the communication networks through which the information about the innovation is spread are not organizationally sanctioned, hence, do not receive direct organizational support. Because of this, understanding the unique network characteristics that enable effective grassroots diffusion is important. Research Question 3 reflects this importance. Table 3 provides related propositions.

*RQ3: What characteristics of communication networks facilitate grassroots diffusion?*

| |
|---|
| P3a: Strong ties within a single network increases grassroots diffusion speed within that network. |
| P3b: Weak ties between networks facilitate organization-wide grassroots diffusion. |
| P3c: High task interdependence facilitates grassroots diffusion. |
| P3d: Work-group and ego networks have equal influence on members' attitudes about the innovation. |

**Table 3: Propositions related to Communication Networks**

**Strong vs. Weak Communications Linkages in Grassroots Diffusion**

To understand grassroots diffusion it is necessary to consider the presence of a variety of networks. Relatively small work groups or personal communication networks combine to form the overall diffusion network. It is useful to think of networks within networks. The smaller workgroup or personal networks exist within the larger network of the organization, and organizations combine to form even larger networks.

Interestingly, highly effective grassroots diffusion requires a combination of networks characterized by both strong and weak ties. Strong ties are formed among people who communicate frequently. Weak ties, in contrast, refer to connections among people who communicate infrequently (or, by mediated channels) (Grannovetter, 1973). Information spreads quickly through a network characterized by strong ties (P3a). In these highly cohesive networks, communication is frequent and there are many shared interests. Once someone in a cohesive network adopts, information about the innovation is quickly spread to others in the network. Frequent communication (strong ties) translates into rapid diffusion. In addition, the stronger ties of a cohesive network allows more social influence to occur within this network through a process known as contagion by cohesion (Monge & Contractor, 2003).

However, if only strong ties are present, diffusion is likely to be limited to the network into which the innovation was originally introduced. Weak ties are required to bridge structural holes (Burt, 1992) in the overall diffusion network (P2b). People with whom one has weak ties are likely embedded in structural holes that represent disconnections in the overall diffusion network. If no individuals in the initial network are connected through weak ties to other, dissimilar networks, then diffusion is limited to those networks that are connected through strong ties. An example may help illustrate this point. For convenience, we use IM as the innovation. Consider the diffusion network shown in Figure 2.

The focal innovation (IM) is introduced into the organization by the initiator, who is a member of the Network A. Ties are strong within this network, so IM diffuses quickly. One member of the initial network has a weak tie with a member of Network B. Communication through this weak tie diffuses IM to Network B, then diffuses the innovation through Network B via strong ties. A member of Network B has a weak tie with a member of Network C. This weak tie serves to diffuse IM to Network C. This process continues until IM diffuses throughout a

large portion of the organization. Although not shown in the figure, weak ties also allow diffusion from organization to organization.

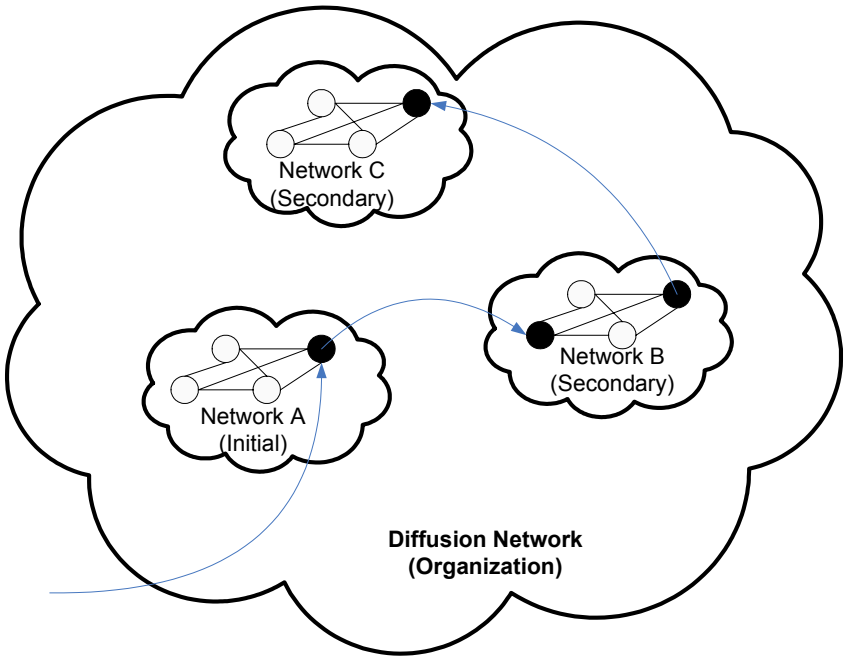



**Figure 2 - Diffusion using Strong and Weak Ties**

Communication networks where members' tasks are highly interdependent are more conducive to grassroots diffusion (P3c) than are networks characterized by low task interdependence (Rice, Grant Schmitz & Torobin, 1990). Greater levels of task interdependence require higher levels of coordination, which in turn requires more communication. The more frequent communication affords greater opportunity to communicate information related to the innovation. In the case of communication innovations, there are also greater incentives to promote diffusion. Assuming the innovation leads to more efficient or effective communication, individuals have incentives to promote adoption.

Broadly speaking, communication networks in an organization may be classified as either being work-group networks or ego networks. As the name implies, work-group networks are structured according to the work tasks in which individuals are involved. In contrast, ego networks are organized around communication flows rather than by formal work structures (Fulk, 1993). Empirical evidence indicates that work-group networks have a greater influence on attitudes and behavior (Fulk, 1993). However, the referent group that influences attitudes may be

determined through formal structures (as in work groups) or through behavior and communication patterns (as in ego networks) (Rice et al., 1990; Kraut et al., 2000). Because grassroots diffusion is not sanctioned by organizations it may be that ego networks are equally important sources of influence (P3d).

## Innovations Suited to Grassroots Diffusion

It is likely that some innovations are more conducive to grassroots diffusion than others. In this section, we discuss some aspects of innovations that may help us understand the types of innovations that are most likely to diffuse through grassroots processes. Note that these are generalizations, so it is possible that innovations that do not meet all of the characteristics described below will diffuse through grassroots. Research question 4 pertains to innovation characteristics that may facilitate grassroots diffusion. Table 4 provides related propositions .

*RQ4: What characteristics of innovations facilitate grassroots diffusion?*

| | |
|---|---|
| P4a: | Innovations with low initial cost are better suited to grassroots diffusion. |
| P4b: | Highly observable innovations are better suited to grassroots diffusion. |
| P4c: | Highly trialable innovations are better suited to grassroots diffusion. |
| P4d: | Innovations characterized by low adoption risk are better suited to grassroots diffusion. |
| P4e: | Innovations characterized by reciprocal interdependence are better suited to grassroots diffusion. |
| P4f: | Innovations that can be added to existing technology clusters are better suited to grassroots diffusion. |

**Table 4: Propositions related to the Innovation**

We expect that innovations that have low initial costs are more likely to diffuse through grassroots processes (P4a). Low initial cost is one aspect of relative advantage (Rogers, 1995), which has been shown to influence use intentions (Agarwal & Prasad, 1997). While low initial cost correlates with adoption regardless of the diffusion process, it is especially important in grassroots diffusion as individuals must bear the cost of implementing the innovation. However, if the utility is sufficiently high, even high-cost innovation may diffuse through grassroots.

Perceptions of the observability of an innovation are positively related to adoption (Rogers, 1995). This includes the observability of the innovation itself as well as the results of its use (Karahanna, Straub & Chervany, 1999). Similarly, we expect that when the presence and

results of using an innovation are readily apparent, that innovation is more conducive to grassroots diffusion (P4b). In grassroots diffusion, organizations do not take steps to communicate information regarding either the existence of the innovation or benefits of adopting; the ability of potential adopters to observe the innovation in use will be more important, as a result.

Trialability is also important to grassroots diffusion. Innovations that are high in trialability are relatively easy to experience without making full commitment to adoption (Rogers, 1995). Perceived trialability is a partial determinant of potential adopters' attitudes towards adopting an innovation (Karahanna, et al., 1999). Innovations that require high levels of commitment before they can be experienced are more risky to adopt. Because of the lack of organizational sanction, grassroots diffusion is inherently risky. Trialability mitigates some of this risk, making trialable innovations better suited to grassroots diffusion (P4c). Similarly, innovations that carry low adoption risk are more likely to be successfully diffused though grassroots (P4d), as organizational resources and sanction may be required to overcome the levels of risk present with high-risk innovations. Without organizational support, individual adopters may not be willing to undertake high-risk adoptions.

Many innovations exhibit sequential interdependence; later adopters benefit from early adopters use of the innovation, but the reverse is not true. Innovations that are highly interactive, in contrast, exhibit reciprocal interdependence. For these innovations, early adopters benefit from later adopters use of the innovation (Markus, 1987). This is well-illustrated by IM. When later adopters begin using IM, the IM network grows. Early adopters benefit because they can now use IM to communicate with more people. Because of the reciprocal interdependence, early adopters have an incentive to promote diffusion. Initiators must compensate for the lack of organizational resources devoted to diffusion making such incentives critically important in grassroots diffusion (P4e).

A less obvious, but quite intriguing, characteristic of grassroots-susceptible innovations relates to the concept of technology cluster innovations. Often, innovations are combined with others to form bundles or clusters of innovations (Chin & Moore, 1991; Rogers, 1995). Although we typically study innovations individually, some believe that potential adopters view innovations in bundles. For example, it has been proposed that the innovation of the Internet should be considered a technology cluster innovation (Prescott & Van Slyke, 1997).

Innovations that can be added to already-adopted clusters are good candidates for grassroots diffusion (P4f). The Internet, email and IM offer interesting examples of how the concept of technology clusters might help us understand grassroots diffusion. The Internet, which is a technology cluster (Prescott & Van Slyke, 1997), provides the infrastructure for most email systems. In fact, as the name implies, Internet-based email requires adoption of the Internet. This is an example of a contingent relationship among innovations in a cluster; one must adopt the Internet in order to adopt email. (We acknowledge that some email systems do not require the Internet. However, the vast majority of email systems in use today utilize the Internet.) Most IM systems also require the Internet and so have a contingent relationship. However, email and IM have a different sort of relationship. This cluster may be viewed from two perspectives. First, they share a common platform (the Internet). Because of this adopting either IM is easier if one has already adopted email. In addition, the innovations share a common function. Both are used for relatively rapid electronic communication. Experience using email may facilitate the adoption of IM.

It is likely that innovations that fit into existing clusters are better candidates for grassroots diffusion. Of course, this is not a requirement. An innovation that provides sufficient utility may diffuse through grassroots even if it does not fit into a previously-adopted cluster. However, adopting technologies that may couple with an existing cluster may either require less effort and/or provide more utility, which increases the chances of grassroots diffusion occurring.

## Processes

The processes involved in grassroots diffusion also hold the potential for interesting and informative research. In this section, we discuss the influence methods and communication media preferences of initiators. Learning processes likely to occur in grassroots diffusion are also discussed. Table 5 provides a number of propositions related to processes.

| |
|---|
| P5a: Initiators will use a variety of influence methods depending on the influence target and situation. |
| P5b: Initiators will use a variety of communication media depending on the situation. |
| P5c: Initiators will favor media that is similar to the focal innovation. |
| P5d: Learning about the innovation will occur through observational learning. |
| P5e: Learning about the innovation will occur through application play. |

**Table 5: Propositions related to Processes**

*RQ5a: What influence methods do initiators use to encourage others to adopt the innovation?*

Because of the high uncertainty of adopting an innovation without organizational support or sanction social influence is critically important to grassroots diffusion. Social influence is more important when one makes decisions under high uncertainty (Pfeffer, Salancik & Leblebici, 1976). Social influence may be exerted through a variety of means, including overt statements (Fulk, 1993), vicarious learning, and enforcement of group norms (Lewis & Seibold, 1993). In addition, salient others may provide standards by which to judge the appropriateness of adoption. Their use also increases the saliency of adoption by calling attention to the adoption of the innovation by others (Fulk, 1993). The breadth of influence methods provides initiators with a toolkit of more and less overt ways to encourage adoption. Widespread grassroots diffusion requires influencing a variety of people in a variety of situations. Different influence methods may be appropriate for different situations. Therefore, we expect that initiators will use a variety of these methods, without any particular method being dominant (P5a).

*RQ5b: What, if any, media preferences will initiators exhibit when encouraging adoption of the innovation?*

The choice of communication media used to encourage adoption may also be a fruitful area of research, as stated in the research question above. A number of theories may inform studies of media choice, including media richness theory (Daft & Lengel, 1986), social influence theory, and social presence theory. These theories may be used to complement one another, although social theories may be better suited for studying newer media (Webster & Trevino, 1995). Space limitations preclude discussions of these and other relevant theories. However, we are able to offer some thoughts regarding how initiators might choose media. First, we expect that a variety of media will be used to communicate awareness of the innovation and the benefits of its use (P5b). Successful initiators tend to be skilled in communication and are likely to be able to choose the most appropriate media given the communication's goal and target individual(s). Second, in cases where the focal innovation is similar to, or offers significant improvements over existing media, initiators may favor those existing media (P5c). For example, using email (an existing media) to communicate the benefits of IM provides initiators with some interesting opportunities. First, using email allows initiators to communicate the similarities that

email and IM share. This makes adoption of IM easier and less risky. Second, initiators may be able to point out how IM might have certain advantages over email. For example, IM allows almost instantaneous, synchronous communication.

*RQ5c: By what processes do individuals learn about the innovation?*

In grassroots diffusion, individual users make up for the lack of formal training and support. Because of this, understanding how individuals learn about the innovation is important. Social learning theory (Bandura, 1986) provides some insights into how learning might occur in grassroots diffusion. In the absence of formal training and promotion efforts, an individual may learn by observing the use innovation by others (P5d). After such observations, the individual adapts the observed behaviors to fit his or her needs and circumstances. This is similar to the idea of vicarious learning by observation in social influence theory.

Another informal means of learning about an innovation is the process of application play (Belanger & Van Slyke, 2000). In the absence of formal training, users may explore the capabilities of a computer application by using it for non-work purposes (play). Over time as the user expands their knowledge of the application, s/he begins to use the application for work-related tasks, effectively transferring the learning from leisure to work-related activities. This learning occurs with little overt effort expended by the user (Belanger & Van Slyke, 2000). The relative lack of explicit effort required for learning through application play makes it especially applicable for situations of grassroots diffusion (P5e).

## Conclusions and Limitations

The role of users is an under-represented, but critical area of diffusion research. In this paper, we describe the phenomenon of grassroots diffusion. We also pose a number of research questions related to grassroots diffusion. Further, we discuss a number of issues related to these questions. From these discussions, we derive theory-based propositions. Through these discussions, we promote a research agenda that may be a starting point for better understanding grassroots diffusion.

A number of limitations of this paper should be noted. First, we focus on organizationally-relevant innovations, even though it is possible for organizationally-irrelevant innovations to spread through grassroots diffusion. Second, we acknowledge a pro-innovation bias in much of this paper. In addition, we have primarily focused on a communication

innovation, IM, in much of our discussion. Grassroots diffusion may also apply to non-communication innovations as well. Finally, the bulk of the propositions put forward in this paper may be applicable to non-grassroots diffusion. Of course, discovering novel forces and processes unique to grassroots diffusion would be of great benefit. We acknowledge that we have fallen short of this goal. Hopefully, however, we have succeed in providing some initial direction for research into grassroots diffusion.

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