



External exposure, boundary-spanning, and opinion leadership in remote communities: A network experiment

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ARTICLE INFO

Keywords:

Network interventions
Network manipulation
Boundary-spanning
Opinion leadership
Multiple networks
Remote communities
ERGM

ABSTRACT

Are boundary spanners opinion leaders in ethnically segregated remote low-income communities or are they shunned? Can external exposure create opinion leaders in such peripheral communities? To answer these questions, we invited randomly selected farmers from 16 randomly selected communities in Sumatra to three-day networking and training events outside of their villages. The substantive purpose of these events was for the farmers to learn new practices from their peers in the visited locations. Eighteen months later, we conducted a sociocentric survey of information-sharing networks in the 16 communities. These 16 networks included 380 members, of which 117 participated in our randomized intervention and 263 were in the control group. We found that participants of our randomized intervention had an average indegree that was double that of the control group (2.8 vs 1.4). We applied Exponential Random Graph Models to the 16 networks to account for endogenous network tendencies. We treated participation in the intervention and the number of boundary-spanning links of each actor as node covariates. Results from our models show that actors who participated in the intervention had higher levels of influence in their communities than the control group, and actors with more boundary spanning links were more popular sources of advice. The results suggest that network interventions do not always need to rely on opinion leaders. Under certain conditions, interventions can create opinion leaders by changing local social networks. We conclude with methodological implications for using interventions in social network research.

1. Introduction

Social networks are important channels for learning, innovation, and information diffusion in isolated agrarian communities (Isaac et al., 2014, 2007; Bodin and Prell, 2011). For the inhabitants of such communities, direct exposure to the external world can be an eye-opening experience. Meeting people outside of their village can open access to knowledge that is unavailable at home (Matouš and Todo, 2018). However, traditional village dwellers might not always see the value of such exposure, and information coming from external sources might not be widely accepted, particularly in societies characterised by high levels of territorialism or ethnic fragmentation (Barnes et al., 2016).

This study is about boundary spanning and opinion leadership in remote communities. Boundary spanning and opinion leadership are distinct but potentially intertwined concepts. Boundary spanners communicate across the boundaries of their groups (Shah et al., 2018). Opinion leaders are popular individuals whom others seek for information and whose practices are likely to be imitated (Valente and

Davis, 1999; Parau et al., 2017).

In peripheral communities, new ideas and practices often come from outside and are adopted first by those on the margin of the local networks whose attention is directed outwards (Valente, 1995). New practices diffuse widely in the local communities only if opinion leaders accept them and opinion leaders will be careful to do that. If external influences are generally frowned upon, opinion leaders may be reluctant to engage with the external world and adopt practices coming from outside. In contrast, if boundary spanning brings respect and prestige, the people whose links cross the network boundary will be in the centre of community attention, and the diffusion of external innovations will become faster (Rogers, 2003).

Understanding these mechanisms and the ways to manipulate them is useful for disseminating information in isolated settlements, promoting good practices, and designing network interventions that could effectively improve people's lives in marginalized communities. Numerous studies have been conducted on personal attributes of opinion leaders (Rogers, 2003) but we still do not sufficiently understand

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<https://doi.org/10.1016/j.socnet.2018.08.002>

the network mechanisms of how external social influences affect opinion leadership in remote agrarian communities. Only a very small number of sociocentric studies have been conducted in rural regions of developing countries, where social learning via informal networks is the dominant mechanism of information dissemination (Shakya et al., 2017; Perkins et al., 2015). The overwhelming majority of empirical evidence on boundary spanning in social networks stems from corporate and organizational settings (Barnes et al., 2016), and almost all research on the relationships between brokerage, prestige, and trust, comes from networks of North Americans and Europeans (Burt and Burzynska, 2017). Moreover, it is very rare for network studies to deliberately manipulate the studied networks (Valente, 2017), which further limits the degree to which we can truly understand the network mechanisms of interest (Groce et al., 2018).

The aim of this research is to identify how boundary-spanning and opinion leadership interacts in remote communities in Sumatra. To understand the involved network mechanisms, we designed an experiment in which we manipulated the local farmers' information-sharing networks by exposing randomly selected individuals to social learning opportunities outside of their communities. Using Exponential Random Graph Models (ERGMs), we assessed how (1) boundary-spanning links and (2) short-term external social exposure relates to actors' network centralities within their communities over a period of 18 months.

2. Theory

2.1. Boundary spanning

The importance of boundary spanners for connecting diverse knowledge pools and communities of practice has been recognised in the literature (Reagans and McEvily, 2003; van Meerkerk and Edelenbos, 2014). Whereas dense relations inside groups and network closure facilitate coordination, collaboration, and trust (Frank et al., 2011; Coleman, 1990, 1988; Greif, 1989; Uzzi, 1997), boundary-spanners can play a crucial role in the transmission of new information between communities (Matous, 2015; Dowd et al., 2014; Muñoz-Erickson et al., 2010; Isaac and Matous, 2017).

Boundary spanners are less constrained by the ways things are done within their community (Muñoz-Erickson et al., 2010). In agrarian regions, experimentation and adaptation are important especially for communities facing environmental threats such as soil degradation caused by inappropriate practices. Understanding complex environmental problems, such as soil degradation, requires that actors access a wide range of environmental experiences that may not be available in a single community (Bodin, 2017).

Boundary spanning is related to structural holes spanning but there are differences between the two concepts. While actors connecting disconnected network cliques (for example, by talking to two group members who do not talk to each other) span a structural hole, the term "boundary-spanning" is typically used for linking an organization's internal network to sources of information outside of its (nominalistically-defined) boundary (Tushman, 1977; see also Fig. 1a for illustration). Reagans et al. (2004) distinguish structural holes within and outside of groups. While structural holes inside groups of people that are expected to collaborate (e.g. project teams in the corporate world) hinder cooperation, bridging external structural holes by boundary-spanning links of the team members to diverse parts of their organizations is considered useful (Reagans et al., 2004).

Although boundary-spanning and bridging structural holes is not always the same, there are some caveats and some general lessons from structural holes studies worth reviewing here. Structural holes theory predicts that good things come to those who reach to untapped parts of networks (Burt, 1995). The benefits that managers in Western corporations gain by structural holes-bridging have been well demonstrated (Gargiulo and Benassi, 2000; Burt, 2000; Burt et al., 2000).

However, it has been pointed out that these theories may be culturally biased (Zhixing and Anne, 2007). We know little about social network mechanisms in non-industrialised and non-Western settings where sociocentric studies are scant (Shakya et al., 2017). Studies of entrepreneurs in China suggested that bridging actors are generally less trusted, although contact with outsiders can be highly valuable especially in isolated contexts of weak institutions and scarce resources (Burt et al., 2018).

Barnes et al. (2016) has found that in some contexts, when network boundaries correspond with ethnic boundaries, boundary-spanners may be penalized for sharing information across social divides. Some people may be less likely to accept information from those who received it from outside. Those who interact only within their own group develop a sense of "us" against "them" towards the outside (Bodin, 2017). There are also other issues associated with structural holes. In the corporate context, structural hole-spanning has been linked to heavy psychological burden often experienced by individuals placed between different cliques (Krackhardt, 1999), and simulation studies suggest that the cost brokers pay by going against natural network tendencies, such as bonding within cliques, may not be worth the instrumental pay off (Prell and Lo, 2016).

2.2. Opinion leadership

According to Rogers (2003, p.388), "[o]pinion leadership is the degree to which an individual is able to influence other individuals' attitudes or overt behaviour in a desired way with a relatively high frequency". Opinion leadership can be measured sociometrically. "The sociometric method consists of asking respondents whom they sought (or hypothetically might seek) for information or advice about a given topic... Opinion leaders are those members of a system who receive the greatest number of sociometric choices...Undoubtedly, the sociometric technique is a highly valid measure of opinion leadership, as it is measured through the perception of followers." (Rogers, 2003, p. 308–310, see also Fig. 1b)

Opinion leaders, through their central positions in the local social networks, enable collective sense-making and the development of a shared knowledge base across the network (Bodin, 2017; Bodin et al., 2006; Westley et al., 2013). Evidence proves that opinion leaders, as identified by sociometric approaches, play a crucial role in social diffusion processes. In previous randomized controlled trial studies, what opinion leaders did was significantly more likely to be widely adopted across the network compared to cases in which the same innovation was disseminated via randomly selected network members (Lomas et al., 1991). Entire villages in Korea and Taiwan have been found to adopt the particular type of contraceptive method that the opinion leaders in their village chose, although the local inhabitants had access to information about other contraceptive methods from public sources (Kohler, 1997; Montgomery and Casterline, 1993). Opinion leaders' influence may come from their expertise. It has also been shown that farmers in Sumatra who are central in their community networks are good problem solvers (Pratiwi and Suzuki, 2017).

Identifying and targeting opinion leaders is by far the most popular strategy in network interventions, aiming at information dissemination and behavioural change. Only a small number of network intervention studies go beyond the identification of influential nodes and use more sophisticated network intervention strategies such as network manipulation (Valente, 2017). Moreover, because sociometric surveys are seldom conducted in practical intervention projects to rigorously identify influential individuals, network interventions typically target community members in visibly prominent positions, who are simply presumed to be opinion leaders (Valente, 2017). It is a common mistake in the design of network interventions that outsiders ask opinion leaders to promote practices that do not fit local thinking and social conditions. When opinion leaders start behaving in ways that are too progressive or incompatible with the local standards, they lose their

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