How behavior spreads: the science of complex contagions

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BOOK REVIEW

How behavior spreads: the science of complex contagions, by Damon Centola, Princeton and Oxford, Princeton University Press, 2018, 312 pp., $35.00 (paperback), ISBN: 9780691175317

As our society has evolved into social structures organized around networks (Castells, 1996), it is crucial for researchers and practitioners to unpack the impact of network structure on human behavior. Damon Centola's new book, *How Behavior Spreads: The Science of Complex Contagions*, presents an original theoretical framework for understanding network diffusion. Using both computer simulations and online experiments, this book compellingly demonstrates that the intuitive way to speed up the viral diffusion of diseases can backfire, resulting in the failure to spread social behaviors.

In Chapter 1, Centola's exploration of network diffusion begins with the argument that the dynamics of social change can be fruitfully examined from a social network perspective. By conceptualizing social change as a collective rather than an individual phenomenon, he emphasizes that the network of social influence, or 'the complex interactions of many interdependent actors' (p. 6), plays an important role in determining successful dissemination. While acknowledging the power of networks, Centola cautions that the intuitive theory of diffusion can lead us to make erroneous judgements about how behaviors spread through networks.

The remainder of *How Behavior Spreads* is divided into four interrelated parts. Part I provides theoretical foundations for studying network diffusion. Chapter 2 discusses the strength of weak ties theory (Granovetter, 1973) and its implications for diffusion research. The main lesson from the theory is that weak ties between otherwise distant actors create shortcuts across the network and can be highly efficient for behavioral contagion. However, much empirical research has reported that randomized networks of weak ties do not accelerate social change. Instead, clustered networks of strong ties are more suitable for spreading new behaviors. Chapter 3 explains this empirical puzzle by developing the theory of complex contagions. Using computer simulations, Centola confirms that the impact of tie strength on the rate of diffusion is contingent on behavioral complexity. While weak ties speed up simple contagions by reaching more diverse targets, strong ties are ideal conduits for transmitting complex contagions that require a high degree of social reinforcement. This chapter then directs attention to the structural reason why relationally strong ties contribute to large-scale diffusion. Specifically, it is the width of bridges, defined as the number of overlapping ties between two groups, that makes clustered networks of strong ties efficient for the spread of complex contagions in a large population. Chapter 4 further investigates the causal effect of network structure on diffusion through an online experiment. The results show that placing participants into a clustered network consisting of strong ties (close, redundant ties) with wide bridges increases both the rate of diffusion and the level of behavioral commitment. By contrast, a randomized network composed of weak ties (long, non-redundant ties) without wide bridges does not produce enough confirmation and therefore impedes behavioral contagion throughout the online community. The main lesson from these chapters is that wide bridges of social reinforcement are necessary for the diffusion of complex contagions.

Part II explores the practical implications of the spread of complex contagions. Chapter 5 emphasizes that even moderately consequential behaviors always involve risk, cost, legitimacy, complementarity, and other sources of complexity, so the theoretical insights generated from

chapters 2 through 4 can be applied to mobilization efforts for spreading social movements, new technologies, and health behaviors. Chapter 6 considers the setting in which new innovations face strong opposition. As simulation results reveal that the choice of seeding strategy determines the success of a contested innovation, clustered seeding works much better than random seeding due to the presence of wide bridges as stable channels of social reinforcement. By limiting early adopters' exposure to the whole population, the clustered seeding approach leads to the emergence of incubator neighborhoods that provide 'reinforcing support for one another to maintain the behavior' (p. 103) without 'being swamped early on by countervailing influences from the rest of the population' (p. 107). Chapter 7 applies the theory of complex contagions to organizational contexts. Centola empirically shows that wide bridges have advantages over brokerage ties in promoting the spread of new workplace practices and norms. Brokerage ties that bridge otherwise disconnected groups over long distances are often too narrow to create sufficient social reinforcement for diffusion. These results suggest that managers can improve organizational capacity for innovation and learning by strategically designing an organizational network composed of 'overlapping groups with wide bridges between them' (p. 129).

Taking these practical applications into consideration, Part III takes a hands-on perspective and introduces how to construct social capital through social design. Chapter 8 argues that anonymous interactions in the virtual world produce new forms of social capital that cannot be available to vulnerable groups in traditional face-to-face communication. The experimental evidence highlights the importance of social relevance in establishing influential relationships among online strangers. Wide bridges of social reinforcement may not facilitate the diffusion process unless the network is designed to match strangers based on the right kind of social relevance. Chapter 9 discusses how to create social contexts for behavior change. The author finds that the design of relationships shapes whether social reinforcement and social relevance induce or impede desirable contagions. While social support provides an intuitive explanation for the success of a health intervention, it is social comparison that offers useful social capital to the online community, resulting in increased cumulative physical activity. Altogether, the findings from Part III suggest that a slight change to the relational feature of an online setting can lead to significant differences in the network dynamics of collective behavior.

The final part of the book draws conclusions from the previous chapters. The main takeaway is that social networks with relevant sources of social reinforcement provide useful pathways in the diffusion process. The intuitive idea that maximizing early adopters' exposure to the rest of the population accelerates the rate of diffusion does not improve the spread of complex contagions. In addition, social design can be used to construct new forms of social capital online and stimulate people to adopt beneficial behaviors.

How Behavior Spreads makes important contributions to the literature on communication, sociology, network science, and public health by developing a novel, rigorous, counterintuitive theory of complex contagions, thus addressing age-old problems of diffusion. The impact of the book goes beyond academic boundaries. It illustrates the ways in which social science research offers practical guidelines for health interventions, social movement mobilization, innovation management, and organizational change. Methodologically, the book demonstrates the utility of computational methods and advanced experimental techniques in generating theoretical insights that would be otherwise unavailable. As this work focuses only on how network structure causally influences the diffusion process, one important and promising direction for future research will be an investigation of the coevolution of networks and behavioral contagion. Multilevel theorization is also needed because social influence that connects micro-level adoption and macro-level diffusion is shaped by network properties at the individual, dyadic, triadic, group, organizational, and global levels. Last but not least, the theoretical

arguments that differentiate simple from complex contagions can be further developed. Little is known about the mechanism through which behavioral complexity emerges and changes over time.

Overall, *How Behavior Spreads* is a must-read for researchers who are interested in social networks, social change, communication and technology, and computational social science. The lessons drawn from the book can also help health workers, movement activists, managers, user experiences designers to improve the success of diffusion and induce behavior change within a community.

References

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