

Research Statement

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My research centers on the diffusion of innovations theory (Rogers, 2003) in organizational, health, and environmental communication contexts. More specifically, I study the spread of big data technologies through cross-disciplinary collaborations in scientific organizations, the flow of health interventions through social clusters in cultural communities, and the dissemination of pro-environmental behaviors through persuasive messages in modern societies. Recently, I am moving my diffusion research into the new context of diversity, inclusion, and social justice. *Diffusion* is the communicative process through which a new technology, behavior, practice, idea, business model, policy, etc. spreads and changes through certain channels and media within and among organizations and social systems (Kee & Dearing, forthcoming). Traditional diffusion research examines innovation attributes (i.e., relative advantage, perceived complexity), adopter categories (i.e., early adopters, laggards), and social networks (i.e., opinion leaders, isolates) as predictors of non/adoption. My work extends diffusion theory by looking at the role of the organization behind an innovation, the role of social clusters in diffusion networks, and message framing of an innovation in the adoption and diffusion process.

First, I study the diffusion of cyberinfrastructure (CI; a supercomputing and computational platform for big data) as a workplace technology in scientific organizations. My dissertation on CI adoption led me to realize that organizational capacity (or the lack of) plays a critical role, but little research attention has been devoted to this factor. This is the focus of my NSF CAREER grant funded in 2015, along with five other NSF grants in this line of work. For example, in a project with a computer scientist at the University of Missouri-Columbia, we are designing an AI-powered chatbot to assist medical researchers and clinicians as users with adopting and implementing a CI platform for processing and filtering COVID-19 related information and data (see Kee, Calyam, & Regunath, 2021). In another project, I am working with a group of multi-institutional computer scientists (headed by a PI at the University of Southern California) to help technologists and scientists in big science and at major facilities (e.g., Arecibo Observatory, Large Hadron Collider) to implement a model of data lifecycle our team developed for managing big data with CI technologies. All these NSF studies are sociotechnical projects, as my collaborators and I believe that “*If you build it (CI), they (the users) will **not** come*” unless equal attention is also given to the social and organizational challenges of CI adoption, implementation, and diffusion (see Kee, Le, & Jitkajornwanich, 2021).

Second, I study the diffusion of health prevention behaviors. Health prevention (e.g., cancer screening) is a unique innovation to study as it is self-focused and risk-oriented. The adoption of a health prevention decision may require the joint decision and/or support of family, friends, and loved ones. Diffusion research has traditionally embraced Granovetter’s weak ties hypothesis in understanding the diffusion of new information. However, with a group of mathematicians and data scientists, we explored the role of strong ties in facilitating the diffusion of health prevention and intervention embedded in a complex relational context, a different phenomenon than the diffusion of news information, consumer electronics, and other innovations often studied in traditional diffusion research. By incorporating the mathematical theory of simplicial complexes with diffusion theory via a computer simulation, we developed the *Simplicial Model of Social Aggregation* (see Kee, Sparks, Struppa, & Mannucci, 2013; Kee, Sparks, Struppa, Mannucci & Damiano, 2016). I plan to continue developing this model in the case of PrEP (pre-exposure prophylaxis, an HIV prevention medication) adoption and diffusion in the LGBTQIA+ community.

Third, I study the diffusion of water conservation as a pro-environmental behavior. Pro-environmental behaviors present a unique opportunity to study an innovation that is others-focused and future-oriented (i.e., create and/or maintain a sustainable environment for future generations). Such adoption decisions are challenging because people in general respond more readily to innovation with self-focused and short-term implications. Out of this work is a typology of 12 messaging strategies, such as loss aversion and goal setting (see Liang, Kee, & Henderson, 2018; Liang, Henderson, & Kee, 2018. Note: Henderson was an undergraduate student). Through a series of online experiments testing three of the 12 strategies, my collaborators in media and communication discipline and I found that combinatorial use of two strategies, instead of traditional use of a single strategy, can more effectively lead to attitude change about water conservation in the residential context. However, agricultural water conservation can make a bigger impact than residential water conservation. This led to two USDA grant proposals currently under review. The first proposal is a TTU interdisciplinary collaboration with a faculty member in crop ecophysiology and precision agriculture and another faculty in agricultural and applied economics to conduct an on-farm trial of precision irrigation technologies for sustainable agriculture in West Texas, a semiarid region. The second proposal is a collaboration with the same TTU agricultural economist and a Texas A&M biological and agricultural engineering researcher who specializes in water systems modeling. The project aims to use participatory modeling and data-driven graphical model structures to investigate the acceptance of scientific communication about the water systems among agricultural stakeholders (e.g., farmers) in High Plains near Lubbock and Rio Grande Valley near El Paso.

Since joining TTU, I started moving my diffusion research to the new context of diversity, inclusion, and social justice. This line of work is grounded in an investigation of information diffusion on WordPress, where my co-author in media and communication and I developed a framework to analyze the linguistic/textual features of blogs, then build message concepts, and create validated instructional materials to guide content creators in composing more diffusible blog posts (see Liang & Kee, 2018). Moving this framework into the social justice context, my master's advisee, Sayo Okunloye, whom I met during my first semester of Fall 2019 at TTU, successfully defended her thesis entitled, "The Linguistic and Message Features Driving Information Diffusion on Twitter: The Case of #RevolutionNow in Nigeria" in December 2020. Sayo analyzed 56,985 tweets of a political protest that took place in July 2019 in Nigeria. She identified the linguistic categories, message length, and linking mechanisms (i.e., hashtags, mentions, URLs) that drove (and impeded) information diffusion on Twitter. The manuscript based on her thesis is currently under review at a communication journal. Moreover, we started analyzing a new dataset on Black Lives Matter (N=98,205) collected between May 26 and June 26, 2020, the month after George Floyd was killed on May 25, 2020. Our goal is to identify the linguistic, textual, and message design features that can lead to wider diffusion of social movements and diversity, inclusion, and social justice on social media, such as Black Lives Matter on Twitter.

In conclusion, I study diffusion in various contexts, including organizational, scientific, health, environmental, and social justice. I work with media/communication and multidisciplinary collaborators within TTU and at other universities, as well as my under/graduate students in these projects, leading to publications, grant proposals, and funded projects. I employ qualitative, quantitative, and computational methods to investigate diffusion. My research aims to achieve both theoretical advancements in diffusion theory, as well as societal impacts in big science, health prevention, water conservation, and social justice. My work has been funded by the NSF, Bill and Melinda Gates Foundation, and Robert Wood Johnson Foundation, totaling over US\$12 million to date. Furthermore, my publications have attracted a citation of almost 6,000 counts, based on Google Scholar. I plan to continue extending my diffusion research by engaging students in the Innovation Diffusion Lab (<https://www.IDLresearch.org/>), which I lead at Texas Tech University, and training the next generation of diffusion scholars.