

The modeling of multiple relationships in social networks

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A study conducted by Columbia Business School's Prof. Asim Ansari, William T. Dillard Professor of Marketing, Marketing, and Oded Koenigsberg, Barbara and Meyer Feldberg Associate Professor of Business, Marketing, alongside Florian Stahl, Assistant Professor, Department of Business Economics, University of Zurich, creates models that identify and predict how multiple relationships form in social networks. The research was recently featured in the *Journal of Marketing Research*.

The researchers observed that multiple, distinct types of relationships often occur among users of the same network, and existing models that explain how relationships form in a network don't account for these variations. For example, when people connect with each other through networks, they connect via multiple relationships. Online, two Facebook users may be "friends", but may not regularly communicate with each other directly; a user commenting on another's profile or otherwise actively communicating represents a different type of relationship in the network. Offline, multiple relationships also exist, as when employees in different departments in an organization perform different types of work (for instance, marketing and operations), but still interact with each other. The researchers wanted to know whether the formation of one type of relationships in a network could predict connections via other types of relationships.

The professors develop an integrated statistical framework for simultaneously modeling the connectivity structure of multiple



relationships of different types on a common set of actors. They use hierarchical bayesian methods for estimation and illustrate their model with two applications: the first application uses a sequential network of communications among managers involved in new product development activities, and the second uses an online collaborative social network of musicians. The researchers modeled both direct (a relationship with a clear sender and receiver) and undirected relationships (such as a collaboration relationship), to prove how disparate relationships can be jointly modeled within a common framework. In terms of multiple relationships, the statistical framework created by the researchers can also captured weighted and un-weighted relationships.

In terms of social networking online, the researchers focused on a Swiss social networking site for music artists, where three types of relationships were studied: individual friendships between artists; relationships based on communication or the exchange of information, such as direct messages or comments about upcoming concerts; and artists' downloads of other artists' music. They found that common factors determined the likelihood that each of these relationships would form, including geographical proximity of users; the online, as opposed to offline, popularity of artists; and whether the users shared an identity as an individual artist or as part of a band. These factors were related with the existence of a relationship and its strength — for instance, the more messages two users sent each other, the stronger the connection between them.

In terms of networking in the workplace, the researchers measured the impact of interventions in a network by focusing on an organization's small network of different groups of managers — such as research and development, marketing, and operations — involved in the development of a new product. These managers were moved into one shared facility, with researchers examining the types and strength of relationships between managers from different departments before and after the



intervention. The model accurately predicted what relationships would form based on common characteristics and predicted the effects of intervention on relationships in the network.

The research has several applications for marketing managers, customers relationship managers, and direct marketers. This research can help identify and target influential users in a network, predict network relationships, and improve understanding of the network structure. This can help to better leverage word-of-mouth marketing or the information transfer potential of a particular network. In addition, operations managers can use this model to better understand the social and communication structure of their organizational network, which can lead to solutions for increased efficiency and productivity among employees. While the study's applications involved small networks, recent research has shown that while online networks can have millions of members, communities within such networks are relatively small, with sizes in the vicinity of 100 members. This implies that very large networks can be broken down into clusters of tightly knit communities, and when such communities are identified, their methodological framework can then be used on such communities to further understand the nature of linkages within these subcommunities.

Provided by Columbia Business School

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