SOM MGT 573
Network Interventions

Thursdays 6:00–9:00 p.m.
EMBA Spring Term -- 2017
Location: SOM, 2200 Blumetti Classroom

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Course Description:

By exploring influential and cutting-edge work in network science, this course will equip students with tools to analyze problems related to phenomena as diverse as: product marketing, sustainability initiatives, financial market contagions, team assembly and performance, firm mergers, demand forecasting, diffusion of innovation, and the spread of rumors, cooperation, violence, infection, and so on. We will explore both online and offline networks, and diverse ideas like social capital, "big data" methods, AI manipulations, online community formation, tipping points, team performance, demand forecasting, and information cascades.

An understanding of networks is crucial to leadership in entrepreneurial, business, government, or non-profit activities. Leaders make decisions in an increasingly complex world defined by formal and informal networks – networks of employees and institutions, of collaborators and competitors, of patients and providers, of brands and customers. Novel big-data technologies and computational techniques make this complexity visible and even manipulable. Increasingly, we can intervene in networks to achieve public policy or management objectives. Consequently, the topics and methods covered in the course are relevant to multiple management domains.

Social Network Analysis (SNA) refers to both a theoretical perspective and a set of methodological techniques. As a theoretical perspective, SNA stresses the interdependence among entities – such as customers, employees, investors, patients, doctors, brands, or NGOs – which can give rise to novel properties of the system. SNA focuses on the relationships among interacting units and on how the interaction pattern (the architecture of connections, or the "topology"), or the spreading processes within the network ("contagion"), affect the behavior of the component entities and the system as a whole. As a methodological approach, SNA refers to techniques steeped in graph theory, with statistical and computational applications.

The course will also involve four in-class exercises using novel software to explore social network structure and function. And the course concludes with a set of student presentations on the application of SNA in their organization, industry, or field of interest.

Course Website:

A collection of links to the readings and other materials will be on Canvass.

Course Requirements:

• class attendance and participation (50%)
• business application memo (four pages) and presentation (50%) – possibly to be done as teams, depending on class size

Participation is a key requirement. Much of the learning in this class will occur from the give-and-take among students and the professor. This requires reading all of the materials and coming to class with something to say. You will be expected to be able to summarize the basic argument of every assigned reading.

For the memo and related presentation, you will choose a management problem you are familiar with, and apply a network perspective, outlining the ways in which the problem relates to network principles and/or ways in which it might be addressed using network principles.

Collaboration and Citation:

Discussion and the exchange of ideas are essential to academic work. However, you should ensure that any written work you submit for evaluation is the result of your own research and writing, and that it reflects your own approach to the topic. You must also properly cite any books, articles, websites, lectures, etc., that have helped you with your work (we do not care what citation format you follow, so long as you follow one).

Teaching Fellow:

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office hours: by appointment

Readings

Readings are available online via Canvass on the course website.

Also, please obtain:

Christakis, N.A. and Fowler J.H. *Connected: The Surprising Power of Our Social Networks and How They Shape Our Lives*. New York: Little Brown, 2009.

February 16
1) Course Introduction
2) Social Contagion in Offline and Offline Networks

We will introduce what networks are, how they differ from mere groups, how they are mapped, and how they come to have special properties. How, exactly, does the whole come to be greater than the sum of its parts in the social and managerial spheres?

How do diverse phenomena, ranging from obesity to kindness to ideas to product adoption spread across social ties within face-to-face and online networks? In what ways do people's behaviors, emotions, and attributes depend not only on their own choice and actions, but also on the choices and actions of other people to whom they are connected, directly or indirectly?

We will consider the fact that networks can affect human populations adversely, by promoting violence or animosity, or leading to groupthink. And not all ties between people are positive; many are negative, or antagonistic, and these can play important roles in the health and well being of communities and workplaces of all sizes.

Finally, we will introduce the concept of "social capital," first advanced by sociologist James Coleman in 1988, and also the concept of "emergent" properties of social systems. How and why do groups of people come to have properties that do not inhere in the individuals themselves? And to what productive ends, both good and bad, might social capital be put – by individuals on their own behalf and by managers and policymakers on behalf of communities or firms?

NA Christakis and JH Fowler, *Connected: The Surprising Power of Our Social Networks and How They Shape Our Lives*. New York: Little Brown, 2009 – Chapters 1, 2, 3, 4, and 8.

R Iyengar, C Van den Bulte, and TW Valente, "Opinion leadership and social contagion in new product diffusion," *Marketing Science* 2011; 30:195–212

S Goel, A Anderson, J Hofman, and DJ Watts, "The Structural Virality of Online Diffusion," *Management Science* 2015; 62: 180-196.

March 2
3) Social Network Interventions: Targeting and Social Marketing
4) Social Network Interventions: Manipulating Network Structure

We will consider two types of network interventions: where a manager or policy-maker manipulates social contagion transpiring within populations, or when a manager manipulates the connections, or social structure, within populations. How can we exploit an understanding of social network structure and function to intervene in the world to achieve diverse objectives (e.g., in public health)? How can we foster social contagion, or manipulate connection among entities to affect collective health-related behavior?

TW Valente, "Network Interventions," *Science* 2012; 337: 49–53.

D Centola, "The Spread of Behavior in an Online Social Network Experiment," *Science* 2010; 329: 1194–1197.

D Rand, S Arbesman, and NA Christakis, "Dynamic Social Networks Promote Cooperation in Experiments with Humans," *PNAS: Proceedings of the National Academy of Sciences* 2011; 108: 19193-19198.

DA Kim, AR Hwong, D Stafford, DA Hughes, AJ O'Malley, JH Fowler, and NA Christakis, "Social Network Targeting to Maximise Population Behaviour Change: A Cluster Randomised Controlled Trial," *The Lancet* 2015; 386: 145-153.

A Banerjee, AG Chandrasekhar, E Duflo, and MO Jackson, "The Diffusion of Microfinance," *Science* 2013; 324: 1236498

March 16
5) Network Sensors Offline and Online
6) Networks Within and Between Institutions

We will consider two further applied topics.

We can use an understanding of network structure and function not only to deliver information and products *into* a network, but also to extract information *from* a network, optimizing forecasts about epidemic disease, product adoption, and information diffusion – online and offline. We will analyze cases related to the adoption of new drugs and online brand-related and informational cascades.

We will also consider networks between or within entities such as firms, hospitals, etc.. The structure of the ties of employees such as doctors affects their performance. And the structure of the networks formed between institutions as diverse as hospitals, NGO's, factories, etc., affects their productivity and efficiency.

NA Christakis, and JH Fowler, "Social Network Sensors for Early Detection of Contagious Outbreaks," *PLoS One* 2010; 5(9): e12948.

M Garcia-Herranz, EM Egido, M Cebrian, NA Christakis, and JH Fowler, "Using Friends as Sensors to Detect Global-Scale Contagious Outbreaks," *PLoS One* 2014; 9(4): e92413

R Cross and L Prusak, "The People That Make Organizations Stop --- Or Go" *Harvard Business Review* 2002; 80(6): 104-112.

M Barnett, NA Christakis, AJ O'Malley, JP Onnela, NL Keating, and B Landon, "Physician Patient-Sharing Networks and the Cost and Intensity of Care in US Hospitals," *Medical Care* 2012; 50: 152-160

N Eagle, M Macy, and R Claxton, "Network Diversity and Economic Development," *Science* 2010; 328: 1029-1031

April 6
7) In-Class Experience: *Breadboard* Exercise: Coordination in Groups
8) In-Class Experience: *Breadboard* Exercise: Sharing in Groups

In this session, we will use *Breadboard* software developed in the Human Nature Lab to play network games, and to analyze the results. We will evaluate means to intervene in networks to make groups better able to *coordinate* their collective efforts to achieve solutions to hard problems, or how to help them share resources (in a "sharing economy").

M Kearns, S Suri, and N Montfort, "An Experimental Study of the Coloring Problem on Human Subject Networks," *Science* 2006; 313: 824-827

April 20
9) In-Class Experience: *Breadboard* Exercise: Cooperation and Decision-Making in Groups
10) In-Class Experience: *Trellis* Network Mapping

In this session, we will use *Breadboard* to play further network games, and to analyze the results. We will evaluate means to intervene in networks to make groups better able to respond to challenges and emergencies.

Furthermore, we will use software in the Human Nature Lab (*Trellis*) to map our own class network. These ideas and tools are also finding wide application in workplaces, schools, hospitals, and other venues where population behavior change, at scale, is desired.

B Uzzi and S Dunlap, "How to Build Your Network," *Harvard Business Review*, 2005.

May 4
11) Case Presentations

We will present and discuss the network assessments and studies that students have made of management topics of their own interest.