

SI 722, Fall 2005
M 9–12 AM
412 West Hall

Theories and Models in Information Studies

Theories and models guide the research process in all areas of information studies. But their nature varies widely across academic fields. Theories and models may be mathematical, analogical, or qualitative. In order to choose an appropriate research method (experiment, statistical analysis, survey, ethnography, historiographical, etc.), researchers need an explicit understanding of what theories and models are, and how they interact with the collection and analysis of empirical data.

This course covers a number of major theories and models from a variety of fields, such as information theory, distributed cognition, and Turing machines. However, it does not attempt to survey every theory relevant to information studies. Instead, the course provides a framework for the analysis of theories and models, introducing concepts such as epistemology, ontology, falsifiability, scientific paradigms, research programmes, infrastructure, trading zones, boundary objects, structuration, and actor networks. It trains students to recognize different kinds of theories and models, to discern their relative advantages and disadvantages, and to understand the relationship of theories to research methods. It also includes practical study in how to build new theories. Thus the course will be useful to student researchers faced with the task of choosing, developing, and testing their own theories and models.

Prerequisites: SI 701 (2–semester sequence). Open to SI doctoral students who have completed their first year of study.

Relation to requirements for SI PhD program: counts toward "Research Methods and Theories" requirement (was "research methods" prior to 2005.) Can be counted toward a two–course cluster with permission of advisor.

Instructor: Assoc. Prof. Paul N. Edwards. Office phone: 764–2617. Email: pne@umich.edu. Office hours: Fri 10:30–12 or by appointment.

Course books and other readings: all readings will be available for download on CTools *except* the required books. Since enrollment in the course is small, you are expected to order books online. One very expensive book (*HCI Models, Theories, and Frameworks*) is optional for purchase; a copy will be placed on reserve and the relevant chapters will be available on CTools, but if possible recommend that you purchase it if you can afford.

Required books:

Michael E. Hobart and Zachary Sayre Schiffman. *Information Ages: Literacy, Numeracy, and the Computer Revolution*. Baltimore: Johns Hopkins University Press, 1998.

Thomas S. Kuhn, *The Structure of Scientific Revolutions*. Chicago: University of Chicago, 1962.

James B. Rule, *Theory and Progress in Social Science* (New York: Cambridge University Press, 1997).

Pamela J. Shoemaker, James W. Tankard, and Dominic L. Lasorsa, *How to Build Social Science Theories*. Thousand Oaks, CA: Sage, 2004.

Optional book (expensive, but recommended):

John M. Carroll, *HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science*. San Francisco, Calif.: Morgan Kaufmann, 2003

Assignments

- 1) Short paper on the nature of theories and models (1500–2000 words). Due
- 2) Short paper on a theory or model outside your major field of study (1500–2000 words).
- 3) Term paper (3500–5000 words): Identify a significant theoretical debate in your research area. Describe the theory or theories (or models) involved, differentiating them from the methods used to test or apply them. Then, using concepts discussed in the first part of the course, analyze the quality of the theory or model as such.

Course Schedule

Sept. 12: Introduction: Words, Numbers, and Computers

Reading: Michael Hobart & Zachary Schiffman (1998), Information Ages: Literacy, Numeracy, and the Computer Revolution. Read the whole book, focusing especially on Chapters 1, 3–8, and Conclusion.

Sept. 19: Paradigms and Scientific Knowledge

Reading: Paul Carlile and Clayton Christensen (2005), “Practice and Malpractice in Management Research” (CTools)

Thomas S. Kuhn, *The Structure of Scientific Revolutions* (1962). Since this is probably the most important book ever written about the nature of scientific theory, every PhD student should know this text. However, it is not necessary to ponder every word of it carefully; Kuhn is not the world’s most engaging writer and arguments that were current 40 years ago are no longer so important. *Therefore, while I do expect you to read much of the book, please also make liberal use of the following resources:*

Frank Pajares, Outline of *Structure*:
<http://www.des.emory.edu/mfp/Kuhn.html>
Frank Pajares, Synopsis of *Structure*:
<http://www.des.emory.edu/mfp/kuhnsyn.html>

Sept. 23 or 30 (makeup date TBD): Theories, Models, Data, and Proof (I)

Reading: Donald Mackenzie, "Negotiating Arithmetic, Constructing Proof: The Sociology of Mathematics and Information Technology," *Social Studies of Science* 23:1 (1993), 37–65 (CTools)

Shoemaker et al., *How to Build Social Science Theories*, Chapters 1 and 7

Rule, *Theory and Progress in Social Science*, Introduction and Chapter 1

Sept. 26: NO CLASS

Oct. 3: Theories, Models, Data, and Proof (II)

Reading: Naomi Oreskes, Kristin Shrader–Frechette, and Kenneth Belitz.
"Verification, Validation, and Confirmation of Numerical Models in the Earth Sciences." *Science* 263 (1994): 641–46 (CTools)

Paul N. Edwards, "Global Climate Science, Uncertainty and Politics: Data–Laden Models, Model–Filtered Data." *Science as Culture* 8, no. 4 (1999): 437–72 (CTools)

Geoffrey C. Bowker, "Biodiversity Datadiversity." *Social Studies of Science* 30:5 (2000): 643–83 (CTools)

Oct. 10: Turing Machines, Undecidability, and NP–completeness

Reading: John E. Hopcroft, Rajeev Motwani, and Jeffrey D. Ullman. *Introduction to Automata Theory, Languages, and Computation* (Reading, MA: Addison–Wesley, 2001), Chapters 8–10 (on reserve)

Review: Shannon, "A Mathematical Theory of Communication" (CTools)

— **Short paper #1 due Friday, Oct. 14 by 5:00 PM** —

Oct. 17: FALL STUDY BREAK — no class

Oct. 24 – Topic TBD

— **Prospectus for final paper due in class** —

Oct. 31 – Theories and Models in HCI

Reading: John M. Carroll, *HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science*. San Francisco, Calif.: Morgan Kaufmann, 200 (on reserve, or buy a copy)

Chapter 4, “Users’ Mental Models: The Very Ideas”

Chapter 8, “Distributed Cognition”

Chapter 12, “Applying Social Psychological Theory to the Problems of Group Work”

Nov. 7 – Social Network Theory

Readings: Rule, *Theory and Progress in Social Science*, Chapter 5

Other readings TBD

Review: Mark Granovetter, “The Strength of Weak Ties” and “Weak Ties Revisited” (CTools)

Robert Putnam, “Bowling Alone” (CTools)

Nov. 14 – Social Theory and Social Science I

Reading: Shoemaker et al. *How to Build Social Science Theories*, Chapters 2–4, 8–9.

Rule, *Theory and Progress in Social Science*, Chapter 7

— **Short paper #2 due in class** —

Nov. 21 – Social Theory and Social Science II

Reading: Anthony Giddens, *The Constitution of Society* (Berkeley, CA: University of California Press, 1984), Chapters 1 and 4 (on electronic reserve via CTools/MIRLYN, or buy a copy of the book)

Paul Gingrich, [overview of Giddens](#) (CTools)

Rule, *Theory and Progress in Social Science*, Chapter 8

Nov. 28 – Economic Theory and Technological Change

Paul David, “Clio and the Economics of Qwerty.” *American Economic Review* 75 (1985): 332–37 (CTools)

S. J. Liebowitz and Stephen E. Margolis. “The Fable of the Keys.” *Journal of Law and Economics* 33 (1990): 1–25 (CTools)

Rule, *Theory and Progress in Social Science*, Chapter 3

Dec. 5 - Topic TBD

Reading: TBD

Dec. 12 - Conclusion

No reading assignment

— Final paper due in class —