FALL 2010
PSYCHOLOGY 757 SEMINAR:

INNOVATION AND TECHNOLOGY: A SOCIO-TECHNICAL PERSPECTIVE

TUESDAYS 6:00 - 8:45
736 Poe Hall

INSTRUCTOR: DENIS O. GRAY (712 Poe)
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Background

Technology has always been considered one of the key elements that define society or civilization. In modern societies, the ability to innovate, including the ability to create, deploy, and implement new technologies (including social and organizational technologies) and to anticipate and/or control their effects has taken on much greater importance. Technology is a critical contributor to the health and vitality of a society and its major institutions; technology can have a significant effect on our ability to meet many of the challenges confronting modern society (e.g., global competition; flat or shrinking resource bases; a variety of social and environmental problems; demands for increased productivity and effectiveness). Technology has a direct and significant impact on our standard of living and the quality of our lives (both positive and negative). As a consequence, interest in understanding and ultimately predicting and managing the outcomes of the innovation process has been growing within corporate, governmental, educational and other sectors.

Coverage:

This seminar will provide a **broad** review of social and behavioral science theory and research on *innovation processes and the outcomes and consequences of implementing technologies.* Technology will be viewed as both a "dependent variable" and an "independent variable". Emphasis will be placed on the interaction of sociotechnical systems.

While viewing technology as a dependent variable, our readings will focus on individual, group, organizational (e.g., management practices, communication systems) and social factors and forces which can and do affect the creation, deployment and implementation of new and effective technologies (including social technologies). One goal of these readings and discussions will be to provide some insight into the extent to which one can predict and/or optimize the innovation process. While viewing technology as an independent variable, our readings will focus on the *intended* and *unintended* consequences (e.g., psychological, social and economic) for individuals, organizations and societies implementing and using various technologies. The first several weeks of readings will be devoted to providing a conceptual overview of these two themes. The remainder of the semester will be devoted to specific topics which fall within these themes. Depending on class interest, we may change the order of covering these topics.

Class Format:

Class will be run in seminar format. Students will be asked to summarize and discuss the reading assignments; lecturing will be kept to a minimum. Student will provide brief written comments via a listserv established for the class (Please address two questions: *What was new or a surprise in the readings? What didn't you understand or think needs more discussion in class?).* General discussions will focus on the implications of the readings for theory, research and practice. Where appropriate guest speakers will be invited to meet with the class. Since it's difficult to study technology in the abstract, students will be encouraged to use this course and assignments to help them understand the processes which contribute to the creation of a given technology or type of technology (e.g., information, manufacturing, social) and/or the impact of a specific technology in a given setting (e.g., industry, education, government, etc.). The annotated bibliography due at the end of the semester will be the major vehicle for accomplishing this goal.

Readings:

The course readings will come from a required book and a set of journal articles and book chapters. Each week you will be assigned a set of required readings. Individual articles and chapters will be available in digital form.

Fagerberg, J., Mowery, D.C., & Nelson, R.R. (Eds.) (2006). *The Oxford Handbook of Innovation.* New York: Oxford University Press.

National Science Board (2010). Science and engineering indicators 2010. Washington, D.C. Available on line at: http://www.nsf.gov/statistics/seind10/]).

In addition, the syllabus will list a set of supplemental readings (labeled with an asterisk) that students who want a more in depth background on that topic may want to review. These readings will not be part of the course pack (they tend to come from articles "retired" from earlier syllabi) If you have trouble finding these readings see the instructor, I should have a copy.

Assignments:

- **Thought Paper:** take home; 7 pages or less: **30%** (due **Oct. 26**); see Appendix A. Students who are not satisfied with their performance on this assignment, can request permission to do a second thought paper at the end of the semester.
- **Annotated Bibliography**: literature review and presentation: **60%** (15% presentation; 45% paper, due last class **Dec. 7**); see Appendix B.
- **Class participation:** will include participation in class and via web-based comments: **10%**

Grading:

Letter grade: A,B,C,D,U with +/-

Class Schedule and Assignments:

Week 1: August 24
Distribute and Discuss Syllabus

Week 2: August 31
Innovation Process: Definitions, Theories, Conceptions, and Perspectives

Week 3: September 7
Innovation Process Perspectives

Week 4: September 14
Research Enterprise

Week 5: September 21
Innovation -- A Focus on Networks and Organizations; (AB Concept Due)

Week 6: September 28
Levels of Analysis and Methodological Issues

Week 7: October 5
Technology Outcomes: Theories and Models

Week 8: October 12
Adoption & Implementation

Week 9: October 19
No class; Work on AB Research

Weeks 10: October 26 **(Thought paper due)**
Public Policy and Related Issues in the Innovation Process

Week 11: November 2
Industry-University Relations; (AB Outline; Readings Well Underway)

Week 12: November 9
Emerging Innovation Issues

Week 13: November 16
Innovation and Technology Speaker Panel

Week 14: November 23
Student Presentations (Tuesday of Thanksgiving Week)

- Student attendance for all student presentation sessions is required and is critical to your participation grade

Week 15: November 30
Student Presentations

Week 16: December (Exam Week)
Student Presentations; Annotated Bibliography due

Class Schedule and Reading Assignments: (* = optional, check with instructor or find in lib.)

Week 1

Discuss goals of course; distribute and review syllabus

Week 2

Innovation Processes: Definitions, Theories, Conceptions, and Perspectives

Fagerberg, J. (2006). Innovation: A guide to the literature (pp. 1-26). In Fagerberg, J., Mowery, D.C. & Nelson, RR. (Ed.s). *Oxford Handbook of Innovation.* New York: Oxford University Press.

Chesbrough, H. (2006). Open innovation: A new paradigm for understanding industrial innovation (pp.1-12). In Chesbrough, H., Vanhaverbeke, W. & West, J. (Eds.). *Open innovation: Researching a New Paradigm.* Oxford: Oxford University Press.

House, E.R. (1981). Three perspectives on innovation: Technological, political, and cultural. In R. Lehming and M. Kane (Eds.), *Improving schools: Using what we know* (pp.17-41). Beverly Hills, CA: Sage.

Hughes, T.P. (1994). Technological momentum. In Smith, M.R., & L. Marx (Eds.) *Does technology drive history? The dilemma of technological determinism* (pp. 101-113). Cambridge, MA: MIT Press.

Florida, R. (2002). The rise of the creative class: and how it's transforming work, leisure, community and everyday life. (chapter 1 and 14; pp. 1-17; pp. 249-266). NY: Basic Books.

Anonymous. (1995). *Comments on technology and society.*

W.T. Grant Foundation (2010). *Request for research proposals: Understanding the acquisition, interpretation and use of research evidence in policy and practice.* NY: W.T. Grant Foundation.

Supplemental readings:

*Tornatzky, L.G. & Fleischer, M. (1990). *The processes of technological innovation* (Ch 2; pp. 9-25). NY: Lexington

*Castells, M.(1998). *End of Millenium.* (Collapse of the soviet union: The technology question) (pp. 26-37). Malden, MA: Blackwell.

Week 3

Innovation Process Perspectives

Pavitt, K. (2006). Innovation processes (pp. 86-114). In Fagerberg, J., Mowery, D.C. & Nelson, RR. (Ed.s). *Oxford Handbook of Innovation.* New York: Oxford University Press.

Gulbrandsen, M. (2008). *The role of basic research in innovation.* Oslo, Norway: Center for Advanced Study. Accessed on August 12, 2010 from http://www.cas.uio.no/Publications/Seminar/Confluence_Gulbrandsen.pdf.

Chesbrough, H. (2006). New puzzles and new findings (pp.15-34). In Chesbrough, Vanhaverbeke, W. & West, J. (Eds.). *Open innovation: Researching a New Paradigm.*

Tushman, M.L. & Anderson, P. & O'Reilly, C. (1997). Technology cycles, innovation streams and ambidextrous organizations: Organization renewal through innovation streams and strategic change. In Tushman, M.L., & P. Anderson (Eds.) *Managing strategic innovation and change*: A collection of readings (pp. 3-23). NY: Oxford University Press.

Ward, T. (2004). Cognition, creativity and entrepreneurship. *Journal of Business Venturing*. 19, 173-188.

Supplemental Readings

* Abrahamson, E. (1991). Managerial fads and fashions: The diffusion and rejection of innovations. *Academy of Management Review, 16,* 586-612.

Week 4

Research Enterprise

Stokes, D.E. (1994). *Completing the Bush model: Pasteur's Quadrant*. Centre for Science, Policy and Outcomes. Retrieved August 10, 2010, from World Wide Web: http://www.cspo.org/products/conferences/bush/Stokes.pdf

Stokols, D., Hall, K.L., Taylor, B.K. & Moser, R.P. (2008). The science of team science: An overview of the field and introduction to the supplement. *American Journal of Preventive Medicine, 35,* S77-S93.

National Science Board (2010). *Science & engineering indicators 2010.* Arlington, VA: National Science Foundation. Read *Overview* and one other chapter. [Access at: http://www.nsf.gov/statistics/seind10/]

Supplemental Readings

*Stokes, D. (1997). *Pasteur's quadrant*. (Chapter 3; pp. 58-89). Washington, DC: Brookings Institution Press

*Kline, S. & Rosenberg, N. (1986) An overview of innovation. (pp.275-305) In R. Landau and N. Rosenberg (Eds.), *Positive sum strategy*. Washington, DC: National Academy Press.

Week 5

Innovation -- A Focus on Organizations and Networks; AB Concept Due

Lam, A. (2006). Organizational innovation (pp. 115-147). In Fagerberg, J., Mowery, D.C. & Nelson, RR. (Ed.s). *Oxford Handbook of Innovation.* New York: Oxford University Press.

Uzzi, Brian (1996). The sources and consequences of embeddedness for the economic performance of organizations: The network effect. *American Sociological Review*, 61 (August), pp 674 - 698.

von Hippel, Eric, & von Krogh, Georg (2003). Open source software and the "private-collective" innovation model: Issues for organization science. *Organization Science*, 14(2), pp 209 - 223.

Zahra, S. & George, G. (2002). Absorptive capacity: A review, reconceptualization and extension. *Academy of Management Review*, 27, 185-203.

Supplemental Readings:

*L. Michelle Bennett, Howard Gadlin & Samantha Levine-Finley (2010). Collaboration and team Science Field Guide. Washington, D.C.: National Institute of Health. (pp. 1-27+)

* Hargadon, A. and R. I. Sutton (1997). Technology brokering and innovation in a product development firm. *Administrative Science Quarterly* 42(4): 716-749.

*Granovetter, Mark (1985). Economic action and social structure: The problem of embeddedness. American Journal of Sociology, 91(3), pp 481-510.

*Kash, Don E., & Rycroft, Robert E. (2000). Patterns of innovating complex technologies: A framework for adaptive network strategies. Research Policy, 29, pp 819-831.

*Jones, Gareth R., & George, Jennifer M. (1998). The experience and

evolution of trust: Implications for cooperation and teamwork. Academy of Management Review, 23(3), pp 531-546.

*Kanter, R.M. (1988). When a thousand flowers bloom: Structural, collective, and social conditions for innovation in organization. In B. M. Staw & L.L. Cummings, *Research in Organizational Behavior, Vol.10*, (pp. 169-211). NY: JAI Press.

*Rycroft, R. (2003) *Self-organizing innovation networks: Implications for globalization*. Washington, DC: George Washington University Center for the Study of Globalization, Occasional Paper Series.

*Powell, W. W., K. W. Koput, et al. (1996). Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly, 41*(1): 116-145.

Week 6

Levels of Analysis and Methodological Issues

Smith, K. (2006). Measuring innovation (pp. 148-177). In Fagerberg, J., Mowery, D.C. & Nelson, RR. (Ed.s). *Oxford Handbook of Innovation.* New York: Oxford University Press.

Bamberger, P. (1991). Reinventing innovation theory: Critical issues in the conceptualization, measurement and analysis of technological innovation. *Research in the Sociology of Organizations, 9*, 265-295.

Binkerhoff, J.M. (2002). Assessing and improving partnership relationships and outcomes: A proposed framework. *Evaluation and program planning*. 25, 215-231.

Gray, D.O. (2008). Making team science better: Applying improvement-oriented evaluation principles to evaluation of cooperative research centers. *New Directions for Evaluation*, 118, 73-87.

Supplemental Readings:

* Popper, S. (1995). *Economic approaches to measuring the performance and benefits of fundamental science*. Santa Monica: Rand Corp. Report (MR-708.0-OSTP)

*Ruegg, R. & Feller, I. (2003). *A toolkit for evaluating pubic R&D investment: Models, methods, and findings from ATP's first decade.* Washington, DC: National Institute of Standards and Technology. Chapter 1 2 (pp. 13-60). [access electronic copy at: http://www.atp.nist.gov/eao/gcr03-857/contents.htm]

*McLauglin, J.A. & Jordan, G.B. (1999). Logic models: a tool for telling your program's performance story. *Evaluation and Program Planning*, *22*, 65-72.

Week 7

Technology Outcomes: Theories and Models

McGinn, R. E. (1991). *Science, technology and society* (pp. 72-102). Englewood Cliffs, N.J.: Prentice Hall.

Faberberg, J. & Godinho, M.M. (2006). Innovation and catching up (pp. 515-542). In Fagerberg, J., Mowery, D.C. & Nelson, RR. (Ed.s). *Oxford Handbook of Innovation.* New York: Oxford University Press. [may substitute chapters 18 (economic growth), 20 (competitiveness) or 21 (employment)].

DiMaggio, P. Hargittai, E., Neuman, W. R., & Robinson, J.P. (2001). Social implications of the internet. *Annual Review of Sociology*, 27, 307-336.

Tenner, E. (1996). *Why things bite back: Technology and the revenge of consequences* (pp. 3-25). NY: Alfred A. Knopf.

Cozzens, S. (2007). Distributive justice in science and technology policy. *Science and Public Policy*, 34, 85-94.

Christensen, Clayton M., Baumann, Heiner, Ruggles, Rudy, & Sadtler, Thomas M. (2006). Disruptive Innovation for Social Change. *Harvard Business Review*, December, 94-101.

Week 8

Adoption & Implementation

Hall, B.H. (2006). Innovation and diffusion (pp. 459-484). In Fagerberg, J., Mowery, D.C. & Nelson, RR. (Ed.s). *Oxford Handbook of Innovation.* New York: Oxford University Press.

Singhal, A. & Dearing, J.W. (2006). *Communication of innovations: A journey with Ev Rogers.* Thousand Oaks, CA: Sage Publications. Chapters 1 and 2; pp. 13-60.

Mayer, J.P. & Davidson, W.S. (2000). Dissemination of innovation as social change (pp. 421-438). In J. Rappaport & E. Seidman (Eds.). *The handbook of community psychology*. NY: Plenum Press.

Wandersman, A., Flaspohler, P., & Saul, J. (2008). Illuminating the interactive systems framework for dissemination and implementation. *American Journal of Community Psychology, 41*(3-4).

Scheirer, M.A. (2005). Is sustainability possible? A review and commentary on empirical studies of program sustainability. *American Journal of Evaluation*, 26(3), 320-347

Supplemental readings

Blakely, C.H., Emshoff, J.G., & Roitman, D.B. (1984). Implementing innovative programs in public sector organizations. In S. Oskamp. (Ed.), *Applied Social Psychology Annual: Applications in Organizational Settings* (pp.87-108), *5*, Beverly Hills, CA: Sage.

Glisson, C. & Schoenwald, S.K. (2005). The ARC organizational and community intervention strategy for implementing evidence-based children's mental health treatments. *Mental Health Services Research*, 7, 243-259.

**Tornatzky, L.G. & Fleischer, M. (1990). *The processes of technological innovation* Chapter 9; pp. 197-232. New York: Lexington.

*Gray, D.O., Jakes, S., Emshoff, J. & Blakely, C. (2003). Dissemination and community psychology: A case of partial implementation? Special Issues on Experimental Social Innovation and Dissemination. *American Journal of Community Psychology*. 32(4), 359-370.

Week 10

Public Policy and Related Issues in the Innovation Process

Lundvall, B. & Borras, S. (2006). Science, technology and innovation policy (pp. 599-631). In Fagerberg, J., Mowery, D.C. & Nelson, RR. (Ed.s). *Oxford Handbook of Innovation.* New York: Oxford University Press.

Stine, D. (2008). *Science and Technology Policymaking: A Primer* (CRS Report to Congress: Order Code RL34454). Washington, DC: Congressional Research Service.

Pisano, G.P. & Shih, W.C. (2010). Restoring American competitiveness. Harvard Business Review, July-August, 114-125.

Plosila, W. (2004). State science and technology-based economic development policy: History, trends and developments. *Economic Development Quarterly*, 18, 113-126.

Supplemental Activity

Professorial Lecture: Why science policy research?; 3rd March 2009 Speaker: Ben R. Martin, Professor of Science and Technology Policy Studies, SPRU - Science and Technology Policy Research; streaming video http://www.sussex.ac.uk/video/sussexlectures/audio/benmartin.mp3

Week 11

Industry-University Relations

Mowrey, D. & Sampat, B.N. (2006). Universities in national innovation systems (pp. 209-239). In Fagerberg, J., Mowery, D.C. & Nelson, RR. (Ed.s). *Oxford Handbook of Innovation.* New York: Oxford University Press.

Etzkowitz, H., Webster, A., Gebhardt, C., Terra, B. (2000). The future of the university and the university of the future: Evolution of ivory tower to entrepreneurial paradigm. *Research Policy, 29*, 313-330.

Boardman, C. & Gray, D.O. (in press). The new science and engineering management: Cooperative research centers as government policies, industry strategies and organizations. *Journal of Technology Transfer*.

Tornatzky, L.T., Waugaman, P.G. & Gray, D.O. Introduction (pp. 13-26). *Innovation U.: New university roles in a knowledge economy*. Research Triangle Park, NC: Southern Growth Policy Board.

Behrens, T. & Gray, D.O. (2001). Unintended consequences of cooperative research: Impact of industry sponsorship on climate for academic freedom and other graduate student outcomes. *Research Policy*, pp. 179-199.

Spoth, R.L., Greenberg, M.T. (2005). Toward a comprehensive strategy for effective practitioner-scientist partnerships and larger-scale community health and well-being. *American Journal of Community Psychology*, 35, 107-126.

Supplemental Readings

* Gray, D.O. & Boardman, C. (Eds.) (2010). Special Issue Cooperative Research Centers: Policy, industry, organizational and role perspectives, December, *Journal of Technology Transfer*.

*Henry Etzkowitz & Loet Leydesdorff, (2000) The dynamics of innovation: from National Systems and ‘‘Mode 2’’ to a Triple Helix of university–industry–government relations, * *Research Policy*, vol 29, pp 109–123.

* Toker, U. & Gray, D.O. (2008). Innovation spaces: Workspace planning and innovation in U.S. university research centers. *Research Policy, 37*, 309-329.

*Feller, I., Ailes, C. & Roessner, D. (2002). Impacts of research universities on technological innovation in industry: Evidence from engineering research centers. *Research Policy*, 31, 457-474.

*Mansfield, E. (1995). Academic research underlying industrial innovations: Sources, chaaracteristics and financing. (pp. 55-65).

Week 12

Emerging Issues

Bozeman, B., Dietz, J. S., & Gaughan, M. (2001). Scientific and technical human capital: An alternative model for research evaluation. *International Journal Of Technology Management, 22*(7-8), 716-740. (conference version provided).

Ranga, M. & Etzkowitz, H. (2010). Athena in the world of techne: The gender dimension of technology, innovation and entrepreneurship.

Rockerfeller Foundation (2010). Scenarios for the future of technology and international economic development. NY: Rockerfeller Foundation and Global Business Network.

Gilbert, B. A., Audretsch, D.B. & McDougall (2004). The emergence of entrepreneurship policy. *Small Business Economics*, 22, 313-323.

Other readings to be added based on class recommendation.

Weeks 13

Innovation and Technology Speaker Panel

Week 14

Class Presentations

Week 15

Class Presentations

Week 16

Class Presentations

Appendix A

PSY757: Thought paper assignment

Instructions: 5 pages double-spaced (not counting references and figures); Times New Roman font; one-inch margins

1. Address the following question: Which five readings have had the greatest impact on your thinking about innovation and technology? How have they affected your thinking? How might this affect your research and/or practices interests in the future? It is perfectly acceptable to build upon (not self- plagiarize) comments provided to the weekly blog.

Appendix B

PSY 757: INNOVATION AND TECHNOLOGY
Instructions for the Annotated Bibliography (AB)[1]

Purpose: The purpose of this assignment is to provide each student with an opportunity to explore a specific innovation and technology-related topic of interest to them in more depth while showing how well the topic links to the framework and theories we have covered during the semester. Many past students have used this assignment as a vehicle for getting started on or amplifying their thesis or dissertation literature review. I would consider this a very constructive way to approach this assignment.

A. Written Assignment: Prepare an annotated bibliography (AB) which also includes an introduction and conclusions section. AB should be based on at least 8 journal articles *or equivalent (e.g. chapters)*. Paper will constitute 75% of AB grade.

1. An annotated bibliography provides a review of the literature by "summarizing" or abstracting individual readings on a given topic. In this case, you should provide an update on *theory, research and/or practice on some innovation/technology topic.*
2. Your "abstracts" should be both descriptive (e.g., summary of findings, conclusions and/or recommendations) and ***evaluative*** (e.g., your commentary on the quality, completeness, etc. of the item). Abstracts should *average* about two double-spaced pages. *Heads up:* Please note that the single biggest shortcoming I have found in past abstracts has been a failure to provide evaluative analysis!
3. Your AB should be accompanied by two sections: a) a 3-4 page introduction (double-spaced); this section should describe the topic/issue/problem you are concerned with, how it is related to the broad innovation/technology literature we have been covering and the *purpose of your review* (e.g., to understand what is known about a topic based on research, to understand recommended or "best practices", etc.); b) a 4-6 page conclusions section in which you provide a summary and commentary on the articles/chapters you have abstracted. The conclusions section should demonstrate the student's ability to **synthesize and integrate** "what is known and what is not known" (e.g., "gaps" or neglected issues) on the topic.
4. Readings summarized in your review should be drawn from scholarly literature (e.g., journal articles, book chapters or books, journal length proceedings, etc.) not popular periodicals. In some cases a student may negotiate reading a book in lieu of several articles/chapters.
5. The AB should primarily include recent literature (past 4 years). If after scanning the literature you believe you may have problems meeting this criterion, please come see me.
6. I prefer "APA" citation format but will accept other recognized style conventions.

B. Class presentation of Annotated Bibliography:
Purpose: to share with class important sources you identified and insights you gained in the course of doing your literature review.
Format:
Oral description of your AB; twenty minutes; 5 minutes for questions; handouts recommended;

Suggested Outline:
Topic and purpose of review; Overview of kind of sources you found (e.g., quality, relevance to topic); More detailed description of best source(s); Conclusions

Note: Students must get my approval for the topic they choose and the type of readings they will be including. See target dates in syllabus for guidance on making progress on this assignment.

[1] An annotated bibliography is a list of citations to books, articles, and documents. Each citation is followed by a brief descriptive and evaluative summary, the annotation. The purpose of the annotation is to inform the reader of the relevance, accuracy, and quality of the sources cited.