MGT 791: Special topic — Innovation
Spring 2013
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Room BA 323E, Wednesday, 1:00—3:45

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Overview and Objectives

This class will introduce you to key concepts and questions in the scholarly study of innovation, which are relevant whether your interest is in innovation *per se* or innovation as a setting in which to study other issues. "Innovation studies" is a very broad term, potentially encompassing many scholarly communities—some overlapping (strategy and innovation studies) and others more separated (e.g., engineering and management both study innovation, but rarely cite the other). We'll focus on the portion of the innovation literature that engages with management, particularly at the macro (strategy) level.

The class has 4 primary objectives

1. You should develop a mental model of the literature in innovation studies and show an understanding of and appreciation for the key concepts and theories in studies.
2. You should be able to critically review academic, practitioner, and peer research.
3. You should develop new ideas and/or approaches that advance some portion of the theory/research in innovation studies or its application to other fields.
4. You should be able to communicate both verbally and in writing, current knowledge, critical evaluations and new ideas in innovation studies topics developed in this seminar.

Our five sessions fall into two general categories

- Foundational issues
  - Class 1 — Innovation as a field of study & the measurement of innovation
  - Class 2 — The classification of innovations over their lifecycle
  - Class 3 — Markets for innovation and knowledge
- Prominent discussions within innovation studies
  - Class 4 — Innovative alliances
  - Class 5 — Product and organizational modularity

There are, of course, many other discussions within innovations studies we could examine, but I chose these two because chosen their importance, their connection to work outside innovation *per se*, and their application of the foundational issues addressed in our first three classes.

Each session will include both foundational and recent works and address both theoretical and empirical contributions. Given time limitations, our examination will be introductory rather than exhaustive. I've provided supplemental readings—for which you are not responsible in class—as recommendations if

you want to pursue any given topic further. Reflecting the class' objectives, our discussion will include 1) what the author did, 2) how well they did it, and 3) what new questions the paper raises.

Class preparation and participation[1]

Your learning and the learning of your classmates will depend upon you arriving to class fully prepared and then participating fully in the discussion. Our discussions will be loosely structured and interactive.

Prior to each session, for each assigned reading you will complete a "NOTES" sheet (please use the blank on the last page of this syllabus—You can handwrite or word process; you may expand onto more than 1 page per reading if need be). Refer to the reading list below for whether to complete an "X" or a "Y" style notes sheet for a given reading. These notes sheets are critical for your class preparation. The "X" sheets will also help you learn a structured way of approaching an article that is directly useful in writing your own scholarly articles. We will talk about that approach in more detail in class.

Your entire grade in this course will be based on my assessment of how well you prepared and participated, so read the material carefully with the NOTES questions in mind, complete the NOTES sheets for each reading in meaningful way, and do not leave any questions blank or incompletely answered. Make a photocopy of your completed set of NOTES to give me at the start of each session. Keep the originals for yourself to and mark up during the class discussion.

IMPORTANT: You are not responsible for NOTES for class one.

Session 1: Introduction: The study and measurement of innovation (Feb 6)

Background

Innovation is a very broad field of study. Over time, it has become a literature unto itself, which overlaps and draws on many fields including economics, sociology, public policy, organization theory and strategy. As an orientation, I've selected one paper that examines the development of "innovation studies" as a scientific field. The details are less important than getting a sense of the issues the field has considered over time and the "camps" into which it has divided.

One of the great challenges in innovation studies is measurement. Many studies use patents and patent citations, despite their many imperfections and limitations. So, it is worth spending some time to understand what patents are and their strengths and weaknesses as measures of innovation. You can work in chronological order. The Griliches, Narin *et al* and Lanjouw *et al* are foundational references on the use of patents. Patent citations are often used also. Alcacer and Gittelman is a great piece in this regard. It first reviews the relevant literature and then raises serious questions about earlier work. Roach and Cohen is another take on what patent citations *really* tell us.

Readings (Read all, NOTES *not* required, but be well prepared).

Innovation as a field of study

Fagerberg, J., & Verspagen, B. 2009. Innovation studies—The emerging structure of a new scientific field. ***Research Policy***, 38(2): 218-233.

Measuring innovation

Alcacer, J., & Gittelman, M. 2006. Patent Citations as a Measure of Knowledge Flows: The Influence of Examiner Citations. ***Review of Economics and Statistics***, 88(4): 774-779.

[1] Thanks to Don Lange for permission to use this wording and the affiliated notes forms.

Griliches, Z. 1990. Patent statistics as economic indicators: a survey. ***Journal of Economic Literature***, 28: 1661-1707.

Hagedoorn, J., & Cloodt, M. 2003. Measuring Innovative Performance: Is There an Advantage in Using Multiple Indicators? ***Research Policy***, 32(8): 1365-1379.

Lanjouw, J. O., Pakes, A., & Putnam, J. 1998. How to Count Patents and Value Intellectual Property: the Uses of Patent Renewal and Application Data. ***Journal of Industrial Economics***, 46(4): 405-432.

Narin, F., Noma, E., & Perry, R. 1987. Patents as indicators of corporate technological strength. ***Research Policy***, 16(2-4): 143-155.

Roach, M., & Cohen, W. M. 2012. Lens or Prism? Patent Citations as a Measure of Knowledge Flows from Public Research. ***Management Science***.

Session 2: The classification of innovations over their life-cycle (Feb 13)

Background

Not all innovations are the same in their precedents or their effects on firms and industries. So, we'll start with two papers that develop different schema for classifying innovations, Abernathy & Clark and Henderson & Clark. Over the life-cycle of an innovation and the industry it enables, the nature of the most prevalent innovations changes, which influences both firms and the overall industry. At the same time, certain innovations can "reset the clock", potentially restarting the innovation life-cycle. Dosi discusses a driver of the life-cycle, the natural development of technological paradigms and trajectories. Gort & Klepper and Tushman & Anderson examine the nature and impact of the innovation life-cycle at the industry and firm level respectively. Dowell & Swaminathan is an empirical application relating a key strategic choice—when in the industry life-cycle to enter—to firm exploration and survival.

Readings (X = prepare notes using the X-style form; Y = prepare notes using the Y-style form, S = supplemental reading)

(S) Afuah, A. 2001. Dynamic boundaries of the firm: are firms better off being vertically integrated in the face of a technological change? ***Academy of Management Journal***, 44(6): 1211-1228.

(Y) Abernathy, W. J., & Clark, K. B. 1985. Innovation - mapping the winds of creative destruction. ***Research Policy***, 14(1): 3-22.

(S) Christensen, C. M. 1997. The innovator's dilemma: When new technologies cause great firms to fail. Boston, Mass: Harvard Business School Press. (book, not on the P: drive)

(Y) Dosi, G. 1982. Technological paradigms and technological trajectories. ***Research Policy***, 11(3): 147-162.

(X) Dowell, G., & Swaminathan, A. 2006. Entry timing, exploration, and firm survival in the early US bicycle industry. ***Strategic Management Journal***, 27(12): 1159-1182.

(X) Gort, M., & Klepper, S. 1982. Time paths in the diffusion of product innovations. ***Economic Journal***, September: 630-653.

(Y) Henderson, R. M., & Clark, K. B. 1990. Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. ***Administrative Science Quarterly***, 35: 9-30.

(S) Klepper, S., & Simons, K. L. 1997. Technological extinctions of industrial firms: an inquiry into their nature and causes. ***Industrial and Corporate Change***, 6(2): 379-460.

(S) Mitchell, W. 1989. Whether and when? Probability and timing of incumbents' entry into emerging industrial subfields. ***Administrative Science Quarterly***, 34: 208-230.

(S) Sarkar, M. B., Echambadi, R., Agarwal, R., & Sen, B. 2006. The effect of the innovative environment on exit of entrepreneurial firms. ***Strategic Management Journal***, 27(6): 519-539.

(X) Tushman, M. L., & Anderson, P. 1986. Technological Discontinuities and Organizational Environments. ***Administrative Science Quarterly***, 31(3): 439-465.

Session 3: Markets for innovation (Feb 20)

Background

Innovations ultimately only matter if the firm can translate them into increased revenues or lower costs. This often requires combining the core innovation with other resources and capabilities, which the innovating firm may not possess. Thus, innovative firms often face the need to either buy innovative knowledge from outside or sell their innovative knowledge. The "market for innovation" or "market for knowledge" is fundamentally different than the market for other goods. These differences are among the reasons that innovation studies stands apart from standard economics and management.

The Arrow article is a succinct retelling of an issue he first raised in *Essays in the Theory of Risk Bearing* (1971): why knowledge is fundamentally different from other production inputs and outputs. Caves *et al* and Teece are foundational works on how the nature of innovative knowledge affects attempts to trade it and to profit from it. Gans and Stern extend these works to incorporate competitive dynamics. Fosfuri and Leone & Reichstein are empirical examinations of outward and inward innovation licensing, respectively.

In 2003, Henry Chesbrough built upon this literature to introduce the idea of "open innovation", which has spurred a rich stream of both practitioner and scholarly literature. Frankly, I don't think it's clear yet whether the open innovation literature is theoretically distinct from markets for innovation or reflects the greatly enhanced use of these markets by firms. Regardless, it is a growing and potentially promising area. The Lichtenthaler article is a nice literature review, providing an efficient introduction to the key papers and themes, as well as discussing its relationship to the broader literature.

Readings (X = prepare notes using the X-style form; Y = prepare notes using the Y-style form, S = supplemental reading)

(S) Arora, A. 1997. Patents, licensing, and market structure in the chemical industry. ***Research Policy***, 26(4-5): 391-403.

(S) Arora, A., Fosfuri, A., & Ronde, T. 2013. Managing Licensing in a Market for Technology. ***Management Science***.

(Y) Arrow, K. J. 1996. Technical information and industrial structure. ***Industrial and Corporate Change***, 5(2): 645-652.

(S) Baldwin, C., & von Hippel, E. 2011. Modeling a Paradigm Shift: From Producer Innovation to User and Open Collaborative Innovation. ***Organization Science***, 22(6): 1399-1417.

(X) Caves, R., Crookell, H., & Killing, J. P. 1983. The imperfect market for technology licenses. ***Oxford Bulletin of Economics and Statistics***, 45(3): 249-267.

(X) Fosfuri, A. 2006. The licensing dilemma: Understanding the determinants of the rate of technology licensing. ***Strategic Management Journal***, 27(12): 1141-1158.

(Y) Gans, J. S., & Stern, S. 2003. The product market and the market for "ideas": commercialization strategies for technology entrepreneurs. ***Research policy***, 32(2): 333-350.

(X) Leone, M. I., & Reichstein, T. 2012. Licensing-in fosters rapid invention! the effect of the grant-back clause and technological unfamiliarity. ***Strategic Management Journal***, 33(8): 965-985.

(Y) Lichtenthaler, U. 2011. Open Innovation: Past Research, Current Debates, and Future Directions. ***Academy of Management Perspectives***, 25(1): 75-93.

(Y) Teece, D. J. 1986. Profiting from technological innovation: Implications for integration, collaboration, licensing and public-policy. ***Research Policy***, 15(6): 285-305.

Session 4: Alliances, acquisitions and innovation (Feb 27)

Background

Among the ways firms navigate the market for innovations are alliances and acquisitions. Innovative alliances and innovative acquisitions have been approached from two perspectives. Some authors begin with an interest in innovation and examine alliances/acquisitions as firm strategies for managing innovation. Others see innovative alliances/acquisitions as particularly interesting sub-types of the broader alliance/acquisition phenomenon. In reality the distinction isn't quite that crisp, but keeping it in mind may help you place a given article in context.

I recommend beginning with papers related to alliances. Mowery *et al* (1998) and Sampson (2004) examine the governance and performance of innovative alliances. Davis & Eisenhardt takes a more process-oriented approach to the same phenomenon, while Ahuja moves up to the network level. Diestre & Rajagopalan examine the important issue of partner choice.

Next, move to the papers on innovative acquisitions. Ahuja & Katila is a foundational paper in the field. Benson & Ziedonis examine corporate venture capital (CVC) as a precursor to acquisition performance. CVC is an important phenomenon in and of itself, so I've included this paper as an introduction to that literature.

Readings (X = prepare notes using the X-style form; Y = prepare notes using the Y-style form, S = supplemental reading)

(X) Ahuja, G. 2000. Collaboration Networks, Structural Holes, and Innovation: a Longitudinal Study. ***Administrative Science Quarterly***, 45(3): 425-455.

(X) Ahuja, G., & Katila, R. 2001. Technological acquisitions and the innovation performance of acquiring firms: a longitudinal study. ***Strategic Management Journal***, 22(3): 197-220.

(X) Benson, D., & Ziedonis, R. H. 2009. Corporate Venture Capital as a Window on New Technologies: Implications for the Performance of Corporate Investors When Acquiring Startups. ***Organization Science***, 20(2): 329-351.

(Y) Davis, J. P., & Eisenhardt, K. M. 2011. Rotating Leadership and Collaborative Innovation: Recombination Processes in Symbiotic Relationships. ***Administrative Science Quarterly***, 56(2): 159-201.

(X) Diestre, L., & Rajagopalan, N. 2012. Are all sharks' dangerous? New biotechnology ventures and partner selection in R&D alliances. ***Strategic Management Journal***, 33(10): 1115-1134.

(S) Gilson, R. J., Sabel, C. F., & Scott, R. E. 2009. Contracting for innovation: Vertical disintegration and interfirm collaboration. ***Columbia Law Review***, 109(3): 431-502.

(S) Hoetker, G. 2005. How much you know versus how well I know you: selecting a supplier for a technically innovative component. ***Strategic Management Journal***, 26(1): 75-96.

(S) Lerner, J., & Malmendier, U. 2010. Contractibility and the Design of Research Agreements. ***American Economic Review***, 100(1): 214-246.

(S) Mowery, D. C., Oxley, J. E., & Silverman, B. S. 1996. Strategic alliances and interfirm knowledge transfer. ***Strategic Management Journal***, 17(Special Issue: Knowledge and the Firm (Winter, 1996)): 77-91.

(X) Mowery, D. C., Oxley, J. E., & Silverman, B. S. 1998. Technological overlap and interfirm cooperation: implications for the resource-based view of the firm. ***Research Policy***, 27(5): 507-523.

(S) Oxley, J., & Wada, T. 2009. Alliance structure and the scope of knowledge transfer: Evidence from US-Japan agreements. ***Management Science***, 55(4): 635-649.

(S) Oxley, J. E. 1997. Appropriability hazards and governance in strategic alliances: a transaction cost approach. ***Journal of Law, Economics and Organization***, 13(2): 387-409.

(S) Oxley, J. E., & Sampson, R. C. 2004. The scope and governance of international R&D alliances. ***Strategic Management Journal***, 25(8-9): 723-749.

(X) Sampson, R. 2004. The cost of misaligned governance in R&D alliance. ***Journal of Law, Economics and Organization***, 20(2): 484-526.

(S) Sampson, R. 2004. Organizational choices in R&D alliances: Knowledge-based and transaction costs perspectrives. ***Managerial and Decision Economics***, 25: 421-436.

(S) Sampson, R. C. 2007. R&D alliances and firm performance: The impact of technological diversity and alliance organization on innovation. ***Academy of Management Journal***, 50(2): 364-386.

(S) Somaya, D., Kim, Y., & Vonortas, N. S. 2011. Exclusivity in licensing alliances: Using hostages to support technology commercialization. ***Strategic Management Journal***, 32(2): 159-186.

Session 5: Modularity (March 6)

Background

Products are *modular* to the degree that individual components interact with each other through standardized interfaces and can thus undergo autonomous adaptation, so long as they continue to honor the interface. Modularity has also been used analogously to describe organizations, so called "organizational modularity". Modularity has significant impacts on firms, markets, and nature of innovation.

I recommend beginning with Langlois & Robertson and Ulrich, who discuss modularity at the level of the product market and the firm, respectively. Sanchez & Mahoney relate product and organizational modularity (the "mirroring hypothesis"), a relationship that Hoetker questions. Chesbrough & Kusonoki provide a cautionary note regarding organizational modularity. Pils & Cohen examine the impact of modularity on imitation, innovation and sustainable advantage. Lastly, Ethiraj examines how modularity relates to the allocation of innovative effort.

Readings (X = prepare notes using the X-style form; Y = prepare notes using the Y-style form, S = supplemental reading)

(S) Argyres, N., & Bigelow, L. 2010. Innovation, Modularity, and Vertical Deintegration: Evidence from the Early US Auto Industry. ***Organization Science***, 21(4): 842-853.

(S) Baldwin, C. Y. 2008. Where do transactions come from? Modularity, transactions, and the boundaries of firms. ***Industrial and Corporate Change***, 17(1): 155-195.

(S) Baldwin, C. Y., & Clark, K. B. 2000. ***Design rules. Volume 1: The power of modularity***. Cambridge, MA: MIT Press. (Book, not on P: drive)

(Y) Chesbrough, H. W., & Kusunoki, K. 2001. The Modularity Trap: Innovation, Technology Phase Shifts and the Resulting Limits of Virtual Organizations. ***Managing industrial knowledge: creation, transfer and utilization***: 202.

(X) Ethiraj, S. K. 2007. Allocation of inventive effort in complex product systems. ***Strategic Management Journal***, 28(6): 563-584.

(S) Fleming, L., & Sorenson, O. 2001. Technology as a complex adaptive system: evidence from patent data. ***Research Policy***, 30(7): 1019-1039.

(S) Galvin, P. 1999. Product Modularity, Information Structures and the Diffusion of Innovation. ***International Journal of Technology Management***, 17(5): 467-479.

(S) Galvin, P., & Morkel, A. 2001. The effect of product modularity on industry structure: The case of the world bicycle industry. ***Industry & Innovation***, 8(1): 31-47.

(X) Hoetker, G. 2006. Do modular products lead to modular organizations? ***Strategic Management Journal***, 27(6): 501-518.

(S) Hoetker, G., Swaminathan, A., & Mitchell, W. 2007. Modularity and the impact of buyer-supplier relationships on the survival of suppliers. ***Management Science***, 53(2): 178-191.

(Y) Langlois, R. N., & Robertson, P. L. 1992. Networks and innovation in a modular system: lessons from the microcomputer and stereo component industries. ***Research Policy***, 21(4): 297-313.

(X) Pil, F. K., & Cohen, S. K. 2006. Modularity: Implications for imitation, innovation, and sustained advantage. ***Academy of Management Review***, 31(4): 995-1011.

(Y) Sanchez, R., & Mahoney, J. T. 1996. Modularity, flexibility, and knowledge management in product and organization design. ***Strategic Management Journal***, 17: 63-76.

(S) Schilling, M. A. 2000. Toward a general modular systems theory and its application to interfirm product modularity. ***Academy of Management Review***, 25(2): 312-324.

(S) Schilling, M. A., & Steensma, H. K. 2001. The use of modular organizational forms: an industry-level analysis. ***Academy of Management Journal***, 44(6): 1149-1168.

(Y) Ulrich, K. T. 1995. The role of product architecture in the manufacturing firm. ***Research Policy***, 24: 419-440.

(X Style) NOTES--your own words only; no cutting and pasting Student: _____
Title:
Author(s):
Year:

1. What is the common ground that the author is trying to establish with the reader. What is the noncontroversial starting point?

2. What complication or twist to that starting point has the author introduced to make this interesting?

3. Why does that complication matter? Why should we care?

4. How does the author plan to resolve that complication? What therefore is the core purpose of this article?

5. If there are predictions in this article (theoretical propositions or empirical hypotheses), summarize them:

6. If this is an empirical article, summarize the findings:

7. What is the overall contribution here? How has this article changed the way we look at things?

8. Name a concern you have about the article:

9. Name something substantive you liked about the article:

10. Name a question you have for your classmates about the article:

11. Name an idea or two this article gave you for your own research (You only need to answer this last question for one of the articles each week. You will need to report in class on your idea, so be sure to come to class prepared.)

(Y Style) NOTES --your own words only; no cutting and pasting Student: _____

Title:
Author(s):
Year:

1. *What is the purpose of this article?*

2. *What are the key terms in this article and what do they mean?*

3. *Give a complete yet concise summary of this article.*

4. *What are the important takeaways of this article?*