

BSN4811  
Special Seminars in Business: Innovation and Productivity

Friday, 11am-2pm  
Riady Building, #3-5

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A key challenge for Singapore and other developed economies is to sustain economic growth. Growth can be based on working harder (more labour, more investment, more resources) or working smarter (raising productivity). Innovation contributes to working smarter -- getting more from the same resources.

This module introduces recent research in productivity, innovation, and entrepreneurship, focusing on implications for economic policy and business strategy. The module will be highly interactive and apply multiple disciplines including economics, psychology, and management. Students will present research papers, analyze data, write reports, and engage in discussion.

The prerequisite is basic knowledge of microeconomics, statistics, and algebra.

The following syllabus is subject to revision and will be updated online. Please refer to the IVLE for the current version.

#### Assessment

- Class participation: 20%
- Presentation and discussion of research papers: 25%
- Essays: 25%
- Examination: 30%

The assignments are due as follows:

- Slides for presentation and discussion of research paper: due at the start of class on the day of the topic;
- Slides for discussion questions: due at the start of class in following week;
- Slides and report of data analysis: due at the start of class in following the topic.

Note: Penalty of 25% for submission after the deadline.

## Syllabus<sup>1</sup>

Date	Subject	Assignment
#1 Jan 19	Introduction  Productivity <ul style="list-style-type: none"> <li>• TFP</li> <li>• Estimation</li> </ul>	Reading # Chad Syverson, "What Determines Productivity?" <i>Journal of Economic Literature</i> , Vol. 49 No. 2, 2011, 326-365.

Date	Subject	Assignment
#2 Jan 26	Productivity <ul style="list-style-type: none"> <li>• Management</li> <li>• Customer</li> </ul> Econometrics tutorial <ul style="list-style-type: none"> <li>• OLS</li> <li>• Stata</li> </ul>	Readings # Nicholas Bloom, Benn Eifert, et al., "Does management matter? Evidence from India", <i>Quarterly Journal of Economics</i> , Vol. 128 No. 1, February 2013, 1-51. # Ju-ye Lee and Simon Freebody, "Management Practices in Singapore", Policy, Research and Benchmarking Working Group, National Productivity and Continuing Education Council, (undated).

Date	Subject	Assignment
#3 Feb 2	Productivity <ul style="list-style-type: none"> <li>• Customer</li> </ul> Innovation <ul style="list-style-type: none"> <li>• Strategies</li> </ul>	General questions <ol style="list-style-type: none"> <li>1. Bloom et al. show that \$250,000 of consulting raises profit by \$350,000. Why didn't the manufacturers engage consultants before Bloom et al's experiment?</li> <li>2. Refer to the Lee and Freebody study. Suppose that you estimate a company-level regression to explain the management score of Singapore businesses. What explanatory variables would you include? What are the signs of the coefficients that you expect?</li> <li>3. Refer to "A Sectoral Examination of Singapore's Productivity Growth", 2014, and focus on one domestically-oriented sector. To what the extent can better management raise productivity?</li> </ol> Readings ^ Frans Johansson, <i>The Medici Effect: What Elephants and Epidemics Can Teach Us About Innovation</i> , Harvard Business School Press, 2006 (Chapters 1-5) [CL & HSS: HC79 Tec.J 2006].

		<p>^ Alberto Savoia and Patrick Copeland, "Entrepreneurial Innovation at Google", <i>IEEE Computer</i>, April 2011, 56-61.</p> <p>^ Eugene Fitzgerald, Andreas Wankerl, and Carl Schramm, <i>Inside real innovation: How the right approach can move ideas from R&amp;D to market: and get the economy moving</i>, Singapore: World Scientific, 2011 (Chapters 1-4) [HSS: HC79 Tec.Ft 2011].</p> <p>^ Navi Radjou and Jaideep Prabhu, <i>Frugal Innovation: How to do more with Less</i>, Public Affairs, 2014 (Chapters 1-2) [HD45 Rad 2014].</p> <p>#4.</p> <p>Specific question: Read one of the above items.</p> <ol style="list-style-type: none"> <li>Summarize the authors' recommended strategies to increase innovation.</li> <li>Compare the recommended strategies to possible alternatives.</li> <li>How would you test the authors' recommendations? Describe the study – whether laboratory experiment, field experiment, or observational study.</li> </ol>
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Date	Subject	Assignment
#4 Feb 9	Creativity <ul style="list-style-type: none"> <li>● Types</li> <li>● Measures</li> <li>● Influences</li> </ul>	<p># Beth A. Hennessey and Teresa M. Amabile, "Creativity", <i>Annual Review of Psychology</i>, Vol. 61, 2010, 569-98.</p> <p># Adam M. Grant and James W. Berry, "The Necessity of Others is the Mother of Invention: Intrinsic and Prosocial Motivations, Perspective Taking, and Creativity", <i>Academy of Management Journal</i>, 2011, Vol. 54, No. 1, 73-96.</p> <p>^ Angela K.-y. Leung, et al. "Embodied metaphors and creative "acts"", <i>Psychological Science</i>, Vol. 23 No. 5, 2012, 502-509.</p> <p>^ Marilyn Oppezzo and Daniel L. Schwartz, "Give Your Ideas Some Legs: The Positive Effect of Walking on Creative Thinking", <i>Journal of Experimental Psychology: Learning, Memory, and Cognition</i>, 2014.</p> <p>General questions</p> <ol style="list-style-type: none"> <li>Amabile defines creativity as the production of ideas or outcomes that are novel and appropriate to some goal. How does this model apply to totally new, blue-sky inventions (eg, electricity, nuclear physics, Internet) as contrasted with problem-driven innovations (eg, electric vis-a-vis petrol-engine car)?</li> <li>Amabile's Consensual Assessment Technique uses experts to rate creativity. Compare it to the divergent thinking test as a measure of creativity.</li> <li>If individual creativity is purely neurological, what are the implications for management and policy?</li> <li>Experiments in behavioural economics typically pay incentives to encourage the subjects to work hard. How</li> </ol>

		<p>would such payments affect the laboratory experiment carried out by Grant and Berry (2011)?</p> <p>Specific questions</p> <ol style="list-style-type: none"> <li>1. Both the Leung et al. (2012) and Oppezzo and Schwartz (2014) studies find that physical activity stimulates creativity. Compare their explanations for this effect.</li> <li>2. Why does walking stimulate divergent thinking, but not convergent thinking?</li> <li>3. When economists conduct randomized controlled trials, they typically check for selection (control and treatment groups are similar in observable characteristics) and spillovers from the treatment to control groups. In the walking experiments, what would you check?</li> <li>4. Refer to the studies by Leung et al. (2012) and Oppezzo and Schwartz (2014). How would variation of creativity by age or gender affect their findings and managerial implications?</li> </ol> <p><i>Empirical exercise #1:</i> Estimate the TFP growth of either Singapore Airlines or Cathay Pacific Airways over the last 10 years.</p>
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Date	Subject	Assignment
#5 Feb 23	Architecture <ul style="list-style-type: none"> <li>● Exterior</li> <li>● Interior</li> <li>● Proximity</li> </ul>	<p># Edwin Heathcote, "Lovely Laboratories", <i>Financial Times</i>, October 18, 2013.</p> <p># Umut Toker and Denis O. Gray, "Innovation spaces: Workspace planning and innovation in U.S. university research centers", <i>Research Policy</i>, Vol. 37, 2008, 309-329.</p> <p>^ Craig Knight and S. Alexander Haslam, "The Relative Merits of Lean, Enriched, and Empowered Offices: An Experimental Examination of the Impact of Workspace Management Strategies on Well-Being and Productivity", <i>Journal of Experimental Psychology: Applied</i>, Vol. 16, No. 2, 2010, 158-172.</p> <p>^ Jan Dul, Canan Ceylan, and Ferdinand Jaspers, "Knowledge workers' creativity and the role of the physical work environment", <i>Human Resource Management</i>, Vol. 50 No. 6, Nov-Dec 2011, 715-734.</p> <p>+# Thomas Allen and Gunter Henn, <i>The Organization and Architecture of Innovation</i>, Routledge, 2006, Chapter 4.</p> <p>General questions</p> <ol style="list-style-type: none"> <li>1. "Most scientific breakthroughs have occurred in boring buildings. Can a new generation of architects change that?" (<i>Financial Times</i>). Please discuss.</li> <li>2. Allen and Henn describe a factory (Skoda) and university faculty (TUM) arranged around a central spine. How scalable is this architecture?</li> </ol>

		<p>Specific questions</p> <ol style="list-style-type: none"> <li>1. Why do Knight and Haslam (2010) carry out two experiments? Evaluate the choice of sample in each of the experiments.</li> <li>2. What do we learn from Knight and Haslam (2010) about the relative strength of wellbeing and organizational identification as mediators of the effect of the workplace on productivity?</li> <li>3. Referring to the Dul et al. (2011) study, compare the effects of improving the social organizational and physical work environments by one standard deviation on performance. Which is more cost-effective?</li> <li>4. Dul et al. (2011: 727) report that the interaction between creative personality and physical work environment was “relatively high (coefficient: 0.09, but not significant)”. Assess whether this interaction is large or small.</li> </ol>
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Date	Subject	Assignment
#6 Mar 9	<p>Human resource management</p> <ul style="list-style-type: none"> <li>● Incentives</li> <li>● Job rotation</li> <li>● Suggestions</li> <li>● Quality circles</li> <li>● Satisfaction</li> </ul>	<p># Nicholas Bloom and John Van Reenen, “Human resource management and productivity”, <i>Handbook of Labor Economics</i>, Vol. 4, 2011, 1697-1767.</p> <p># Keld Laursen and Nicolai J. Foss, “New human resource management practices, complementarities and the impact on innovation performance”, <i>Cambridge Journal of Economics</i>, Vol. 27 No. 2, 2003, 243-263.</p> <p># Sandra Black and Lisa Lynch, “What’s Driving the New Economy? The Benefits of Workplace Innovation”, <i>Economic Journal</i>, Vol. 114 No. 493, 2004, 97-116.</p> <p>^ Florian Ederer and Gustavo Manso, “Is Pay for Performance Detrimental to Innovation?” <i>Management Science</i>, Vol. 59, No. 7, July 2013, 1496-1513.</p> <p>^ Michael Gibbs, Susanne Neckermann, and Christoph Siemroth, “A Field Experiment in Motivating Employee Ideas”, <i>Review of Economics and Statistics</i>, forthcoming.</p> <p>+ Petri Böckerman and Pekka Ilmakunnas, “The Job Satisfaction-Productivity Nexus: A Study Using Matched Survey and Register Data”, <i>Industrial &amp; Labor Relations Review</i>, Vol. 65 No. 2, April 2012, 244-262.</p> <p>+ Li, Shelley Xin and Sandino, Tatiana, Effects of an Information Sharing System on Employee Creativity, Engagement, and Performance (August 14, 2017). SSRN Working paper 3022205.</p> <p>General questions</p> <ol style="list-style-type: none"> <li>1. “[A]pplication of HRM practices does matter for the likelihood of innovation”, (Laursen and Foss 2003: 258). Do you agree?</li> </ol>

		<ol style="list-style-type: none"> <li>2. Contrast the findings of Laursen and Foss (2003) with Black and Lynch (2004).</li> <li>3. Referring to the Laursen and Foss (2003) study, how would you test for complementarities among new HRM practices in their effect on productivity?</li> </ol> <p>Specific questions</p> <ol style="list-style-type: none"> <li>1. In the Gibbs et al. (2014) experiment, suppose that control groups knew about the rewards given to treatment groups. How might that affect the behaviour of control and treatment groups?</li> <li>2. Gibbs et al. (2014) controlled for age, gender, and tenure. How might these individual characteristics have affected the response to incentives?</li> <li>3. Should Ederer and Manso (2013) have tested for interaction between the treatments and gender?</li> <li>4. Discuss the external validity of the Ederer and Manso (2013) findings.</li> </ol>
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Date	Subject	Assignment
#7 Mar 16	Human resource management <ul style="list-style-type: none"> <li>● Selection</li> <li>● Training</li> </ul> Site visit: Equinix Host: Mr Clement Goh, Managing Director - South Asia	# Virginia Stuart, "Prime Time", <i>UNH Magazine</i> , Fall 2013. # Junhong Chu, I.P.L. Png, and Junjian Yi, "Entrepreneurship and the School of Hard Knocks: Evidence from China's Great Famine", October 2016. ^ Matthew J. Lindquist, Joeri Sol, and Mirjam Van Praag, "Why Do Entrepreneurial Parents Have Entrepreneurial Children?" <i>Journal of Labor Economics</i> , Vol. 33 No. 2, April 2015.  Specific questions <ol style="list-style-type: none"> <li>1. Referring to the Lindquist et al. (2015) study, discuss whether entrepreneurs are born or nurtured.</li> <li>2. What do the Stuart essay and Lindquist et al. (2015) study tell us about the role of selection in increasing innovation in an organization?</li> <li>3. Lindquist et al. (2015) discuss several environmental mechanisms that affect entrepreneurship. In light of their discussion, what kinds of policies or programmes (e.g. NUS Overseas College) do you think are more likely or less likely to be effective in promoting entrepreneurship?</li> </ol> <i>Empirical exercise #2:</i> Retail store self-service payment: Details to be advised.

Date	Subject	Assignment
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#8	<p>[Skip this topic] Diversity</p> <ul style="list-style-type: none"> <li>● Gender, age, ethnicity</li> <li>● Experience</li> <li>● Education</li> </ul>	<p># Ray Reagans, Ezra Zuckerman, and Bill McEvily, "How to make the team: Social networks vs. demography as criteria for designing effective teams", <i>Administrative Science Quarterly</i>, Vol. 49, No. 1, 2004, 101-133.  ^ Marc Gruber, Dietmar Harhoff, and Karin Hoisl, "Knowledge Recombination Across Technological Boundaries: Scientists vs. Engineers", <i>Management Science</i>, Vol. 59, No. 4, 2013, 837-851.  ^ Sander Hoogendoorn, Hessel Oosterbeek, and Mirjam van Praag, "The Impact of Gender Diversity on the Performance of Business Teams: Evidence from a Field Experiment", <i>Management Science</i>, Vol. 59 No. 7, 2013, 1514-1528.</p> <p>General questions</p> <ol style="list-style-type: none"> <li>1. Does diversity increase productivity, and if so, how?</li> <li>2. Does diversity increase innovation, and if so, how?</li> <li>3. Compare job rotation and diversity as ways to increase innovation.</li> <li>4. Reagans et al. (2004) discuss their identification strategy on page 109. Discuss why their analysis does not identify the causal effects of diversity or network structure.</li> </ol> <p>Specific questions</p> <ol style="list-style-type: none"> <li>1. Gruber et al. (2013) study recombination by individual inventors. For a business that employs half engineers and half scientists, what is the expected degree of recombination?</li> <li>2. Hoogendoorn et al. (2013) find that gender diversity contributes to performance. What if gender is correlated with ethnicity?</li> </ol>
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Date	Subject	Assignment
#9 Mar 23	<p>Learning</p> <ul style="list-style-type: none"> <li>● Experience</li> <li>● Knowledge decay</li> <li>● Bench-marking</li> <li>● Spillovers</li> </ul>	<p># Wesley M. Cohen and D. A. Levinthal, "Absorptive capacity: A new perspective on learning and innovation", <i>Administrative Science Quarterly</i>, Vol. 35 No. 1, March 1990, 128-152.  # C. Lanier Benkard, "Learning and Forgetting: The Dynamics of Aircraft Production", <i>American Economic Review</i>, Vol. 90 No. 4, 2000, 1034-54.  # Xiqian Cai, Jie Gong, Yi Lu, and Songfa Zhong, "Recover Overnight? Work Interruption and Worker Productivity", <i>Management Science</i>, forthcoming.  # Amitabh Chandra, "Economics Meets the Geography of Medicine", Harvard University, September 2012.  + Igal Hendel and Yossi Spiegel, "Small Steps for Workers, a Giant Leap for Productivity", <i>American Economic Journal: Applied Economics</i>, Vol. 6 No. 1, 2014, 73-90.</p> <p>Guest lecture: Gong Jie, "Work Interruption and Productivity".</p>

		<p>General question</p> <ol style="list-style-type: none"> <li>1. Referring to Chandra (2012), discuss whether organizations should invest in learning from best practices of others?</li> <li>2. How does research into learning in the aircraft manufacturing and steel industries apply to other industries?</li> </ol> <p><i>Empirical exercise #3:</i>  Estimate learning curves for New York heart surgeons.  Reference: New York State Department of Health, <i>Adult Cardiac Surgery in New York State 2009-2011</i>, March 2014.</p> <p>General questions:</p> <ol style="list-style-type: none"> <li>1. Consider the sources of learning that increase organizational productivity. Which of these are subject to decay and to what extent?</li> <li>2. "The more of its competitors' spillovers there are..., the more incentive the firm has to invest in its own R&amp;D" (Cohen and Levinthal 1990). Discuss whether own and spillover R&amp;D are complements or substitutes.</li> <li>3. How do the estimates of Cohen and Levinthal (1990) bear on the models in Figures 1 and 2?</li> </ol>
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Date	Subject	Assignment
#10 Apr 6	Adoption of innovations <ul style="list-style-type: none"> <li>● Innovation cycle</li> <li>● Absorptive capacity</li> <li>● Incentives</li> <li>● Network effects</li> </ul>	# Philip Anderson and Michael L. Tushman, "Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change", <i>Administrative Science Quarterly</i> , Vol. 35 No. 4, December 1990, 604-34. # Michael L. Katz and Carl Shapiro, "Systems competition and network effects", <i>Journal of Economic Perspectives</i> , Vol. 8 No. 2, Spring 1994, 93-115. ^ Steven F. Bolling, et al. "Predictors of Mitral Valve Repair: Clinical and Surgeon Factors", <i>Annals of Thoracic Surgery</i> , Vol 90 No. 6, 2010, 1904-1912. ^ Andrew A. King and Baljir Baatartogtokh, "How useful is the theory of disruptive innovation?" <i>MIT Sloan Management Review</i> , Vol. 57 No. 1, 2015, 77-90. ^ David Atkins, et al., "Organizational Barriers to Technology Adoption: Evidence from Soccer-Ball Producers in Pakistan", <i>Quarterly Journal of Economics</i> [Ignore theory appendix].  General questions: <ol style="list-style-type: none"> <li>1. Anderson and Tushman (1990: 614-615) argue that "In regimes of low appropriability, a single dominant</li> </ol>

		<p>design will emerge following each technological discontinuity ... majority of potential adopters will await the emergence of an industry standard before purchasing a new product or installing a new process technology". Discuss in the context of smartphones -- comparing the iOS, Android, and other systems.</p> <p>2. With network effects, current adoption depends on past adoptions by others. Discuss the challenges in estimating network effects.</p> <p>Specific questions:</p> <ol style="list-style-type: none"> <li>1. With network effects, current adoption depends on past adoptions by others. Discuss the challenges in estimating network effects.</li> <li>2. Repair of the mitral heart valve requires more surgical skill than replacing the valve. Bolling et al. (2010) analysed patient and surgeon characteristics that are associated with repair. How could you use multiple regression to improve on their analysis? What other factors would you include?</li> <li>3. In the Atkins et al. (2014) study, the businesses that did not respond to the initial survey tended to be larger than those that did respond. Discuss the possible reasons and implications.</li> <li>4. To better understand the diffusion of the new soccer ball making technology, why should we study the management of the diemakers?</li> </ol>
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Date	Subject	Assignment
#11 Apr 13	Geography <ul style="list-style-type: none"> <li>● Clustering</li> <li>● Knowledge spillovers</li> <li>● Professional mobility</li> <li>● Location choice</li> </ul>	<p># Gerald Carlino and William R. Kerr, "Agglomeration and Innovation", in <i>Handbook of Regional and Urban Economics</i>, forthcoming. (Exclude Sect 4.3.1)</p> <p># Jarle Moen, "Is Mobility of Technical Personnel a Source of R&amp;D Spillovers?" <i>Journal of Labor Economics</i>, Vol. 23, No. 1, January 2005, 81-114.</p> <p>^ Juan Alcacer and Wilbur Chung, "Location strategies and knowledge spillovers", <i>Management Science</i>, Vol. 53 No. 5, May 2007, 760-776.</p> <p>Specific questions:</p> <ol style="list-style-type: none"> <li>1. Moen (2005) finds that workers in more R&amp;D-intensive industries earn relatively less in the earlier years and more in later years. How does this theory apply to (a) doctors and (b) satellite engineers? How does it apply to a small labour market like Singapore?</li> </ol>

		<p>2. Alcacer and Chung (2007) interpret local stocks of patents as source of knowledge spillovers. But what if stocks of patents proxy for the stock of engineers and scientists? How would this affect the interpretation of their empirical results?</p> <p>General questions:</p> <ol style="list-style-type: none"> <li>1. How would improvements in information and communication technologies change the effect of geographical proximity on innovation?</li> <li>2. Suppose that the total factor productivity of businesses increases with the stock of knowledge in the vicinity. Does this mean that businesses benefit from a positive externality?</li> <li>3. In a cross-sectional U.S. study, Skinner and Staiger (2007) find that the adoption of beta blockers to treat heart attacks in the early 2000s correlated geographically with the adoption of hybrid corn in 1930s-40s. What does this finding suggest about the adoption of innovation?</li> </ol>
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Date	Subject	Assignment
#12 Apr 20	<p>Appropriability</p> <ul style="list-style-type: none"> <li>● Patents</li> <li>● Trade secrecy</li> <li>● Covenants not to compete</li> </ul>	<p># Teece, David J., "Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy", <i>Research Policy</i>, Vol. 15, No. 6, 1986, 285-305.</p> <p># Heidi L. Williams, "Intellectual Property Rights and Innovation: Evidence from the Human Genome", <i>Journal of Political Economy</i>, Vol. 121 No. 1, 2013, 1-27.</p> <p>^ I.P.L. Png, "Law and Innovation: Evidence from State Trade Secrets Laws", <i>Review of Economics and Statistics</i>, March 2017.</p> <p>^ Matt Marx, Deborah Strumsky, and Lee Fleming, "Mobility, Skills, and the Michigan non-compete experiment", <i>Management Science</i>, Vol. 55, No. 6, June 2009, 875-889.</p> <p>Specific questions:</p> <ol style="list-style-type: none"> <li>1. Williams' (2013), Table 1, shows that more innovations were derived from Celera genes than non-Celera genes. Does that suggest that Celera's patenting encouraged subsequent innovation?</li> <li>2. How does follow-on innovation from Celera genes depend on the efficiency of the market for licensing?</li> <li>3. Referring to the Png (2017) study. Suppose that there are no spillovers of R&amp;D between</li> </ol>

		<p>businesses? How would that affect the interpretation of the empirical results?</p> <ol style="list-style-type: none"> <li>4. The UTSA was associated with more R&amp;D among larger and more R&amp;D intensive companies (Png 2017). Is that good or bad for society?</li> <li>5. Marx et al. (2009) show that mobility is lower in a state that enforces non-competition agreements. From society's viewpoint, is this good or bad?</li> <li>6. The Michigan Antitrust Reform Act of 1985 (MARA) provided an exception that that the statute repealed by MARA would "remain in force for the purpose" of enforcing any liability under the repealed act. This means that any pre-existing non-competition agreement would <i>not</i> be enforceable. Given this, how would the MARA have affected mobility over time? What does this imply for the findings of Marx et al. (2009)?</li> </ol> <p><i>Empirical exercise #4:</i>  Estimate patents as function of revenue and R&amp;D among Singapore publicly-listed companies. (a) How would you estimate the effect of reforms to the patent law in 2004?  (b) How would you address R&amp;D being endogenous?</p> <p>General questions:</p> <ol style="list-style-type: none"> <li>1. Does stronger protection of intellectual property increase innovation?</li> <li>2. How do knowledge spillovers depend on the laws of intellectual property rights, trade secrets, and employment?</li> <li>3. "Although subsequent court decisions have upheld some of EMI's patent claims, once the product was in the market it could be reverse engineered and its essential features copied" (Teece 1986: 298). Please discuss.</li> </ol>
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