

BSS4003A

Special Seminars in Business: Innovation and Productivity

Friday, 11am-2pm
Riady Building, #

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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 only 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: 20%
- Data analysis: 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.

Syllabus¹

Date	Subject	Assignment
#1 Jan 13	Introduction Productivity <ul style="list-style-type: none"> • TFP • Estimation Econometrics tutorial	Reading # Chad Syverson, "What Determines Productivity?" <i>Journal of Economic Literature</i> , Vol. 49 No. 2, 2011, 326-365.

Date	Subject	Assignment
#2 Jan 20	Productivity <ul style="list-style-type: none"> • Management 	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). Empirical exercise: For any airline, estimate TFP growth over the last 10 years. General question: Identify and explain other important factors that might affect productivity which Syverson (2011) did not review.

Date	Subject	Assignment
#3 Jan 27	Innovation <ul style="list-style-type: none"> • Economic growth • Types • Sources 	General questions <ol style="list-style-type: none"> 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? 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? 3. Refer to "A Sectoral Examination of Singapore's Productivity Growth", 2014, and focus on one domestically-oriented sector. To what the extent can

¹ Notes: # Instructor presentation; ^ Student presentation; + For reference only.

		<p style="text-align: center;">better management raise productivity?</p> <p>Readings</p> <p>^ 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> <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&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>Specific question: Read one of the above items.</p> <ol style="list-style-type: none"> a) Summarize the authors' recommended strategies to increase innovation. b) Compare the recommended strategies to possible alternatives. c) Thought experiment: How would you test the authors' recommendations?
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Date	Subject	Assignment
#4 Feb 3	Creativity <ul style="list-style-type: none"> ● Types ● Measures ● Stimulants 	<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>^ Marily 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"> 1. 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)? 2. Amabile's Consensual Assessment Technique uses experts to rate creativity. Compare it to the divergent thinking test as a measure of creativity.

		<p>3. If individual creativity is purely neurological, what are the implications for management and policy?</p> <p>Specific questions</p> <ol style="list-style-type: none"> 1. Experiments in behavioural economics typically pay incentives to encourage the subjects to work hard. How would such payments affect the laboratory experiment carried out by Grant and Berry (2011)? 2. Both the Leung et al. (2012) and Oppezzo and Schwartz (2014) studies find that physical activity stimulates creativity. Compare their explanations for this effect. 3. Why does walking stimulate divergent thinking, but not convergent thinking? 4. 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? 5. Refer to the studies by Grant and Berry (2011), Leung et al. (2012), Oppezzo and Schwartz (2014). How would variation of creativity by age or gender affect their findings and managerial implications?
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Date	Subject	Assignment
#5 Feb 10	Architecture <ul style="list-style-type: none"> • Exterior • Interior • Proximity 	<p># Thomas Allen and Gunter Henn, <i>The Organization and Architecture of Innovation</i>, Routledge, 2006, Chapter 4.</p> <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>^ Ben Waber, Jennifer Magnolfi, and Greg Lindsay, "Workspaces That Move People", <i>Harvard Business Review</i>, Vol. 92 No. 10, October 2014, 68-77.</p> <p>General questions</p> <ol style="list-style-type: none"> 1. "Most scientific breakthroughs have occurred in boring buildings. Can a new generation of architects change that?" (<i>Financial Times</i>). Please discuss. 2. Allen and Henn describe a factory (Skoda) and university

		<p>faculty (TUM) arranged around a central spine. How scalable is this architecture?</p> <p>Specific questions</p> <ol style="list-style-type: none"> 1. 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? 2. 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. 3. Evaluate the empirical design of the Toker and Gray (2008) study. What do we learn from the study about the effect of office design on scientific productivity? 4. Referring to Toker and Gray (2008) Table 5, how would you estimate and report the effect of accessibility on interaction? 5. Referring to Waber et al. (2014), can frequent unintended meetings be bad for productivity and innovation? 6. In a survey of workers in coworking spaces, 75% reported an increase in productivity after joining their space (Waber et al. 2014). Discuss this finding and its managerial implications.
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Date	Subject	Assignment
#6 Feb 17	<p>Human resource management</p> <ul style="list-style-type: none"> ● Incentives ● Job rotation ● Suggestions ● Quality circles ● Decentralization 	<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”, SSRN Working Paper 2420965, 2014.</p> <p>+ Petri Böckerman and Pekka Ilmakunnas, “The Job Satisfaction-Productivity Nexus: A Study Using Matched Survey and Register Data”, <i>Industrial & Labor Relations Review</i>, Vol. 65 No. 2, April 2012, 244-262.</p> <p>Specific questions</p> <ol style="list-style-type: none"> 1. “[A]pplication of HRM practices does matter for

		<p>the likelihood of innovation”, (Laursen and Foss 2003: 258). Do you agree?</p> <ol style="list-style-type: none"> 2. Contrast the findings of Laursen and Foss (2003) with Black and Lynch (2004). 3. Referring to the Laursen and Foss (2003) study, how would you test for complementarities among new HRM practices in their effect on productivity? 4. 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? 5. Gibbs et al. (2014) controlled for age, gender, and tenure. How might these individual characteristics have affected the response to incentives? 6. Should Ederer and Manso (2013) have tested for interaction between the treatments and gender? 7. Discuss the external validity of the Ederer and Manso (2013) findings.
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Date	Subject	Assignment
#7 Mar 3	<p>Human resource management</p> <ul style="list-style-type: none"> • Selection • Training <p>Site visit: Equinix Host: Mr Clement Goh, Managing Director - South Asia</p>	<p># Virginia Stuart, “Prime Time”, <i>UNH Magazine</i>, Fall 2013. ^ 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. ^ Junhong Chu, I.P.L. Png, and Junjian Yi, “Entrepreneurship and the School of Hard Knocks: Evidence from China’s Great Famine”, October 2016.</p> <p>Specific questions</p> <ol style="list-style-type: none"> 1. Referring to the Lindquist et al. (2015) study, discuss whether entrepreneurs are born or nurtured. 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? 3. Refer to the Chu et al. (2016) study. What does the School of Hard Knocks teach and how? <p>Empirical exercise Using the China survey data-set, investigate any relation between entrepreneurship and (i) self-efficacy, (ii) resilience, (iii) persistence and tenacity, and (iv) craftiness and opportunism. Compare OLS with IV estimates.</p>

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<p>#8 Mar 10</p>	<p>Diversity</p> <ul style="list-style-type: none"> ● Gender, age, ethnicity ● Experience ● Education 	<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.</p> <p>^ 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.</p> <p>^ 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"> 1. Does diversity increase productivity, and if so, how? 2. Does diversity increase innovation, and if so, how? 3. Compare job rotation and diversity as ways to increase innovation. <p>Specific questions</p> <ol style="list-style-type: none"> 1. Reagans et al. (2004) discuss their identification strategy on page 109. Discuss why their analysis does <i>not</i> identify the causal effects of diversity or network structure. 2. 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? 3. Hoogendoorn et al. (2013) find that gender diversity contributes to performance. What if gender is correlated with ethnicity?
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Date	Subject	Assignment
<p>#9 Mar 17</p>	<p>Learning</p> <ul style="list-style-type: none"> ● Experience ● Knowledge decay ● Bench-marking ● Spillovers 	<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.</p> <p># C. Lanier Benkard, "Learning and Forgetting: The Dynamics of Aircraft Production", <i>American Economic Review</i>, Vol. 90 No. 4, 2000, 1034-54.</p> <p># Xiqian Cai, Jie Gong, Yi Lu, and Songfa Zhong, "Recover Overnight? Work Interruption and Worker Productivity", February 2016.</p> <p>^ Amitabh Chandra, "Economics Meets the Geography of Medicine", Harvard University, September 2012.</p> <p>^ 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>Specific questions</p> <ol style="list-style-type: none"> 1. Referring to Chandra (2012), discuss whether organizations should invest in learning from best practices of others? 2. How does research into learning in the aircraft manufacturing and steel industries apply to other industries? 3. Referring to the Hendel and Spiegel (2014) study, suppose that the business acquired another steel plant. To what extent could it apply the learning of its original plant to the new plant? <p>Empirical exercise: Reference: New York State Department of Health, <i>Adult Cardiac Surgery in New York State 2009-2011</i>, March 2014.</p> <ol style="list-style-type: none"> 1. Refer to the New York report, Appendices 1-3. To estimate the effects of hospitals and surgeons, what variables would you add to the regressions? Ideally, what data would you like? 2. Refer to the data for New York heart surgeons. (a) For surgeons with 8 or more data points, chart the risk-adjusted mortality rate against experience for (i) coronary artery bypass graft (CABG) and (ii) valve surgeries. (b) Use OLS to estimate the learning rates in CABG and valve surgeries with dummy variables for each surgeon. <p>General questions:</p> <ol style="list-style-type: none"> 1. Consider the sources of learning that increase organizational productivity. Which of these are subject to decay and to what extent? 2. "The more of its competitors' spillovers there are..., the more incentive the firm has to invest in its own R&D" (Cohen and Levinthal 1990). Discuss whether own and spillover R&D are complements or substitutes. 3. How do the estimates of Cohen and Levinthal (1990) bear on the models in Figures 1 and 2?
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Date	Subject	Assignment
#10 Mar 24	Adoption of innovations <ul style="list-style-type: none"> • Innovation cycle • Absorptive capacity • Incentives 	# 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.

	<ul style="list-style-type: none"> • Network effects 	<p>^ 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.</p> <p>^ David Atkins, et al., "Organizational Barriers to Technology Adoption: Evidence from Soccer-Ball Producers in Pakistan", Yale University, May 2014 [Ignore theory appendix].</p> <p>Specific questions:</p> <ol style="list-style-type: none"> 1. With network effects, current adoption depends on past adoptions by others. Discuss the challenges in estimating network effects. 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? 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. 4. To better understand the diffusion of the new soccer ball making technology, why should we study the management of the diemakers? <p>Empirical exercise:</p> <ol style="list-style-type: none"> 1. Estimate models of (i) residential broadband penetration and (ii) mobile phone ownership in China. <p>General question</p> <ol style="list-style-type: none"> 1. Anderson and Tushman (1990: 614-615) argue that "In regimes of low appropriability, a single dominant 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.
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Date	Subject	Assignment
#11 Mar 31	Geography <ul style="list-style-type: none"> • Clustering • Knowledge spillovers • Professional 	# Gerald Carlino and William R. Kerr, "Agglomeration and Innovation", in <i>Handbook of Regional and Urban Economics</i> , forthcoming. (Exclude Sect 4.3.1) ^ Jarle Moen, "Is Mobility of Technical Personnel a Source of R&D Spillovers?" <i>Journal of Labor Economics</i> , Vol. 23,

	<p>mobility</p> <ul style="list-style-type: none"> • Location choice 	<p>No. 1, January 2005, 81-114. ^ 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"> 1. Moen (2005) finds that workers in more R&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? 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>General questions:</p> <ol style="list-style-type: none"> 1. How would improvements in information and communication technologies change the effect of geographical proximity on innovation? 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? 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?
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Date	Subject	Assignment
#12 Apr 7	<p>Appropriability</p> <ul style="list-style-type: none"> • Patents • Trade secrecy • Covenants not to compete 	<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. ^ 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. ^ I.P.L. Png, "Law and Innovation: Evidence from State Trade Secrets Laws", <i>Review of Economics and Statistics</i>, 2017. ^ 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"> 1. Referring to the Png (2017) study. Suppose that there are no spillovers of R&D between businesses? How would that affect the interpretation of the empirical results? 2. The UTSA was associated with more R&D among larger and more R&D intensive companies (Png 2017). Is that good or bad for society? 3. Marx et al. (2009) show that mobility is lower in a state that enforces non-competition agreements. <ul style="list-style-type: none"> ▪ From society's viewpoint, is this good or bad? <p>Empirical exercise:</p> <ol style="list-style-type: none"> 1. Estimate patents as function of revenue and R&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&D being endogenous? <p>General questions:</p> <ol style="list-style-type: none"> 1. Does stronger protection of intellectual property increase innovation? 2. How do knowledge spillovers depend on the laws of intellectual property rights, trade secrets, and employment? 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.
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Date	Subject	Assignment
#13 Apr 14	<p>Policy</p> <ul style="list-style-type: none"> • Open innovation • Self service • Evaluation 	<p>^ Teppo Felin and Todd R. Zenger, "Closed or open innovation? Problem solving and the governance choice", <i>Research Policy</i>, Vol. 43 No. 5, 2014, 914-925.</p> <p>^ Kai-Lung Hui and I. P. L. Png, "Research Note—Migration of Service to the Internet: Evidence from a Federal Natural Experiment", <i>Information Systems Research</i>, Vol. 26 No. 3, 2015, 606-618.</p> <p>Guest lecture: Professor Pasha Mahmood, Frugal Innovation.</p> <p>Specific questions:</p> <ol style="list-style-type: none"> 1. Referring to Felin and Zenger's (2014) Figure 1, should they add a third dimension -- the degree to which the innovation is general vis-a-vis specific to a particular user?

		<ol style="list-style-type: none">2. How does Felin and Zenger's (2014) model apply to totally new, blue-sky inventions as contrasted with problem-driven innovations?3. What do the findings of the Hui and Png (2015) study imply for the "digital divide"? <p>General questions</p> <ol style="list-style-type: none">1. Why should any organization <i>not</i> engage in open innovation?2. How does the trend towards self-service affect the measurement of total factor productivity?3. From a societal standpoint, is it reasonable to charge a higher price to consumers who prefer human service?
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