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Identify the sources of innovations: beyond R&D



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R&D is not enough. Significant R&D spending might be necessary for some firms to develop new technologies but certainly do not guarantee their innovation success. **Identifying innovation opportunities** requires finding new combinations of new or existing technologies with new or existing needs.



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The **triggers of innovation opportunities** which firms should proactively exploit include internal sources such as new knowledge, challenging routines and serendipity, and external sources such as changes in markets, industry and environmental constraints.



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Sizeable innovation opportunities do not pop up out of the blue. Organizations must invest time and resources to combine, integrate and **mature innovation ideas into potential opportunities**. They should also pursue already emerging opportunities and focus on scaling

them up.

Bibliography

R&D is not enough

Keywords: market pull, R&D as a source of innovation, technology, technology push

- (Book) Johnson, S. (2010) [*Where good ideas come from*](#), Penguin Books.
- (Book) Nonaka, I., & Takeuchi, H. (1995). [*The knowledge-creating company: How Japanese companies create the dynamics of innovation*](#). Oxford University Press.
- (Video) "[Where good ideas come from](#)" by Steven Johnson
- (Article) Ahmadpoor, M., & Jones, B. F. (2017). The dual frontier: Patented inventions and prior scientific advance. *Science*, 357(6351), 583-587.
- (Article) Arora, A., Belenzon, S., & Pataconi, A. (2018). The decline of science in corporate R&D. *Strategic Management Journal*, 39(1), 3-32.
- (Article) Atuahene-Gima, K. (1996). Market orientation and innovation. *Journal of Business Research*, 35(2), 93-103.
- (Article) Baumann, J., & Kritikos, A. (2016). 'The link between R&D, innovation and productivity: Are micro firms different?'. *Research Policy*, 45, 1263-1274.
- (Article) Berchicci, L. (2013). Towards an open R&D system: Internal R&D investment, external knowledge acquisition and innovative performance. *Research Policy*, 42(1), 117-127.
- (Article) Brem, A., & Voigt, K. I. (2009). Integration of market pull and technology push in the corporate front end and innovation management—Insights from the German software industry. *Technovation*, 29(5), 351-367.
- (Article) Cassiman, B., & Veugelers, R. (2006). In search of complementarity in innovation strategy: Internal R&D and external knowledge acquisition. *Management Science*, 52(1), 68-82.
- (Article) Cattani, G., & Ferriani, S. (2008). A core/periphery perspective on individual creative performance: Social networks and cinematic achievements in the Hollywood film industry. *Organization Science*, 19(6), 824-844.
- (Article) Coyne, K. P., Clifford, P. G., & Dye, R. (2007). Breakthrough thinking from inside the box. *Harvard Business Review*, 85(12), 70-8.
- (Article) Di Stefano, G., Gambardella, A., & Verona, G. (2012). Technology push and demand pull perspectives in innovation studies: Current findings and future research directions. *Research Policy*, 41(8), 1283-1295.
- (Article) Dougherty, D. (1990). Understanding new markets for new products. *Strategic Management Journal*, 59-78.
- (Article) Elkins, T., & Keller, R. (2003) 'Leadership in research and development organizations: a literature review and conceptual framework'. *Leadership Quarterly*, 14, 587-606.
- (Article) Ethiraj, S. K., Kale, P., Krishnan, M. S., & Singh, J. V. (2005). Where do capabilities come from and how do they matter? A study in the software services industry. *Strategic Management Journal*, 26(1), 25-45.
- (Article) Foster, R. N. (2003). Corporate performance and technological change through

- investor's eyes. *Research-Technology Management*, 46(6), 36-43.
- (Article) García-Manjón, J. V., & Romero-Merino, M. E. (2012). Research, development, and firm growth. Empirical evidence from European top R&D spending firms. *Research Policy*, 41(6), 1084-1092.
 - (Article) Gieryn, T. F. (1983). Boundary-work and the demarcation of science from non-science: Strains and interests in professional ideologies of scientists. *American Sociological Review*, 781-795.
 - (Article) Guellec, D., and B. Van Pottelsberge De La Potterie (2003), R&D and Productivity Growth: Panel Data Analysis of 16 OECD Countries, *Economics of Innovation and New Technology*, 12, 225-243
 - (Article) Hagedoorn, J., & Wang, N. (2012). Is there complementarity or substitutability between internal and external R&D strategies?. *Research Policy*, 41(6), 1072-1083.
 - (Article) Hirsch-Kreinsen, H. (2008). "Low-Tech" Innovations. *Industry and Innovation*, 15(1), 19-43.
 - (Article) Jensen, M.B., Johnson, B., Lorenz, E., & Lundvall, B.A. (2007). Forms of knowledge and modes of innovation. *Research Policy*, 36, 680-693.
 - (Article) Kumar, V., Jones, E., Venkatesan, R., & Leone, R. P. (2011). Is market orientation a source of sustainable competitive advantage or simply the cost of competing?. *Journal of Marketing*, 75(1), 16-30.
 - (Article) Leiponen, A. (2012). The benefits of R&D and breadth in innovation strategies: a comparison of Finnish service and manufacturing firms. *Industrial and Corporate Change*, 21(5), 1255-1281.
 - (Article) Morgan, R. E., & Berthon, P. (2008). Market orientation, generative learning, innovation strategy and business performance inter-relationships in bioscience firms. *Journal of Management Studies*, 45(8), 1329-1353.
 - (Article) Mowery, D., & Rosenberg, N. (1979). The influence of market demand upon innovation: a critical review of some recent empirical studies. *Research Policy*, 8(2), 102-153.
 - (Article) Nelson, R. R. (1959). The simple economics of basic scientific research. *Journal of Political Economy*, 67(3), 297-306.
 - (Article) Parrilli, M., & Heras, H. (2016). STI and DUI innovation modes: Scientific-technological and context-specific nuances. *Research Policy*, 45, 747-756.
 - (Article) Ping L., S. Young, (1996) International technology transfer examined at technology component level: a case study in China, *Technovation*, 16(6), 277-286
 - (Article) Rammer, C., Czarnitzki, D., & Spielkamp, A. (2009). Innovation success of non-R&D-performers: substituting technology by management in SMEs. *Small Business Economics*, 33(1), 35-58
 - (Article) Salter, Ammon J., and Ben R. Martin. "The economic benefits of publicly funded basic research: a critical review." *Research Policy* 30.3 (2001): 509-532.
 - (Article) Santamaría, L., Nieto, M.J., & Barge-Gil, A. (2009). Beyond formal R&D: Taking advantage of other sources of innovation in low-and medium-technology industries. *Research Policy*, 38(3), 507-517.
 - (Article) Spanjol, J., Qualls, W. J., & Rosa, J. A. (2011). How many and what kind? The role of strategic orientation in new product ideation. *Journal of Product Innovation Management*, 28(2), 236-250.
 - (Article) Stock-Homburg, R. M., Heald, S. L., Holthaus, C., Gillert, N. L., & von Hippel, E.

- (2020). Need-solution pair recognition by household sector individuals: Evidence, and a cognitive mechanism explanation. *Research Policy*, 104068.
- (Article) Tipping, J., & Zeffren, E. (1995) 'Assessing the value of your technology', *Research-Technology Management*, 38, 22-40.
 - (Article) Yam, R. C., Guan, J. C., Pun, K. F., & Tang, E. P. (2004). An audit of technological innovation capabilities in Chinese firms: some empirical findings in Beijing, China. *Research Policy*, 33(8), 1123-1140
 - (Article) Zhou, K. Z., Yim, C. K., & Tse, D. K. (2005). The effects of strategic orientations on technology-and market-based breakthrough innovations. *Journal of Marketing*, 69(2), 42-60.

Triggers of innovation opportunities: beyond new tech

Keywords: *accidental discoveries, bottom of the pyramid, reverse innovation, serendipity, sources of innovation*

- (Book) Drucker P. (1985) [The Discipline of Innovation](#), HBR 63(3), 65-72
- (Book) Lienhard, J. H. (2008). [How invention begins: echoes of old voices in the rise of new machines](#). Oxford University Press.
- (Book) Prahalad, C. K. (2009). [The fortune at the bottom of the pyramid](#), revised and updated 5th anniversary edition: *Eradicating poverty through profits*. FT Press.
- (Book) Sunstein, C. (2017) [#Republic: Divided Democracy in the Age of Social Media](#). Princeton University Press;
- (Video) Hal Gregersen [The Four Behaviors Of Innovative Leaders](#)
- (Video) [Innovation In Unlikely Places](#) by Kuczmariski Innovation (on Vimeo)
- (Article) Denrell, J., Fang, C., & Winter, S. G. (2003). The economics of strategic opportunity. *Strategic Management Journal*, 24(10), 977-990.
- (Article) Dew, N., Sarasvathy, S. D., & Venkataraman, S. (2004). The economic implications of exaptation. *Journal of Evolutionary Economics*, 14(1), 69-84.
- (Article) Dimov, D. (2011). Grappling with the unbearable elusiveness of entrepreneurial opportunities. *Entrepreneurship Theory and Practice*, 35(1), 57-81.
- (Article) Eckhardt, J. T., & Shane, S. A. (2003). Opportunities and entrepreneurship. *Journal of Management*, 29(3), 333-349.
- (Article) Evangelista, R., & Vezzani, A. (2010). The economic impact of technological and organizational innovations. A firm-level analysis. *Research Policy*, 39, 1253-1263.
- (Article) Flowers, S. (2008). Harnessing the hackers: The emergence and exploitation of Outlaw Innovation. *Research Policy*, 37(2), 177-193.
- (Article) Foss, N.J., Lyngsie, J., & Zahra, S.A. (2013). The role of external knowledge sources and organizational design in the process of opportunity exploitation. *Strategic Management Journal*, 34(12), 1453-1471.
- (Article) Freeman, C. (1994). The economics of technical change. *Cambridge Journal of Economics*, 18(5), 463-514.
- (Article) Fultz, A. E., & Hmieleski, K. M. (2021). The art of discovering and exploiting unexpected opportunities: The roles of organizational improvisation and serendipity in new venture performance. *Journal of Business Venturing*, 36(4), 106121.
- (Article) Garud, R., Gehman, J., & Giuliani, A. P. (2018). Serendipity arrangements for exapting science-based innovations. *Academy of Management Perspectives*, 32(1), 125-140.

- (Article) Gemmell, R. M., Boland, R. J., & Kolb, D. A. (2012). The socio-cognitive dynamics of entrepreneurial ideation. *Entrepreneurship Theory and Practice*, 36(5), 1053-1073.
- (Article) Gino, F. (2018). The Business Case for Curiosity. *Harvard Business Review*, Sep.-Oct.
- (Article) Gnekpe, C., & Coeurderoy, R. (2017). The impact of internal and external technology sourcing on innovation performance: a review and research agenda. *International Journal of Technology Management*, 73(1-3), 21-38.
- (Article) Govindarajan, V., & Ramamurti, R. (2011). Reverse innovation, emerging markets, and global strategy. *Global Strategy Journal*, 1(3-4), 191-205.
- (Article) Govindarajan, V., & Euchner, J. (2012). Reverse innovation. *Research-Technology Management*, 55(6), 13-17.
- (Article) Laursen, K. (2012). Keep searching and you'll find: what do we know about variety creation through firms' search activities for innovation?. *Industrial and Corporate Change*, 21(5), 1181-1220.
- (Article) Lounsbury, M., & Crumley, E. T. (2007). New practice creation: An institutional perspective on innovation. *Organization Studies*, 28(7), 993-1012.
- (Article) Park, J. S. (2005). Opportunity recognition and product innovation in entrepreneurial hi-tech start-ups: a new perspective and supporting case study. *Technovation*, 25(7), 739-752.
- (Article) Prahalad, C. K. (2012). Bottom of the Pyramid as a Source of Breakthrough Innovations. *Journal of Product Innovation Management*, 29(1), 6-12.
- (Article) Ray, S., & Ray, P. K. (2011). Product innovation for the people's car in an emerging economy. *Technovation*, 31(5-6), 216-227.
- (Article) Santos-Vijande, M., & Alvarez-Gonzalez, L. (2007). 'Innovativeness and organizational innovation in total quality oriented firms: The moderating role of market turbulence'. *Technovation*, 27, 514-532.
- (Article) Shah, S. K., & Tripsas, M. (2007). The accidental entrepreneur: The emergent and collective process of user entrepreneurship. *Strategic Entrepreneurship Journal*, 1(1-2), 123-140.
- (Article) Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science*, 11(4), 448-469.
- (Article) Von Zedtwitz, M., Corsi, S., Søberg, P. V., & Frega, R. (2015). A typology of reverse innovation. *Journal of Product Innovation Management*, 32(1), 12-28.
- (Article) Yaqub, O. (2018). Serendipity: Towards a taxonomy and a theory. *Research Policy*, 47(1), 169-179.

From generating ideas to identifying sizeable innovation opportunities

Keywords: economics of science, opportunity sourcing, technology readiness level, technology transfer, university spin-offs

- (Book) Chesbrough, H. (2006) [Open Business Models](#); Harvard Business School Press
- (Book) R. Landau and N. Rosenberg (eds) [The Positive Sum Strategy: Harnessing Technology for Economic Growth](#), Washington D.C.: National Academy Press
- (Video) [GE Ventures Corporate Venture Strategy](#)
- (Article) Acs, Z. J., Audretsch, D. B., & Feldman, M. P. (1992). Real effects of academic

- research: comment. *The American Economic Review*, 82(1), 363-367.
- (Article) Acs, Z. J., Audretsch, D. B., & Lehmann, E. E. (2013). The knowledge spillover theory of entrepreneurship. *Small Business Economics*, 41(4), 757-774
 - (Article) Alvarez, S. A., & Barney, J. B. (2007). Discovery and creation: Alternative theories of entrepreneurial action. *Strategic Entrepreneurship Journal*, 1(1-2), 11-26.
 - (Article) Ambos, T. C., Mäkelä, K., Birkinshaw, J., & d'Este, P. (2008). When does university research get commercialized? Creating ambidexterity in research institutions. *Journal of Management Studies*, 45(8), 1424-1447.
 - (Article) Arora, A., Fosfuri, A., & Gambardella, A. (2001). Markets for technology and their implications for corporate strategy. *Industrial and Corporate Change*, 10(2), 419-451.
 - (Article) Audretsch, D. B., & Keilbach, M. (2008). Resolving the knowledge paradox: Knowledge-spillover entrepreneurship and economic growth. *Research Policy*, 37(10), 1697-1705.
 - (Article) Bekkers, R., & Freitas, I. M. B. (2008). Analysing knowledge transfer channels between universities and industry: To what degree do sectors also matter?. *Research Policy*, 37(10), 1837-1853.
 - (Article) Bozeman, B. (2000). Technology transfer and public policy: a review of research and theory. *Research Policy*, 29(4-5), 627-655.
 - (Article) Bozeman, B., Rimes, H., & Youtie, J. (2015). The evolving state-of-the-art in technology transfer research: Revisiting the contingent effectiveness model. *Research Policy*, 44(1), 34-49.
 - (Article) Brooks, H. (1994). The relationship between science and technology. *Research Policy*, 23(5), 477-486.
 - (Article) Budish, E., Roin, B. N., & Williams, H. (2015). Do firms underinvest in long-term research? Evidence from cancer clinical trials. *American Economic Review*, 105(7), 2044-85.
 - (Article) Chen, P.C., & Hung, S.W. (2016). An actor-network perspective on evaluating the R&D linking efficiency of innovation ecosystems. *Technological Forecasting and Social Change*, 112, 303-312.
 - (Article) Colyvas, J., Crow, M., Gelijns, A., Mazzoleni, R., Nelson, R. R., Rosenberg, N., & Sampat, B. N. (2002). How do university inventions get into practice?. *Management Science*, 48(1), 61-72.
 - (Article) Colyvas, J. A. (2007). From divergent meanings to common practices: The early institutionalization of technology transfer in the life sciences at Stanford University. *Research Policy*, 36(4), 456-476.
 - (Article) Criscuolo, P., Salter, A., & Ter Wal, A.L. (2013). Going underground: Bootlegging and individual innovative performance. *Organization Science*, 25(5), 1287-1305.
 - (Article) Dosi, G. (1988). Sources, procedures, and microeconomic effects of innovation. *Journal of Economic Literature*, 1120-1171.
 - (Article) Dosi, G. (1997). Opportunities, incentives and the collective patterns of technological change. *The Economic Journal*, 107(444), 1530-1547.
 - (Article) Florén, H., & Frishammar, J. (2012). From preliminary ideas to corroborated product definitions: Managing the front end of new product development. *California Management Review*, 54(4), 20-43.
 - (Article) Harmon, B., Ardishvili, A., Cardozo, R., Elder, T., Leuthold, J., Parshall, J., ... & Smith, D. (1997). Mapping the university technology transfer process. *Journal of Business*

- Venturing*, 12(6), 423-434.
- (Article) Hellmann, T. (2007). The role of patents for bridging the science to market gap. *Journal of Economic Behavior & Organization*, 63(4), 624-647.
 - (Article) Jaffe, A. B. (1989). Real effects of academic research. *The American Economic Review*, 957-970.
 - (Article) Kedia, B. L., & Bhagat, R. S. (1988). Cultural constraints on transfer of technology across nations: Implications for research in international and comparative management. *Academy of Management Review*, 13(4), 559-571.
 - (Article) Kirchberger, M. A., & Pohl, L. (2016). Technology commercialization: a literature review of success factors and antecedents across different contexts. *The Journal of Technology Transfer*, 41(5), 1077-1112.
 - (Article) Landry, R., Amara, N., & Lamari, M. (2001). Climbing the ladder of research utilization: Evidence from social science research. *Science Communication*, 22(4), 396-422.
 - (Article) Lockett, A., & Wright, M. (2005). Resources, capabilities, risk capital and the creation of university spin-out companies. *Research Policy*, 34(7), 1043-1057.
 - (Article) Mansfield, E. (1991). Academic research and industrial innovation. *Research Policy*, 20(1), 1-12.
 - (Article) Miller, K., McAdam, R., & McAdam, M. (2018). A systematic literature review of university technology transfer from a quadruple helix perspective: toward a research agenda. *R&D Management*, 48(1), 7-24.
 - (Article) Murray, F. (2002). Innovation as co-evolution of scientific and technological networks: exploring tissue engineering. *Research Policy*, 31(8-9), 1389-1403.
 - (Article) Nambisan, S., & Sawhney, M. (2007). A buyer's guide to the innovation bazaar. *Harvard Business Review*, 85(6), 109-118.
 - (Article) Ndonzuau, F. N., Pirnay, F., & Surlemont, B. (2002). A stage model of academic spin-off creation. *Technovation*, 22(5), 281-289.
 - (Article) Nemet, G.F. (2009). Demand-pull, technology-push, and government-led incentives for non-incremental technical change. *Research Policy*, 38(5), 700-709.
 - (Article) Newbert, S. L. (2005). New firm formation: A dynamic capability perspective. *Journal of Small Business Management*, 43(1), 55-77.
 - (Article) O'Connor, G. C., & Rice, M. P. (2013). New market creation for breakthrough innovations: Enabling and constraining mechanisms. *Journal of Product Innovation Management*, 30(2), 209-227.
 - (Article) Partha, D., & David, P. A. (1994). Toward a new economics of science. *Research Policy*, 23(5), 487-521.
 - (Article) Pisano, G. (2006). Can science be a business?. *Harvard Business Review*, 10, 1-12.
 - (Article) Powers, J. B., & McDougall, P. P. (2005). University start-up formation and technology licensing with firms that go public: a resource-based view of academic entrepreneurship. *Journal of Business Venturing*, 20(3), 291-311.
 - (Article) Qian, H., & Acs, Z. J. (2013). An absorptive capacity theory of knowledge spillover entrepreneurship. *Small Business Economics*, 40(2), 185-197.
 - (Article) Roberts, E. B. (2007). Managing invention and innovation. *Research-Technology Management*, 50(1), 35-54.
 - (Article) Rogers, E. M., Takegami, S., & Yin, J. (2001). Lessons learned about technology transfer. *Technovation*, 21(4), 253-261.
 - (Article) Romer, P.M. (1990) Endogenous Technological Change, *Journal of Political*

Economy 98: S71-S102

- (Article) Stephan, P. E. (1996). The economics of science. *Journal of Economic Literature*, 34(3), 1199-1235.
- (Article) Stern, S. (2004). Do scientists pay to be scientists?. *Management Science*, 50(6), 835-853.
- (Article) Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, 15(6), 285-305.
- (Article) Veugelers, R., & Cassiman, B. (1999). Make and buy in innovation strategies: evidence from Belgian manufacturing firms. *Research Policy*, 28(1), 63-80.
- (Article) Vohora, A., Wright, M., & Lockett, A. (2004). Critical junctures in the development of university high-tech spin-out companies. *Research Policy*, 33, 147-175
- (Article) Walsh, J. P., Lee, Y. N., & Jung, T. (2016). Win, lose or draw? The fate of patented inventions. *Research Policy*, 45(7), 1362-1373.
- (Article) Welsh, R., Glenna, L., Lacy, W., & Biscotti, D. (2008). Close enough but not too far: Assessing the effects of university-industry research relationships and the rise of academic capitalism. *Research Policy*, 37(10), 1854-1864.
- (Article) Zahra, S. A., Van de Velde, E., & Larraneta, B. (2007). Knowledge conversion capability and the performance of corporate and university spin-offs. *Industrial and Corporate Change*, 16(4), 569-608.
- (Article) Zhu, K., Kraemer, K. L., & Xu, S. (2006). The process of innovation assimilation by firms in different countries: a technology diffusion perspective on e-business. *Management Science*, 52(10), 1557-1576.
- (Article) Zucker, L. G., Darby, M. R., & Armstrong, J. S. (2002). Commercializing knowledge: University science, knowledge capture, and firm performance in biotechnology. *Management Science*, 48(1), 138-153.

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