

# PROFESSIONAL PRACTICE 2

**Resource List**  
**Practicals (seminar)**

**SEMESTER 2, 2021**

**COURSE CONVENOR**  
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**Australian  
National  
University**

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# Themes

Weekly Theme	Description	Subjects for Pracs
<b>WEEK 1</b> Introduction to Professional Practice 2		
<b>WEEK 2</b> How To Write Like A Professional For Non-Professionals (writing a Perspective and Op-Ed piece)		
<b>UNPACKING EXPERTISE</b> During weeks 3-6, we will learn more about what constitutes expertise and profession in our new world and recent challenges facing professionals in different disciplines.		
<b>WEEK 3</b> Evidence and Expertise	As engineering and computer professionals, you need to perform effectively in the complex context. But how should we know our context? How does the context shape you and your practice as a professional? In week 3, we will discuss about what's an expert, and the importance of evidence in defining professional standards and expectations. During seminar we will also discuss what evidence-based practice is and why engineers and computer scientific should be aware of it.	(1) What's an expert? Contested expertise (2) Evidence-based expertise (3) Politics of evidence
<b>WEEK 4</b> Responsible Expertise	In week 4 we will learn about different types of professional (regarding their expertise) such as I-shaped, T-shaped, and Pi-shaped. We will also learn more about multidisciplinary, interdisciplinarity, and transdisciplinarity and their importance in professional practice in engineering and computer science.	(1) Types of expertise (2) Multidisciplinarity, interdisciplinarity, and transdisciplinarity (3) Responsible and systems-oriented expertise

<b>WEEK 5</b> Expertise Paradox	<p>It is not always the best intention to provide the best results. Sometimes our expertise and the way we practice as a professional may create the most harm in long term for next generations and the environment. In week 5 we will discuss about these issues. In particular, we will learn about Jevons paradox and the application of Jevons paradox in the emerging fields such as AI, and other emerging areas in energy sector.</p>	<ul style="list-style-type: none"> <li>(1) Jevons paradox</li> <li>(2) Future of Jevons paradox (e.g. AI, energy)</li> <li>(3) Politics of Jevons paradox</li> </ul>
<b>WEEK 6</b> The Crisis Of Expertise	<p>Trust is one the most important feature of any social system. It is a driving force that hold our communities together. In various topics such as climate change and vaccinations, we can see the downfall of trust between professionals and the public. People tend to dismiss advice from professionals. COVID-19 pandemic also brought into sharp focus the importance of trust between public and professionals. In week 6 we will discuss how this new situation is related to our professional practice in engineering and computer science, and what should we do as professional to keep the trust going.</p>	<ul style="list-style-type: none"> <li>(1) The importance of trust</li> <li>(2) Expertise in a 'post-truth' society</li> <li>(3) Expertise in post-Covid society</li> </ul>
<b>FUTURE EXPERTISE</b> <p>During weeks 7-11, we will learn more about how new changes in our world would affect professional practice in engineering and computer science in the years to come. We will focus specifically on industry 4.0 and will see how it is related with skills we need to develop as engineering and computer professionals.</p>		
<b>WEEK 7</b> Constructing Future	<p>During weeks 3-6 we learned what constitutes expertise and profession in our new world and recent challenges facing professionals in different disciplines. Before we continue our discussion on how these new changes will affect the professional practice in engineering and computer science in future, in week 7 we will learn more about how the future is constructed and the role engineers and computer professionals. We specifically discuss about the relation between imaginaries and future that is built by engineers. We will learn how fiction puts the science in engineering, and sci-fi inspires engineers and computing professionals to build a brand new world.</p>	<ul style="list-style-type: none"> <li>(1) The power of science fiction I</li> <li>(2) The power of science fiction II (global perspective)</li> <li>(3) Socio-technical imaginary</li> </ul>

<b>WEEK 8</b> Industry 4.0	In week 8, we will learn about history of industrial revolutions and industry 4.0 and its impact on new demanded employees' competencies development. We will discuss the top skills needed to succeed in the fourth industrial revolution.	<ul style="list-style-type: none"> <li>(1) History of industrial revolutions</li> <li>(2) Concept of industry 4.0</li> <li>(3) Politics of industry 4.0</li> </ul>
<b>WEEK 9</b> Engineering Expertise In Industry 4.0	In week 9, we look into a wide range of Industry 4.0 applications in different disciplines and discuss how professional practice in engineering and computer science would be evolving in the coming years. We learn which skills are important for success in the industry 4.0 market and how those skills can empower us to make better decisions in our professional practice.	<ul style="list-style-type: none"> <li>(1) Industry 4.0 applications</li> <li>(2) Industry 4.0 readiness</li> <li>(3) Supply Chain 4.0</li> </ul>
<b>WEEK 10</b> Global Perspective On Industry 4.0	According to World Economic Forum, India and China together can lead the Industry 4.0. Also other emerging economies are increasingly focusing their strategies to become a force in the new industrial revolution. In week 10, we explore industry market in the future of three countries: India, China, and Germany. We will learn how they are different and how they are similar to each other. Through that we will discuss about set of skills and competencies that are, and will be, in demand in these countries as well as globally.	<ul style="list-style-type: none"> <li>(1) Industry 4.0 in Germany</li> <li>(2) Industry 4.0 in China</li> <li>(3) Industry 4.0 in India</li> </ul>
<b>WEEK 11</b> Intervention In Industry 4.0	<p>As engineering and computer science professionals we need to take a 'responsible' position in our approach towards industry 4.0. In week 11 we will learn about why systems thinking and responsible innovation framework can help us to navigate industry 4.0 safely.</p> <p>We will learn navigating this complex and interdependent landscape requires that we transcend traditional mechanistic and fragmented science, to better understand the nature of changes and to devise solutions to manage them in collaboration. In this week we will explore the ways in which industry 4.0 and its underlying socio-technical imaginaries, could be subject to a set of systemic interventions. Finally we will discuss how these systemic interventions should, and will, be part of professional practice in the future of engineering and computer science.</p>	<ul style="list-style-type: none"> <li>(1) Systemic failures</li> <li>(2) Systemic interventions</li> <li>(3) Being responsible in industry 4.0</li> </ul>



# Resources

# WEEK3

## EVIDENCE AND EXPERTISE

As engineering and computer professionals, you need to perform effectively in the complex context. But how should we know our context? How does the context shape you and your practice as a professional? In week 3, we will discuss about what's an expert, and the importance of evidence in defining professional standards and expectations. During seminar we will also discuss what evidence-based practice is and why engineers and computer scientists should be aware of it.

## Subject 1: What's an expert?



### Key Resources

- ↓ Watson, J. C. (2019). What Experts Could Not Be. *Social Epistemology*, 33(1), 74-87. [\[Link\]](#)
- ↓ Origgi, G. (2015). What Is An Expert That A Person May Trust Her? Towards A Political Epistemology Of Expertise. *HUMANA. MENTE Journal of Philosophical Studies*, 8(28), 159-168. [\[Link\]](#)
- ↓ Sharman, A. (2015). The impact of controversy on the production of scientific knowledge (No. 207). London: Grantham Research Institute on Climate Change and the Environment. [\[Link\]](#)
- ↓ Farrington-Darby, T., & Wilson, J. R. (2006). The nature of expertise: A review. *Applied ergonomics*, 37(1), 17-32. [\[Link\]](#)
- ↓ Ericsson, K. A., Hoffman, R. R., Kozbelt, A., & Williams, A. M. (Eds.). (2018). *The Cambridge handbook of expertise and expert performance*. Cambridge University Press. [\[Link\]](#) (Chapter2)
- ↓ Barrotta, P., & Montuschi, E. (2018). Expertise, relevance and types of knowledge. *Social Epistemology*, 32(6), 387-396. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- Who counts as an expert and whose knowledge is deemed relevant in different political settings?
- What's an expertise? What counts, as expertise in different context (e.g. countries)?
- What's a good or bad expertise? What's a 'judgmental call'?
- In what ways experts and scientists are different and/ similar?
- What conditions make possible the creation of new systems of expertise, and what makes them legitimate?
- What's the relationship between expertise and expert's authority?
- What's the contested relationship between expertise and democracy?
- What's the role of controversy in shaping expertise, and production of scientific knowledge?
- What's the relationship between the expert scientific knowledge and local knowledge?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 2: Evidence-based expertise



### Key Resources

- ↓ Davies, H. T., & Nutley, S. M. (Eds.). (2000). What works?: Evidence-based policy and practice in public services. Policy Press. [\[Link\]](#) (Chapters 1&2)
- ↓ Paley, J. (2006). Evidence and expertise. Nursing Inquiry, 13(2), 82-93. [\[Link\]](#)
- ↓ Reay, T., Berta, W., & Kohn, M. K. (2009). What's the evidence on evidence-based management?. Academy of Management Perspectives, 23(4), 5-18. [\[Link\]](#)
- ↓ Kitchenham, B. A., Dyba, T., & Jorgensen, M. (2004, May). Evidence-based software engineering. In Proceedings. 26th International Conference on Software Engineering (pp. 273-281). IEEE. [\[Link\]](#)
- ↓ Vilkins, S., & Grant, W. J. (2017). Types of evidence cited in Australian Government publications. Scientometrics, 113(3), 1681-1695. [\[Link\]](#)
- ↓ Barends, E., Rousseau, D. M., & Briner, R. (2014). Evidence Based Practice The Basic Principles. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What's an evidence-based management? What's an evidence-based decision-making?
- What counts as evidence?
- What's the nature of evidence?
- What is the benefit of taking an evidence-based approach?
- What's the role of experts in evidence-based approach?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 3: Politics of evidence



### Key Resources

- ↓ Parkhurst, J. (2017). The politics of evidence: from evidence-based policy to the good governance of evidence (p. 182). Taylor & Francis.. [\[Link\]](#) (Chapter 2, pp 39-84)
- ↓ Forsyth, T. (2020). Who shapes the politics of expertise? Co-production and authoritative knowledge in Thailand's political forests. Antipode, 52(4), 1039-1059. [\[Link\]](#)
- ↓ Cairney, P., & Oliver, K. (2017). Evidence-based policymaking is not like evidence-based medicine, so how far should you go to bridge the divide between evidence and policy?. Health research policy and systems, 15(1), 1-11. [\[Link\]](#)
- ↓ Mena-Tudela, D., González-Chordá, V. M., Cervera-Gasch, A., Maciá-Soler, M. L., & Orts-Cortés, M. I. (2018). Effectiveness of an Evidence-Based Practice educational intervention with second-year nursing students. Revista latino-americana de enfermagem, 26. [\[Link\]](#)
- ↓ Sohn, J. (2018). Navigating the politics of evidence-informed policymaking: strategies of influential policy actors in Ontario. Palgrave Communications, 4(1), 1-12. [\[Link\]](#)
- ↓ Rycroft-Malone, J. (2006). The politics of the evidencebased practice movements: Legacies and current challenges. Journal of Research in Nursing, 11(2), 95-108. [\[Link\]](#)
- ↓ Cairney, P (2016). The politics of evidence-based policymaking. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- How can we evaluate the effectiveness of evidence-based approaches?
- How do evidence-based approaches vary in different fields and disciplines? What are the similarities and differences?
- What's the politics of evidence?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

# WEEK4

## RESPONSIBLE EXPERTISE

In week 4 we will learn about different types of professionals (regarding their expertise) such as I-shaped, T-shaped, and Pi-shaped. We will also learn more about multidisciplinary, interdisciplinarity, and transdisciplinarity and their importance in professional practice in engineering and computer science.

# Subject 1: Types of expertise



## Key Resources

- ↓ Johnson, P. E., Zuolkernan, I. A., & Tukey, D. (1993). Types of expertise: an invariant of problem solving. *International Journal of man-machine studies*, 39(4), 641-665. [\[Link\]](#)
- ↓ Bourne Jr, L. E., Kule, J. A., & Healy, A. F. (2014). Expertise: defined, described, explained. *Frontiers in psychology*, 5, 186. [\[Link\]](#)
- ↓ Collins, H. (2013). Three dimensions of expertise. *Phenomenology and the cognitive sciences*, 12(2), 253-273. [\[Link\]](#)
- ↓ Kinchin, I. M., & Cabot, B. (2010). Reconsidering the dimensions of expertise: from linear stages towards dual processing. *London Review of Education*, 8(2), 153-166. [\[Link\]](#)
- ↓ Conley, S. N., Foley, R. W., Gorman, M. E., Denham, J., & Coleman, K. (2017). Acquisition of T-shaped expertise: an exploratory study. *Social Epistemology*, 31(2), 165-183. [\[Link\]](#)
- ↓ Wu, J., Zou, X., & Kong, H. (2012, June). Cultivating T-shaped engineers for 21st century: experiences in China. In 2012 ASEE annual conference & exposition (pp. 25-372). [\[Link\]](#)
- ↓ Boehm, B., & Koolmonojwong, S. (2019). Educating I-Shaped Computer Science Students to Become T-Shaped System Engineers. *Procedia Computer Science*, 153, 71-79. [\[Link\]](#)
- ↓ Boynton, A. (2011). Are You an "I" or a "T"? – Forbes [\[Link\]](#)
- ↓ McCarthy, M (2020). Forget the T — you want to become a Pi-shaped designer [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What are the different types of expertise?
- What are different dimensions of expertise?
- Who is an I-shaped, T-shaped, Pi-shaped expert? What are the key characteristics of each type of expert? What are the key skills required for each of them?
- Can we change the type of our expertise? How? How can we move between different types of expertise? What are the challenges and opportunities?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 2: Multidisciplinarity, interdisciplinarity, and transdisciplinarity



### Key Resources

- ↓ Jahn, T., Bergmann, M., & Keil, F. (2012). Transdisciplinarity: Between mainstreaming and marginalization. *Ecological Economics*, 79, 1-10. [\[Link\]](#)
- ↓ Nicolescu, B. (2014). Methodology of transdisciplinarity. *World Futures*, 70(3-4), 186-199. [\[Link\]](#)
- ↓ Alvargonzález, D. (2011). Multidisciplinarity, interdisciplinarity, transdisciplinarity, and the sciences. *International studies in the philosophy of science*, 25(4), 387-403. [\[Link\]](#)
- ↓ Choi, B. C., & Pak, A. W. (2007). Multidisciplinarity, interdisciplinarity, and transdisciplinarity in health research, services, education and policy: 2. Promoters, barriers, and strategies of enhancement. *Clinical and Investigative Medicine*, E224-E232. [\[Link\]](#)
- ↓ Takeuchi, M. A., Sengupta, P., Shanahan, M. C., Adams, J. D., & Hachem, M. (2020). Transdisciplinarity in STEM education: a critical review. *Studies in Science Education*, 56(2), 213-253. [\[Link\]](#)
- ↓ Colpaert, J. (2018). Transdisciplinarity revisited. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What's the meaning and function of multidisciplinarity, interdisciplinarity, and transdisciplinarity in research and practice? What are the differences and similarities between them? Why should someone take one of them not the other in certain situations? What's the relationship between each of them and the 'science'?
- What's transdisciplinarity? What's its history in academic discourse? What's the methodology of transdisciplinarity?
- How can we increase effectiveness of multiple disciplinary teamwork? What are the promoters, barriers, and ways to enhance such teamwork?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.



## Subject 3: Towards a responsible expertise



### Key Resources

- ↓ Phillips, L., & Ilcan, S. (2007). Responsible expertise: Governing the uncertain subjects of biotechnology. *Critique of anthropology*, 27(1), 103-126. [\[Link\]](#)
- ↓ Douglas, H. (2008). **The role of values in expert reasoning.** *Public Affairs Quarterly*, 22(1), 1-18. [\[Link\]](#)
- ↓ Rousseau, D., & Wilby, J. (2014). Moving from disciplinarity to transdisciplinarity in the service of thrivable systems. *Systems Research and Behavioral Science*, 31(5), 666-677. [\[Link\]](#)
- ↓ Brown, V. A. (2015). Utopian thinking and the collective mind: Beyond transdisciplinarity. *Futures*, 65, 209-216. [\[Link\]](#)
- ↓ Lawrence, R. J. (2015). Advances in transdisciplinarity: Epistemologies, methodologies and processes. [\[Link\]](#)
- ↓ Hofkirchner, W. (2016). Transdisciplinarity and Systems Thinking. [\[Link\]](#)
- ↓ Bammer, G (2017). Toolkits for transdisciplinary research [\[Links\]](#)
- ↓ Elliott, K. C. (2006). **An ethics of expertise based on informed consent.** *Science and Engineering Ethics*, 12(4), 637-661. [\[Link\]](#)
- ↓ Jensen, G., & Delany, C. (2016). The discourse on ethics and expertise in professional practice. In *Professional practice discourse marginalia* (pp. 73-82). Brill Sense. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- How systems thinking can be used for transdisciplinarity?
- What's collective thinking, reflective thinking, wicked problems?
- How to move from disciplinarity to transdisciplinarity?
- What are the relevant concepts and methods for undertaking a transdisciplinary research?
- How expert's expertise could be ethical and responsible?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

# WEEK5

## EXPERTISE PARADOX

It is not always the best intention to provide the best results. Sometimes our expertise and the way we practice as a professional may create the most harm in long term for next generations and the environment. In week 5 we will discuss about these issues. In particular, we will learn about Jevons paradox and the application of Jevons paradox in the emerging fields such as AI, and other emerging areas in energy sector.

# Subject 1: Jevons paradox



## Key Resources

- ↓ Alcott, B. (2005). Jevons' paradox. *Ecological economics*, 54(1), 9-21. [\[Link\]](#)
- ↓ York, R., & McGee, J. A. (2016). Understanding the Jevons paradox. *Environmental Sociology*, 2(1), 77-87. [\[Link\]](#)
- ↓ Owen, D. (2010). The efficiency dilemma. *The New Yorker*, 20(27), 78-80. [\[Link\]](#)
- ↓ Polimeni, J. M., & Polimeni, R. I. (2006). Jevons' Paradox and the myth of technological liberation. *Ecological Complexity*, 3(4), 344-353. [\[Link\]](#)
- ↓ Sorrell, S. (2009). Jevons' Paradox revisited: The evidence for backfire from improved energy efficiency. *Energy policy*, 37(4), 1456-1469. [\[Link\]](#)
- ↓ Polimeni, J. M., Mayumi, K., Giampietro, M., & Alcott, B. (2015). The myth of resource efficiency: the jevons paradox. *Routledge*. [\[Link\]](#)
- ↓ Sears, L., Caparelli, J., Lee, C., Pan, D., Strandberg, G., Vuu, L., & Lin Lawell, C. Y. C (2018). Jevons' paradox and efficient irrigation technology. *Sustainability*, 10(5), 1590. [\[Link\]](#)
- ↓ Alcott, B. (2008). Historical overview of the Jevons Paradox in the literature. *The Jevons Paradox and the myth of resource efficiency improvements*, 8. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What's Jevons paradox? What is the history of it? Why is it important?
- Why Jevons paradox can occur? Where are the places that we should look for it?
- What does Jevens paradox say about technological innovation, and our fascinations with increasing efficiency?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 2: Future of Jevons paradox (e.g. AI, energy)



### Key Resources

- ↓ Freire-González, J., & Puig-Ventosa, I. (2015). Energy efficiency policies and the Jevons paradox. *International Journal of Energy Economics and Policy*, 5(1), 69. [\[Link\]](#)
- ↓ Owen, D. (2010). The efficiency dilemma. *The New Yorker*, 20(27), 78-80. [\[Link\]](#)
- ↓ Figus, G., Turner, K., & Katris, A. (2018). Energy saving innovations and economy wide rebound effects. [\[Link\]](#)
- ↓ Copiello, S. (2017). Building energy efficiency: A research branch made of paradoxes. *Renewable and Sustainable Energy Reviews*, 69, 1064-1076. [\[Link\]](#)
- ↓ Dauvergne, P. (2020). Is artificial intelligence greening global supply chains? Exposing the political economy of environmental costs. *Review of International Political Economy*, 1-23. [\[Link\]](#)
- ↓ Zimmerman, A. (2018). Sustainability-Efficiency Paradox: The Efficacy of State Energy Plans in Building a More Sustainable Energy Future. [\[Link\]](#)
- ↓ Wallis, S., Barbieri, L., Damiano, A., & Burke, M. (2020). The role of technology achieving the future we want. In *Sustainable Wellbeing Futures*. Edward Elgar Publishing. [\[Link\]](#)
- ↓ Saenko, K. (2020) It takes a lot of energy for machines to learn – here's why AI is so power-hungry [\[Link\]](#)

For your presentation try to engage with the following research questions:

- How different fields and disciplines think about 'Jevons Paradox' ? (e.g. rebound effect, Khazzoom–Brookes, Downs–Thomson)
- What are the real implications of Jevons Paradox in different sectors (e.g. energy, water)?
- How Jevons Paradox can help us to think differently about the future of AI and machine learning?

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## Subject 3: Politics of Jevons paradox



### Key Resources

- ↓ Freeman, R., Yearworth, M., & Preist, C. (2016). Revisiting Jevons' paradox with system dynamics: Systemic causes and potential cures. *Journal of Industrial Ecology*, 20(2), 341-353. [\[Link\]](#)
- ↓ York, R. (2006). Ecological paradoxes: William Stanley Jevons and the paperless office. *Human Ecology Review*, 143-147. [\[Link\]](#)
- ↓ Giampietro, M., & Mayumi, K. (2018). Unraveling the complexity of the Jevons paradox: the link between innovation, efficiency, and sustainability. *Frontiers in Energy Research*, 6, 26. [\[Link\]](#)
- ↓ Freeman, R., Yearworth, M., & Preist, C. (2016). Revisiting Jevons' paradox with system dynamics: Systemic causes and potential cures. *Journal of Industrial Ecology*, 20(2), 341-353. [\[Link\]](#)
- ↓ Foster, J. B., Clark, B., & York, R. (2010). Capitalism and the curse of energy efficiency. *Monthly Review*, 62(6), 1-12. [\[Link\]](#)
- ↓ Vaughn, K. (2012). Jevons Paradox: The Debate That Just Won't Die. *RMI Outlet*, Plug into New Ideas, March, 20. [\[Link\]](#)
- ↓ Freire-González, J., & Puig-Ventosa, I. (2015). Energy efficiency policies and the Jevons paradox. *International Journal of Energy Economics and Policy*, 5(1), 69. [\[Link\]](#)
- ↓ Polimeni, J. M., & Polimeni, R. I. (2006). Jevons' Paradox and the myth of technological liberation. *Ecological Complexity*, 3(4), 344-353. [\[Link\]](#)
- ↓ Nabavi, E. (2017). The end of paradox? Stop looking in the wrong place for achieving sustainability. [\[Link\]](#)

For your presentation try to familiarize yourself with the concept of Jevons paradox and then engage with the following research questions:

- Why after 200 years can we still observe Jevons paradox in many different fields and contexts, from transportation, to energy, and AI? why the paradox won't die even though we're aware of it? What are systemic causes and potential cures?
- What is the politics behind it? Why are we simultaneously aware of it and increasingly addict to it? How could adopting the systems approach enable us to better understand its causes and potential solutions?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

# WEEK6

## THE CRISIS OF EXPERTISE

Trust is one the most important feature of any social system. It is a driving force that hold our communities together. In various topics such as climate change and vaccinations, we can see the downfall of trust between professionals and the public. People tend to dismiss advice from professionals. COVID-19 pandemic also brought into sharp focus the importance of trust between public and professionals. In week 6 we will discuss how this new situation is related to our professional practice in engineering and computer science, and what should we do as professional to keep the trust going.

# Subject 1: The importance of trust

## ✓ Key Resources

- ↓ Ariely, D. (2017) Why trust is so important and how we can get more of it?, TEDxJaffa [\[Link\]](#)
- ↓ Brien, A. (1998). Professional ethics and the culture of trust. *Journal of Business Ethics*, 17(4), 391-409. [\[Link\]](#)
- ↓ Sellman, D. (2006). The importance of being trustworthy. *Nursing Ethics*, 13(2), 105-115. [\[Link\]](#)
- ↓ Ryu, Y., Kim, S., & Kim, S. (2018). Does trust matter? analyzing the impact of trust on the perceived risk and acceptance of nuclear power energy. *Sustainability*, 10(3), 758. [\[Link\]](#)
- ↓ Riegelsberger, J., Sasse, M. A., & McCarthy, J. D. (2006). Rich media, poor judgement? A study of media effects on users' trust in expertise. In *People and Computers XIX—The Bigger Picture* (pp. 267-284). Springer, London. [\[Link\]](#)
- ↓ Whyte, K. P., & Crease, R. P. (2010). Trust, expertise, and the philosophy of science. *Synthese*, 177(3), 411-425. [\[Link\]](#)
- ↓ Johnson, D., & Grayson, K. (2005). Cognitive and affective trust in service relationships. *Journal of Business research*, 58(4), 500-507. [\[Link\]](#)
- ↓ Kunkel, J., Donkers, T., Barbu, C. M., & Ziegler, J. (2018). Trust-related Effects of Expertise and Similarity Cues in Human-Generated Recommendations. In *IUI Workshops*. [\[Link\]](#)
- ↓ Xie, Y., & Peng, S. (2011). How do corporate associations influence customer relationship strength? The effects of different types of trust. *Journal of Strategic Marketing*, 19(5), 443-454. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- Why is trust important?
- What is the nature of 'trust' in professional practice? What does it involve? how can we cultivate trust in our professional practice?
- How trust and professional practice are related and shaped one another?
- what sort of professional culture promotes trust? How can it be implemented by a profession and engendered in the individual professional?
- What trust means in the relation between science and society, between expert and ordinary citizens? What are different types of trust?
- How trust, expertise, and media representations are interconnected?
- What is cognitive and affective trust and how it is related to professional practice in engineering and computer science?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 2: Expertise in a 'post-truth' society



### Key Resources

- ↓ Brown, T. (2016). Evidence, expertise, and facts in a "post-truth" society. [\[Link\]](#)
- ↓ Nothing but the truth, BBC [\[Link\]](#)
- ↓ The Roots of the 'Post-Truth' Era, WNYC [\[Link\]](#)
- ↓ Edmans, A (2018). What to trust in a "post-truth" world, TED Talk. [\[Link\]](#)
- ↓ Sismondo, S. (2017). Post-truth?. [\[Link\]](#)
- ↓ Peters, M. A., & Besley, T. (2019). Citizen science and post-normal science in a post-truth era: Democratising knowledge; socialising responsibility. [\[Link\]](#)
- ↓ Funtowicz, S. O., & Ravetz, J. R. (1993). Science for the post-normal age. *Futures*, 25(7), 739-755. [\[Link\]](#)
- ↓ Dankel, D. J., Vaage, N. S., & van der Sluijs, J. P. (2017). Post-normal science in practice. [\[Link\]](#)
- ↓ Farrell, K. N. (2020). Untrol: post-truth and the new normal of post-normal science. *Social epistemology*, 34(4), 330-345. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What's post-truth? What are the roots of post-truth era?
- How post-truth, evidence, and expertise are related?
- Why is expertise in crisis? How does that relate to the level of trust between experts and public?
- How post-truth society and evidence-based approaches are related?
- What is normal and post normal science? Why is it important? And how post-truth and post-normal science are related?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.



## Subject 3: Expertise in post-Covid society



### Key Resources

- ↓ Post-truth expertise (in post-covid society) (2020) [\[Link\]](#)
- ↓ Aksoy, C., Eichengreen, B., & Saka, O. (2020). Revenge of the Experts: Will COVID-19 Renew or Diminish Public Trust in Science?. [\[Link\]](#)
- ↓ Parmet, W. E., & Paul, J. (2020). COVID-19: the first posttruth pandemic. [\[Link\]](#)
- ↓ Evans, J. H., & Hargittai, E. (2020). Who Doesn't Trust Fauci? The Public's Belief in the Expertise and Shared Values of Scientists in the COVID-19 Pandemic. *Socius*, 6, 2378023120947337. [\[Link\]](#)
- ↓ Llewellyn, S. (2020). Covid-19: how to be careful with trust and expertise on social media. *BMJ*, 368. [\[Link\]](#)
- ↓ van Dijck, J., & Alinead, D. (2020). Social Media and Trust in Scientific Expertise: Debating the Covid-19 Pandemic in The Netherlands. *Social Media+ Society*, 6(4), 2056305120981057. [\[Link\]](#)
- ↓ Lavazza, A., & Farina, M. (2020). The role of experts in the Covid-19 pandemic and the limits of their epistemic authority in democracy. *Frontiers in public health*, 8. [\[Link\]](#)
- ↓ Åkerman, M., Taipale, J., Saikkonen, S., Kantola, I., & Bergroth, H. (2020). Expertise and its Tensions. [\[Link\]](#)
- ↓ Battiston, P., Kashyap, R., & Rotondi, V. (2021). Reliance on scientists and experts during an epidemic: Evidence from the COVID-19 outbreak in Italy. *SSM-population health*, 13, 100721. [\[Link\]](#)
- ↓ Bennett, M. (2020). Should I do as I'm told? Trust, Experts, and COVID-19. *Kennedy Institute of Ethics Journal*, 30(3), 243-263. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- Will Covid-19 renew or diminish public trust in science? How is this related to post truth?
- What is the role of social media dynamics in the public exchange of information between experts, policy-makers, mass media, and citizens? How are they working together? What are the challenges?
- How does social media undermine and enhance public trust in scientific expertise during a crisis?
- In covid case, who are more skeptical of experts? how public believe in the expertise and shared values of experts?
- What did epistemic authority attributed to experts look like during covid, in different countries?
- How were experts' recommendations for covid different from one another, in different countries?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

# WEEK7

## CONSTRUCTING FUTURE

During weeks 3-6 we learned what constitutes expertise and profession in our new world and recent challenges facing professionals in different disciplines. Before we continue our discussion on how these new changes will affect the professional practice in engineering and computer science in future, in week 7 we will learn more about how the future is constructed and the role engineers and computer professionals. We specifically discuss about the relation between imaginaries and future that is built by engineers. We will learn how fiction puts the science in engineering, and sci-fi inspires engineers and computing professionals to build a brand new world.

# Subject 1: The power of science fiction I



## Key Resources

- ↓ Camarena, M. E. (2020). Predictions of Science Fiction That Came True. In *Outer Space and Popular Culture* (pp. 129-144). Springer, Cham. [\[Link\]](#)
- ↓ Miller, C. A., & Bennett, I. (2008). Thinking longer term about technology: is there value in science fiction-inspired approaches to constructing futures?. *Science and Public Policy*, 35(8), 597-606. [\[Link\]](#)
- ↓ Gunn, E. (2014). How America's leading science fiction authors are shaping your future. *Smithsonian Magazine*. [\[Link\]](#)
- ↓ When science fiction inspires real technology [\[Link\]](#)
- ↓ Johnson, B. D. (2011). Science fiction prototyping: Designing the future with science fiction. *Synthesis Lectures on Computer Science*, 3(1), 1-190. [\[Link\]](#)
- ↓ Zaidi, L. (2019). Worldbuilding in science fiction, foresight and design. *Journal of Futures Studies*, 23(4), 15-26. [\[Link\]](#)
- ↓ Wong, R. Y., Van Wyk, E., & Pierce, J. (2017, June). Real-fictional entanglements: Using science fiction and design fiction to interrogate sensing technologies. In *Proceedings of the 2017 Conference on Designing Interactive Systems* (pp. 567-579). [\[Link\]](#)
- ↓ Reinsborough, M. (2017). Science fiction and science futures: considering the role of fictions in public engagement and science communication work. *Journal of Science Communication*, 16(4), C07. [\[Link\]](#)
- ↓ Costello, E., Brown, M., Donlon, E., & Girme, P. (2020). 'The Pandemic Will Not be on Zoom': A Retrospective from the Year 2050. *Postdigital Science and Education*, 2(3), 619-627. [\[Link\]](#)
- ↓ Hrotic, S. (2014). The evolution and extinction of science fiction. *Public Understanding of Science*, 23(8), 996-1012. [\[Link\]](#)
- ↓ Torras, C. (2020). Science-fiction: a mirror for the future of humankind. *Idees (Barcelona)*, (48), 1-10. [\[Link\]](#)
- ↓ von Stackelberg, P., & McDowell, A. (2015). What in the world? Storyworlds, science fiction, and futures studies. *Journal of Futures Studies*, 20(2), 25-46. [\[Link\]](#)
- ↓ Lefsrud, L. M., & Meyer, R. E. (2012). Science or science fiction? Professionals' discursive construction of climate change. *Organization Studies*, 33(11), 1477-1506. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What is science fiction and how do writers create it?
- What are the effects of science fiction on society?
- What is the connection between science fiction and technology?
- How is science fiction being used as a tool for change today?
- Is there value in science fiction-inspired approaches to constructing futures? What are those values and how we might leverage them to make positive changes for our future? What does history tell us about science fiction and its relevance to our daily practices?

- What is science fiction prototyping, and how it can be used in designing new technologies? And what are the benefits of using it in the design process?
- How fictions can be used in public engagement and science communication work?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 2: The power of science fiction II (global perspective)



### Key Resources

- ↓ Milojevic, I., & Inayatullah, S. (2003). Futures dreaming outside and on the margins of the western world. *Futures*, 35(5), 493-507. [\[Link\]](#)
- ↓ Menadue, C. B., & Cheer, K. D. (2017). Human culture and science fiction: A review of the literature, 1980-2016. *SAGE Open*, 7(3), 2158244017723690. [\[Link\]](#)
- ↓ Marcus, A. (2013, July). User-experience and science-fiction in Chinese, Indian, and Japanese films. In *International Conference of Design, User Experience, and Usability* (pp. 72-78). Springer, Berlin, Heidelberg. [\[Link\]](#) (see page 72)
- ↓ Song, M. (2015). After 1989: The new wave of Chinese science fiction. *China Perspectives*, 2015(2015/1), 7-13. [\[Link\]](#)
- ↓ Mathur, S. (2004). Caught between the Goddess and the cyborg: Third-World Women and the politics of Science in Three Works of Indian Science Fiction. *The Journal of Commonwealth Literature*, 39(3), 119-138. [\[Link\]](#)
- ↓ Song, M. (2013). Variations on Utopia in Contemporary Chinese Science Fiction. *Science Fiction Studies*, 40(1), 86-102. [\[Link\]](#)
- ↓ Chambers, C. (2003). Postcolonial Science Fiction: Amitav Ghosh's *The Calcutta Chromosome*. *The Journal of Commonwealth Literature*, 38(1), 58-72. [\[Link\]](#)
- ↓ Csicsery-Ronay Jr, I. (2012). What do we mean when we say "Global Science Fiction"? Reflections on a new nexus. *Science Fiction Studies*, 39(3), 478-493. [\[Link\]](#)
- ↓ Wright, D. L. (2010). Unpacking Japan's 21st century "National Conversation": images of the future beyond the iron cage of the "Catch Up" model (Doctoral dissertation, Queensland University of Technology). [\[Link\]](#)
- ↓ Pynnä, K. (2014). Science fiction: President Medvedev's campaign for Russia's "technological modernization". *Demokratizatsiya*, 22(4), 605. [\[Link\]](#)
- ↓ Major, P. (2003). Future perfect? Communist science fiction in the Cold War. *Cold War History*, 4(1), 71-96. [\[Link\]](#)
- ↓ Tatarchenko, K., & Peters, B. (2017). Tomorrow begins yesterday: data imaginaries in Russian and Soviet science fiction. *Russian Journal of Communication*, 9(3), 241-251. [\[Link\]](#)
- ↓ Yaszek, L. (2006). Afrofuturism, science fiction, and the history of the future. *Socialism and Democracy*, 20(3), 41-60. [\[Link\]](#)
- ↓ Csicsery-Ronay Jr, I. (2003). Science Fiction and Empire. *Science Fiction Studies*, 231-245. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What is science fiction in non-western world and how do writers create it?
- What are the effects of science fiction on society? For example how Indian science fiction influences Indian society? (also, Japanese, Russian, Chinese, etc.)
- What is the connection between science fiction and technology in non-western world?
- How is science fiction being used as a tool for change in different countries?

- How has science fiction been developed and used in non-western countries (e.g. India, China, Japan, Russia, African countries), and how did they shape the future of their societies?
- What's the politics and futures of science fiction?
- What's the relation between science fiction and imperialism?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 3: Socio-technical imaginary



### Key Resources

- ↓ Harvard STS Group. Frequently Asked Questions about Sociotechnical Imaginaries [\[Link\]](#)
- ↓ Jasanoff, S., & Kim, S. H. (2013). Sociotechnical imaginaries and national energy policies. *Science as culture*, 22(2), 189-196. [\[Link\]](#)
- ↓ Braun, R., & Randell, R. (2020). Futuramas of the present: the “driver problem” in the autonomous vehicle sociotechnical imaginary. *Humanities and Social Sciences Communications*, 7(1), 1-10. [\[Link\]](#)
- ↓ Ballo, Ingrid Foss. "Imagining energy futures: Sociotechnical imaginaries of the future Smart Grid in Norway." *Energy Research & Social Science* 9 (2015): 9-20. [\[Link\]](#)
- ↓ Mager, A., & Katzenbach, C. (2021). Future imaginaries in the making and governing of digital technology: Multiple, Contested, Commodified. [\[Link\]](#)
- ↓ Smith, J. M., & Tidwell, A. S. (2016). The everyday lives of energy transitions: Contested sociotechnical imaginaries in the American West. *Social Studies of Science*, 46(3), 327-350. [\[Link\]](#)
- ↓ Kuchler, M., & Bridge, G. (2018). Down the black hole: Sustaining national socio-technical imaginaries of coal in Poland. *Energy Research & Social Science*, 41, 136-147. [\[Link\]](#)
- ↓ Karademirler, M. Sociotechnical Imaginaries on The Futures of Urban Mobility [\[Link\]](#)
- ↓ Sismondo, S. (2020). Sociotechnical imaginaries: An accidental themed issue. [\[Link\]](#)
- ↓ Konrad, K., & Böhle, K. (2019). Socio-technical futures and the governance of innovation processes—An introduction to the special issue. *Futures*, 109, 101-107. [\[Link\]](#)
- ↓ Nickelsen, N. C. M. (2018, November). Socio-Technical Imaginaries and Human-Robotics Proximity-The Case of Bestic. In *Robophilosophy/TRANSOR* (pp. 212-220). [\[Link\]](#)
- ↓ Groves, C., Henwood, K., Shirani, F., Butler, C., Parkhill, K., & Pidgeon, N. (2016). The grit in the oyster: using energy biographies to question socio-technical imaginaries of ‘smartness’. *Journal of Responsible Innovation*, 3(1), 4-25. [\[Link\]](#)
- ↓ Rensfeldt, A. B., & Player-Koro, C. (2020, December). “Back to the future”: Socio-technical imaginaries in 50 years of school digitalization curriculum reforms. In *Seminar. net* (Vol. 16, No. 2, pp. 20-20). [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What is sociotechnical imaginary? Why is it an important concept? What are the examples of socio-technical imaginaries?
- How are socio-technical imaginaries related to science fiction?
- What is the right unit of analysis for sociotechnical imaginaries?
- How is socio-technical imaginaries related to national policies for technology development?

- How is socio-technical imaginary related to the future of job market and future of education/training?
- How can the concept of socio-technical imaginary be useful in our professional practice?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.



# WEEK8

## INDUSTRY 4.0

In week 8, we will learn about history of industrial revolutions and industry 4.0 and its impact on new demanded employees' competencies development. We will discuss the top skills needed to succeed in the fourth industrial revolution.

# Subject 1: History of industrial revolutions



## Key Resources

- ↓ Coleman, D. C. (1956). Industrial growth and industrial revolutions. *Economica*, 23(89), 1-22. [\[Link\]](#)
- ↓ Field, A. J. (2002). As time goes by: from the industrial revolutions to the information revolution. [\[Link\]](#)
- ↓ Von Tunzelmann, N. (2003). Historical coevolution of governance and technology in the industrial revolutions. *Structural Change and Economic Dynamics*, 14(4), 365-384. [\[Link\]](#)
- ↓ Nuvolari, A. (2019). Understanding successive industrial revolutions: A “development block” approach. *Environmental Innovation and Societal Transitions*, 32, 33-44. [\[Link\]](#)
- ↓ Pozdnyakova, U. A., Golikov, V. V., Peters, I. A., & Morozova, I. A. (2019). Genesis of the revolutionary transition to industry 4.0 in the 21st century and overview of previous industrial revolutions. In *Industry 4.0: Industrial Revolution of the 21st Century* (pp. 11-19). Springer, Cham. [\[Link\]](#)
- ↓ Popkova, E. G., Ragulina, Y. V., & Bogoviz, A. V. (2019). Fundamental differences of transition to industry 4.0 from previous industrial revolutions. In *Industry 4.0: Industrial Revolution of the 21st Century* (pp. 21-29). Springer, Cham. [\[Link\]](#)
- ↓ Kapas, J. (2008). Industrial revolutions and the evolution of the firm's organization: an historical perspective. *Journal of Innovation Economics Management*, (2), 15-33. [\[Link\]](#)
- ↓ Volkova, V. N., Kudryavtseva, A. S., Loginova, A. V., Chernyy, Y. Y., & Leonova, A. E. (2018, July). System analysis of innovative technologies of the industrial revolutions. In *2018 Third International Conference on Human Factors in Complex Technical Systems and Environments (ERGOS and Environments (ERGOS))* (pp. 57-61). IEEE. [\[Link\]](#)

## Subject 2: Concept of industry 4.0



### Key Resources

- ↓ Marr, Bernard (2018). What is Industry 4.0? Here's A Super Easy Explanation For Anyone. Forbs. [\[Link\]](#)
- ↓ Rojko, A. (2017). Industry 4.0 concept: Background and overview. International Journal of Interactive Mobile Technologies, 11(5). [\[Link\]](#)
- ↓ Zezulka, F., Marcon, P., Vesely, I., & Sajdl, O. (2016). Industry 4.0–An Introduction in the phenomenon. IFAC-PapersOnLine, 49(25), 8-12. [\[Link\]](#)
- ↓ Pereira, A. C., & Romero, F. (2017). A review of the meanings and the implications of the Industry 4.0 concept. Procedia Manufacturing, 13, 1206-1214. [\[Link\]](#)
- ↓ Gentner, S. (2016). Industry 4.0: reality, future or just science fiction? How to convince today's management to invest in tomorrow's future! Successful strategies for industry 4.0 and manufacturing IT. CHIMIA International Journal for Chemistry, 70(9), 628-633. [\[Link\]](#)
- ↓ de Paula Ferreira, W., Armellini, F., & De Santa-Eulalia, L. A. (2020). Simulation in industry 4.0: A state-of-the-art review. Computers & Industrial Engineering, 106868. [\[Link\]](#)
- ↓ Avis, J. (2018). Socio-technical imaginary of the fourth industrial revolution and its implications for vocational education and training: A literature review. Journal of Vocational Education & Training, 70(3), 337-363. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What are industrial revolutions and how does industry 4.0 relate to them?
- What is the meaning and implications of industry 4.0?
- What is the relationship between industrial revolutions (and industry 4.0) and science fiction?
- What is the socio-technical imaginary of the fourth industrial revolution?
- What is the impact of the fourth industrial revolution on education, employment, and labor market?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 3: Politics of industry 4.0



### Key Resources

- ↓ Orthia, L. A. (2016). What's wrong with talking about the Scientific Revolution? Applying lessons from history of science to applied fields of science studies. *Minerva*, 54(3), 353-373. [\[Link\]](#)
- ↓ Kovacs, O. (2018). The dark corners of industry 4.0—Grounding economic governance 2.0. *Technology in society*, 55, 140-145. [\[Link\]](#)
- ↓ Lamb, S., Maire, Q., & Doecke, E. (2017). Key skills for the 21st century: An evidence-based review.

# WEEK9

## ENGINEERING EXPERTISE IN INDUSTRY 4.0

In week 9, we look into a wide range of Industry 4.0 applications in different disciplines and discuss how professional practice in engineering and computer science would be evolving in the coming years. We learn which skills are important for success in the industry 4.0 market and how those skills can empower us to make better decisions in our professional practice.

# Subject 1: Industry 4.0 applications



## Key Resources

- ↓ Lu, Y. (2017). Industry 4.0: A survey on technologies, applications and open research issues. Journal of industrial information integration, 6, 1-10. [\[Link\]](#)
- ↓ Liao, Y., Deschamps, F., Loures, E. D. F. R., & Ramos, L. F. P. (2017). Past, present and future of Industry 4.0-a systematic literature review and research agenda proposal. International journal of production research, 55(12), 3609-3629. [\[Link\]](#)
- ↓ Serpanos, D. (2018). The cyber-physical systems revolution. Computer, 51(3), 70-73. [\[Link\]](#)
- ↓ Jazdi, N. (2014, May). Cyber physical systems in the context of Industry 4.0. In 2014 IEEE international conference on automation, quality and testing, robotics (pp. 1-4). IEEE. [\[Link\]](#)
- ↓ Javaid, M., Haleem, A., Vaishya, R., Bahl, S., Suman, R., & Vaish, A. (2020). Industry 4.0 technologies and their applications in fighting COVID-19 pandemic. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 14(4), 419-422. [\[Link\]](#)
- ↓ Sarfraz, Z., Sarfraz, A., Iftikar, H. M., & Akhund, R. (2021). Is COVID-19 pushing us to the fifth industrial revolution (Society 5.0)? Pakistan Journal of Medical Sciences, 37(2), 591. [\[Link\]](#)
- ↓ Kumar, M. S., Raut, R. D., Narwane, V. S., & Narkhede, B. E. (2020). Applications of industry 4.0 to overcome the COVID-19 operational challenges. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 14(5), 1283-1289. [\[Link\]](#)
- ↓ Hofmann, E., & Rüsch, M. (2017). Industry 4.0 and the current status as well as future prospects on logistics. Computers in industry, 89, 23-34. [\[Link\]](#)
- ↓ Roblek, V., Meško, M., & Krapež, A. (2016). A complex view of industry 4.0. Sage Open, 6(2), 2158244016653987. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What are the key features and components of Industry 4.0 both in research and practice? What are the existing Industry 4.0 application fields?
- What are the applications of Industry 4.0 technologies for COVID-19?
- What is Cyber-Physical Systems (CPS) and how is it related to Industry 4.0?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 2: Industry 4.0 readiness



### Key Resources

- ↓ Stentoft, J., Jensen, K. W., Philipsen, K., & Haug, A. (2019, January). Drivers and barriers for Industry 4.0 readiness and practice: a SME perspective with empirical evidence. In Proceedings of the 52nd Hawaii International Conference on System Sciences. [\[Link\]](#)
- ↓ Sony, M., & Naik, S. (2019). Key ingredients for evaluating Industry 4.0 readiness for organizations: a literature review. Benchmarking: An International Journal. [\[Link\]](#)
- ↓ Schumacher, A., Erol, S., & Sihn, W. (2016). A maturity model for assessing Industry 4.0 readiness and maturity of manufacturing enterprises. Procedia Cirp, 52, 161-166. [\[Link\]](#)
- ↓ Rajnai, Z., & Kocsis, I. (2018, February). Assessing industry 4.0 readiness of enterprises. In 2018 IEEE 16th world symposium on applied machine intelligence and informatics (SAMI) (pp. 000225-000230). IEEE. [\[Link\]](#)
- ↓ Schlechtendahl, J., Keinert, M., Kretschmer, F., Lechler, A., & Verl, A. (2015). Making existing production systems Industry 4.0-ready. Production Engineering, 9(1), 143-148. [\[Link\]](#)
- ↓ Industry 4.0: At the intersection of readiness and responsibility Deloitte Global's annual survey on business's preparedness for a connected era [\[Link\]](#)
- ↓ Nick, G., & Pongrácz, F. (2016). How to measure industry 4.0 readiness of cities. Industry 4.0, 1(2), 136-140. [\[Link\]](#)
- ↓ Anbumozhi, V., Ramanathan, K., & Wyes, H. (2020). Assessing the Readiness for Industry 4.0 and the Circular Economy. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What are the drivers and barriers for Industry 4.0 readiness and practice?
- How can organizations identify the factors which they have to assess critically before implementing Industry 4.0?
- How can we assess the Industry 4.0 maturity of industrial enterprises?
- How can we set up a roadmap for the digital transformation in the companies and societies?
- What's the intersection between readiness and responsibility in organizations for Industry 4.0?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 3: Supply Chain 4.0



### Key Resources

- ↓ Tjahjono, B., Esplugues, C., Ares, E., & Pelaez, G. (2017). What does industry 4.0 mean to supply chain?. *Procedia manufacturing*, 13, 1175-1182. [\[Link\]](#)
- ↓ Ghadge, A., Kara, M. E., Moradlou, H., & Goswami, M. (2020). The impact of Industry 4.0 implementation on supply chains. *Journal of Manufacturing Technology Management*. [\[Link\]](#)
- ↓ Moktadir, M. A., Ali, S. M., Kusi-Sarpong, S., & Shaikh, M. A. A. (2018). Assessing challenges for implementing Industry 4.0: Implications for process safety and environmental protection. *Process Safety and Environmental Protection*, 117, 730-741. [\[Link\]](#)
- ↓ Frederico, G. F., Garza-Reyes, J. A., Anosike, A., & Kumar, V. (2019). Supply Chain 4.0 concepts, maturity and research agenda. *Supply Chain Management: An International Journal*. [\[Link\]](#)
- ↓ Hofmann, E., Sternberg, H., Chen, H., Pflaum, A., & Prockl, G. (2019). Supply chain management and Industry 4.0: conducting research in the digital age. *International Journal of Physical Distribution & Logistics Management*. [\[Link\]](#)
- ↓ Kovacs, O. (2018). The dark corners of industry 4.0—Grounding economic governance 2.0. *Technology in society*, 55, 140-145. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What does Industry 4.0 mean to supply chain?
- What is the concept of Supply Chain 4.0? How does that relate to the concept of Industry 4.0? What are the main questions that are asked (research/practice) in Supply Chain 4.0?
- What are the new challenges and opportunities for future supply chains?
- How can we effectively adapt and transit the concept of Industry 4.0 concept into supply chains?
- How can we assess challenges for implementing Industry 4.0? what are the implications for safety and environmental protection?
- What are the dark corners of Industry 4.0? and how does those issues are related to supply chain 4.0?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.



# WEEK10

## GLOBAL PERSPECTIVE ON INDUSTRY 4.0

According to World Economic Forum, India and China together can lead the Industry 4.0. Also other emerging economies are increasingly focusing their strategies to become a force in the new industrial revolution. In week 10, we explore industry market in the future of three countries: India, China, and Germany. We will learn how they are different and how they are similar to each other. Through that we will discuss about set of skills and competencies that are, and will be, in demand in these countries as well as globally.

# Subject 1: Industry 4.0 in Germany



## Key Resources

- ↓ Pfeiffer, S. (2017). The vision of “Industrie 4.0” in the making—a case of future told, tamed, and traded. *Nanoethics*, 11(1), 107-121. [\[Link\]](#)
- ↓ Culot, G., Nassimbeni, G., Orzes, G., & Sartor, M. (2020). Behind the definition of Industry 4.0: Analysis and open questions. *International Journal of Production Economics*, 107617. [\[Link\]](#)
- ↓ Fuchs, C. (2018). Industry 4.0: the digital German ideology. *Triplec: Communication, Capitalism & Critique*, 16(1), 280-289. [\[Link\]](#)
- ↓ Veile, J. W., Kiel, D., Müller, J. M., & Voigt, K. I. (2019). Lessons learned from Industry 4.0 implementation in the German manufacturing industry. *Journal of Manufacturing Technology Management*. [\[Link\]](#)
- ↓ Bauer, W., Schlund, S., Hornung, T., & Schuler, S. (2018). Digitalization of industrial value chains-a review and evaluation of existing use cases of Industry 4.0 in Germany. *LogForum*, 14(3). [\[Link\]](#)
- ↓ Howaldt, J., Kopp, R., & Schultze, J. (2017). Why industrie 4.0 needs workplace innovation—a critical essay about the german debate on advanced manufacturing. In *Workplace innovation* (pp. 45-60). Springer, Cham. [\[Link\]](#)
- ↓ Ferreira, V., & Lisboa, A. (2019). Innovation and Entrepreneurship: From Schumpeter to Industry 4.0. In *Applied Mechanics and Materials* (Vol. 890, pp. 174-180). Trans Tech Publications Ltd. [\[Link\]](#)
- ↓ Jürgens, U. (2021). Automation, Lean Production, Industrie 4.0: The Trajectory of the German Model. *The Journal of Economics*, 61(3•4), 1-20. [\[Link\]](#)
- ↓ Springer, M., & Schnelzer, J. (2019). Differentiation of Industry 4.0 Models: The 4th Industrial Revolution from different Regional Perspectives in Global North and Global South. Vienna, Austria. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What is 'Industrie 4.0'? What's the current German debate on Industrie 4.0? How much is it a technical debate?
- How does German ideology relate to development and evolution of the notion of industry 4.0 in Germany?
- What are different approaches or strategies from the Global North (e.g. Germany's Industrie 4.0, Japan's Society 5.0, and USA's Industrial Internet of Things) in discussing the Fourth Industrial Revolution and its representation in manufacturing, Industry 4.0?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 2: Industry 4.0 in China



### Key Resources

- ↓ Gabriele, A. (2020). The Made in China 2025 Plan. In *Enterprises, Industry and Innovation in the People's Republic of China* (pp. 171-178). Springer, Singapore. [\[Link\]](#)
- ↓ Kuo, C. C., Shyu, J. Z., & Ding, K. (2019). Industrial revitalization via industry 4.0—a comparative policy analysis among China, Germany and the USA. *Global transitions*, 1, 3-14. [\[Link\]](#).
- ↓ Li, L. (2018). China's manufacturing locus in 2025: With a comparison of “Made-in-China 2025” and “Industry 4.0”. *Technological Forecasting and Social Change*, 135, 66-74. [\[Link\]](#)
- ↓ Levine, D. A. (2020). Made in China 2025. *Journal of Strategic Security*, 13(3), 1-16. [\[Link\]](#)
- ↓ Lin, B., Wu, W., & Song, M. (2019). Industry 4.0: Driving factors and impacts on firm's performance: An empirical study on China's manufacturing industry. *Annals of Operations Research*, 1-21. [\[Link\]](#).
- ↓ Müller, J. M., & Voigt, K. I. (2018). Sustainable industrial value creation in SMEs: A comparison between industry 4.0 and made in China 2025. *International Journal of Precision Engineering and Manufacturing-Green Technology*, 5(5), 659-670. [\[Link\]](#).
- ↓ Sun, Y., Li, L., Shi, H., & Chong, D. (2020). The transformation and upgrade of China's manufacturing industry in Industry 4.0 era. *Systems Research and Behavioral Science*, 37(4), 734-740. [\[Link\]](#).
- ↓ Yang, S., Hamann, K., Haefner, B., Wu, C., & Lanza, G. (2018). A method for improving production management training by integrating an Industry 4.0 innovation center in China. *Procedia Manufacturing*, 23, 213-218. [\[Link\]](#).
- ↓ Springer, M., & Schnelzer, J. (2019). Differentiation of Industry 4.0 Models: The 4th Industrial Revolution from different Regional Perspectives in Global North and Global South. Vienna, Austria. [\[Link\]](#)
- ↓ Klomfass, D. (2020). Discourse on the 'Made in China 2025' Strategy in Germany. [\[Link\]](#)
- ↓ Heupel, T., & Congying, Z. (2020). How Industry 4.0 Inspires Chinese Automotive Companies in the Context of Made in China 2025. In *German and Chinese Contributions to Digitalization* (pp. 49-73). Springer Gabler, Wiesbaden. [\[Link\]](#)

For your presentation try to engage with the following research questions:

- What is 'Made in China 2025'? What's the current Chinese debate on industry 4.0?
- How does China's “Made-in-China 2025” plan differ from German's “Industry 4.0” plan?
- What are the critical factors that affect the implementation of “Made-in-China 2025” plan?
- What are different approaches or strategies from the Global South (e.g. China's Made-in-China 2025, Indonesia's Making Indonesia 4.0, and Mexico's Crafting the Future) in discussing the Fourth Industrial Revolution and its representation in manufacturing, Industry 4.0?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

## Subject 3: Industry 4.0 in India



### Key Resources

- ↓ Dhanabalan, T., & Sathish, A. (2018). Transforming Indian industries through artificial intelligence and robotics in industry 4.0. *International Journal of Mechanical Engineering and Technology*, 9(10), 835-845. [\[Link\]](#)
- ↓ Iyer, A. (2018). Moving from Industry 2.0 to Industry 4.0: A case study from India on leapfrogging in smart manufacturing. *Procedia Manufacturing*, 21, 663-670. [\[Link\]](#)
- ↓ Safar, L., Sopko, J., Dancakova, D., & Woschank, M. (2020). Industry 4.0—Awareness in South India. *Sustainability*, 12(8), 3207. [\[Link\]](#)
- ↓ Kamble, S. S., Gunasekaran, A., & Sharma, R. (2018). Analysis of the driving and dependence power of barriers to adopt industry 4.0 in Indian manufacturing industry. *Computers in Industry*, 101, 107-119 [\[Link\]](#).
- ↓ Mashelkar, R. A. (2018). Exponential technology, industry 4.0 and future of jobs in India. *Review of Market Integration*, 10(2), 138-157. [\[Link\]](#).

For your presentation try to engage with the following research questions:

- What's the current Indian debate on industry 4.0?
- How does India's Industry 4.0 plan differ from German's "Industry 4.0" plan?
- What are the critical factors that affect the implementation of India's plan for implementing Industry 4.0?

Please ensure you have reflected on how what you presented to the class is useful for their professional practice, in your final slides. Also list a few take away messages based on what learned in your practicals.

**WEEK 11 resources will be uploaded shortly**