

 FACULTY OF ECONOMICS AND
BUSINESS ADMINISTRATION

INNOVATION MANAGEMENT

2019-2020


GHENT
UNIVERSITY

AT YOUR SERVICE FOR THIS COURSE

Lecturer

Prof. Dr. Katrien Verleye



Teaching Assistant

Drs. Evy Van Lancker




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AGENDA

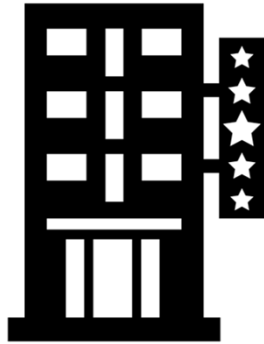
- Course relevance
- Course set-up
- First lecture



COURSE RELEVANCE



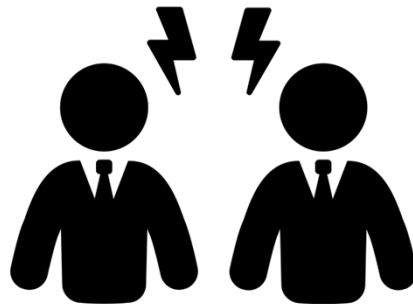
COURSE RELEVANCE



Created by Mahmure Alp
from Noun Project

Created by David
from Noun Project

COURSE RELEVANCE



Created by Marie Van den Broeck
from Noun Project

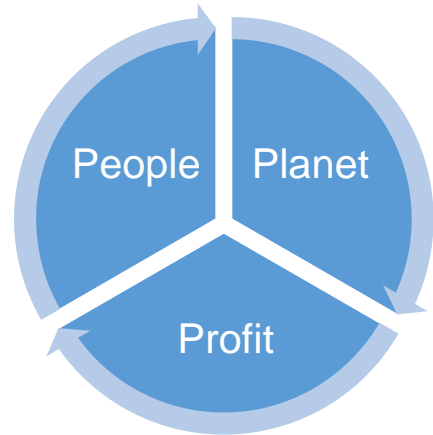
Created by Adrien Coquet
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COURSE RELEVANCE

Negative externalities

- Economic
- Environmental
- Social

BUT



GRAND CHALLENGES



COURSE RELEVANCE



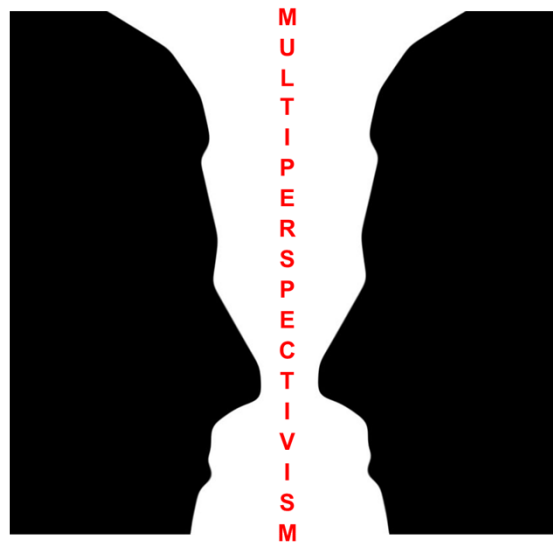
GHENT UNIVERSITY



COURSE SET-UP



COURSE OBJECTIVES



COURSE OBJECTIVES

- I. explain the concept of innovation and key **innovation management concepts, models, and techniques** in the innovation literature
- II. **analyze complex (inter)national business cases and practices** by means of key innovation management concepts, models, and techniques
- III. **discuss** strategic choices concerning innovation and implementing these choices in a **scientific and structured way**
- IV. **reflect critically** on the effects of strategic choices concerning innovation and the implementation of these choices **from an economic, social and ethical perspective.**



COURSE MATERIAL

Melissa Schilling "Strategic Management of Technological Innovation", McGraw-Hill International Sixth Edition, 2020

Slides (with notes) and additional course material available through Ufora

Obligatory readings in preparation for special sessions



COURSE FORMAT

Lectures

- content text book
- content additional academic papers

Special sessions

- special session 1: system analysis
- special session 2: case discussions
- special session 3: group experiment

! active participation is required



GRADING & EVALUATION

Group assignment (cf. special sessions)

- Evaluation of
 - application and integration of conceptual knowledge (cf. course objective I, II)
 - way in which application and integration are presented (cf. course objective III)
 - critical reflection (cf. course objective IV)
- Relative weight: 25% (5 out of 20 points)

Written exam

- Evaluation of
 - application and integration of conceptual knowledge (cf. course objective I, II)
 - way in which application and integration are presented (cf. course objective III)
 - critical reflection (cf. course objective IV)
- Closed book exam – open questions
- Focus on content from **textbook, obligatory readings, lectures, and special sessions**
- Relative weight: 75% (15 out of 20 points)



! Assignment is mandatory to pass for this course

GRADING AND EVALUATION

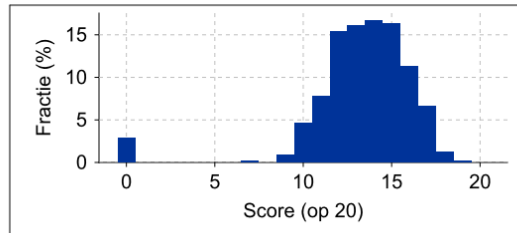
F000892 Innovatiemanagement

Verleye, Katrien

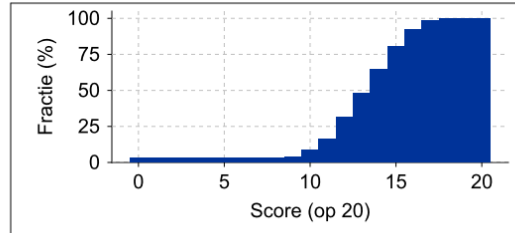
Gewogen aantal studenten in statistiek: 433.2

Laatste statistiek: academiejaar 2018 examensessie 3

histogram



cumulatief



ORGANIZATION OF THE COURSE

Date	Who	Focus	Location
February 14	All	Lecture (Intro + Module I)	UZ Gent – Aud. F
February 21	All	Lecture (Module II)	FEB – aud. Picard (or ONLINE)
February 28	All	Special session 1 with guest lecture (Module I)	Stropkaai
March 6	All	Lecture (Module III)	FEB – aud. Picard (or ONLINE)
March 13	Group A	Special session 2 (Module II/III)	ONLINE
March 20	-	<i>Dies Natalis</i>	
March 27	Group B	Special session 2 (Module II/III)	Campus Ardoyen – iGent – Foyer 12.1
April 3	All	Lecture (Module IV)	FEB – aud. Picard (or ONLINE)
April 10/17	-	<i>Easter Holiday</i>	
April 24	Group A	Special session 3 (Module IV)	ONLINE
May 1	-	<i>Labour Day</i>	n.a.
May 8	Group B	Special session 3 (Module IV)	FEB – aud. Picard
May 15	All	Exam guidelines and Q&A	ONLINE
May 19/20	-	Individual feedback by appointment	Office Prof. Verleye (HOV – office 120.018)

ORGANIZATION OF THE LECTURES

Participation in the lectures is **not mandatory**

Choose whether you want to attend the classroom lecture in Aud. Picard or the online lecture via Ufora **by 16 February 2020**



ORGANIZATION OF THE SPECIAL SESSIONS

Participation in the special sessions is **mandatory**

Choose group A or B for **Special Session 2 and 3** and register your choice via Ufora **by 20 February 2020**

IMPORTANT NOTE 1

Group A: online instructions : submit deliverables **by 27 March 2020 and 8 May 2020** via Ufora

Group B: classroom : submit deliverables **by end of session** (instructions during session)

IMPORTANT NOTE 2

Lecturer will assign students to groups – both in case of classroom sessions and online sessions. Students will be assigned to different groups across the sessions.



COURSE ORGANIZATION

- Send all your **questions about the course** to Evy.Vanlancker@UGent.be by May 9th, so that these can be answered during the online session on May 15th.
- If you want an **individual appointment** with Prof. Verleye to get more feedback about the special sessions, please send an e-mail to Evy.Vanlancker@UGent.be by May 9th, thereby expressing your preference for day and time



Created by Margaret Hagan
from Noun Project



Any other question: feel free to contact Prof. Verleye via
Evy.Vanlancker@UGent.be

COURSE OVERVIEW

SYSTEM LEVEL	INDUSTRY LEVEL	COMPANY LEVEL	PROJECT LEVEL
<ul style="list-style-type: none"> ▪ What is Innovation? ▪ Importance of (Service) Innovation ▪ Systemic Approach to Innovation 	<ul style="list-style-type: none"> ▪ Types / Patterns of Innovation ▪ Standards Battles ▪ Modularity and Platform Competition ▪ Timing of Entry 	<ul style="list-style-type: none"> ▪ Design Strategic Direction ▪ Collaboration Strategies ▪ Protecting Innovation ▪ Choose Innovation Projects 	<ul style="list-style-type: none"> ▪ Organizing for Innovation ▪ Managing the new Product Development Process ▪ Managing New Product Development Teams ▪ Craft a Deployment Strategy
MODULE I			

MODULE I

SESSION OVERVIEW

TOPIC	READING MATERIAL
What is innovation	<ul style="list-style-type: none"> • Schilling - Chapter 1 and 2 • Drucker, P. F. (2002). The discipline of innovation. <i>Harvard Business Review</i>, 80, 95-104. • Lusch, R. F., & Nambisan, S. (2015). Service innovation: A service-dominant logic perspective. <i>MIS quarterly</i>, 39(1). • https://www.bcg.com/publications/collections/most-innovative-companies-2019-artificial-intelligence-platforms-ecosystems.aspx • https://www.forbes.com/innovative-companies/list/#tab:rank
Importance of (service) innovation	<ul style="list-style-type: none"> • Schilling - Chapter 1 • Nidumolu, R., Prahalad, C.K., & Rangaswami, M.R. (2009). Why sustainability is now a key driver of innovation. <i>Harvard Business Review</i>, 87(9): 57-64. • Chesbrough, H. (2011). Open Services Innovation: Rethinking your business to grow and compete in a new era. John Wiley and Sons Ltd. • https://www.globalinnovationindex.org/userfiles/file/reportpdf/qii-full-report-2019.pdf • Huang, M.-H., & Rust, R. (2018)? Artificial Intelligence in Service. <i>Journal of Service Research</i>, 21 (2), 155-172. • https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en • https://www.un.org/sustainabledevelopment/sustainable-development-goals/

SESSION OVERVIEW

TOPIC	READING MATERIAL
Systemic instruments for managing transformative change	<ul style="list-style-type: none"> • Wieczorek, A. J., & Hekkert, M. P. (2012). Systemic instruments for systemic innovation problems: A framework for policy makers and innovation scholars. <i>Science and public policy</i>, 39(1), 74-87. • www.ellenmacarthurfoundation.org • Vijverman, N., Henkens, B., & Verleye, K. (2019). Engagement and technology as key enablers for a circular economy. In H. Linda & S. D.A. (Eds.), <i>Handbook of research on customer engagement</i>. Edward Elgar.

Background readings for Special Session 1

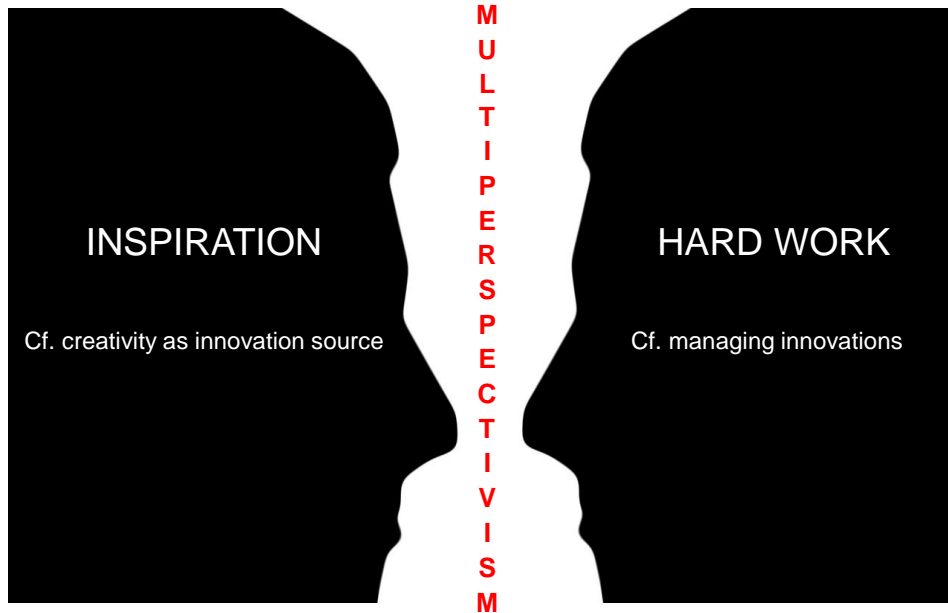
- Wieczorek, A. J., & Hekkert, M. P. (2012). Systemic instruments for systemic innovation problems: A framework for policy makers and innovation scholars. *Science and public policy*, 39(1), 74-87.
- www.ellenmacarthurfoundation.org



WHAT IS INNOVATION?

TWO PERSPECTIVES

Drucker 2002

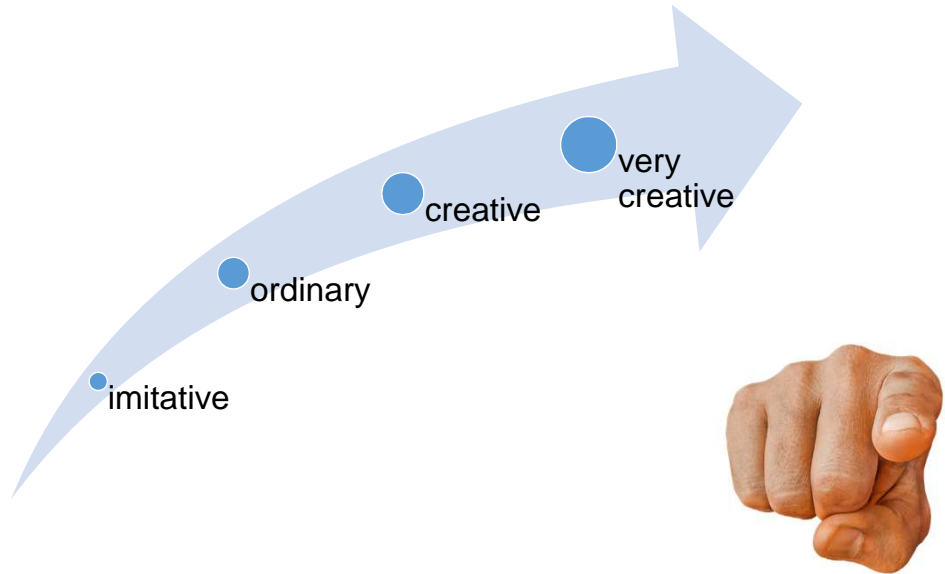


INSPIRATION AS SOURCE OF INNOVATION

ServiceNow Founder Fred Luddy:

“I’ve never had an original idea (...) everything that I have ever done in technology has been inspired by something I’ve seen somebody doing, struggling to do, wishing they could do differently”

IMITATION VERSUS CREATIVITY



THE IMPORTANCE OF CREATIVITY



Cf. creative destruction



DRIVERS OF CREATIVITY



- Motivation
- Personality traits
- Style of thinking
- Intellectual capabilities
- Knowledge
- Environmental factors

MANAGING CREATIVITY

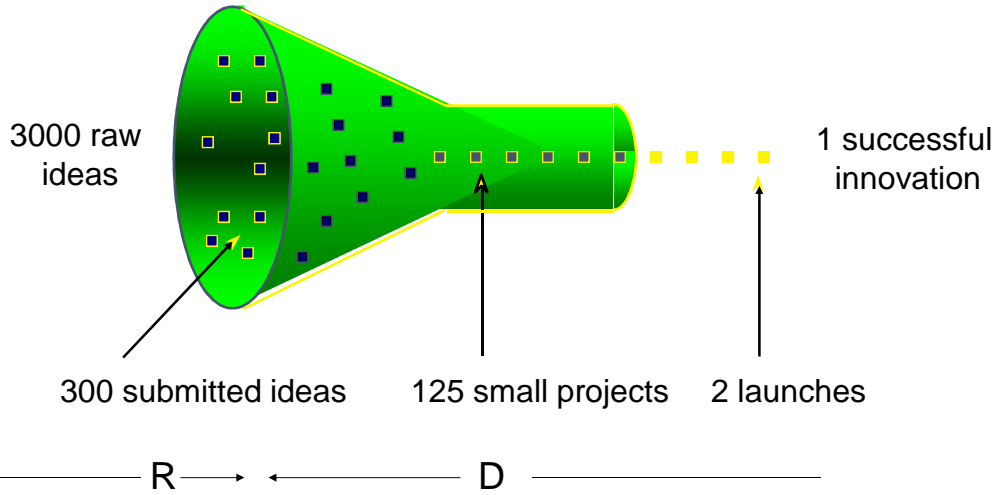
- Unexpected occurrences
- Incongruities
- Process needs
- Industry and market changes
- Demographic changes
- Changes in perception
- New knowledge



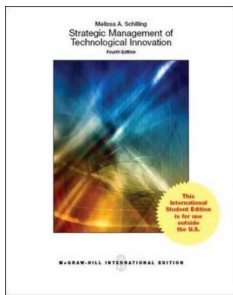
Drucker 2002

HARD WORK PERSPECTIVE

Source : Stevens and Burley (1997)



HARD WORK BEYOND CREATIVITY




INNOVATION

= ideas/invention + **implementation/commercialization**



DEFINITIONS OF INNOVATION

innovation

/ɪnəˈveɪʃ(ə)n/ 

noun

the action or process of innovating.

"innovation is crucial to the continuing success of any organization"

synonyms: change, alteration, revolution, upheaval, transformation, metamorphosis, reorganization, restructuring, rearrangement, recasting, remodelling, renovation, restyling, variation;
More

- a new method, idea, product, etc.

plural noun: **innovations**

"technological innovations designed to save energy"



=> introducing something new

SCHUMPETER 1934

- Introduction of a **good (product)**, which is new to consumers, or one of increased quality than was available in the past
- **Methods of production**, which are new to a particular branch of industry
- The opening of new **markets**
- The use of new **sources of supply**
- New **forms of competition**, which lead to the restructuring of an industry



PORTER 1990

- Improvements in **technology**
- Better **methods** or **ways of doing things**

=> manifested in:

- product changes
- process changes
- new approaches to marketing
- new forms of distribution
- ...

=> resulting from:

- formal R&D
- organizational learning



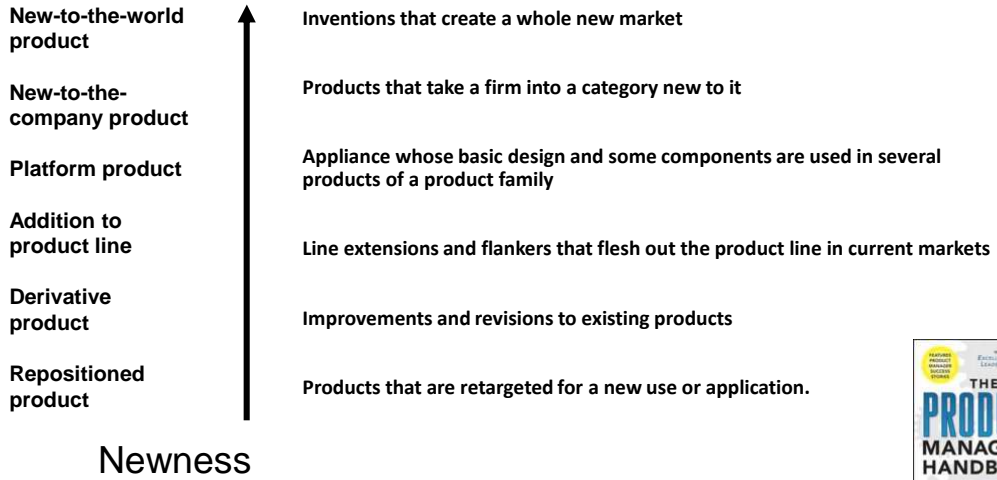
ROGERS 1995

INNOVATION

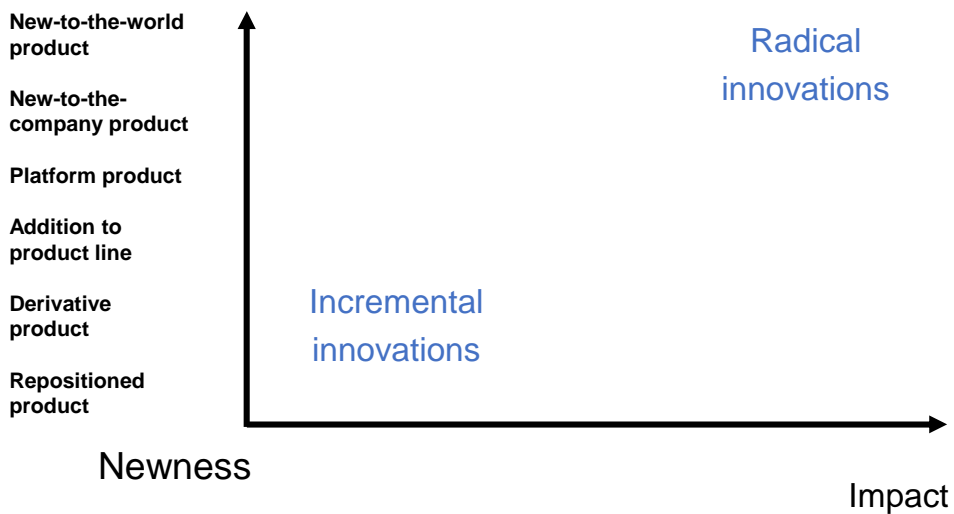
= an idea, practice, or object that is **perceived as new**
by the individual or other unit of adoption



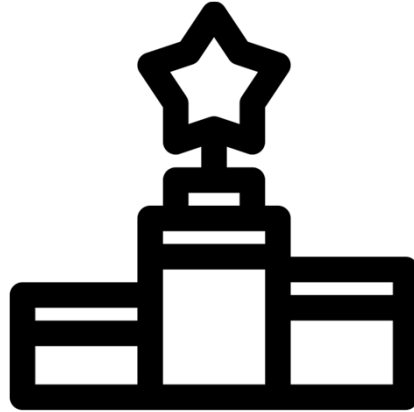
DIFFERENT LEVELS OF NEWNESS



DIFFERENT LEVELS OF INNOVATIVENESS



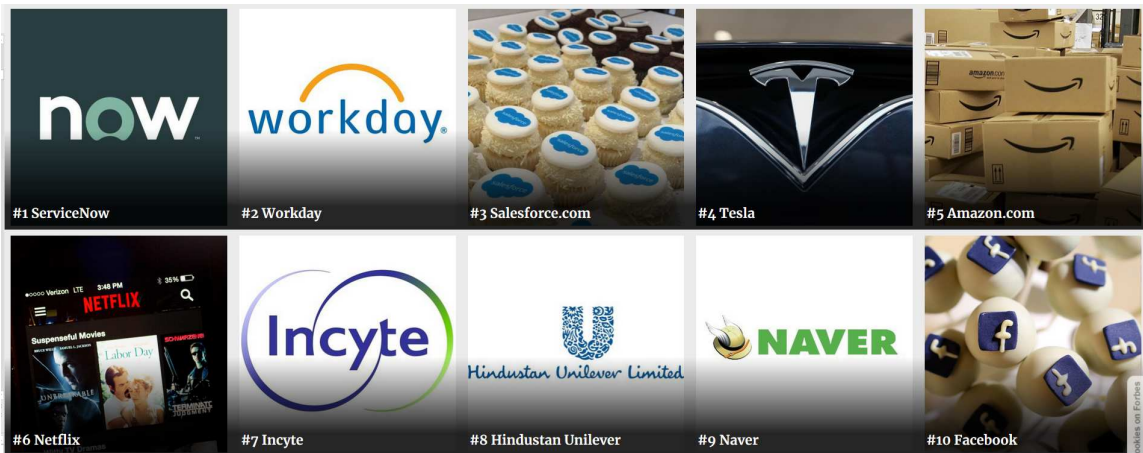
INNOVATIVENESS BATTLES



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from Noun Project



RANKING FORBES 2018



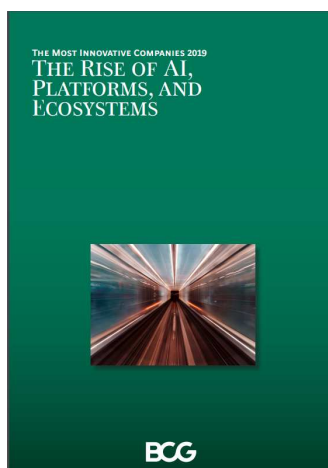
<https://www.forbes.com/innovative-companies/#44740ba81d65>

RANKING BOSTON CONSULTING GROUP 2018



<https://www.forbes.com/sites/innovatorsdna/2018/05/29/how-we-rank-the-most-innovative-companies-2018/#3f2075e81e3c>

INNOVATION TRENDS



- The “most innovative companies in the world” extensively use **Artificial Intelligence (AI)**
- Innovation is a team effort, as “the most innovative companies in the world” increasingly engage in **collaborative platforms/ecosystems** to create products, services, and business models



RISE OF AI

Computer Vision Understanding the visual world around us Explore >	Conversational AI Creating personalized and meaningful interactions Explore >	Integrity Building AI solutions to keep people safe on social platforms Explore >
Natural Language Processing Next generation text understanding and generation Explore >	Ranking & Recommendations Connecting people to what's most meaningful Explore >	Systems Research Developing novel algorithmic, software, and hardware techniques Explore >
Theory Laying foundations for artificial intelligence Explore >	Speech & Audio Powering voice interfaces and audio content understanding Explore >	Human & Machine Intelligence Building algorithms inspired by, and compatible with, human cognition Explore >



<https://ai.facebook.com/research>

RISE OF AI



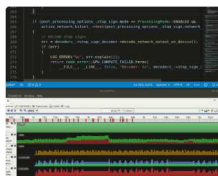
Neural Networks

Apply cutting-edge research to train deep neural networks on problems ranging from perception to control. Our per-camera networks analyze raw images to perform semantic segmentation, object detection and monocular depth estimation. Our birds-eye-view networks take video from all cameras to output the road layout, static infrastructure and 3D objects directly in the top-down view. Our networks learn from the most complicated and diverse scenarios in the world, iteratively sourced from our fleet of nearly 1M vehicles in real time. A full build of Autopilot neural networks involves 48 networks that take 70,000 GPU hours to train. Together, they output 1,000 distinct tensors (predictions) at each timestep.



Autonomy Algorithms

Develop the core algorithms that drive the car by creating a high-fidelity representation of the world and planning trajectories in that space. In order to train the neural networks to predict such representations, algorithmically create accurate and large-scale ground truth data by combining information from the car's sensors across space and time. Use state-of-the-art techniques to build a robust planning and decision-making system that operates in complicated real-world situations under uncertainty. Evaluate your algorithms at the scale of the entire Tesla fleet.



Code Foundations

Throughput, latency, correctness and determinism are the main metrics we optimize our code for. Build the Autopilot software foundations up from the lowest levels of the stack, tightly integrating with our custom hardware. Implement super-reliable bootloaders with support for over-the-air updates and bring up customized Linux kernels. Write fast, memory-efficient low-level code to capture high-frequency, high-volume data from our sensors, and to share it with multiple consumer processes— without impacting central memory access latency or starving critical functional code from CPU cycles. Squeeze and pipeline compute across a variety of hardware processing units, distributed across multiple system-on-chips.



<https://www.tesla.com/autopilotAI>

RISE OF PLATFORMS/ECOSYSTEMS

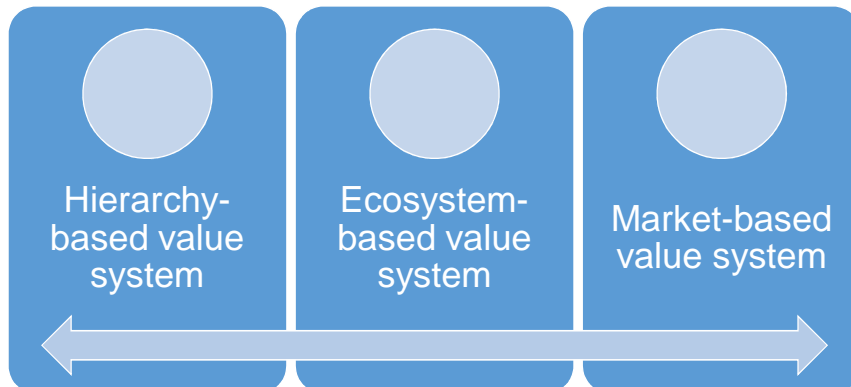


amazon alexa



RISE OF PLATFORMS/ECOSYSTEMS

"An ecosystem is a set of actors with varying degrees of multilateral, nongeneric complementarities that are not fully hierarchically controlled." (p. 2264)



Jacobides et al. 2018

ANY INNOVATION IS A SERVICE INNOVATION

- Shift from focus on tangible goods to associated or stand-alone **intangible** offerings (knowledge and skills)

! including offerings with information-centric focus

- Shift from features and attributes of innovation output to the **value** that is cocreated with other actors in the use of innovations and other resources



Lusch and Nambisan 2015

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IMPORTANCE OF (SERVICE) INNOVATION



TWO PERSPECTIVES

ECONOMIC PERSPECTIVE

cf. avoiding
commodity trap

cf. enabling
economic growth



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SOCIETAL PERSPECTIVE

cf. negative
externalities

cf. tackling grand
challenges

AVOIDING THE COMMODITY TRAP



To grow again and
compete effectively,
businesses must change
the way they approach
innovation and growth

(Chesbrough 2011)



AVOIDING THE COMMODITY TRAP

Competitive success

- **CUSTOMER ADVANTAGES**
 - Production of differentiated products and services
 - Closer fit with customer needs

- **FIRM ADVANTAGES**
 - Protection of margins
 - Lower costs



Schilling (2020)

AVOIDING THE COMMODITY TRAP

	#1	#2	#3	#4	#5
Market value 2019	Apple (US)	Microsoft (US)	Amazon (US)	Alphabet (US)	Berkshire Hathaway (US)
Profits in 2019	Apple (US)	ICBC (China)	Samsung Electronics (South Korea)	China Construction Bank (China)	JP Morgan Chase (US)
Sales 2019	Walmart (US)	Sinopec (China)	Royal Dutch Shell (Netherlands)	PetroChina (China)	BP (UK)
Assets 2019	ICBC (China)	China Construction Bank (China)	Agricultural Bank of China (China)	Bank of China (China)	JP Morgan Chase (US)

<https://ceoworld.biz/2019/06/28/the-top-100-best-performing-companies-in-the-world-2019/>



ENABLING ECONOMIC GROWTH

(technological) innovation



economic growth



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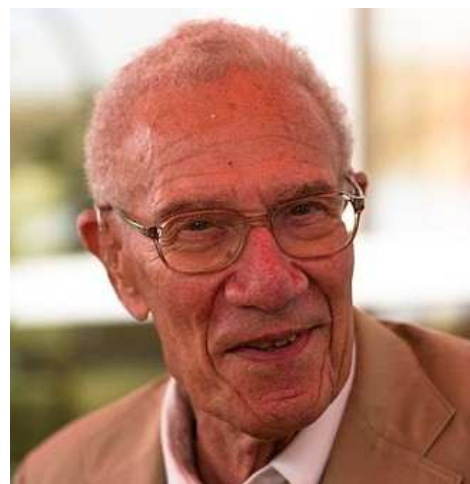
<https://commons.wikimedia.org/w/index.php?curid=17120276>



ENABLING ECONOMIC GROWTH

Solow Growth Model

- Capital
- Labour
- Technological innovation
(**SOLOW RESIDUAL**)



By Olaf Storbeck from Düsseldorf, Deutschland

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<https://commons.wikimedia.org/w/index.php?curid=12675493>



Schilling (2020)

ENABLING ECONOMIC GROWTH

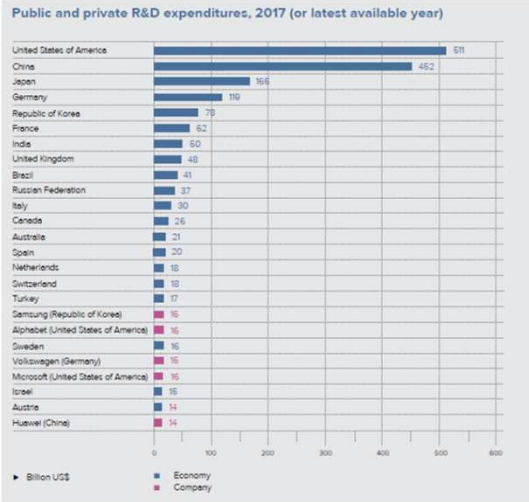


GLOBAL INNOVATION INDEX 2019

Creating Healthy Lives—The Future of Medical Innovation



<https://www.globalinnovationindex.org/userfiles/file/reportpdf/gii-full-report-2019.pdf>



NEGATIVE EXTERNALITIES

= costs (or benefits) that are borne (or reaped) by individuals other than those responsible for creating them (Schilling, 2020)



NEGATIVE EXTERNALITIES

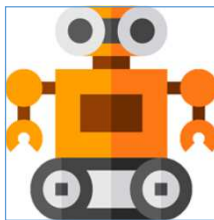
“A major challenge facing society is discovering new ways to grow economies without growing environmental impacts, commonly referred to as “decoupling” economic growth from environmental degradation.”

(Lanoie, 2014)



NEGATIVE EXTERNALITIES

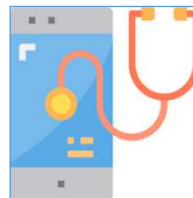
Mechanical jobs replaced



Analytical jobs replaced



Intuitive jobs replaced



Empathetic jobs replaced



Huang and Rust (2018)

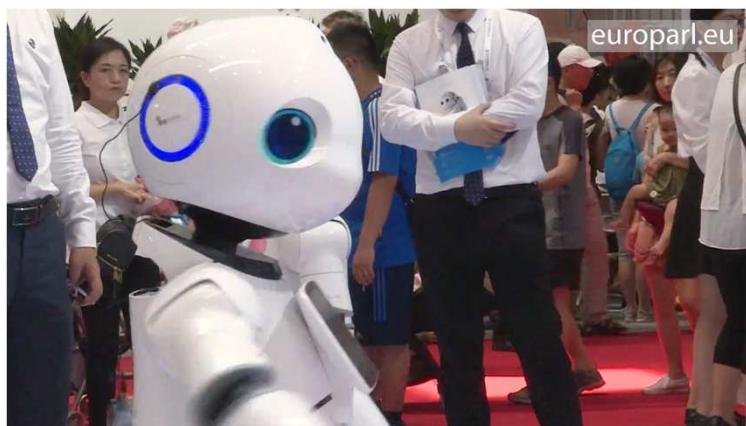
NEGATIVE EXTERNALITIES

- “Amazon scraps secret AI recruiting tool that showed **bias against women**” (Reuters, October 10, 2018)
- “How to design AI that eliminates **disability bias**” (Financial Times, January 26, 2020)
- “**Racial bias** observed in hate speech detection algorithm from Google” (TechCrunch, August 15, 2019)



NEGATIVE EXTERNALITIES

“Europa wil geen monsterlijke AI [Europe does not want a monstrous AI]” (De Standaard, February 6th, 2020)



TACKLING GRAND CHALLENGES

What is the European Green Deal?

December 2019 #EUGreenDeal

The European Green Deal is about **improving the well-being of people**. Making Europe climate-neutral and protecting our natural habitat will be good for people, planet and economy. No one will be left behind.

The EU will:

- Become climate-neutral by 2050
- Protect human life, animals and plants, by cutting pollution
- Help companies become world leaders in clean products and technologies
- Help ensure a just and inclusive transition

"The European Green Deal is our new growth strategy. It will help us cut emissions while creating jobs."
Ursula von der Leyen, President of the European Commission

"We propose a green and inclusive transition to help improve people's well-being and secure a healthy planet for generations to come."
Frans Timmermans, Executive Vice-President of the European Commission

93% of Europeans see climate change as a serious problem

93% of Europeans have taken at least one action to tackle climate change

79% agree that taking action on climate change will lead to innovation

*"Commission will explore measures to ensure that **digital technologies** such as artificial intelligence, 5G, cloud and edge computing and the internet of things can accelerate and maximise the impact of policies to deal with **climate change** and protect the **environment**"*

(European Green Deal, 2019, p. 9)

TACKLING GRAND CHALLENGES

*"**New technologies, sustainable solutions and disruptive innovation** are critical to achieve the objectives of the European Green Deal"*

(European Green Deal, 2019, p. 18)

What will we do?

CLIMATE
The EU will be **climate neutral in 2050**. The Commission will propose a European Climate Law turning the political commitment into a legal obligation and a trigger for investment.
Reaching this target will require action by all sectors of our economy:

ENERGY
Decarbonise the energy sector
The production and use of energy account for more than **75%** of the EU's greenhouse gas emissions

BUILDINGS
Renovate buildings, to help people cut their energy bills and energy use
40% of our energy consumption is by buildings

INDUSTRY
Support industry to innovate and to become global leaders in the green economy
European industry only uses **12%** recycled materials

MOBILITY
Roll out cleaner, cheaper and healthier forms of private and public transport
Transport represents **25%** of our emissions

TACKLING GRAND CHALLENGES



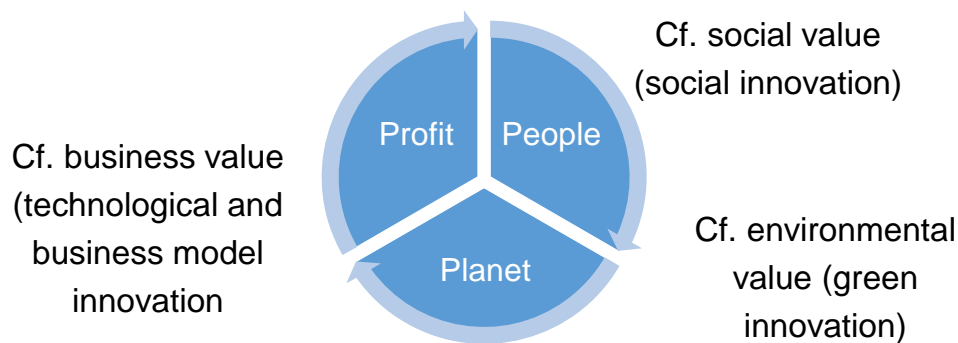
*“The coming years will be a vital period to save the planet and to achieve **sustainable, inclusive human development**”*

(António Guterres, Secretary-General, United Nations)



SUSTAINABILITY AS NEW FRONTIER

Increased recognition of importance of serving **all stakeholders** with innovation – **not only shareholders**



SUSTAINABILITY AS NEW FRONTIER

“... sustainability is a mother lode of organizational and technological innovations that yield both bottom-line and top-line returns. (...) In fact, we find that smart companies now treat **sustainability as innovation’s new frontier.**”

(Nidumolu, Prahalad & Ramaswamy, 2014)

BUT

importance of **systemic approach** to stimulate sustainability oriented (technological) innovation

(Wieczorek and Hekkert, 2012)



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SYSTEMIC APPROACH TO INNOVATION



IMPORTANCE OF SYSTEMIC APPROACH

The **speed** and **direction** of processes oriented towards creating sustainable innovation depend on the **systems** in which these processes are embedded

- national/regional systems
- sectoral systems
- technological systems
- ...

NARROW  BROAD



(Wieczorek and Hekkert 2012)

STRUCTURAL ELEMENTS OF A SYSTEM

Categories	Subcategories
ACTORS	<ul style="list-style-type: none"> • Civil society • Companies: start-ups, SMEs, multinationals,... • Knowledge institutes: universities, schools, research centers,... • Government • NGOs • Other parties: financial organizations, intermediaries, knowledge brokers, consultants,...
INSTITUTIONS	<ul style="list-style-type: none"> • Hard: rules, laws, regulations, instructions,... • Soft: common habits, routines, practices, traditions,...
INTERACTIONS	<ul style="list-style-type: none"> • Level of individual contacts • Network level
INFRASTRUCTURE	<ul style="list-style-type: none"> • Physical: machines, roads, buildings, networks, bridges,... • Knowledge: expertise, know-how, strategic information,... • Financial: subsidies, financial programs, grants,...



(Wieczorek and Hekkert 2012)

FUNCTIONAL ELEMENTS OF A SYSTEM

Entrepreneurial activities
Knowledge development
Knowledge diffusion
Guidance of the search
Market formation
Mobilization of resources
Creation of legitimacy



(Wieczorek and Hekkert 2012)

SYSTEMIC PROBLEMS

= problems that hinder the development of an innovation system and/or system change/transformations

Systemic problem	(Type of) systemic problem
Actor problems	Presence? Capabilities?
Interaction problems	Presence? Quality?
Institutional problems	Presence? Quality?
Infrastructural problems	Presence? Quality?



(Wieczorek and Hekkert 2012)

SYSTEMIC INNOVATION POLICY FRAMEWORK

1. Identify function of system
2. Map structural elements of the system = coupled functional-structural analysis
3. Identify systemic problems
4. Selection of strategies to tackle problems (cf. goals of systemic instruments)
5. Design systemic instruments

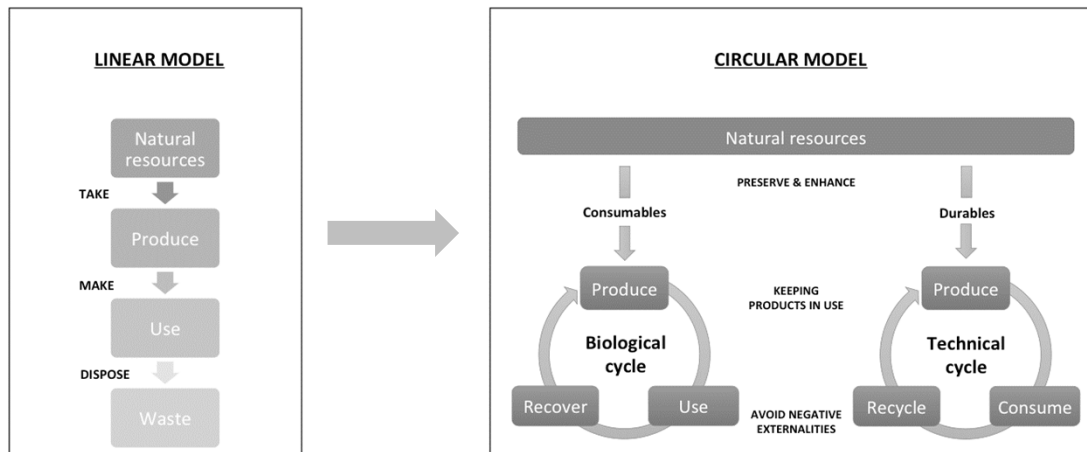
Goal of systemic instruments

- Stimulate and organize participation of relevant actors
- Create space for actors capability development
- Stimulate occurrence of interactions
- Prevent too strong and too weak ties
- Secure presence of hard and soft institutions
- Prevent too weak and too stringent institutions
- Stimulate physical, financial and knowledge infrastructure
- Ensure adequate quality of infrastructure

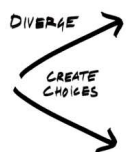
SWEDISH RENEWABLE ENERGY SYSTEM

Systemic problem	(Type of) systemic problem	Jacobsson and Johnson (2000)
Actor problems	Presence? Capabilities?	Poorly articulated demand
Interaction problems	Presence? Quality?	Legislative failure
Institutional problems	Presence? Quality?	Poor connectivity Wrong guidance Market control by incumbents
Infrastructural problems	Presence? Quality?	Failure in educational system

SHIFT TOWARDS A CIRCULAR ECONOMY



SPECIAL SESSION 1



1. Choose a sector (plastics, fashion, or finance)
2. Brainstorm about systemic problems that may hinder the transition towards circular economy in the sector
3. Brainstorm about the goals of systemic instruments and systemic instrument design to facilitate the shift to a circular economy in the sector
4. List questions for Executive Lead of Ellen MacArthur Foundation to gain more insight and/or validate the identified systemic problems, goals of systemic instruments, and systemic instrument design
5. Appoint a spokesperson to address your questions for Executive Lead of Ellen MacArthur Foundation during Special Session 1
6. After guest lecture in Special Session 1, prepare a one-pager with a description of systemic problems (min. 3) and for each of these problems a systemic instrument to tackle it (incl. goals of these instruments)

! IMPORTANT: more detailed instructions during Special Session 1