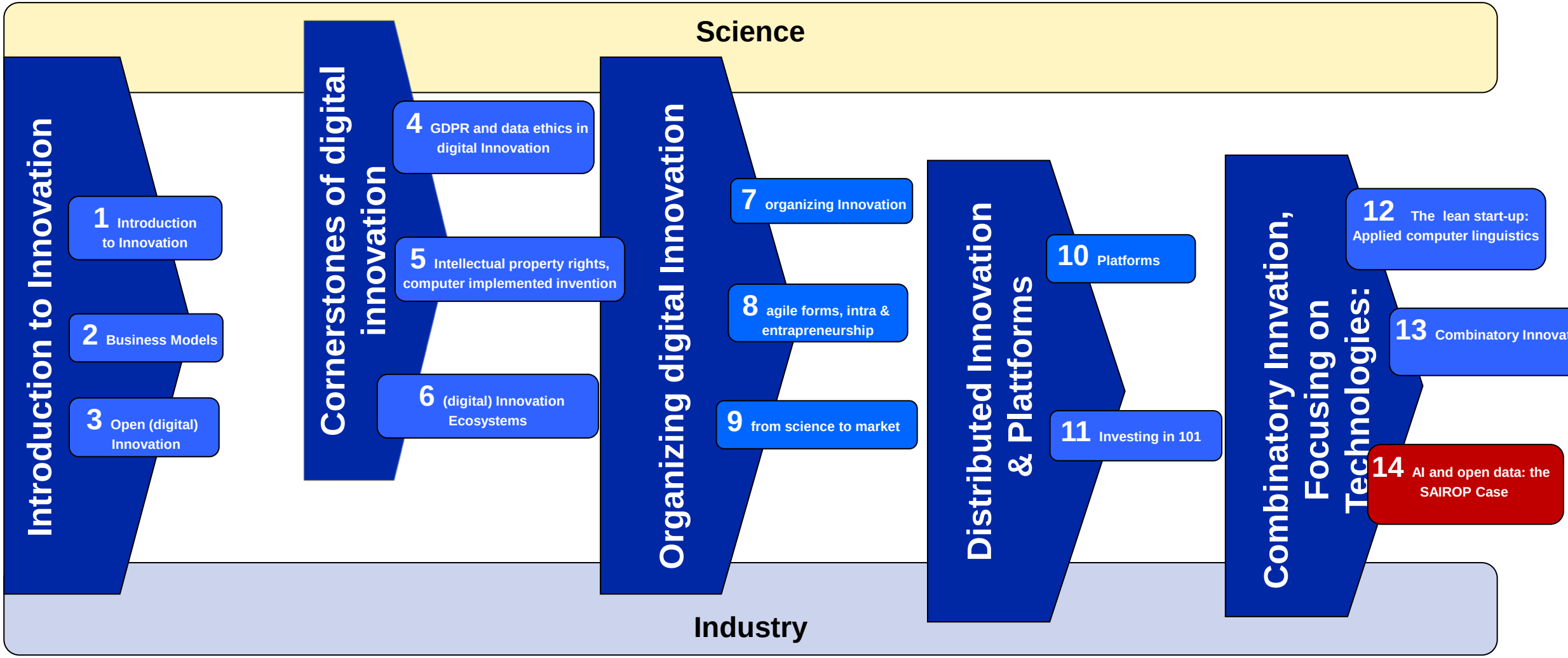
AI and Open Data – what can we learn from research data?

Lecture: Digital Innovation Fall 2021

Teaching Unit 14

Dr. Gabriele Schwarz

gabriele.schwarz@uzh.ch


Science
Introduction to Innovation
1 Introduction to Innovation
2 Business Models
3 Open (digital) Innovation
Cornerstones of digital innovation
4 GDPR and data ethics in digital Innovation
5 Intellectual property rights, computer implemented invention
6 (digital) Innovation Ecosystems
Organizing digital Innovation
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Industry

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Learning objectives

There are some evident that certain **criteria** make a digital innovation project **succeed** or **fail**

You have an idea, what **defines** a **successful** or **failed project** according to interviews with Swiss industry partners

You are aware of the **challenges in digital innovation projects**

You learn that there is no **tendency or direction** in which areas or industry sectors projects are **more likely to succeed** than others

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Questions

1. What are the **criteria** which make a digital innovation project **succeed** or **fail**?
2. What **defines** a **successful** or **failed project** according to the industry partners? Positive and negative influence on innovation
3. What are the respective **challenges in digital innovation projects**? How do they differ from other projects?
4. Is there a **tendency or direction** in which areas or industry sectors projects are **more likely to succeed** than others?

Own research and a Masterthesis by Oliver Brennwald @UZH, former student of the digital innovation course

Digital innovation projects in Switzerland – What leads to success or failure?

Supervisor: Prof. Gerhard Schwabe, Co-supervisor: Dr. Liudmilla Zavolokina & Dr. Gabriele Schwarz

Basis:

(Aramis) Database about all innovation project funded by the Swiss Government (API after a court sentence from the Federal Administrative Court)

10 structured interviews with topshots from the Swiss Digital Innovation Ecosystem

Related Work

Innovation process for digital Innovation projects (Fichman, Dos Santos, and Zheng 2014)

Invention & **Research**, also selection of ideas

Developed around the customer and surrounding systems

Transfer/delivery to the customer, in digital products «deployment»

Impacts of the digital innovation (cost/revenue), also managing and operating the innovation

Slides adapted from the Masterhesis: Idiosyncrasies in Digital Innovation Projects in Switzerland by Oliver Brennwald, University of Zurich, Department of Informatics, 2020

Positive and negative influence on innovation from previous studies

Category	Factor	No. of studies citing		Total
		R&D	NPD	
Environment	Availability of raw materials	4	0	4
Market	Market existence	4	0	4
	Need of low cost	3	1	4
	Competitive environment	1	3	4
Organisation	High level management support	5	1	6
	Emphasise marketing	1	5	6
	R&D process well planned	3	3	6
	Marketing and technology are strengths	1	4	5
	Timing	3	1	4
	Create, make, market interphase	2	2	4
	Training and experience of own people	2	2	4
	Commitment of project staff	3	0	3
	Technology strategy tied to business strategy	0	3	3
Technology	Probability of technical success	5	0	5

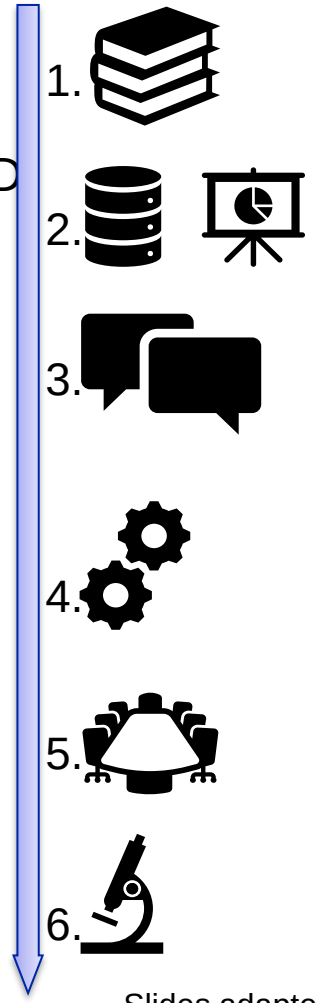
Balachandra and Friar 1997

- Balachandra and Friar 1997 (general innovation, literature review based)
- Cozijnsen et al. 2000 (quantitative survey with Dutch companies)
- Schwarzkopf 2016 (quantitative survey with German investors)

Slides adapted from the Masterhesis: Idiosyncrasies in Digital Innovation Projects in Switzerland by Oliver Brennwald, University of Zurich, Department of Informatics, 2020

Method conducted in the masterthesis

1. **Literature Review** on “digital innovation” and “innovation” (vom Brocke et al. 2009)
2. **Data evaluation** according to the ETL and KDD reference processes (Fayyad et al. 1996)
3. **Qualitative semistructured interviews** (McNamara 2009 , Turner 2010), 10 Interviews (2x Startup, 2x SME, 2x LE, 4x IPA)
   - Standard letter
4. **Coding** with MAXQDA,
   - General Codes
   - Codes related to Research Questions
5. **Workshop** discussion with IMRG
6. **Analysis**



1. RQ1-4: General overview
2. RQ4: Download and Cleaning Skript + Dashboard
3. RQ1-4: Getting interview data
4. RQ1-4: Structuring interview data
5. RQ4: Evaluate Dashboard
6. RQ1-4: Analysing Data
   - Regarding company size
   - Quantitative aspects

Slides adapted from the Masterhesis: Idiosyncrasies in Digital Innovation Projects in Switzerland by Oliver Brennwald, University of Zurich, Department of Informatics, 2020

Key Findings

What are the criteria which make a digital innovation project successful or lead to failure?

Importance (number of reasons mentioned per category):

Category	Ours	Balachandra and Friar 1997	
	Digital Innovation Interviews (N=10)	R&D Studies (N=9)	NPD Studies (N=10)
Market	36%	28.57%	26.67%
Company	31%	42.86%	60.00%
Technology	19%	15.48%	13.33%
Environment	14%	13.10%	0.00%

-> The importance does not represent the reason why some innovation was successful or not!

Slides adapted from the Masterhesis: Idiosyncrasies in Digital Innovation Projects in Switzerland by Oliver Brennwald, University of Zurich, Department of Informatics, 2020

Good teams, partners and intrinsic motivation are key

What are the criteria which make a digital innovation project successful or lead to failure?

Reasons for success:

Factor	Distinct total #	Total #	Category
Good teamwork	6	8	Company
Market existence	6	7	Market
Good employees	5	12	Company
Freedom in project fulfilment and adaption	5	9	Company
Project partner	5	8	Company
Clear target	4	9	Company
Project management	4	7	Company

*"Having deeply **teamwork** driven is very important, it is never a one man show, **always a team effort**. Having a good team, **motivation** and **moral** is important for the success of any kind of projects out there."* Startup_1

*"I said before that an innovation **partnership** is important. [...] Well, I think if you have enough of them [customers], then **success is not guaranteed** but is much more likely."* SME_2

*"We are not tied to it, sometimes you really have to **set a new goal** if you have insights that make something impossible. So you have to find another way."* LE_1

Slides adapted from the Masterhesis: Idiosyncrasies in Digital Innovation Projects in Switzerland by Oliver Brennwald, University of Zurich, Department of Informatics, 2020

Clear targets are the best prevention from failure

What are the criteria which make a digital innovation project successful or lead to failure?

Reasons for failure:

Factor	Distinct total #	Total #	Category
Clear target	5	5	Company
Bureaucracy and administrative overhead	3	4	Company
Inflexibility and changing requirements	2	6	Company
Lack of resources and support	2	6	Company
Self overestimation / lack of partnership	2	4	Company

*"People find it **difficult to specify the goals** and project objectives, what do we want? Everybody has a picture of what the project should actually achieve, they have in their heads."* IPA_1

*"**Administration** and **bureaucracy**, even if the organization would like to continue, **based on the regulations**, it is made difficult."* Startup_2

- Similar results to other studies (Balachandra and Friar 1997, Cozijnsen et al. 2000, Schwarzkopf 2016)
- Reasons for success are more clear/condense
- Reasons for failure are less clear except «Clear target»
- Very different in the expression regarding the company size e.g. "good employees"

Slides adapted from the Masterhesis: Idiosyncrasies in Digital Innovation Projects in Switzerland by Oliver Brennwald, University of Zurich, Department of Informatics, 2020

Early signs of failure differ from company size

Early Sings

Startup	SME	Large Company
Market and Company-related • **Marked validation** • **PoC** • First stakeholders • Conferences/Forums	Market, Company and Employee-related • … • **Soft factors motivation & enthusiasm**	Market, Company, Employee and Team-related • … • **Team/Company spirit** and communication behaviour

*"Most people for whom the projects fail **have felt this for a long time**, that things are slowly going downhill, you just don't want to admit it and you just want to keep it alive."* SME_1

Slides adapted from the Masterhesis: Idiosyncrasies in Digital Innovation Projects in Switzerland by Oliver Brennwald, University of Zurich, Department of Informatics, 2020

Key Findings

What defines a successful or failed project according to the industry partners?

- Technical goals
  - Very hard to measure
  - Change over project duration
  - Agile approach is a must
- Monetary goals
  - Very time dependent (date and duration)

*"Success is very much defined by having **very good requirements** and having a **very good understanding of needs**"* Startup_1

- The bigger a company (LE) the more focus on **direct monetary** goals (returns) or **none** at all (e.g. image for the company).
- Startups and SME use innovation project to save cost indirect (hiring cost, marketing, customer acquisition).

Most challanging is educting the team, promote the idea/product and prevent form copying

What are the respective challenges in digital innovation projects? How do they differ from other projects?

Challenges

- Marketing and education
- Finding good people
- Fast changing environment and technology
- Intellectual property
- Easy copyability
- Law and data protection

"*Most of the time […] the really good ones fall by side because of **lack of know-how** of these judging people.*" LE_1

*"IBM/Google can relatively **quickly replicate** with so and so much manpower if they wanted to. Nobody can forbid that, and nobody can prevent that.*" Startup_2

No relevant distintion between industries

Is there a tendency or direction in which areas or industry sector, projects are more or less successful than others?

No direction or industry sector where projects are performing **significantly better**, every sector has their pros and cons which is prior known (like government/public sector, healthcare, banking/insurances etc.).

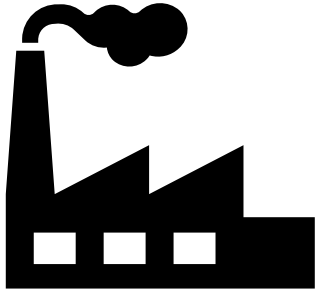
But with the "**Ideal Partner**":

- a chance for success is much higher
- work is easier and faster
- less bureaucracy administration
- other/future businesses could be made

"*[...] the success of the projects is and depends **primarily on the people** and much less on the sectors.*" IPA_1

"*It is best to have **long-term partners**, then you know them, and they know what you want. That's the essence of it.*" LE_2

Different key factors regarding research and/or industry partnerships



Industry Partnerships

- Existing long-term partnership
- Expertise difference
- Size difference
- Concerning/warning with (American) tech giants

Research Partnerships

- Applied science vs research/academic universities
- Education background of existing project staff

Still an unsolved issue: extracting «advice» from the Swiss and EU-research databases

Is there a tendency or direction in which areas or industry sector, projects are more or less successful than others?

- Approach for first clarification
- Can help to find a partner
- Trends can be identified

But:

Strongly data dependent!!

Swiss Eesearch DB

EU research DB

Innodata: Screenshot «Internet Things» Dec. 2021

Additional to the data from the databases . . .

- More **detailed insights** into the world of digital innovation projects in Switzerland, as well as the characteristics of Switzerland why projects where successful/failed

- **Differences** and **similarities** based on company size were found

- Possible idea for **technology trends** and **partner finding** via dashboard based on ARAMIS and Horizon data

Slides adapted from the Masterhesis: Idiosyncrasies in Digital Innovation Projects in Switzerland by Oliver Brennwald, University of Zurich, Department of Informatics, 2020

Conclusion

Digital innovation projects are one of the **most difficult** due to:

- Fast changing markets and difficult to predict
- Convergence and generativity is a curse and a blessing
- Technology giants which have the necessary knowhow and resources are present in Switzerland
- Hardly no defense (IP-Rights)
- Education and technological understanding
- …

Slides adapted from the Masterhesis: Idiosyncrasies in Digital Innovation Projects in Switzerland by Oliver Brennwald, University of Zurich, Department of Informatics, 2020

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Joint forces to develop an open research data overview platform on AI topics – project lead Swiss Adacemy of Engineering Sciences

Media Release

Numerous renowned organizations join forces to work on a Swiss Artificial Intelligence Research Overview Platform

Swiss Artificial Intelligence Research Overview Platform

Zurich 20 May 2021 **Swiss organizations from the fields of research funding, academia and industry have agreed to jointly compile an overview of the expertise of Swiss research institutions in the field of artificial intelligence (AI). As an enabling technology that is finding its way into all areas of daily life, AI is of outstanding importance for Switzerland as a research location and for future value creation. The planned platform – the Swiss AI Research Overview Platform (SAIROP) – Is intended to present an overview of AI competencies in Switzerland's scattered research landscape. To this end, the partners involved will compile information on current research projects from existing databases, process it and make it more accessible by means of the new platform – which is likely to be unique in the European region in the planned level of detail. SAIROP will improve the visibility of Swiss AI research partners, providing a new gateway for local and international companies and research institutions to initiate future innovation projects. SAIROP is scheduled to be launched in fall 2021 and will be publicly accessible.**

Ten organizations have agreed in a Memorandum of Understanding to jointly develop and promote an AI research review. The initiative, coordinated by the Swiss Academy of Engineering Sciences SATW, aims to exploit synergies among the partners involved and to join forces: The organizations are united by the desire to develop and maintain a descriptive overview of current research activities in the field of AI in order to quickly identify and refer appropriate experts. Currently, this information is scattered among databases and websites of research funding organizations and universities. SAIROP will now serve as a central access point to unite the data from different sources and highlight the competencies of Swiss research groups on the basis of current projects.

The Swiss Artificial Intelligence Research Overview Platform

– The launch of the platform has been postponed until February 2022

Qestions & Answers

Picture from: https://blog.zoom.us/happy-holidays-2019-delivering-happiness/ Dez. 2020

Voluntary:
Tip/Hint for Groupwork: Summarizing the Course

Every block will get summarized by a team (# students / 5)

Some of the most relevant slides are already given, you may (and probably should) add more.

Goal: written summary of the most important slides (< 10), write if needed you a draw new ones. Written summary can also contain pictures, bullet points and should be approx 1 page long. (nothing too fancy, just a quick summary)

Introduction to Innovation

Invention versus Innovation

something that has never been made before, or the process of creating something that has never been made before
from: Cambridge Dictionary

more Info: Maximilian Boosfeld
maximilian.boosfeld@wingtra.com

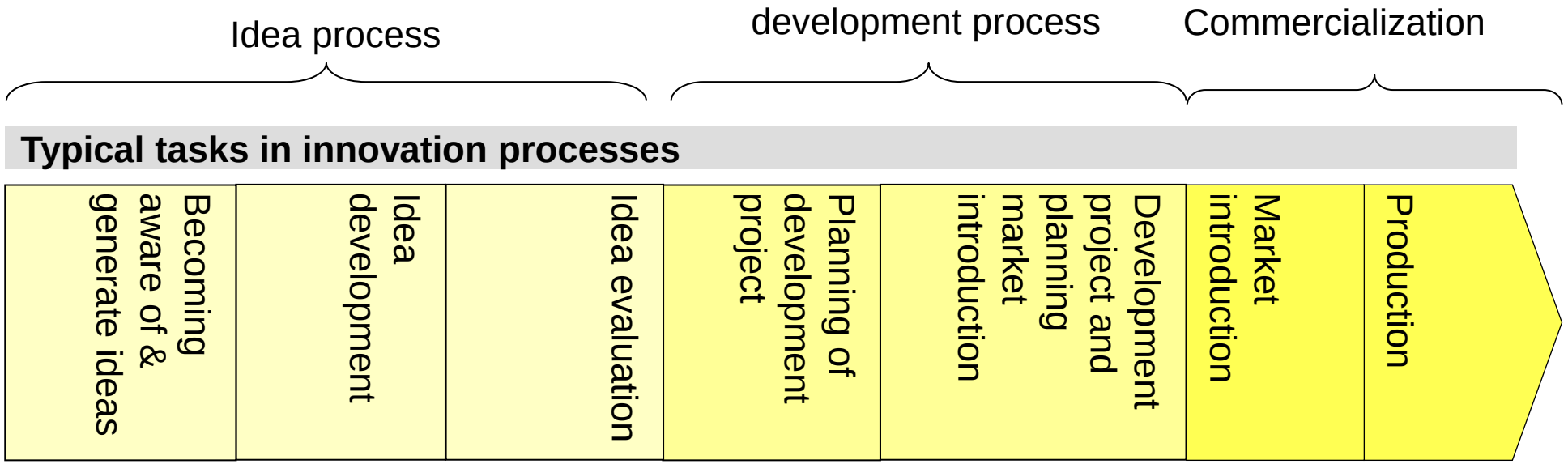
more Info: Wim Ouboter;
Wim.Ouboter@micro.ms

more Info: Dr. Alexander Stuck
alexander.stuck@nano4u.net

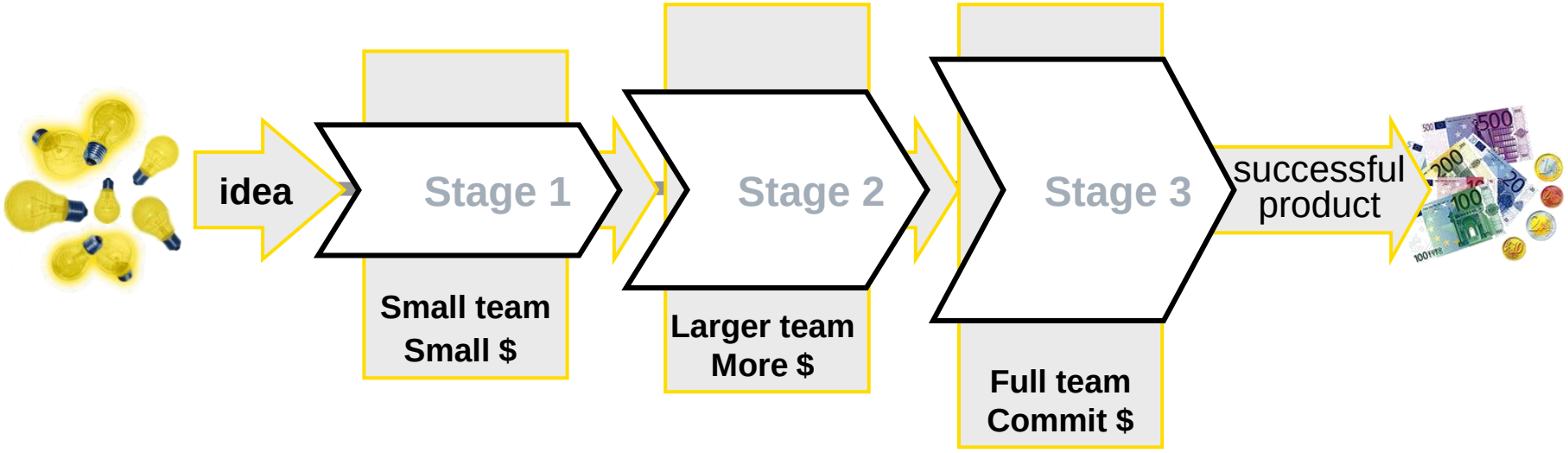
The process of translating an idea or invention into a good or service that creates value or for which customers will pay.
from: businessdictionary.com

The innovation process

Innovation processes have **different phases** and **aim to renew** the product and service portfolio and/or the way this portfolio is brought to the customer. The innovation process contains organizational, technological and qualification **methods** and **approaches** to support innovation.

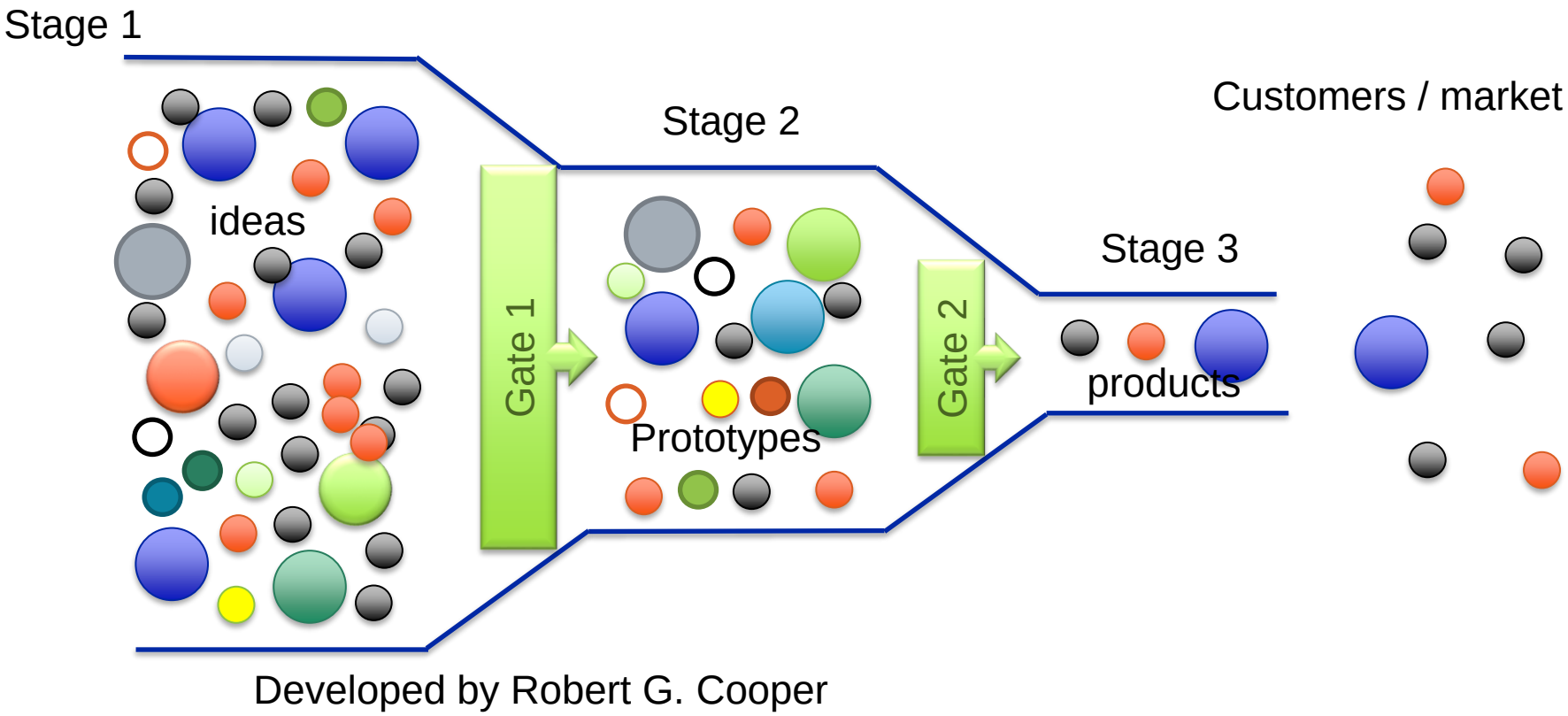


Stages in the Stage-Gate® System



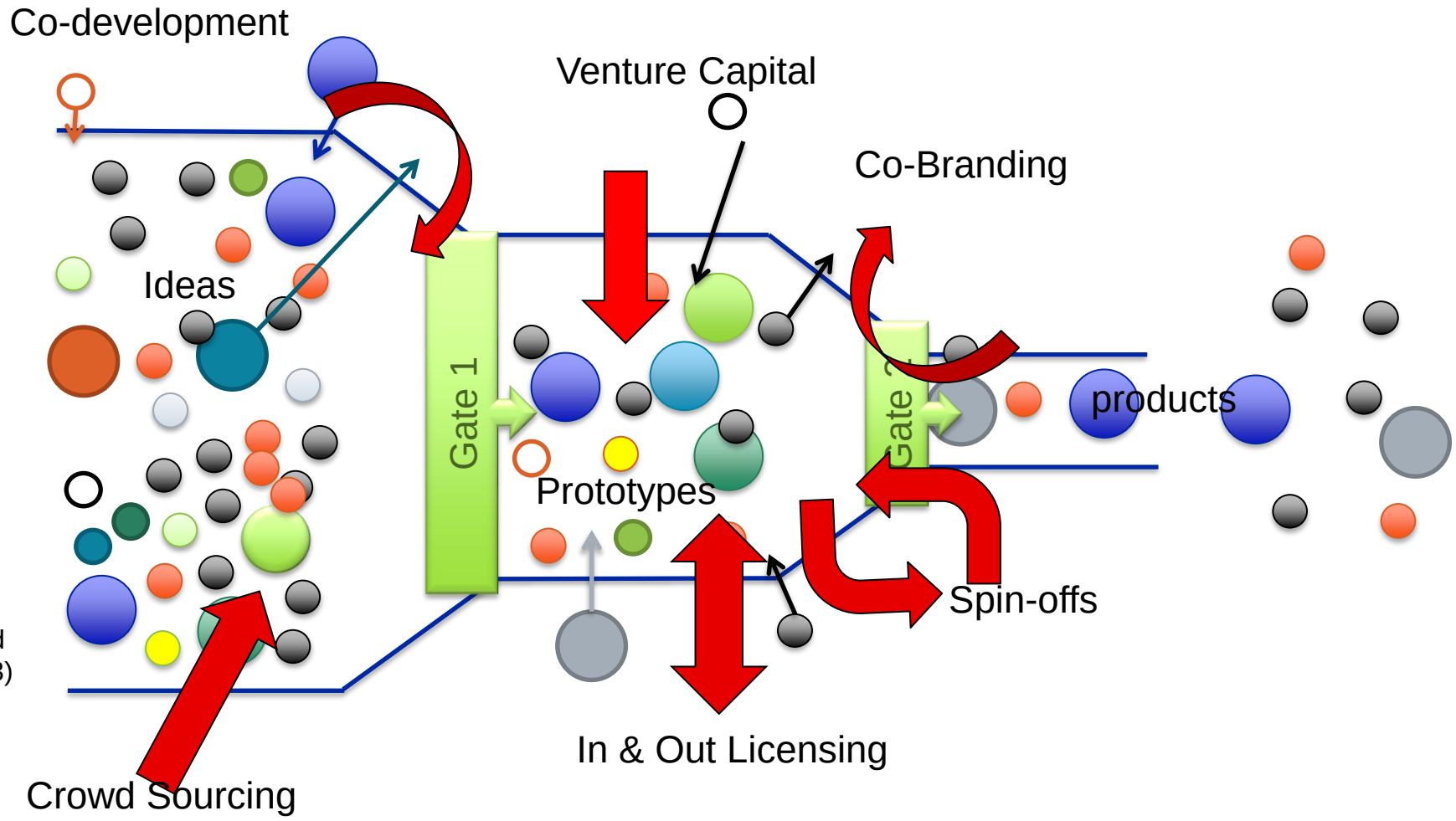
Adapted from Robert Cooper, The Stage Gate System

From the classical stage gate process to . . .



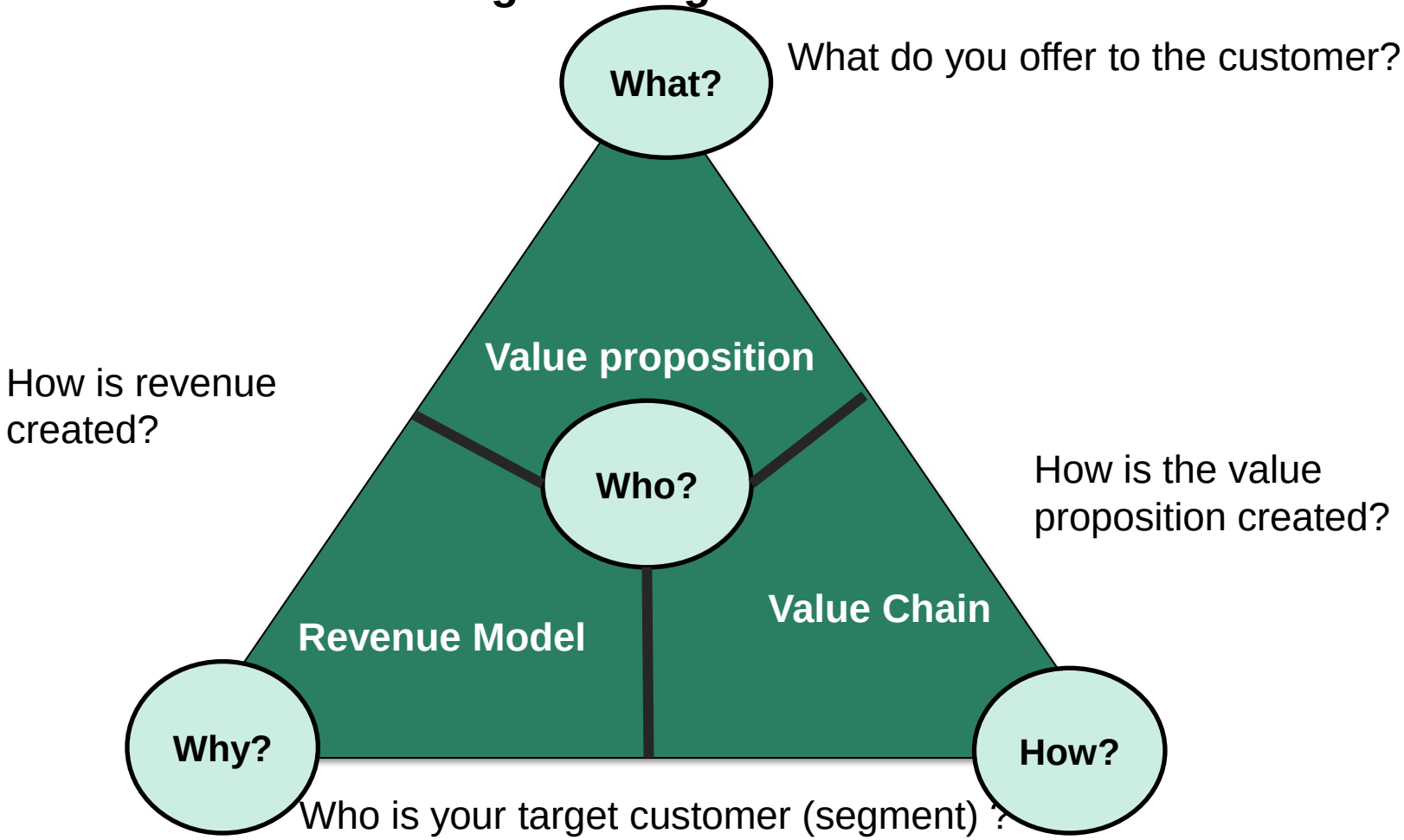
Developed by Robert G. Cooper

To open Innovation



According to Cooper und Chesbrough, H.W. (2003)

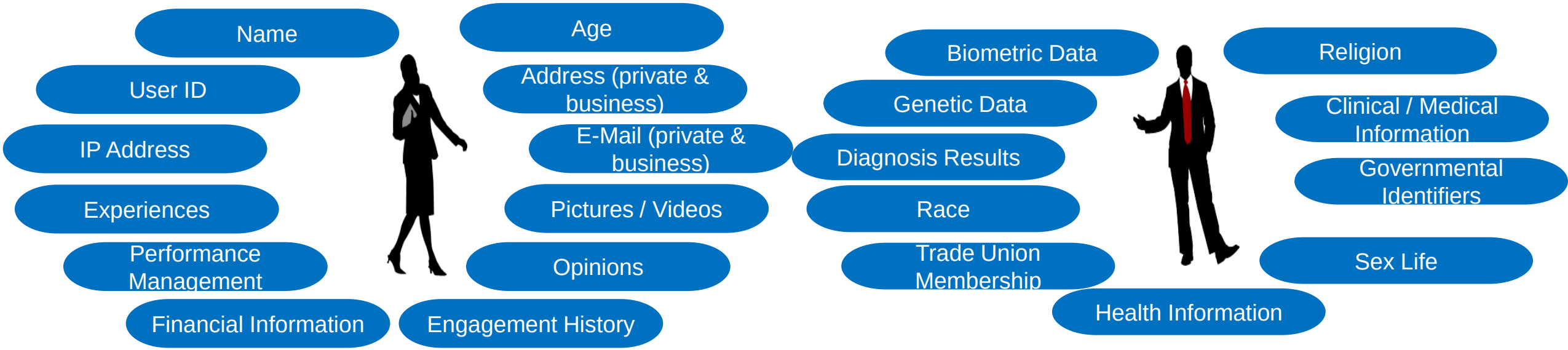
Digital Innovation need new business models – how to implement and which questions to ask are summirized in the «Magic Triangle»



Gassmann, Frankenberger, Csik: The St. Gallen Business Model Navigator (2015) p.7

Cornerstones of Digital Innovation

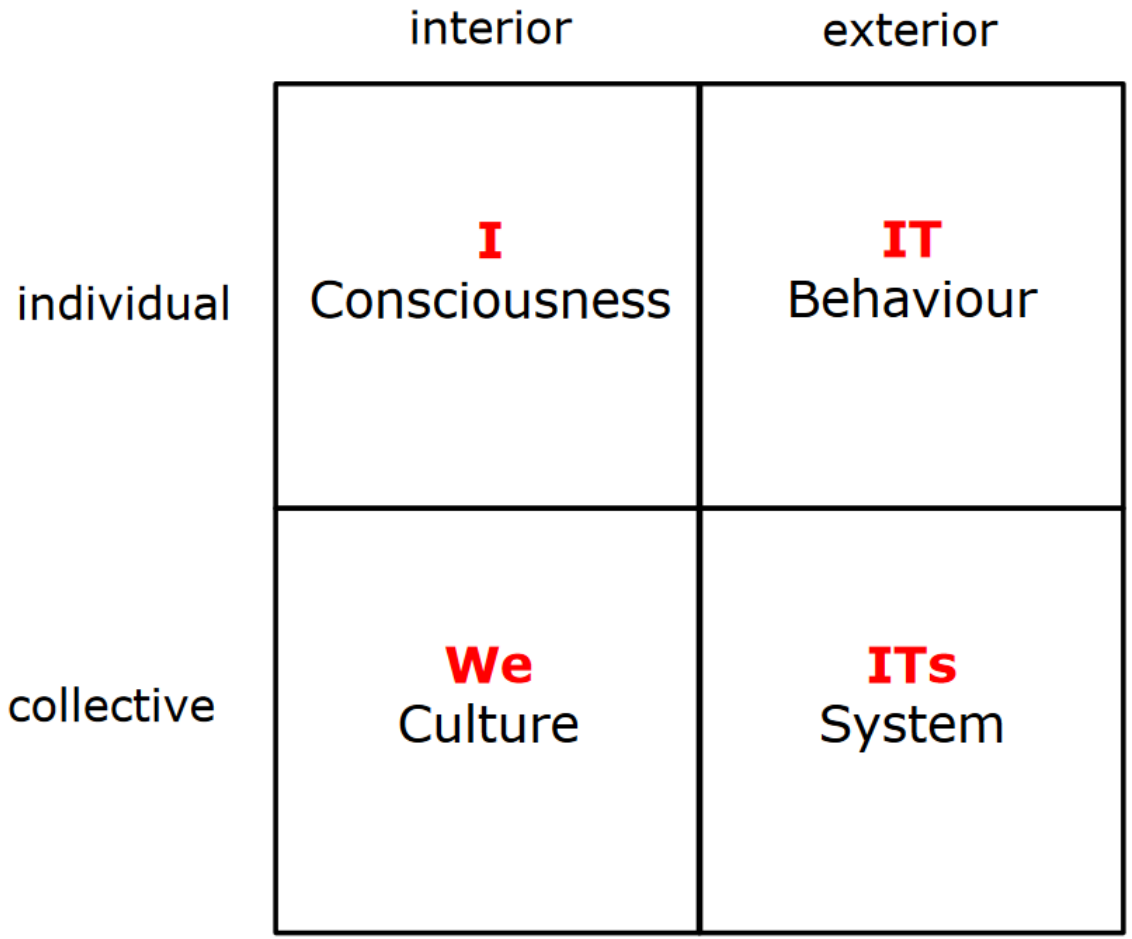
What is Personal Data? And Sensitive Personal Data?



Personal Data means any information relating to an identified or identifiable natural person

Sensitive Personal Data means personal data consisting of information as to the racial or ethnic origin of the data subject, his/her political opinions, his religious beliefs or other beliefs of a similar nature, whether he is a member of a trade union, his physical or mental health or condition, his sexual life, the commission or alleged commission by him of any offence, or any proceedings for any offence committed or alleged to have been committed by him, the disposal of such proceedings or the sentence of any court in such proceedings.

Integral quadrant according to Wilber



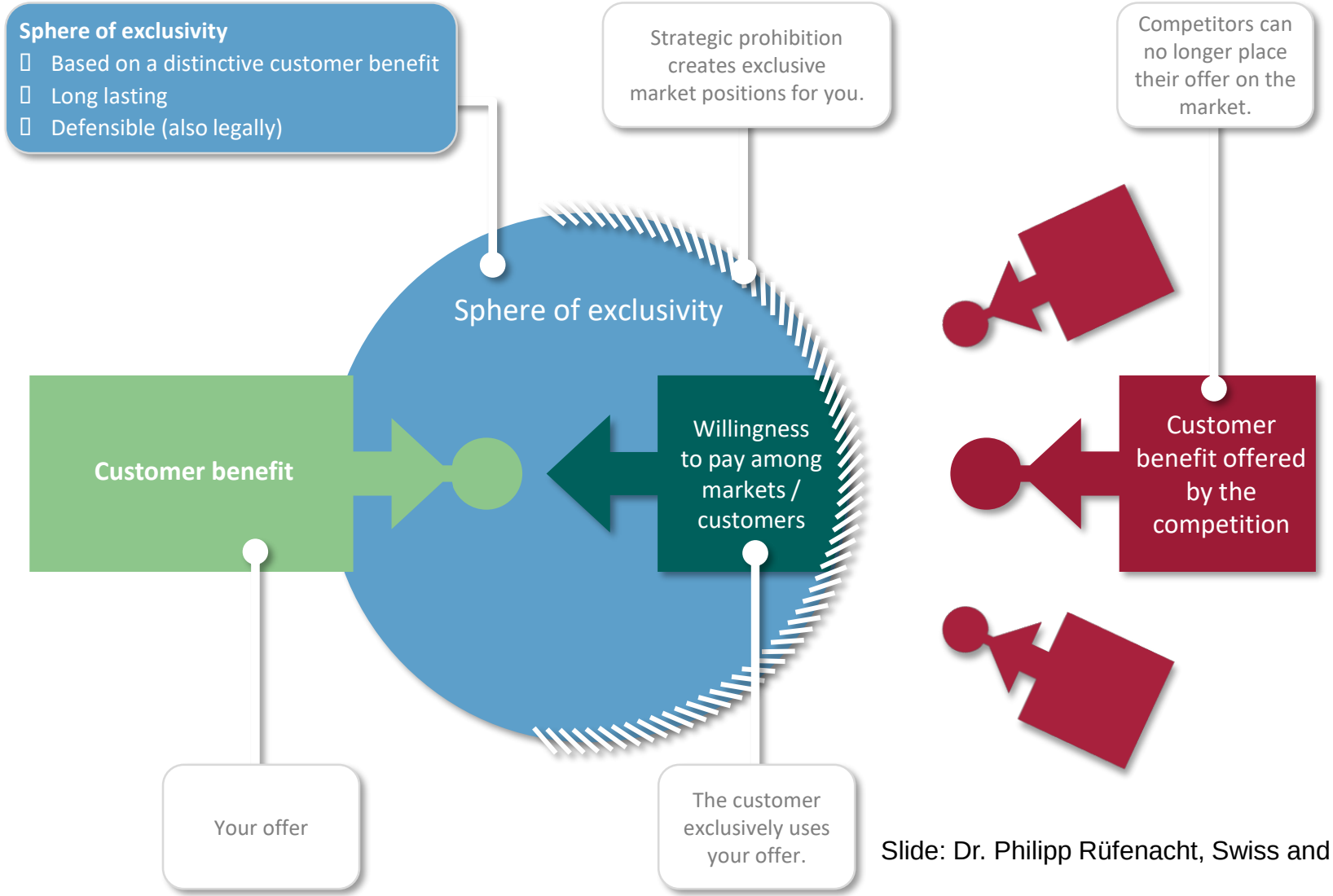
Ken Wilber, p. 30 http://www.kenwilber.com/Writings/PDF/IntroductiontotheIntegralApproach_GENERAL_2005_NN.pdf, Okt 2021

Available protection mechanisms

object	mechanism	aspects (examples)
esthetics	design protection	product shape user interface (?)
Designation	trademark protection	brand, logo
technical innovation	**patent**	hardware technical application of algorithms user interface (?)
software code	**copyright**	source / object code
know-how	secrecy	server-side algorithms AI: training data, classifier
	technical measures	software code / firmware
control	licenses	business model (e. g. pay per use)

Slide: Dr. Philipp Rüfenacht, Swiss and EU Patent Attorney

Why care about IP rights?

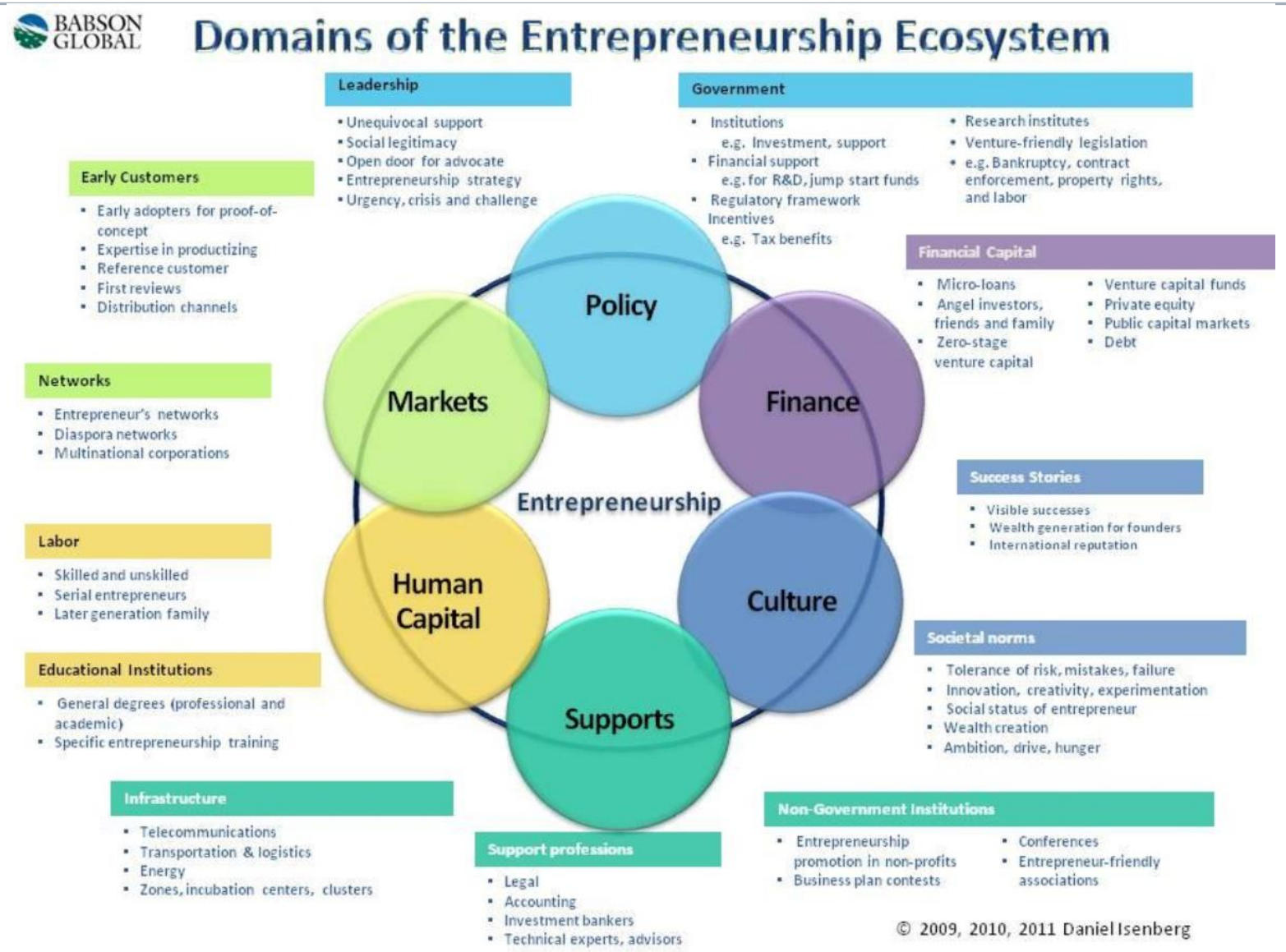


Slide: Dr. Philipp Rüfenacht, Swiss and EU Patent Attorney

A Digital Ecosystem

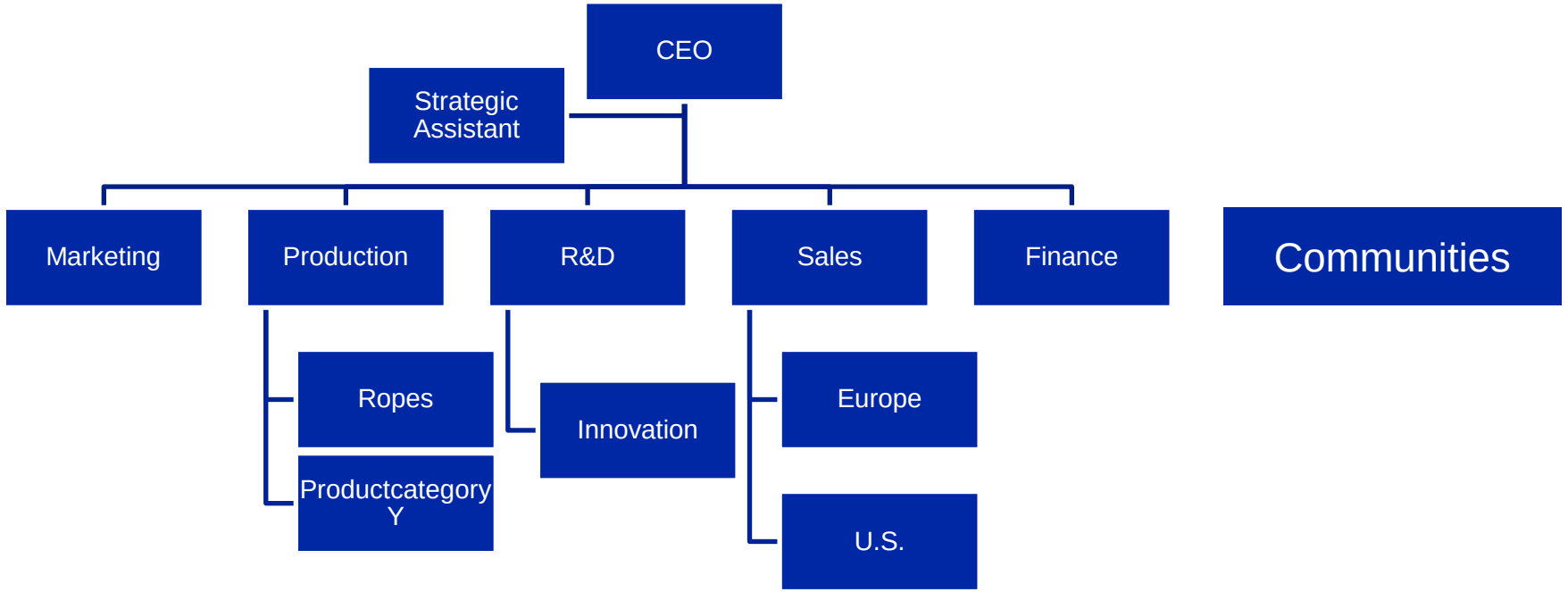
- Have a multi-disciplinary nature
- Are Highly complex
- With the help of computational intelligence, new self-properties environments (such as self-configuration, self-healing, self-management) are created and under steady change

International Conference on Management of Digital Ecosystems, http://medes.sigappfr.org/19/, Oct. 2020


BABSON GLOBAL
Domains of the Entrepreneurship Ecosystem
Leadership
• Unequivocal support
• Social legitimacy
• Open door for advocate
• Entrepreneurship strategy
• Urgency, crisis and challenge
Government
• Institutions e.g. Investment, support
• Financial support e.g. for R&D, jump start funds
• Regulatory framework Incentives e.g. Tax benefits
• Research institutes
• Venture-friendly legislation
• e.g. Bankruptcy, contract enforcement, property rights, and labor
Early Customers
• Early adopters for proof-of-concept
• Expertise in productizing
• Reference customer
• First reviews
• Distribution channels
Financial Capital
• Micro-loans
• Angel investors, friends and family
• Zero-stage venture capital
• Venture capital funds
• Private equity
• Public capital markets
• Debt
Networks
• Entrepreneur's networks
• Diaspora networks
• Multinational corporations
Policy
Markets
Finance
Entrepreneurship
Human Capital
Culture
Supports
Success Stories
• Visible successes
• Wealth generation for founders
• International reputation
Labor
• Skilled and unskilled
• Serial entrepreneurs
• Later generation family
Educational Institutions
• General degrees (professional and academic)
• Specific entrepreneurship training
Societal norms
• Tolerance of risk, mistakes, failure
• Innovation, creativity, experimentation
• Social status of entrepreneur
• Wealth creation
• Ambition, drive, hunger
Infrastructure
• Telecommunications
• Transportation & logistics
• Energy
• Zones, incubation centers, clusters
Support professions
• Legal
• Accounting
• Investment bankers
• Technical experts, advisors
Non-Government Institutions
• Entrepreneurship promotion in non-profits
• Business plan contests
• Conferences
• Entrepreneur-friendly associations
© 2009, 2010, 2011 Daniel Isenberg

Organizing Innovation

Companies need to focus on two key factors to break down silos and build strong personal working relationships: collaboration and commitment from top management

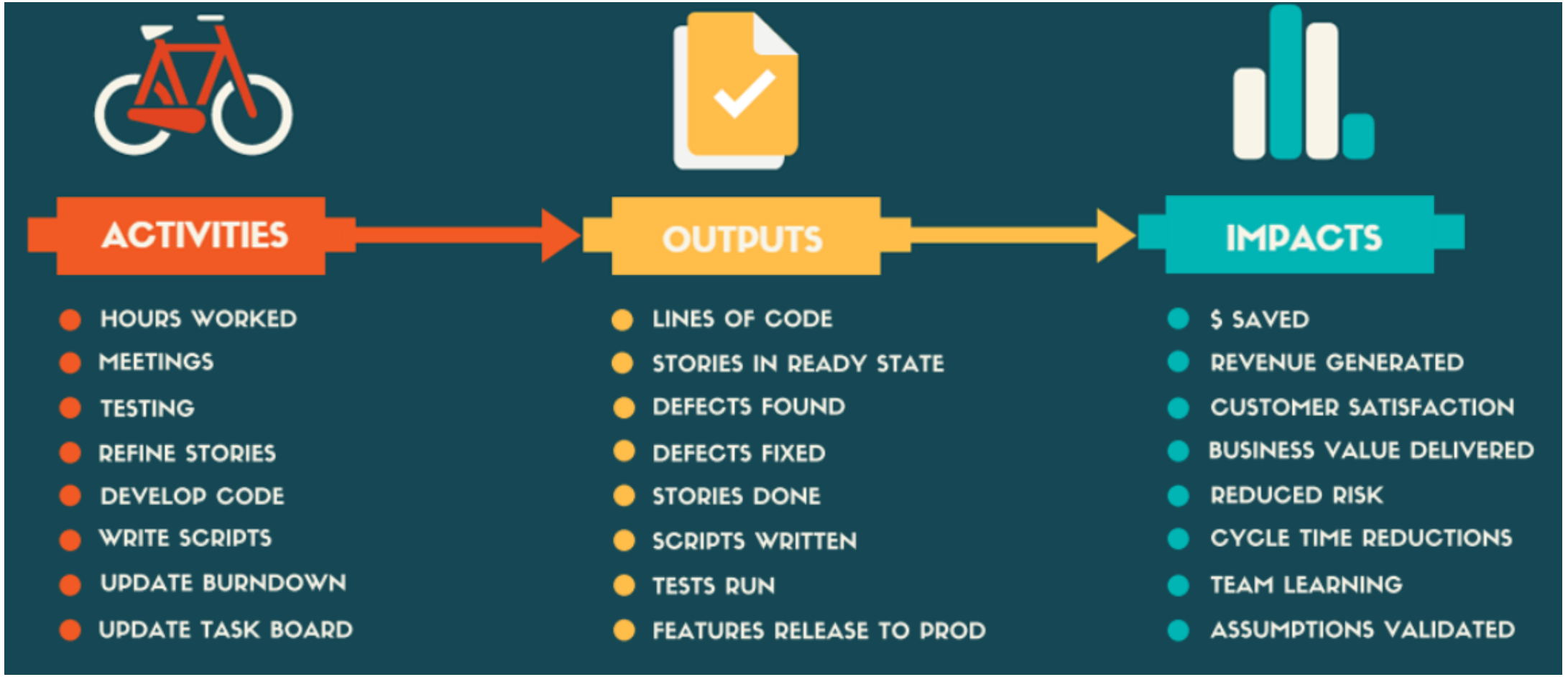


Innovation Process

There are five trademarks of agile organisation

	Trademark		Organizational-agility practices
Strategy	«North Star» embodied across the organizatin		Shared purpose & vision Sensind and seizing opportunities Flexible ressource allocation Actionable strategic guidance
Structure	Network of empowered teams		Clear, flat structure Clear acountable roles
Process	Rapid decision and learning cycles		Rapid interaction Standardized way of working Performance orientation («run / sprint»)
People	Dynamic people model that enables burning for passion		Enterpreneurial drive Cohesive Community Role mobility
Technology	Next-generation enabling technology		Next-generation technology development and delivery practices Evolving technology architecture,systems & tools

In Agile environments: stop measuring activities, start measuring impacts and outputs



https://vitalitychicago.com/blog/agile-teams-deciding-what-measure/, Nov. 2020

One Key Element: Balancing discovery and delivery skills in a team or company

- Associating
- Questioning
- Observing
- Idea networking
- Experimenting

- Analysing
- Planning
- Detail-oriented implementing
- Self-disciplined

Dyer, J.,Gregersen, H., Christensen, C., What do Highly Innovative Companies have in commen ? People, HBR, 2011, p. 10

From a space projects to *Outdooractive, the story of ExoLabs*

This project, which is the result of cooperation between the EcoVision Lab at the Swiss Federal Institute of Technology (ETH) Zurich and **the University of Zurich spin-off Exolabs**, aims to measure snow cover in the mountains in real time.

Innosuisse supports Swiss tourism with Deep Snow

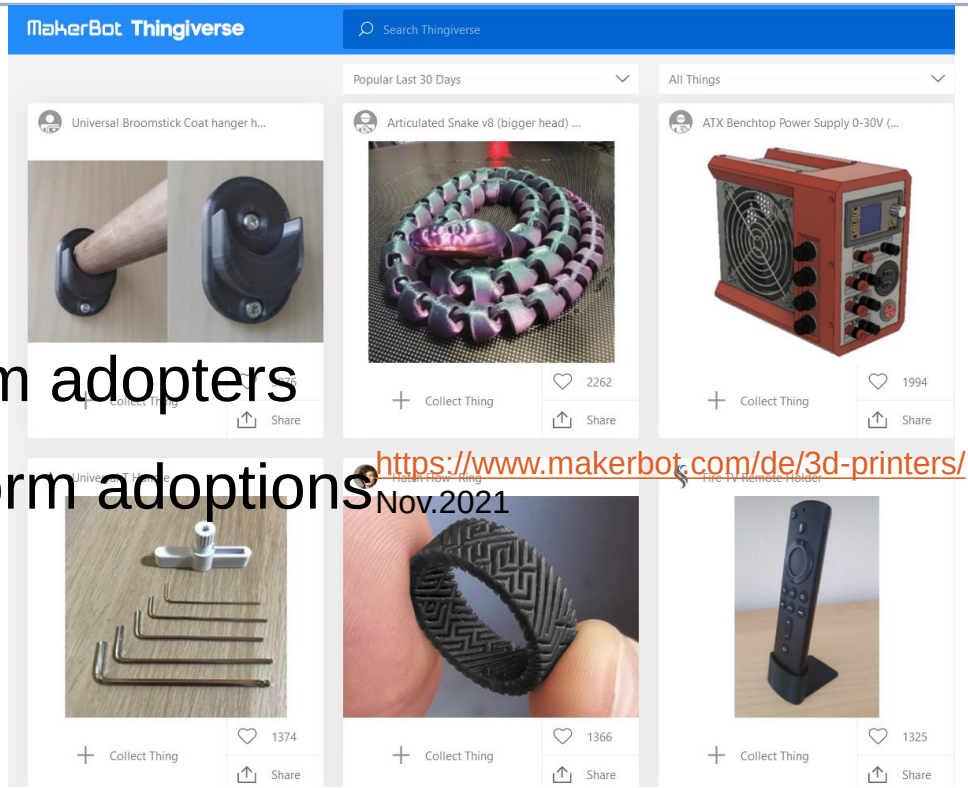
Innosuisse supports projects in a wide range of areas, including tourism in Switzerland. Deep Snow is a prime example of what the Swiss Innovation Agency can offer in terms of support. This project, which is the result of cooperation between the EcoVision Lab at the Swiss Federal Institute of Technology (ETH) Zurich and the University of Zurich spin-off Exolabs, aims to measure snow cover in the mountains in real time. Further project partner include the WSL Institute for Snow and Avalanche Research SLF, Outdooractive, and MountaiNow.

https://www.innosuisse.ch/inno/en/home/funding-business-information/funding-examples/innovation-projects/deepsnow.html, Nov. 2021

Distributed Innovation & Plattforms

Demand Side Evolution of Platforms

1. Structuring an external product «love group»
2. Transforming the love group into early platform adopters
3. Leveraging early adopters to accelerate platform adoptions



https://www.makerbot.com/de/3d-printers/, Nov.2021

Thingiverse

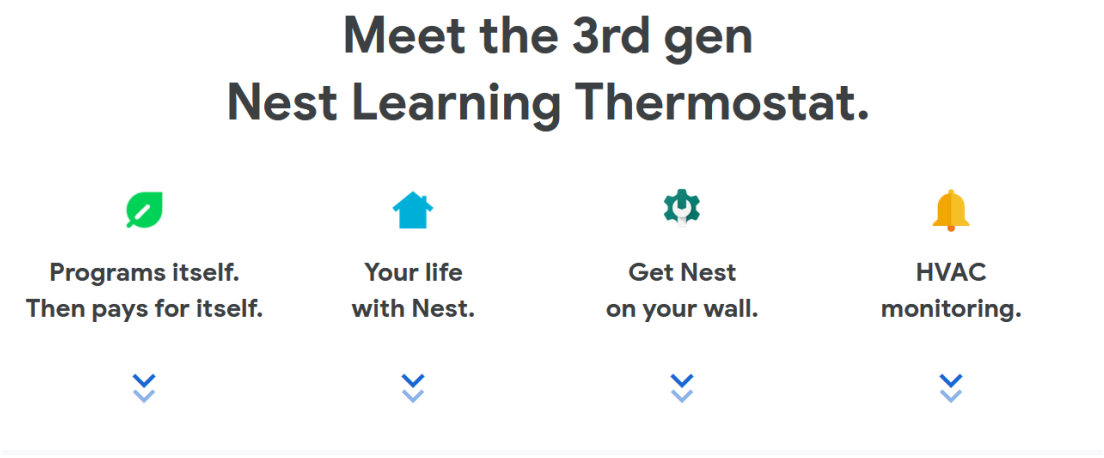
https://www.thingiverse.com/education, Nov. 2021

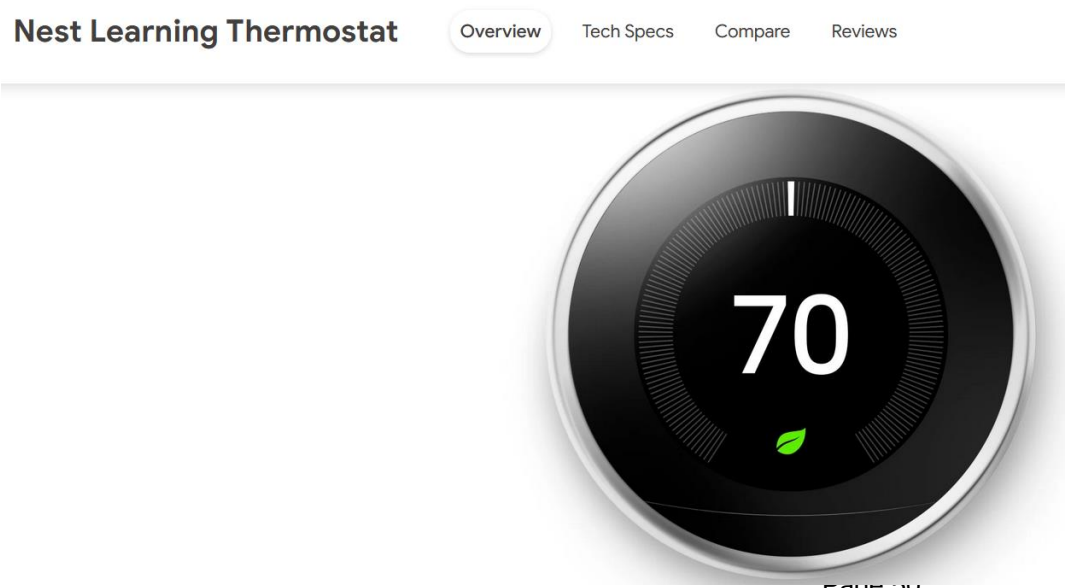
Similar to the Makerbot Example: Companies nurture their users' enthusiasm and support them through these three sages

Supply Side Evolution of Platforms

www.nest.com

1. Internal Product R&D and external complementors
2. Internal Product R&D and blended complementors and community management
3. Hybrid business model management





Disruptive Platforms can thrill whole industries

Product based disruption have a strong **«within the industry»** effect

– E.g. The battle for the «best» mobile phone – iPhone vs. Samsung vs. Huawai

Platform-based disruptions have effects not only inside the industry ut also well **beyond industry boundaries**

– They even can cause industries to collapse

– Even if a platform disruptor can be stopped (Napster) once the idea is out there is only a matter of time until someone other figures out how to commercializie it (in a more legal way: iTunes, Spotiy)

→ Another example: «the Netflix Case, presented by Lucas Thorbecke, Mario Viso & Jaroslaw Kusnierz

Vazquez Sampere, Juan Pablo, Why platform disruption is so much bigger than product disruption, Harvard Businss School Press, April 2016

Investing in Tech Startups is Different

- Very high rate of failures
  - Out of 10 investments, venture capitalists typically expect 1 to succeed, 2-3 to do pretty well, 6-7 to fail.
- The very best startup companies are hugely successful:
  High risk, high reward
  - Not just great businesses, but market-dominating near-monopoly platforms
  - Companies like Google, Facebook or Microsoft created 3+ billionaires and thousands of millionaires each
- Rapid boom-and-bust cycles

Combinatorial Innovation

Combinatory Innovation: Matching different theories, combining technologies, merging (digital) products

Technology is not linear, but rather combinatorial- driven by the combination of a whole lot of things.

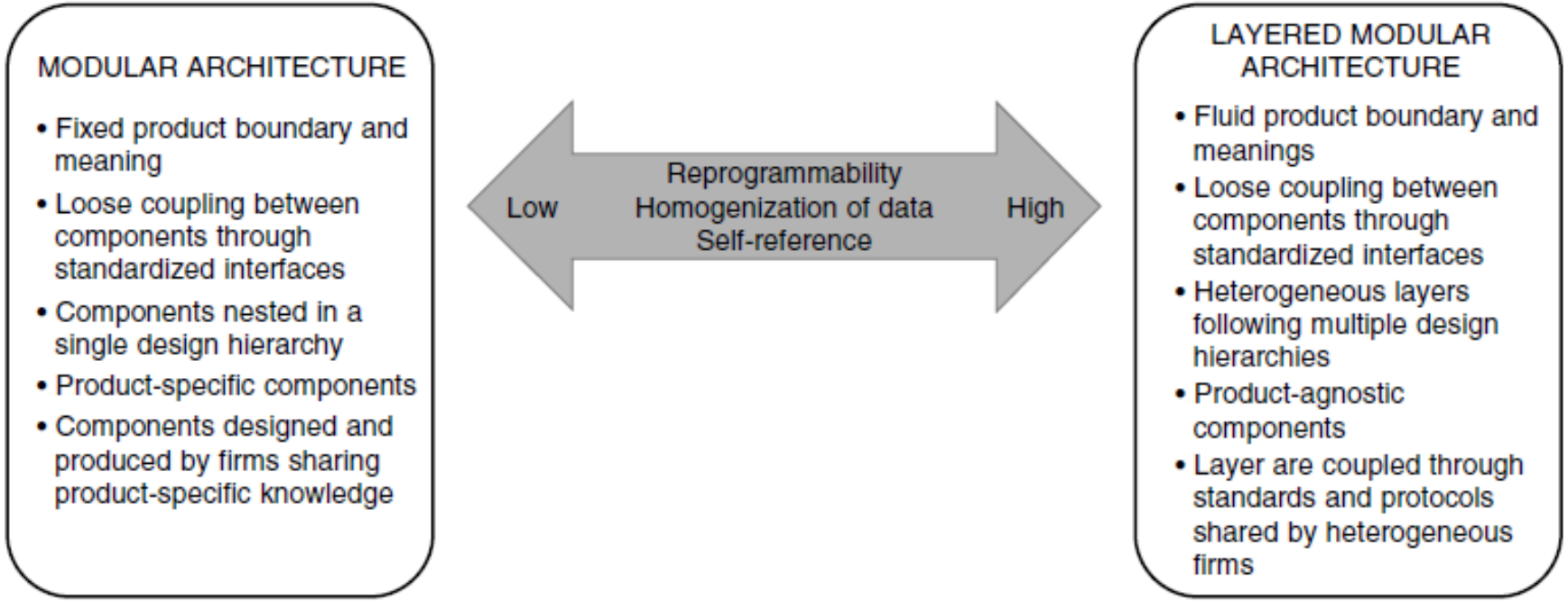
Arthur argues that technology 'builds itself organically from itself' in ways that resemble chemistry or organic life. ***And the significant point about combinatorial innovation is, it brings about radical discontinuities that nobody could have anticipated***.

W. Brian Arthur

http://tuvalu.santafe.edu/~wbarthur/Bio.htm

Arthur, W., Brian, The Nature of Technology: What it is and how it evolves, The Free Press, New York 2009

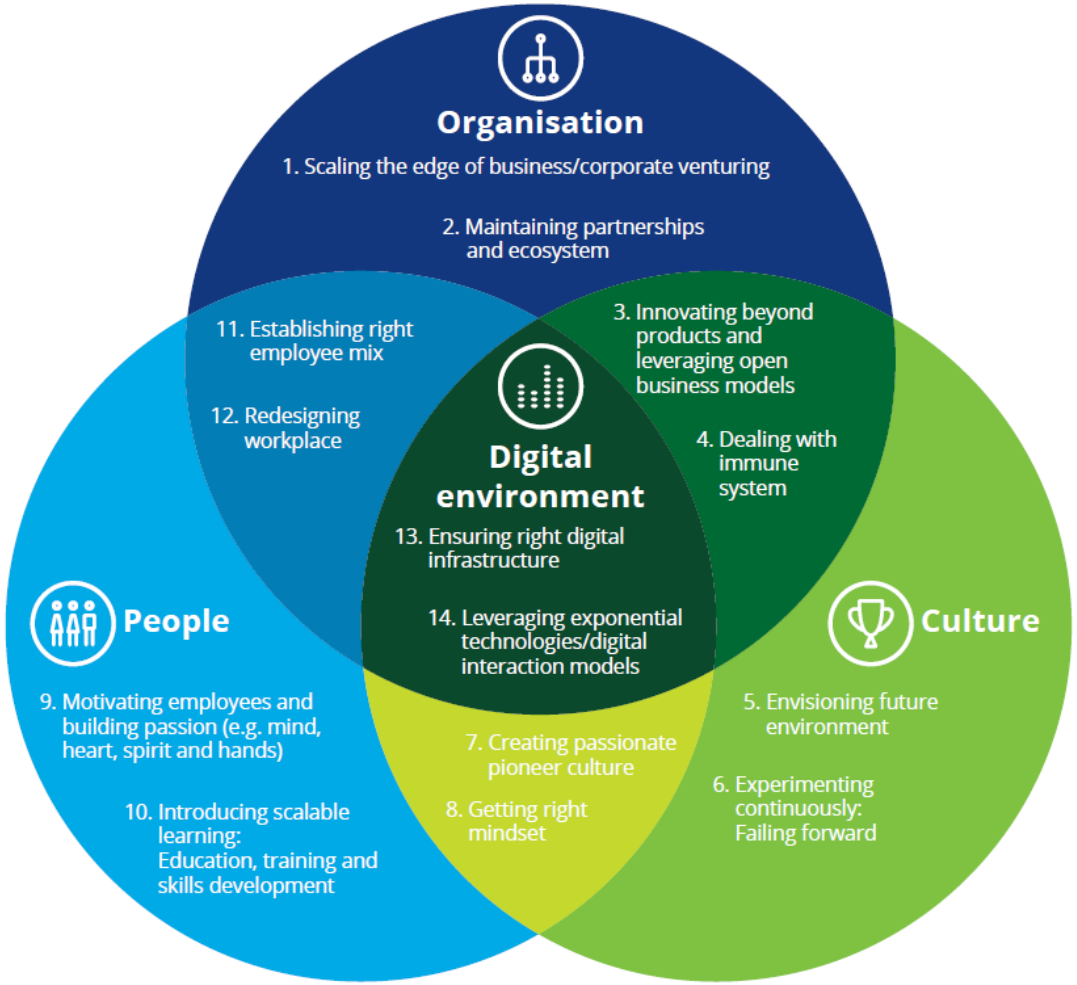
From modular architecture to layered modular architecture



It's not an «either or» but a fluid process

Yoo et al 2010, p. 729

Combinatorial Innovation – «putting all together»:



References

– All the literature used and cited in this course is listed on a seperate file on OLAT

Qestions & Answers

Picture from: https://blog.zoom.us/happy-holidays-2019-delivering-happiness/ Dez. 2020