Combinatorial Innovation

Lecture: Digital Innovation Fall 2021

Teaching Unit 13

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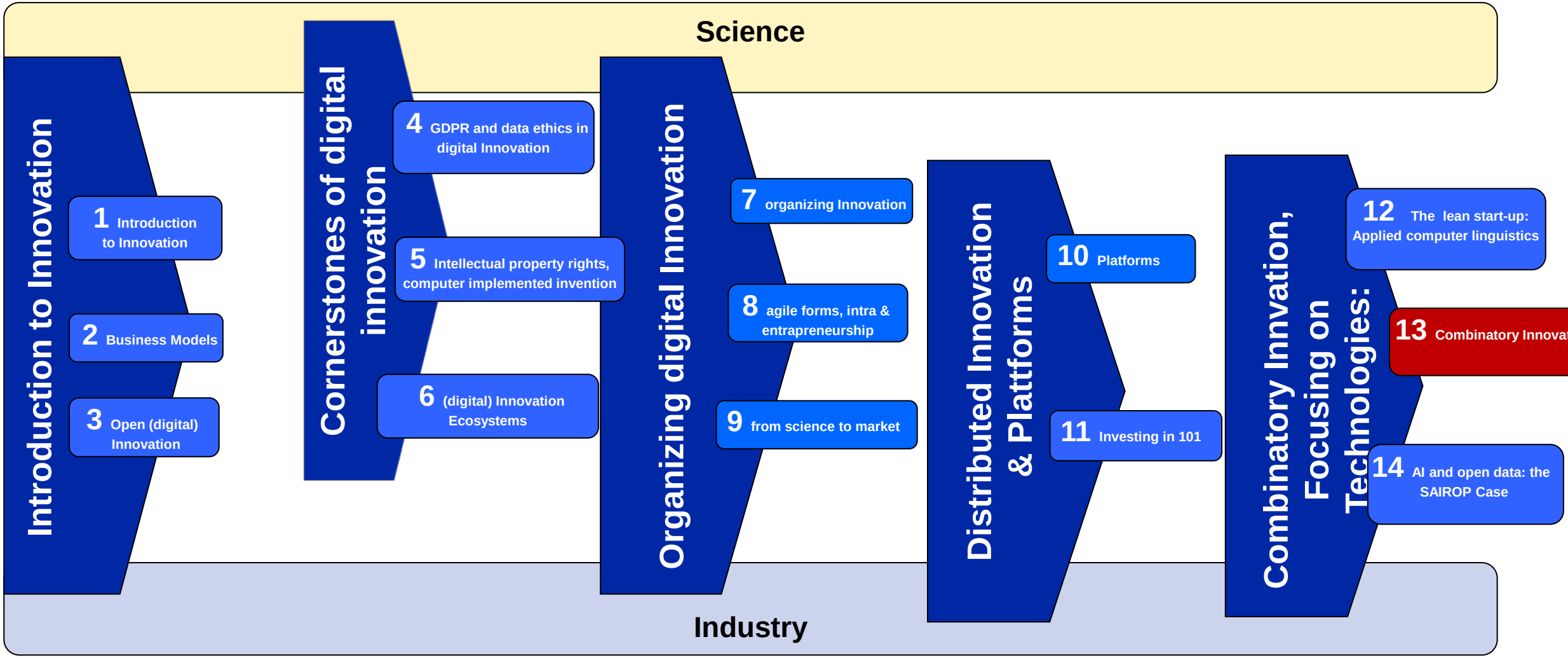

Science
Introduction to Innovation
1 Introduction to Innovation
2 Business Models
3 Open (digital) Innovation
Cornerstones of digital innovation
4 GDPR and data ethics in digital Innovation
5 Intellectual property rights, computer implemented invention
6 (digital) Innovation Ecosystems
Organizing digital Innovation
7 organizing Innovation
8 agile forms, intra & entrapreneurship
9 from science to market
Distributed Innovation & Plattforms
10 Platforms
11 Investing in 101
Combinatory Innvation, Focusing on Technologies:
12 The lean start-up: Applied computer linguistics
13 Combinatory Innovat
14 AI and open data: the SAIROP Case
Industry

Learning objectives

- Combinatorial Innovation is merely putting “different parts” together. You train on a Case how the different jigsaw pieces match together
- The significant point about combinatorial innovation is, it brings radical discontinuities that nobody could have anticipated

Table of Contents

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***.

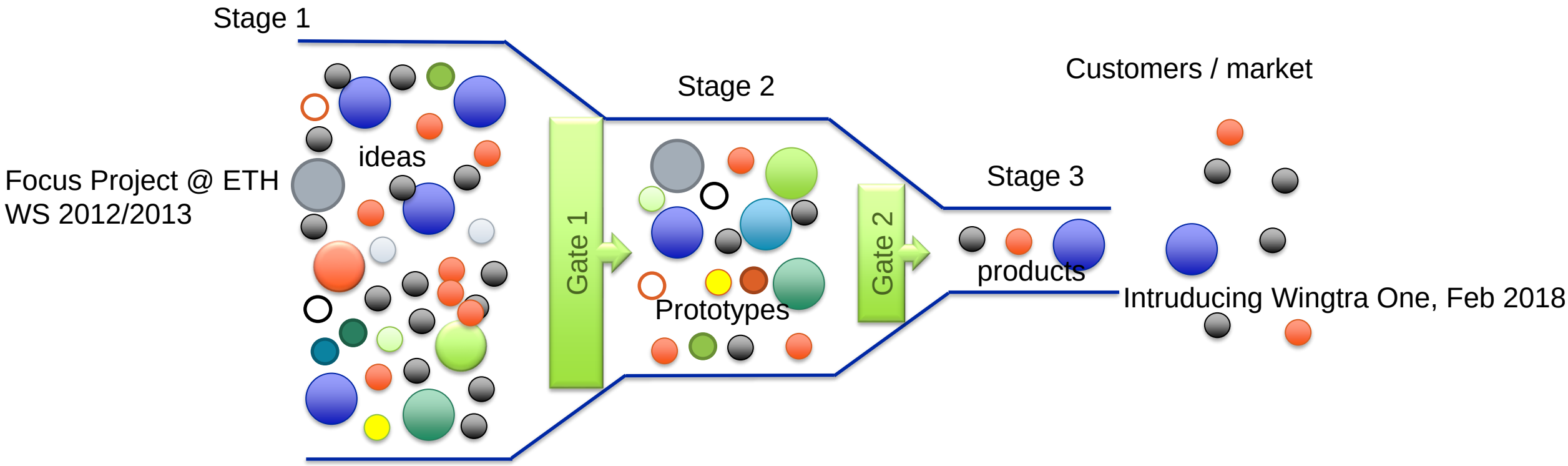
W. Brian Arthur

http://tuvalu.santafe.edu/~wbarthur/Bio.htm
Nov. 2019

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

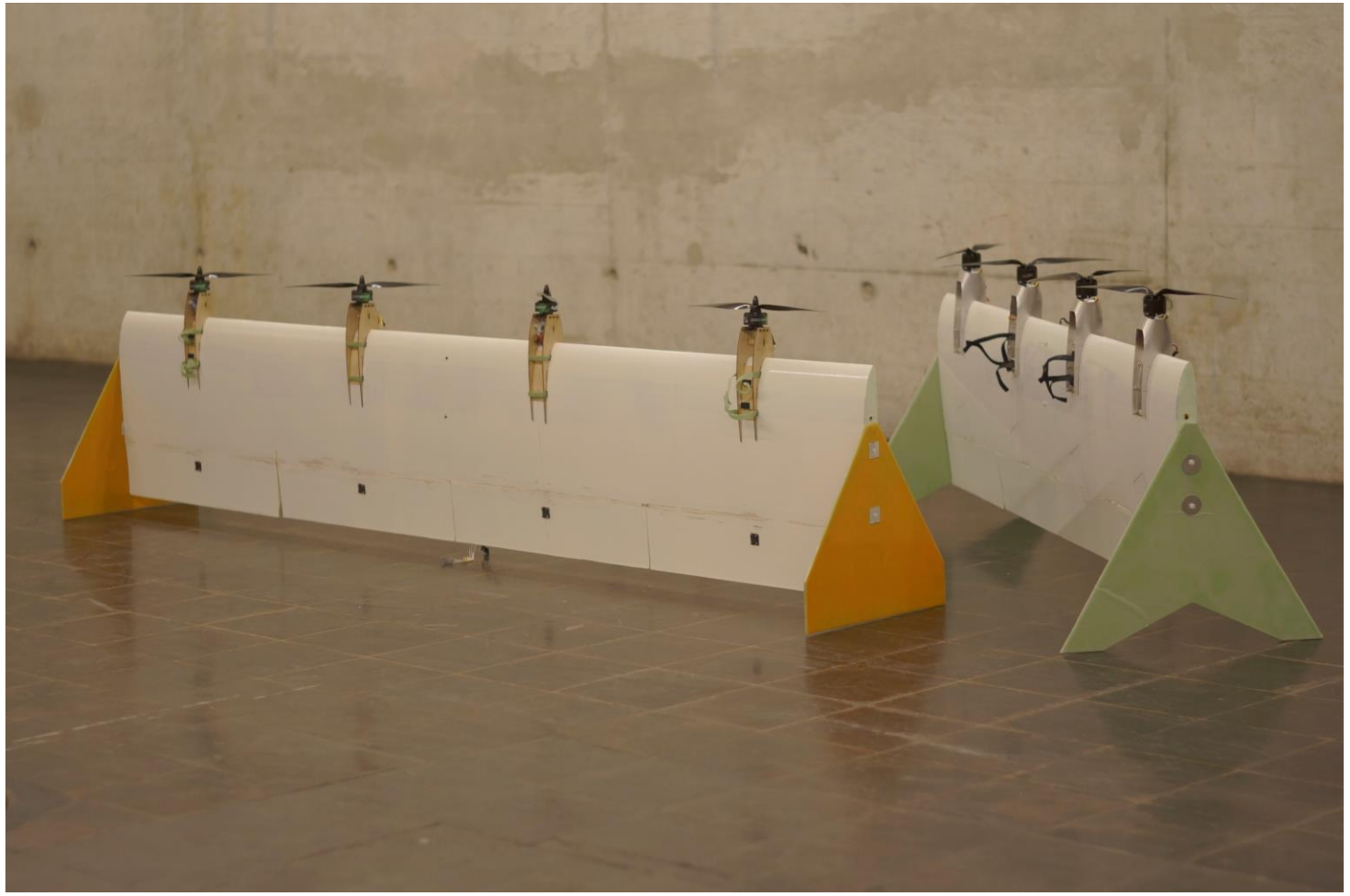
Table of Contents

The Wingra Innovation process



Developed by Robert G. Cooper

From the first prototypes (early 2013)



Picture: received from the Wingtra founding team, Max, Basil & Elias

To first proof of flight in 2015. .

https://www.youtube.com/watch?v=EeCbiTrFW6k

To Wingtra One Zero-Serie . .

https://www.youtube.com/watch?v=QADvPDWtgFU

Product launch in Feb 2018 – elected 2nd best start-up in September 2020

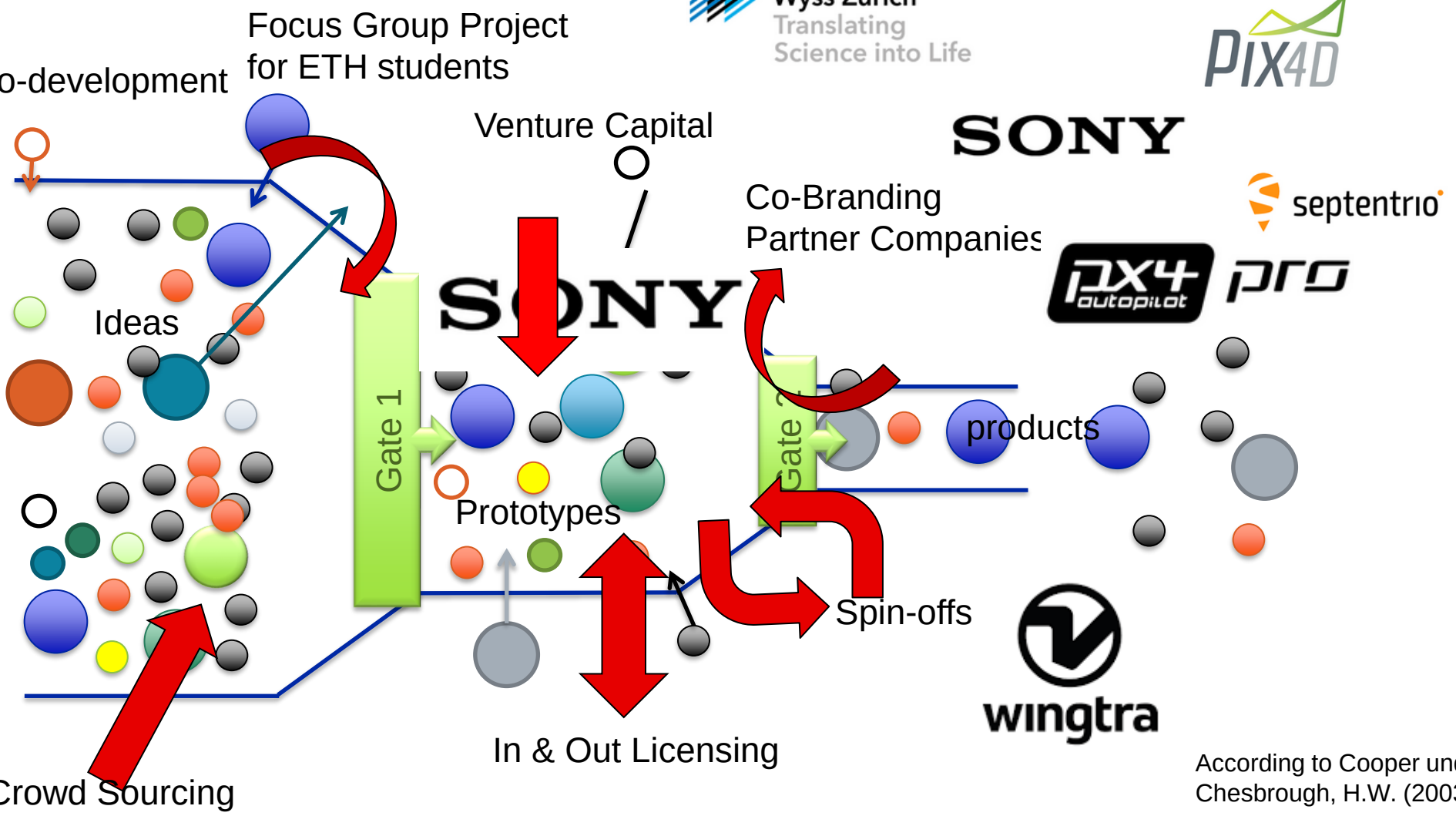
https://www.youtube.com/watch?v=KwkCgDMKTTs&feature=youtu.be, Dec 2021

https://www.venturelab.swiss/Wingtra-places-second-at-the-TOP-100-Swiss-Startup-Award-2020, Dec 2021

ETH Zürich
Autonomous Systems Lab

Wyss Zurich
Translating
Science into Life

PIX4D



SONY

septentrio

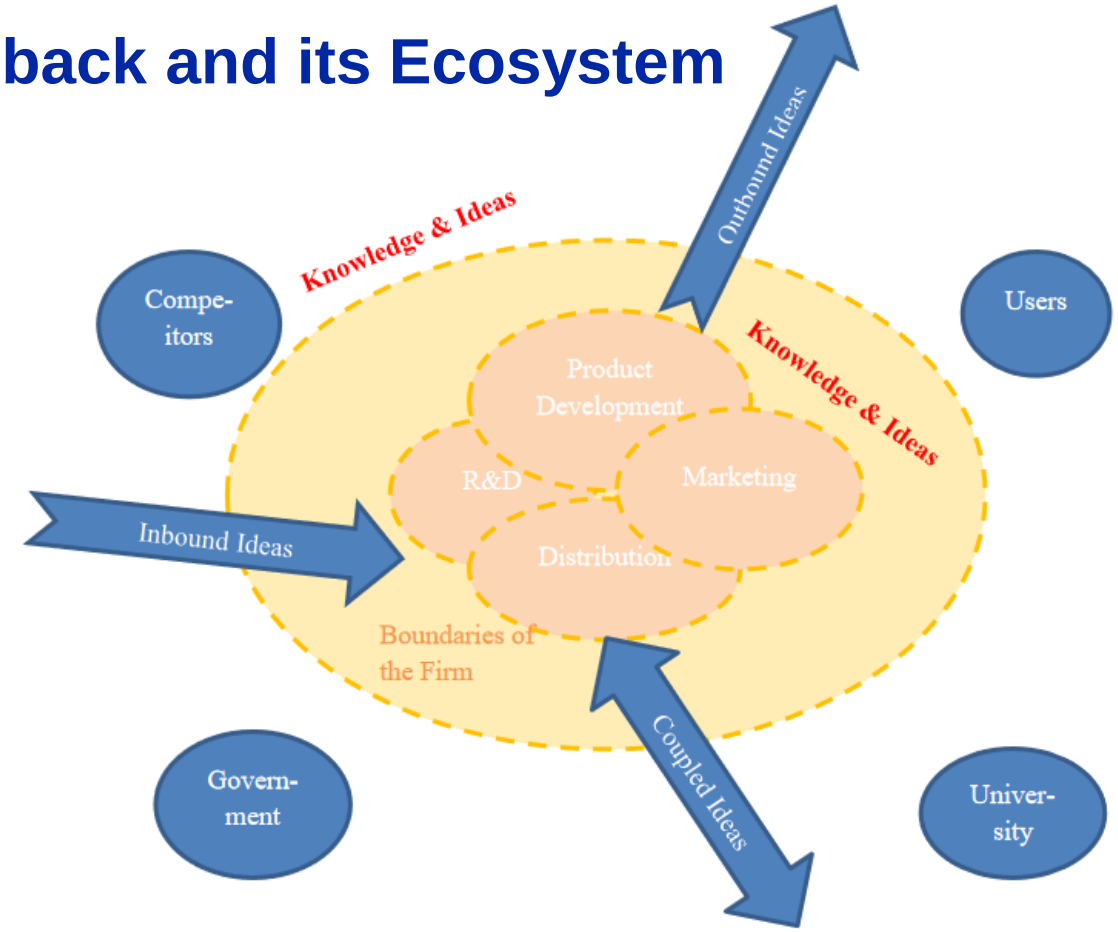
px4 autopilot pro

wingtra

venturelab

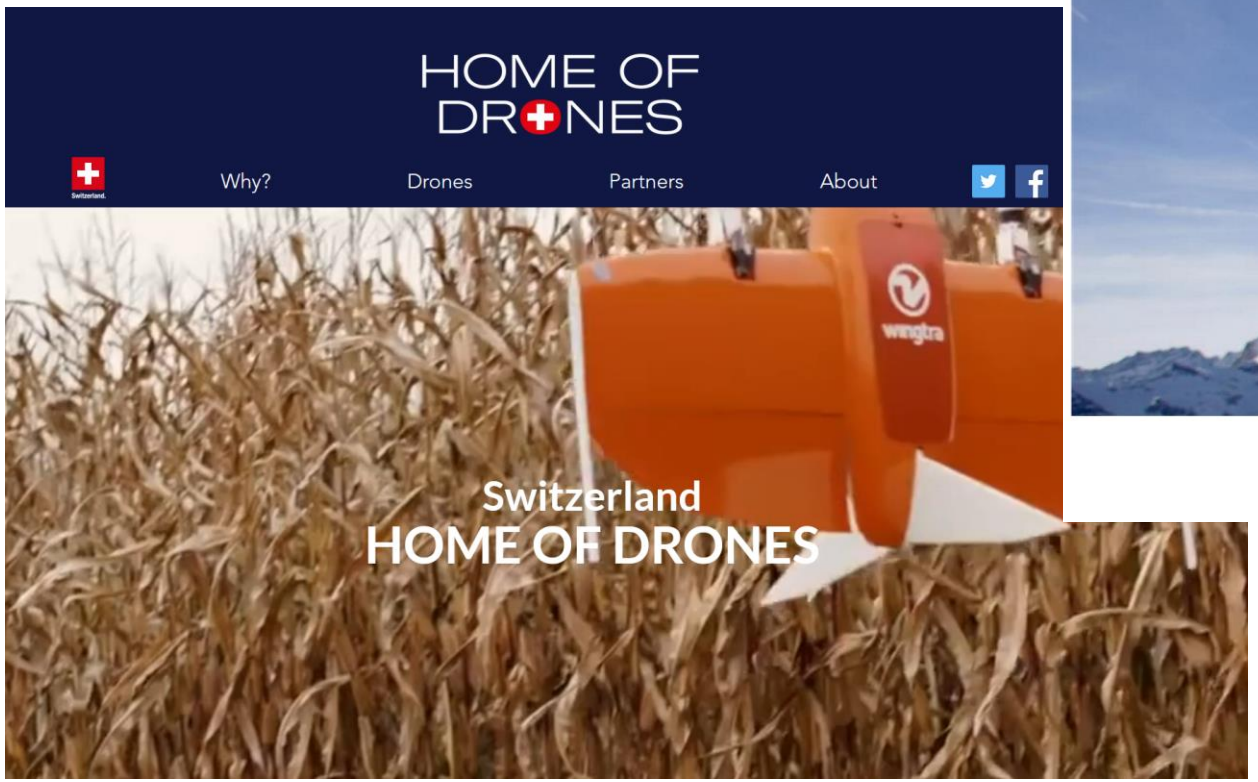
According to Cooper und Chesbrough, H.W. (2003)

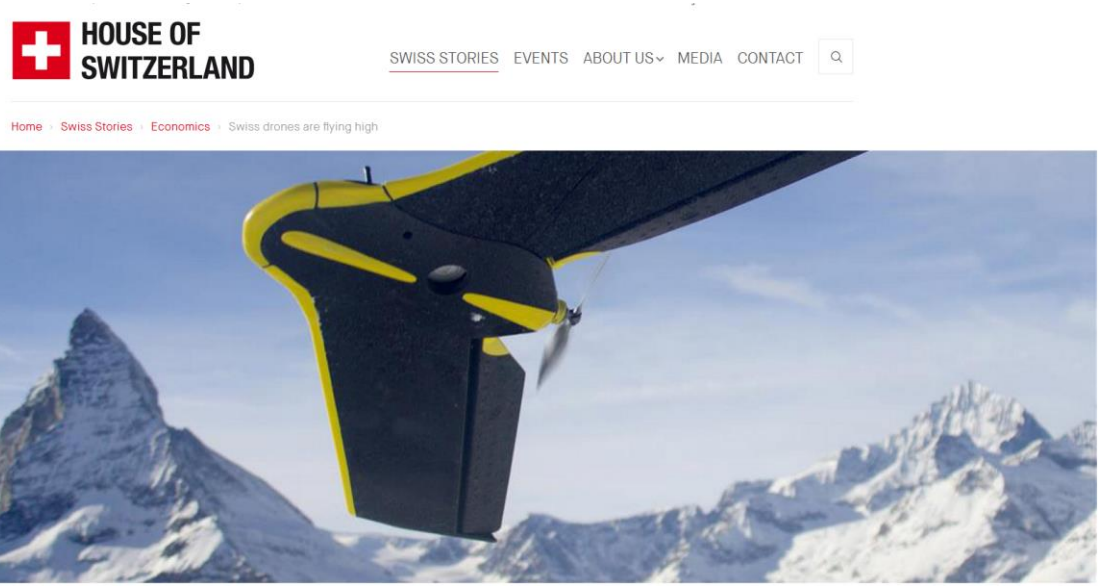
Open Innovation with Feedback and its Ecosystem



This is a generalization of the model described by Vanhaverbeke, Wim, Du Jingshu, Leten, Bart, Aalders, Ferrie, New Frontiers in Open Innovation, Chapter 6 Exploring Open Innovation at the Level of R&D Projects, Oxford University Press 2014

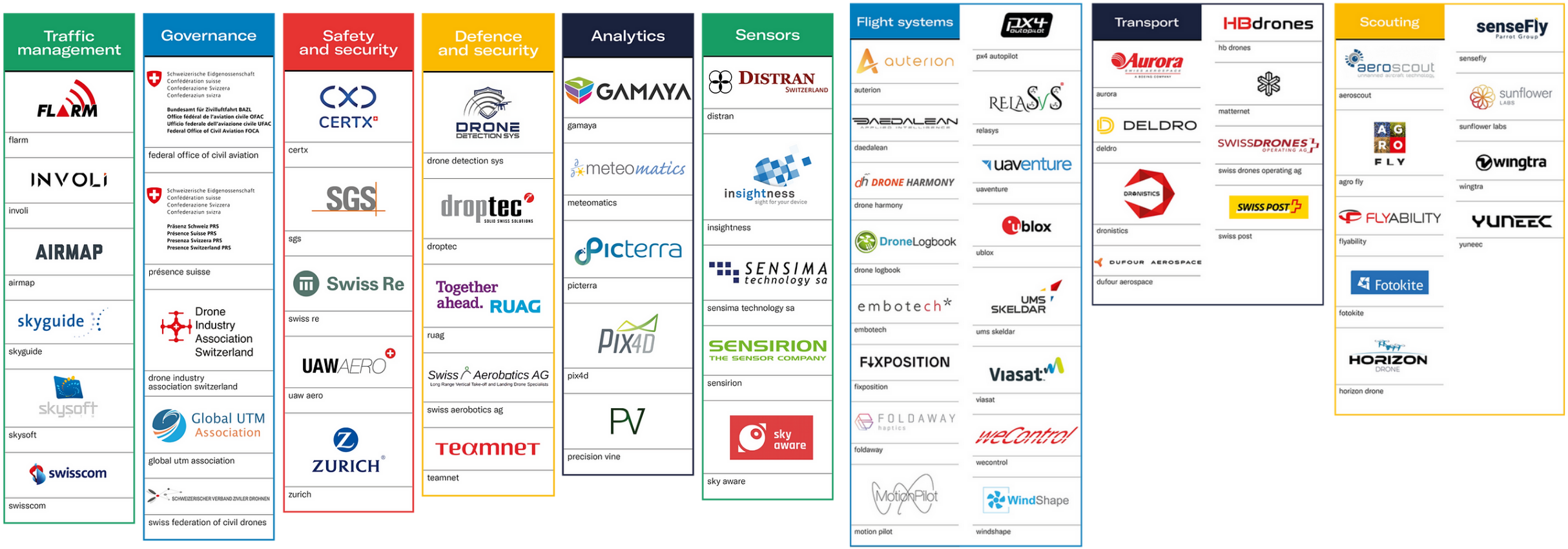
Switzerland's «home of drones»





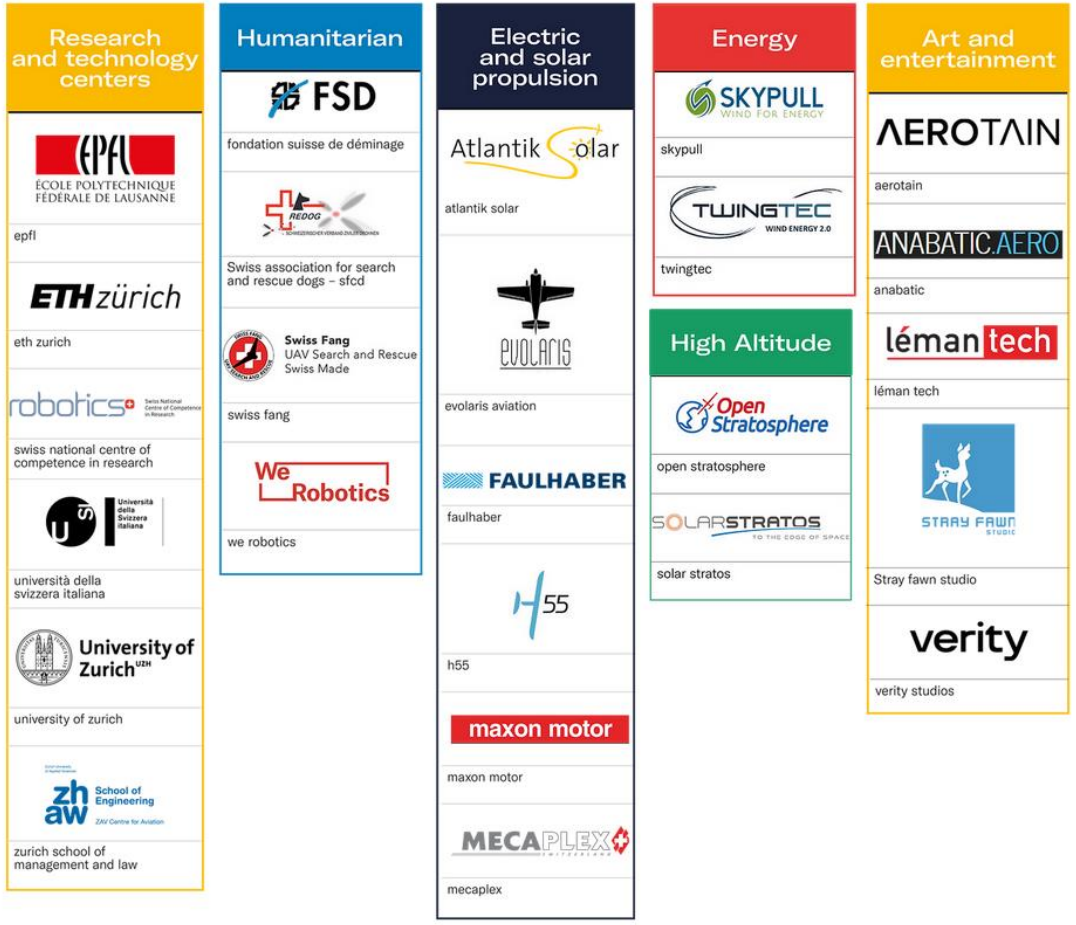
https://www.homeofdrones.org/ & https://houseofswitzerland.org/swissstories/economics/swiss-drones-are-flying-high both Nov. 2021

Switzerland's Ecosystem for Drones (1/2)



https://www.homeofdrones.org/ Nov. 2021

Switzerland's Ecosystem for Drones (2/2)



From modular architecture to layered modular architecture

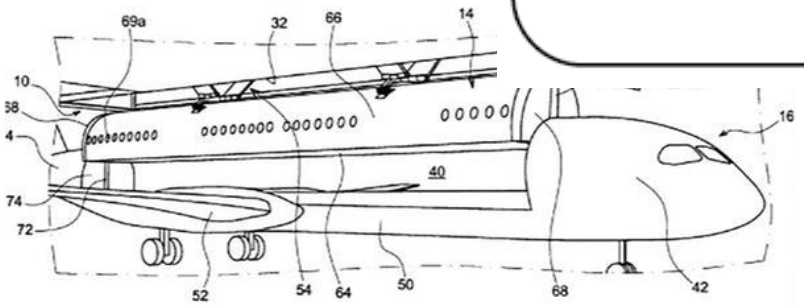
MODULAR ARCHITECTURE

- Fixed product boundary and meaning
- Loose coupling between components through standardized interfaces
- Components nested in a single design hierarchy
- Product-specific components
- Components designed and produced by firms sharing product-specific knowledge

Low — Reprogrammability, Homogenization of data, Self-reference — High

LAYERED MODULAR ARCHITECTURE

- Fluid product boundary and meanings
- Loose coupling between components through standardized interfaces
- Heterogeneous layers following multiple design hierarchies
- Product-agnostic components
- Layer are coupled through standards and protocols shared by heterogeneous firms



https://newatlas.com/airbus-patent-modular-aircraft/40660/ & https://wingtra.com/mapping-drone-wingtraone/
both Dec.2021, Yoo et al 2010, p. 729

Organizing Innovation – Agile & diverse Teams

Wingtra team in summer 2019, picture provided by the Wingtra team

Investing in digital Innovation

INVESTING

Swiss-based Wingtra raises €9 million for its VTOL mapping drone

BY SEN TEAM MAY 31, 2019

“The Swiss drone developer and producer, Wingtra Ltd., recently raised EURO 9 million to further scale its global business. The company leads the vertical take-off and landing (VTOL) drone industry and will use the funds to further grow their global footprint and push the limits in research and development “

- Zurcher Kantonalbank (existing investor)
- Credit Suisse Entrepreneur Capital Ltd.
- Investiere (now verve ventures) www.verve.vc
- private investors

https://startupeuropenews.eu/swiss-based-wingtra-raises-e9-million-for-its-vtol-mapping-drone/, Dec 2021

Table of Contents

Student videos: you may choose *one* Real Case and *one* Harvard Business School (HBS) Case to watch

- Real Case: Unified Payment Interface
- Real Case: Sepia NFT
- Real Case: helpful ETH

- HBS: The Netflix Case
- HBS : The third wave of AI
- HBS : Google and the Niantic Lab
- HBS: Amazon, Google and Apple; Smart Speakers and the battle for the connected home

"And the crucial thing about combinatorial innovation is that it involves radical discontinuities that no one could have foreseen."

Analyze the two videos you have selected:

Where do you see hints or conditions which at first was a "simple merging of what was known" and in a retrospective turned out to be a radical discontinuity / radical innovation? Briefly justify your answer
If this question does not apply to your selection of videos, also justify your answer.

You find the videos on OLAT (Materials/Assignments/Videos)

Table of Contents

Summary

- Combinatorial Innovation is merely putting “different parts” together. You train on a Case/MVP how the different jigsaw pieces match together
- The significant point about combinatorial innovation is it brings radical discontinuities that nobody could have anticipated
- A cornerstone in the development of digital innovation and specially for combinatorial innovation is the modular layered architecutre. There are two critical separation between device and service because of the re-programmability and between network and contents because of the homogenization of data.
- In Switzerland, about 70% of all Innovation efforts are combinatorial innovation projects

References

- Gabison, Garry, Pesole, Annarosa, An Overview of Models of Distributed Innovation; JRC Science and Policy Reports, European Community 2014, http://publications.jrc.ec.europa.eu/repository/bitstream/JRC93533/jrc93533_ap.pdf, Dec. 2021
- Holm, Kathleen, Combinatorial Innovation, Blog https://nhsaccelerator.com/insight/combinatorial-innovation-collaboration-key-successfully-embedding-new-technologies-nhs/, Dec. 2021
- Vanhaverbeke, Wim, Du Jingshu, Leten, Bart, Aalders, Ferrie, New Frontiers in Open Innovation, Chapter 6 Exploring Open Innovation at the Level of R&D Projects, Oxford University Press 2014

https://www.top100startups.swiss/Wingtra

Picture: GSchwarz