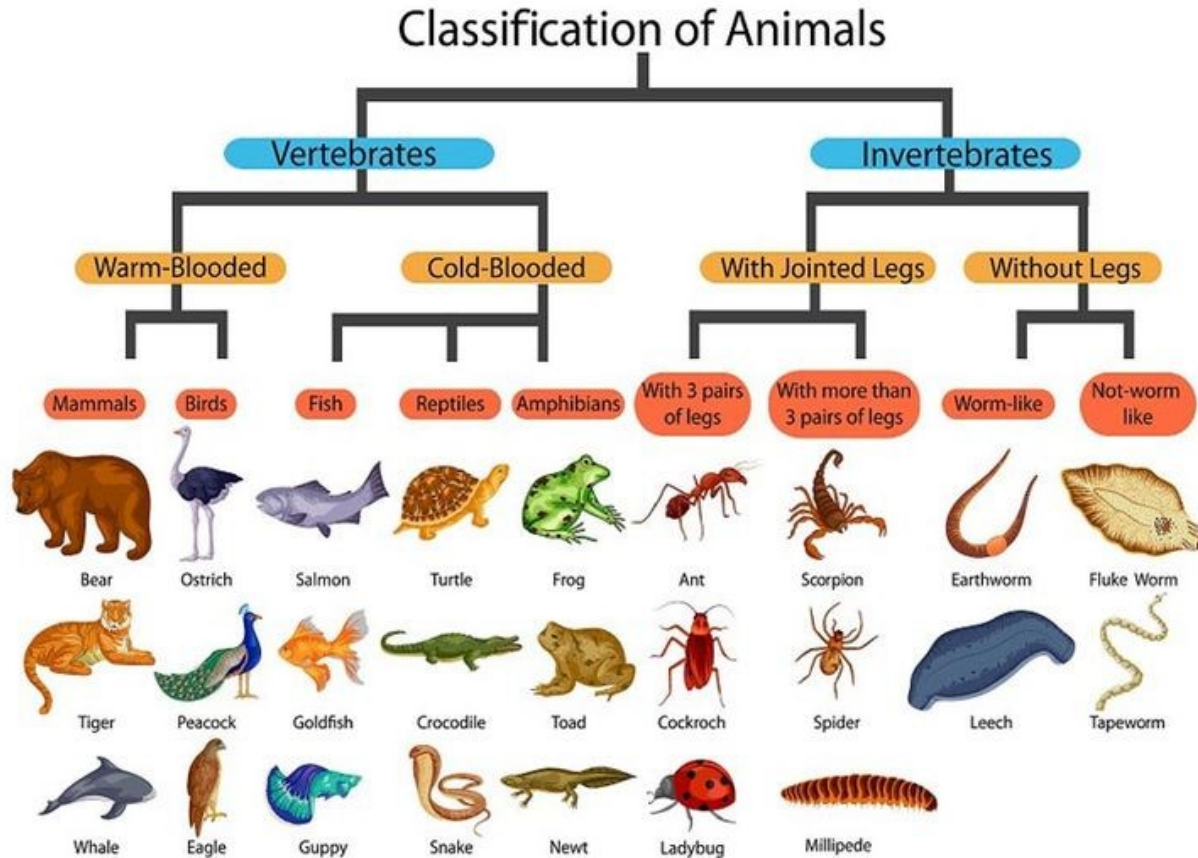


An Innovation Ecosystem to encourage Cybersecurity by Design?

Reid Derby, CyNam
12 Nov 2024



If you could be an animal, what type would you be?



Eurasian Beaver

Castor fiber

Although short-sighted it is believed beavers can see colour. They also have a third, clear eyelid, (nictating membrane) which allows them to see underwater.

Vital for finding food, identifying family members and detecting danger, a beaver's sense of smell is it's most important and one of its strongest senses.



Beavers teeth are reinforced with iron which gives them their distinctive orange colour and allows them to gnaw through wood.



28 European countries have reintroduced beavers since the 1920's. The European population is estimated at 1.5 million individuals but Britain only has an estimated 2,000.

An excellent sense of hearing both on land and underwater allows them to identify predators and family. The inner ear is full of dense fluffy hairs which trap air and prevent water from getting in.



With a lung capacity roughly 3 times that of an adult human beavers can remain underwater for up to 15 minutes at a time.



Beaver fossils and other archaeological remains have been discovered at 104 different sites across Britain.

Up to
1.5 feet
(0.5m)



Large, flat and scaly tail mainly used as a rudder when swimming. Also used to slap the water's surface to deter predators and notify other beavers of danger.

Up to
4.3 feet (1.3m)



Hand-like forepaws allow beavers to easily grasp food and materials. But unlike us it is the outer digit of the hand which is opposable (imagine your thumb and pinky swapped places).



Large webbed hind feet (up to 7 inches) which are mainly used to propel beavers through water up to speeds of 5mph.



Out of 4,660 known species of rodent, the beaver is second only to the Capybara from South America in size.

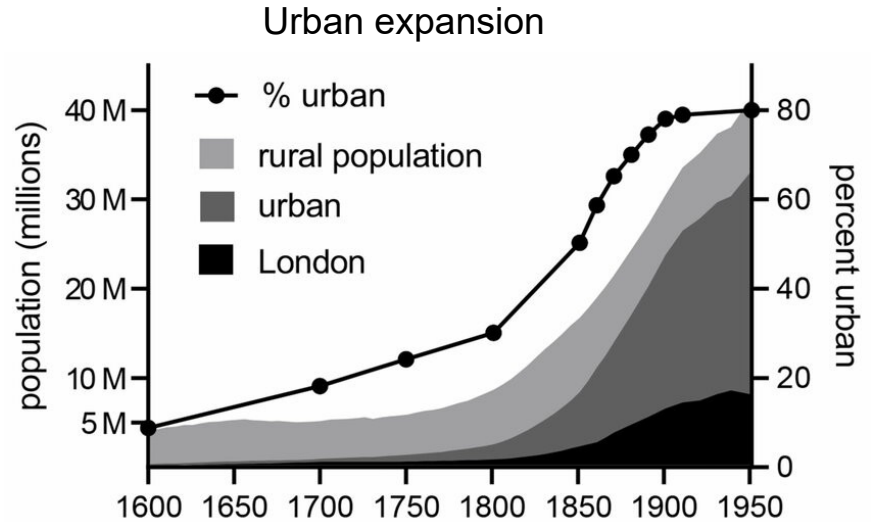
What caused the decline of beavers in the UK?



Deforestation



Monoculture Farming



Beaver was hunted for meat and fur



And Castoreum – secreted from beaver castor sacs



By H. Zell - Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=19881156>



Depiction of a beaver hunt in the 13th Century Salisbury Bestiary, British Library

The Return of the European Beaver



Beavers have existed in Europe for more than 30 million years and populated almost the entire continent. But from the 12th century onwards, these large rodents experienced a sharp population decline due to the deterioration of their habitats and the extensive hunting of fur, meat* and castoreum**. At the beginning of the 20th century, only about 1200 animals had survived in 8 isolated regions of Eurasia. Today, more than 1 million animals are estimated in Europe, and populations are increasing again.

* During the Council of Constance (1414–1418) it was decided that beavers had enough resemblance to fish to be eaten during Lent. This resulted in a number of recipes with "beaver's tail", which was prepared like fish and eaten during fasting or on Fridays.

** Castoreum is a strong-smelling secretion from the beaver's castor sacks used as a medicine and basic aroma in perfumes. It is also believed to act as a potency enhancer and aphrodisiac.

In an effort to supplement the almost extinct beaver population, 7 North American beavers were released in Finland in 1937. By 1973 it turned out that North American beavers belonged to another subspecies (*Castor canadensis*) than Eurasian beavers (*Castor fiber*) with 40 instead of 48 chromosomes. Due to its slightly higher reproduction rate, the North American beaver is slowly displacing its Eurasian competitor. It is since discussed to eradicate the alien species.

Eurasian beavers are the largest rodents native to Eurasia. They weigh 11–30 kg and measure 105–150 cm from head to tail. As a "water body designer", the beaver changes the landscape, creates habitats for numerous other species and improves water quality. In beaver regions there is usually a higher biodiversity of insects, amphibians, birds and fish. Because of these design activities, it is considered a "key species" of semiaquatic ecosystems.

- Historic distribution of Beavers (12th century)
- Relict populations (beginning of 20th century)
- Today's spread of the Eurasian beaver (*Castor fiber*)
- Today's spread of the North American beaver (*Castor canadensis*)

100
animals survived in the Telemark region (South Norway)

200
animals survived along the Elbe (Central Germany)

30
animals survived along the Rhone (South France)

290
animals survived along the Neman and Dnepr rivers (Belarus and Ukraine)

70
animals survived along the Don river (Russia)

Another **500**
animals survived in three separate populations in Siberia and China

Sources:
 Basemap: Natural Earth | Hillsshade by Esri, Arbus, ES, USGS, NOAA, NASA, CNR, N Robinson, NCEM, NOAA, NOAA, GeoDataLynx, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community
 Thematic data:
 D. Halley, Norwegian Institute for Nature Research, Telemark personal communication
 D. Halley, F. Rossi & A. Savolejko, 2018
 E. Veron, 'Histoire biogéographique du Castor d'Europe, Castor Fiber (Rodentia, Mammalia)', 1992

The effects of beaver reintroduction into an ecosystem



PHYSICAL CHANGES

Stream alteration

- Reduced current velocity
- Raised water table
- Increased water surface area & depth
- Increase in sediment trapping
- Reduction of turbidity downstream
- Improved regulation of stream acidity
- Diversification of river bank structure
- Increase in woody debris

Riparian zone alteration

- Felling of the trees
- Increase in open canopy area

EFFECTS ON BIODIVERSITY

- Creation of habitat mosaic
- Increase in pond, pond edge, and dead wood inhabiting species
- Provision of food source and cover for adult and juvenile fish
- Promotion of regeneration of target species (e.g. willow)
- Enhanced understory diversity in riparian zone

EFFECTS ON ECOSYSTEM FUNCTIONS

- Increased water storage
- Flood control
- Erosion control
- Increase in available N and P
- Enhanced nutrient cycling
- Mediation of water temperature
- Increased ecosystem resistance to disturbances

TYPES OF ECOSYSTEM



FOREST ECOSYSTEM



GRASSLAND ECOSYSTEM



MOUNTAIN ECOSYSTEM



DESERT ECOSYSTEM



RIVER ECOSYSTEM



OCEAN ECOSYSTEM



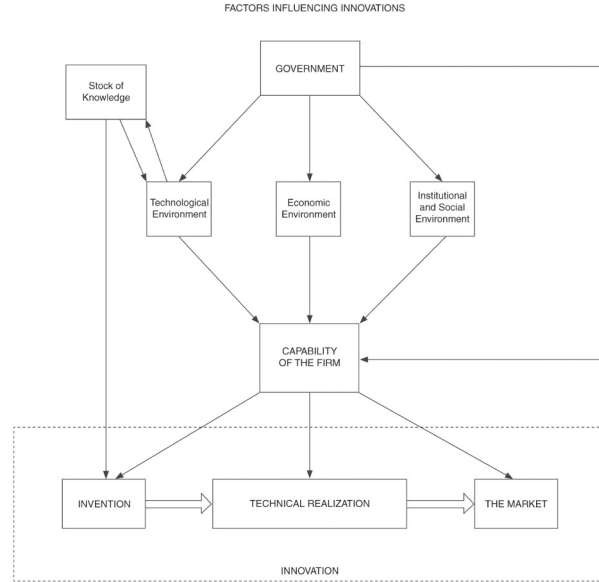
POND ECOSYSTEM

WHEN YOU TAKE A METAPHOR



LITERALLY

What is an innovation (eco)system?



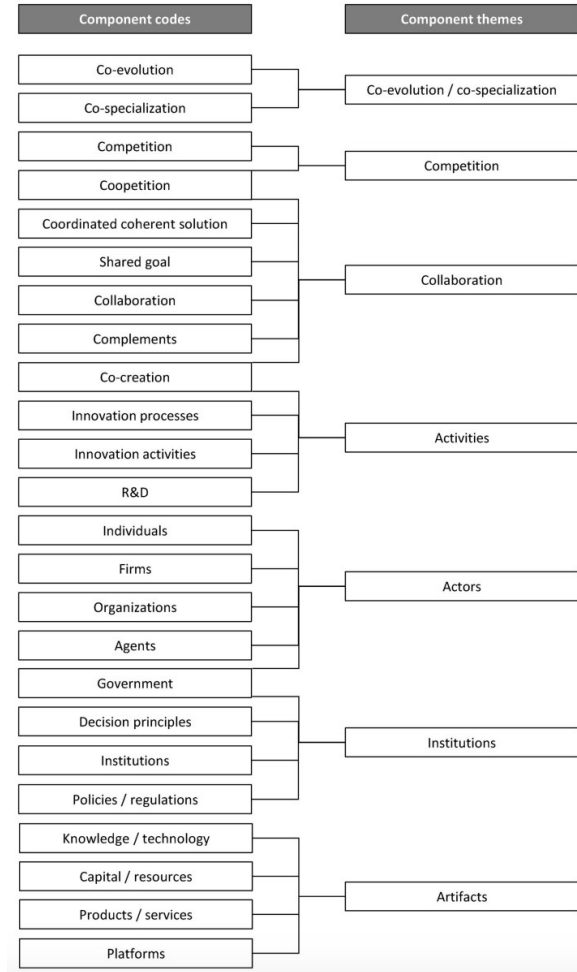
Harvard Business Review www.hbrreprints.org

HBR SPOTLIGHT

Successful innovation requires tracking your partners and potential adopters as closely as you track your own development process.

Match Your Innovation Strategy to Your Innovation Ecosystem

by Ron Adner

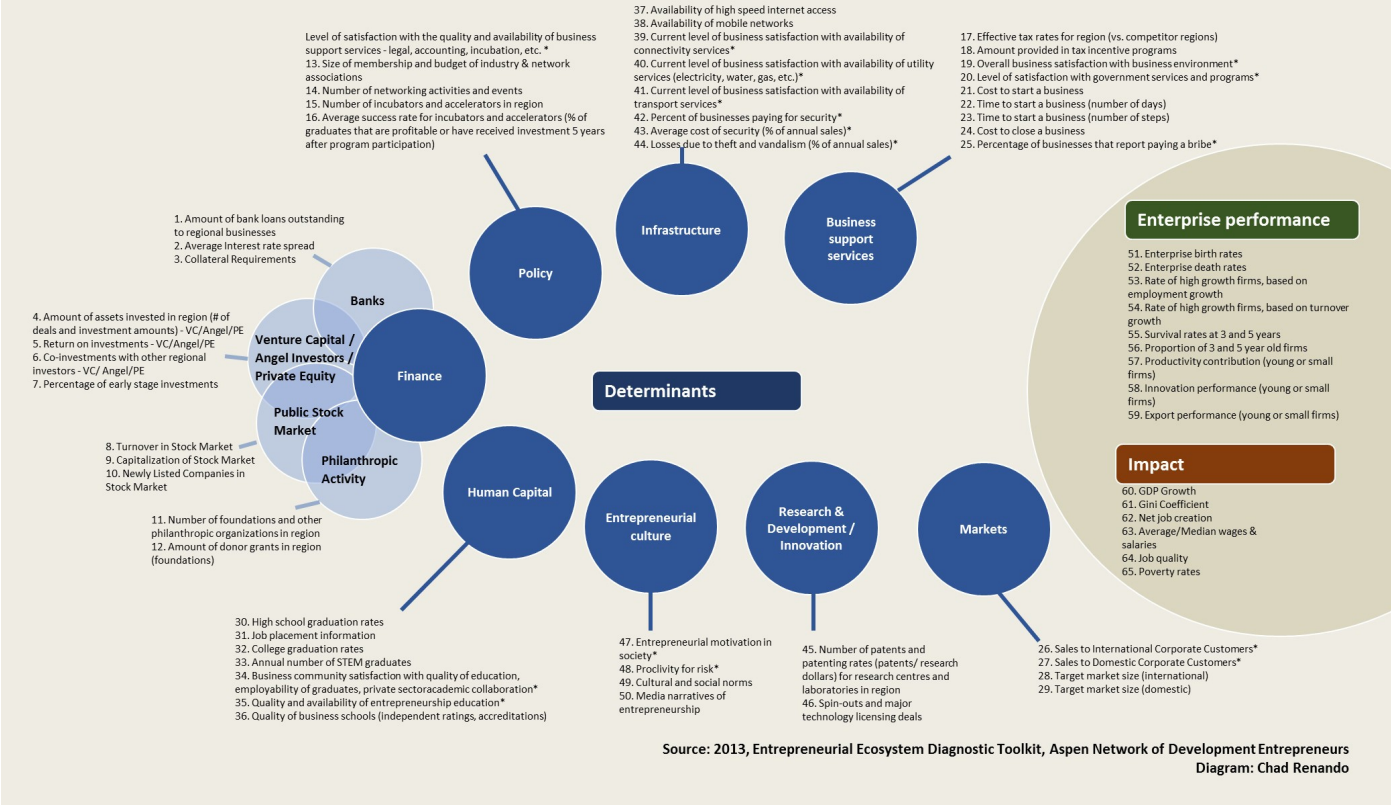


Model 1: Measuring Entrepreneurial Ecosystem Vibrancy, the Kauffman Foundation

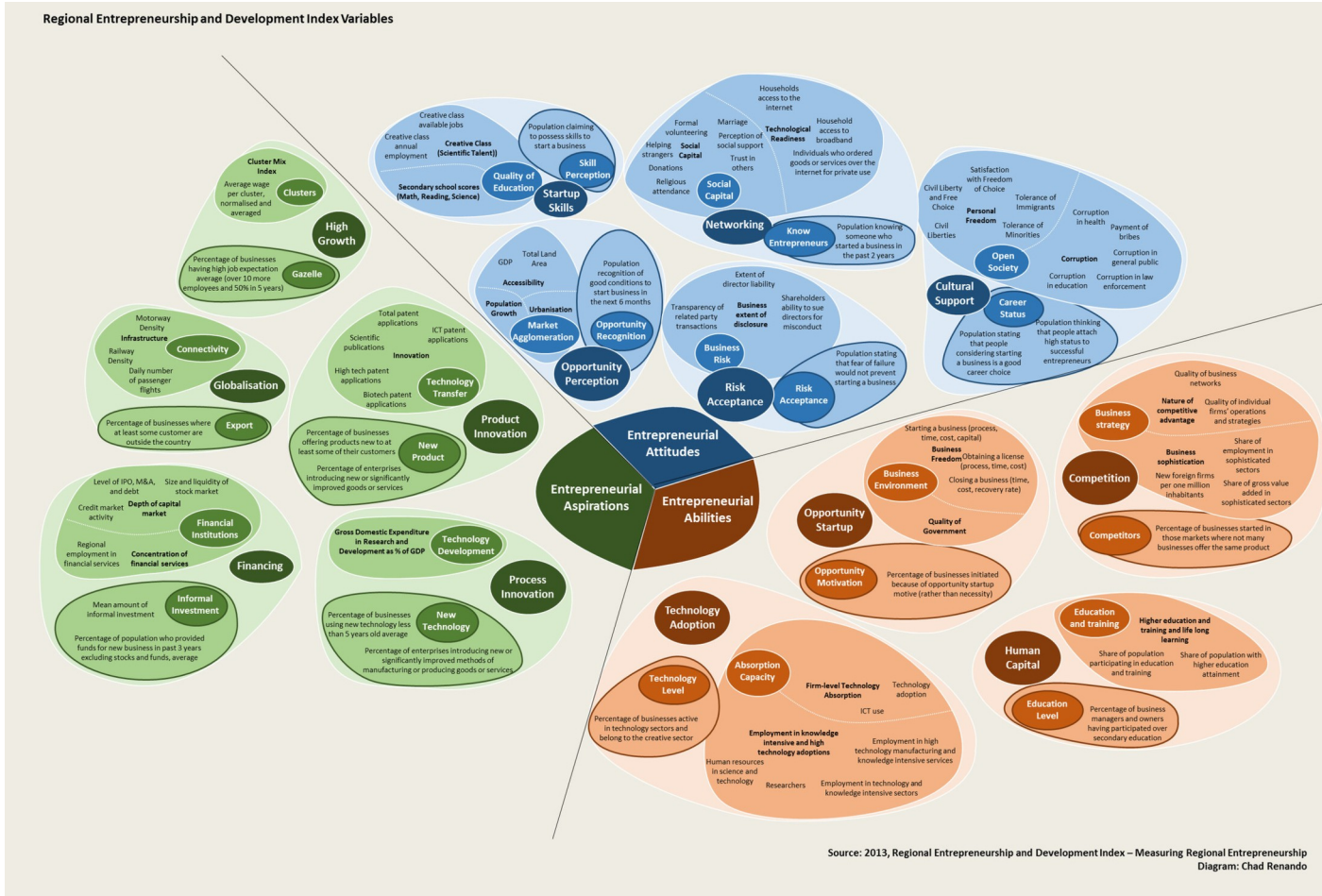


Model 2: Entrepreneurial Ecosystem Diagnostic Toolkit, the Aspen Network of Development Entrepreneurs

Indicators for Assessing Entrepreneurial Ecosystems



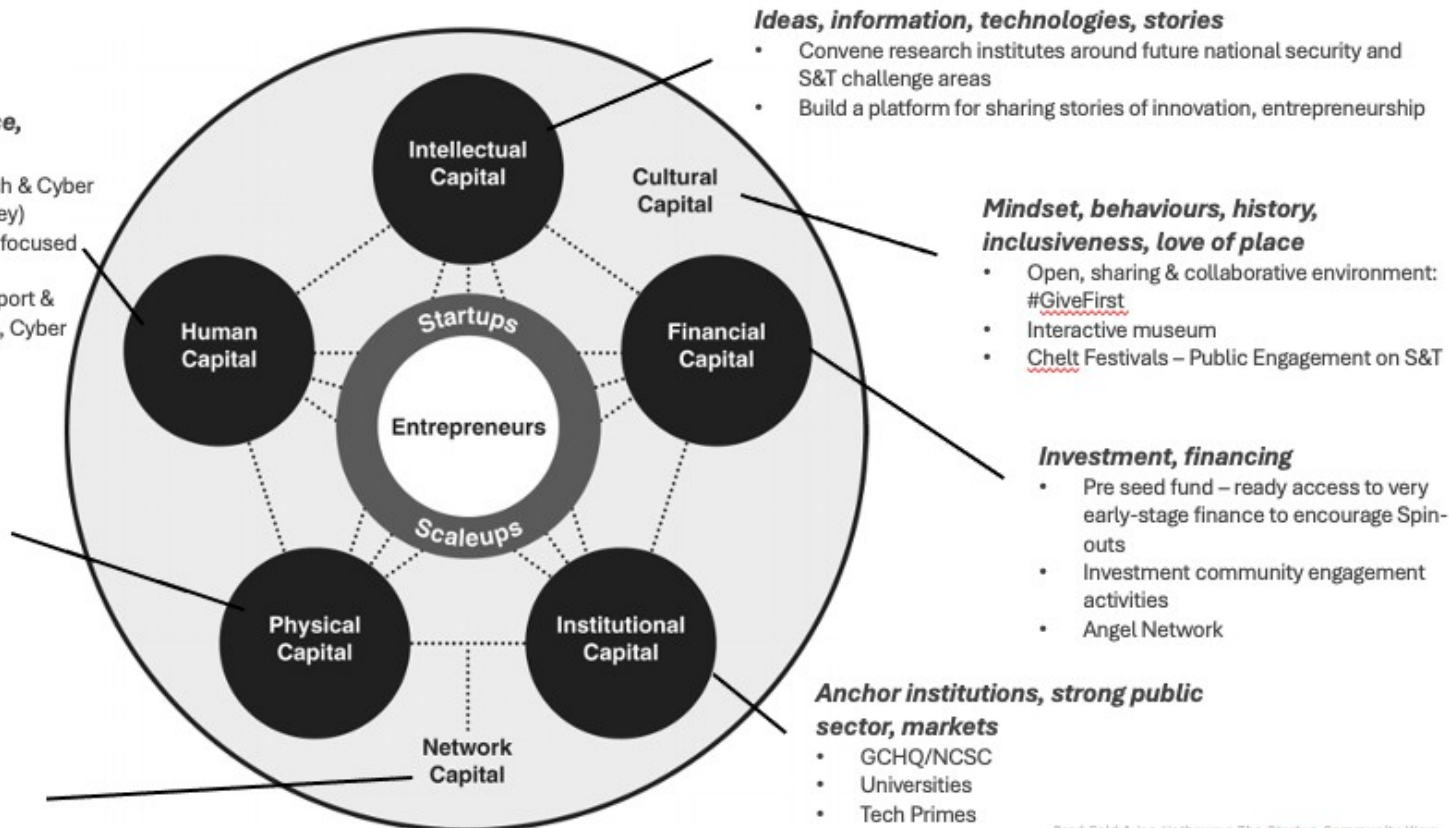
Model 3: The Regional Entrepreneurship and Development Index (REDI)



Create conditions & build capacity for a thriving entrepreneurial and innovation ecosystem:

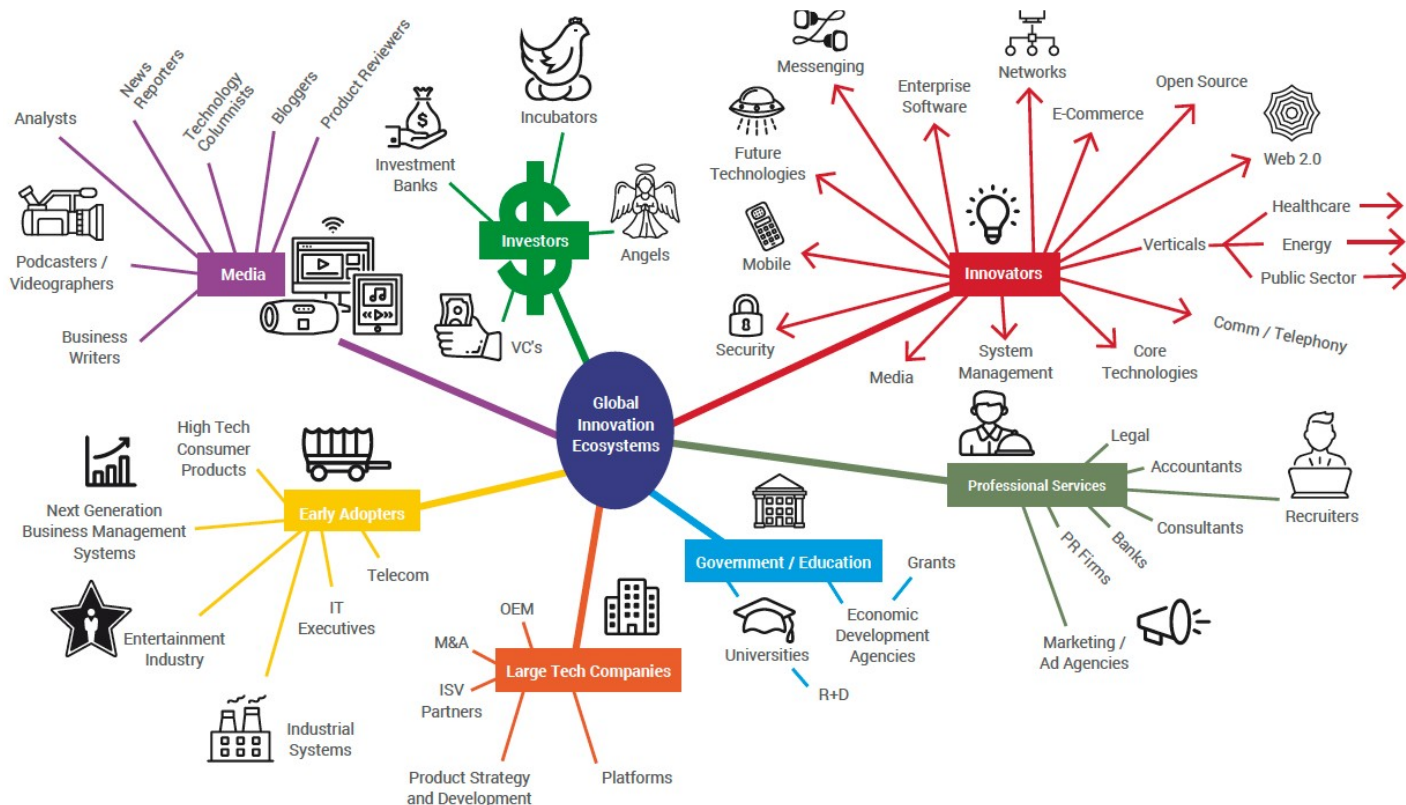
The 7 Capitals

Sits at the heart of a national ecosystem



Find, connect and mobilize different **people** from across the ecosystem

...



Source: 'The power of peers: The future of collaboration lies in global Innovation Ecosystems' (Jennifer Vessels, May 2022)
<https://www.globalfocusmagazine.com/the-power-of-peers-the-future-of-collaboration-lies-in-global-innovations-ecosystems/>

We need Ecosystem Engineers to build the CHERI Ecosystem



(Source: 'Beavers Work, If Permitted' by Elliot McCandless, Sep 2019, <https://beavertrust.org/beavers-work-if-permitted/>)

How can we create a dynamic CHERI innovation network?

The Nature of Networks that Support Innovation

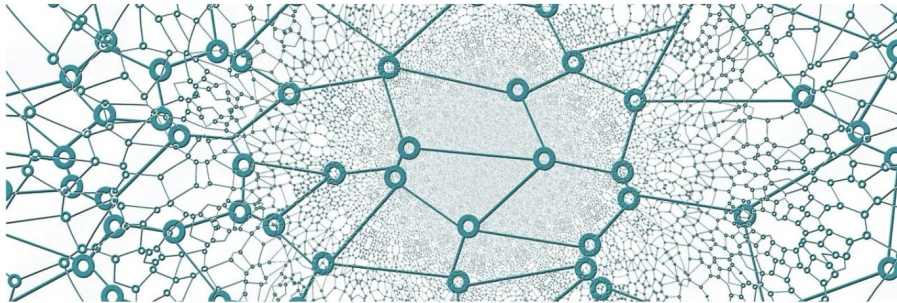


Tobias Stone @ Newsquare · Follow

10 min read · Oct 9, 2023



131



*“A **dynamic network** that has **strong ties** with a high level of closure at the core, set within a **weak network architecture** rich in **bridging ties**. It creates value by facilitating the flow of non-redundant information across structural holes, using the weak ties in its network. **Social Capital** is the main currency of the network, its value being embedded within its social network. The norms and rules of the network are policed using **link reciprocity**, which relies upon the social network being dynamic and rich in Social Capital.”*

Toby Stone, 'The Nature of Networks that Support Innovation' <https://medium.com/@newsquare/the-nature-of-networks-that-support-innovation-e496784b61c3>

We need CHERI Entrepreneurs

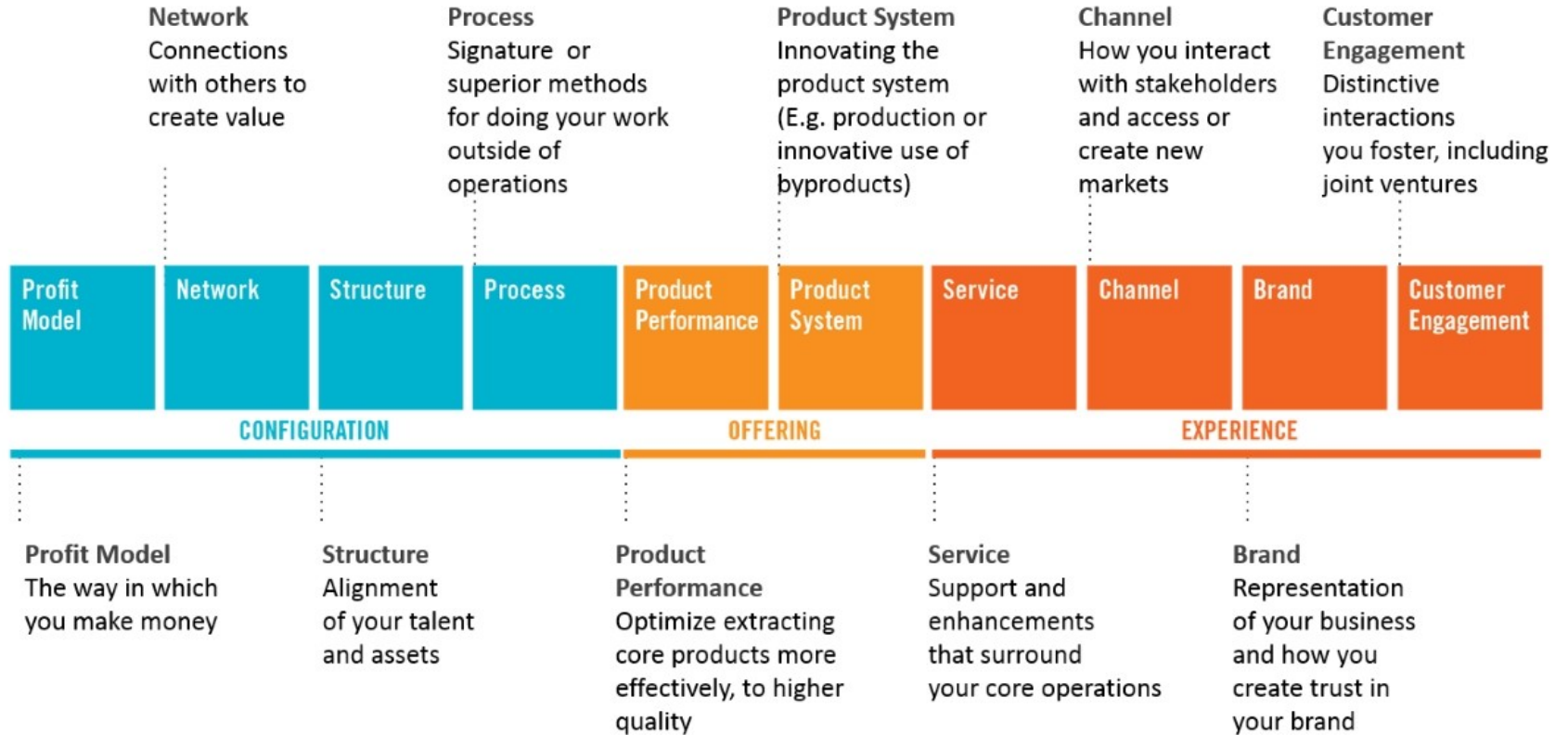
10 Characteristics of Successful Entrepreneurs



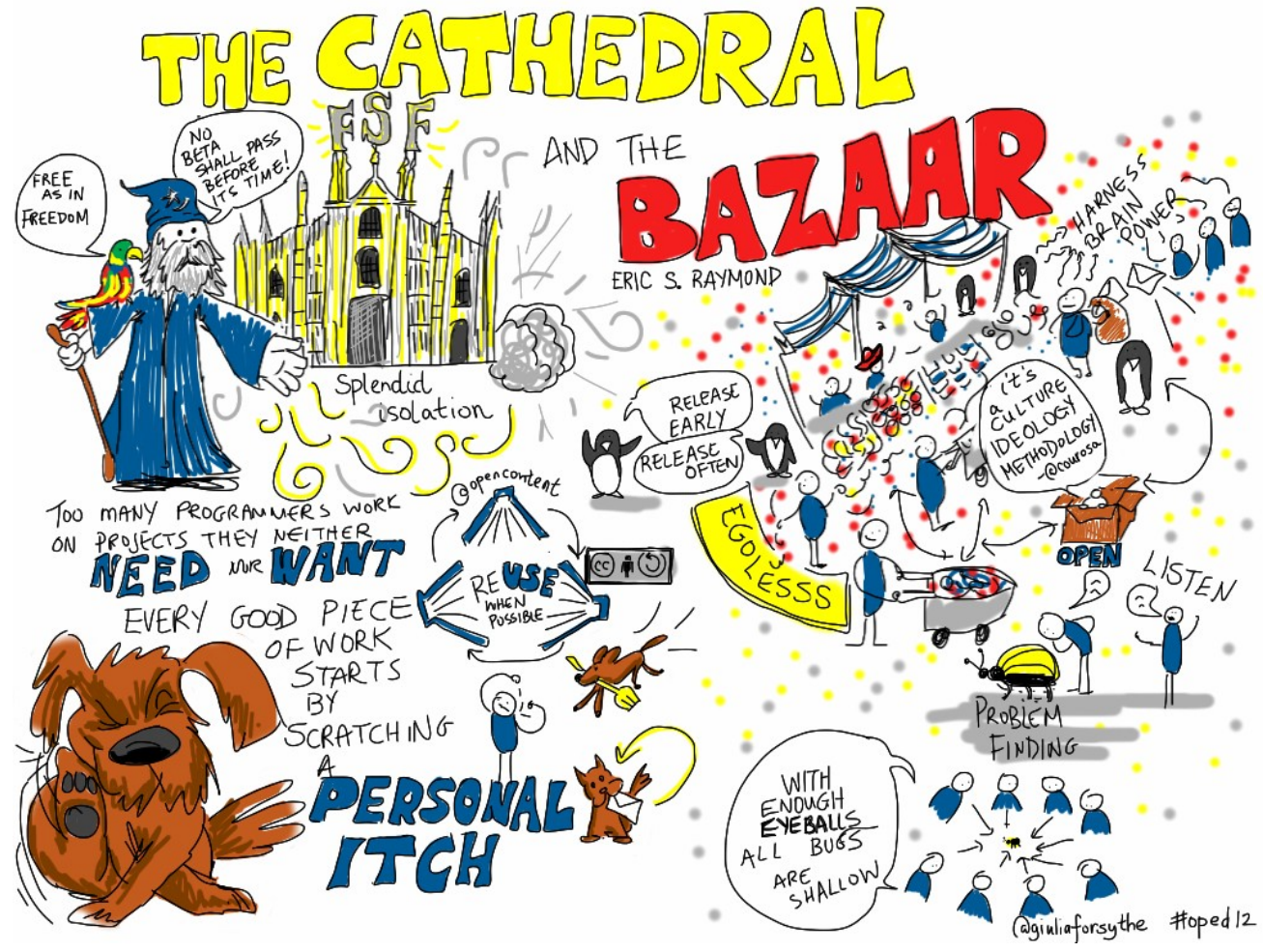
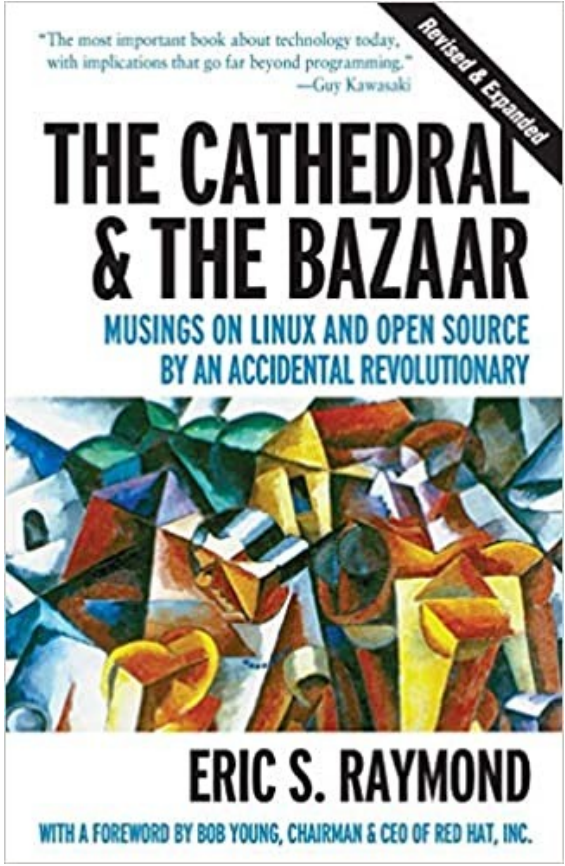
(Source: '10 Characteristics of Successful Entrepreneurs', Kelsey Miller, Jul 2020 <https://online.hbs.edu/blog/post/characteristics-of-successful-entrepreneurs>)



10 types of Innovation for CHERI?



(Source: Peter Fisk blog post on Innovation <https://www.peterfisk.com/insights/key-topics/innovation/>)





CHERI Adoption and Diffusion Research – April 2024

‘We have identified several key sectors who would benefit from CHERI adoption including telecoms, automotive, defence, Information Technology (IT), finance, health and utilities. We have prepared case studies for the first four (others faced similar challenges, benefits and enablers for adoption).’

*‘The key market segments for CHERI adoption within the semiconductor supply chain are **chip designers and systems manufacturers**. Software engineering is also important, as program code needs to be rewritten for the CHERI architecture to ensure the benefits of CHERI are fully realised.’*

Potential future adoption of CHERI

We explored the barriers and enablers to adoption in 5 potential adoption sectors.

Mobile devices: Low likelihood of adoption in the near term

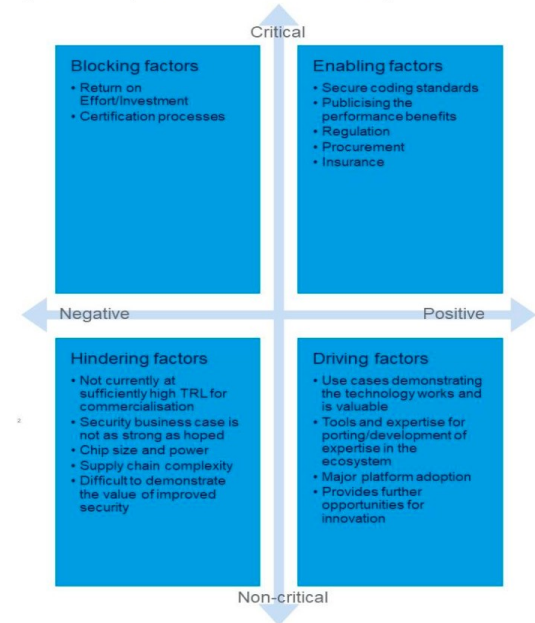
Telecoms Infrastructure: Some strong benefits of adoption, but also some challenges

IOT/Embedded Systems: Economics of adoption for embedded systems are advantageous for CHERI adoption

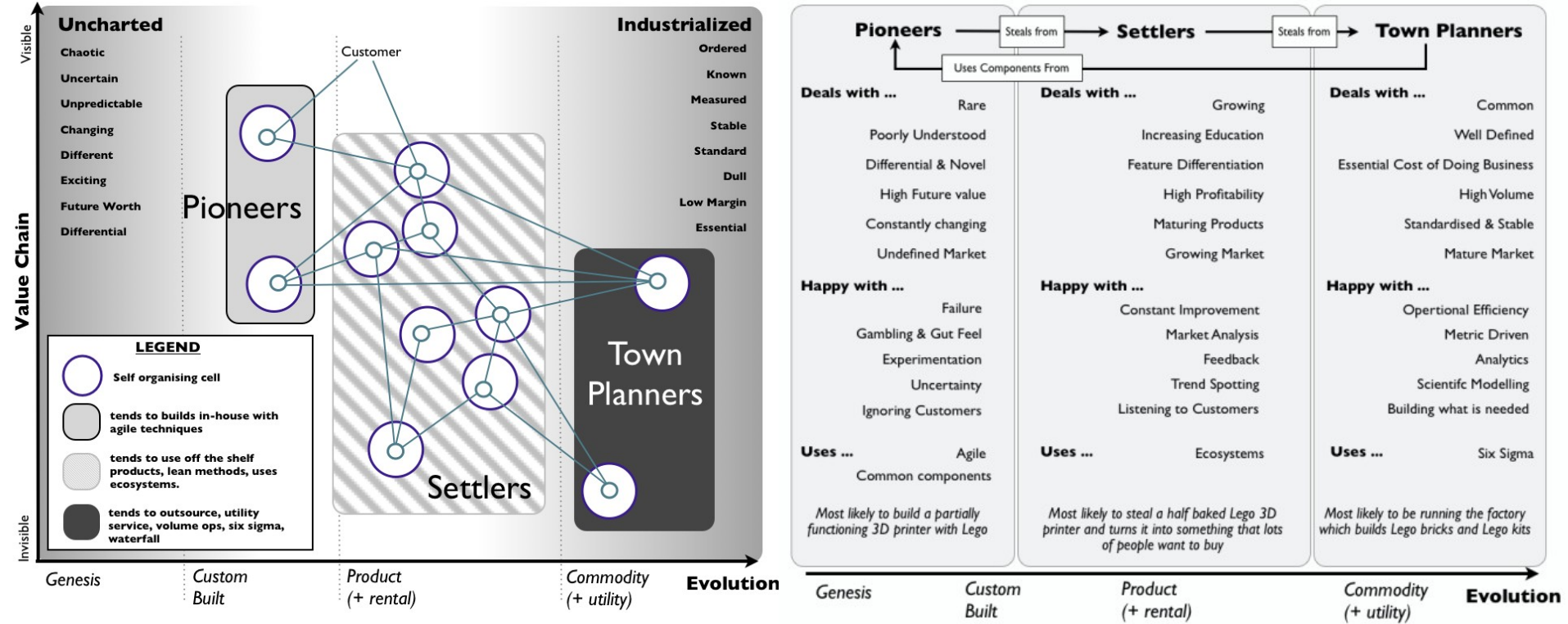
Defence: Evidence of interest from the sector and possible routes to wider adoption through Government procurement levers

Automotive: Some likelihood of adoption with some challenges to overcome

Figure 11: Summary of Barriers and Enablers to CHERI adoption



How to scale the CHERI innovation ecosystem?



(Source: Simon Wardley, 'Pioneers, Settlers, Town Planners' <https://blog.gardeviance.org/2015/03/on-pioneers-settlers-town-planners-and.html>)



CyNam connects talented cyber technology minds and businesses so they can Network. Innovate. Collaborate



The Ecosystem

7,000

Individual
community
members

15

Cyber-tech
businesses from
primes to SMEs



NORTHROP
GRUMMAN

GEMBA
ADVANTAGE

CGI

hexiosec

33

Professional services
firms supporting the
ecosystem

hclaw

WYNNE-JONES
own thinking



hub&

Hazlewoods

INFOSEC

25+

Actively engaged
investors

Foresight



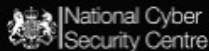
Amadeus
Capital Partners

TENELEVEN

octopus ventures

14

Public sector organisations
engaged



1

Links with regional UK cyber
clusters



25+

Academic, education and
cultural sector connections



Golden Valley Development



Innovation Centre

This nationally significant asset will extend to approximately 160,000 sq ft and comprise high quality office space (self-contained and co-working suites), flexible event spaces, food & beverage facilities and high-quality public realm.



Over 1000 New Homes

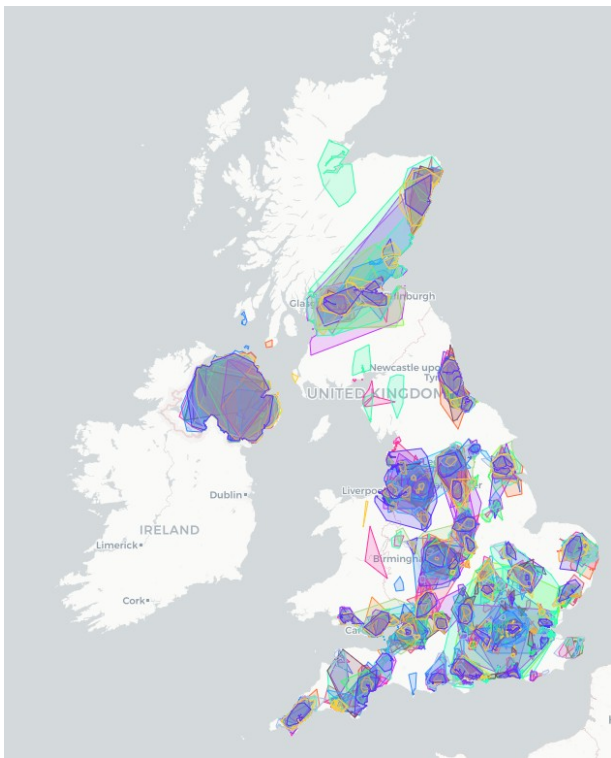
Over 1,000 new homes across a variety of types, tenures, and sizes to meet all needs.



Over 1 Million sq. ft.

Commercial space clustering companies from the tech sectors such as cybersecurity, AI and more – all 100 meters from GCHQ's Doughnut

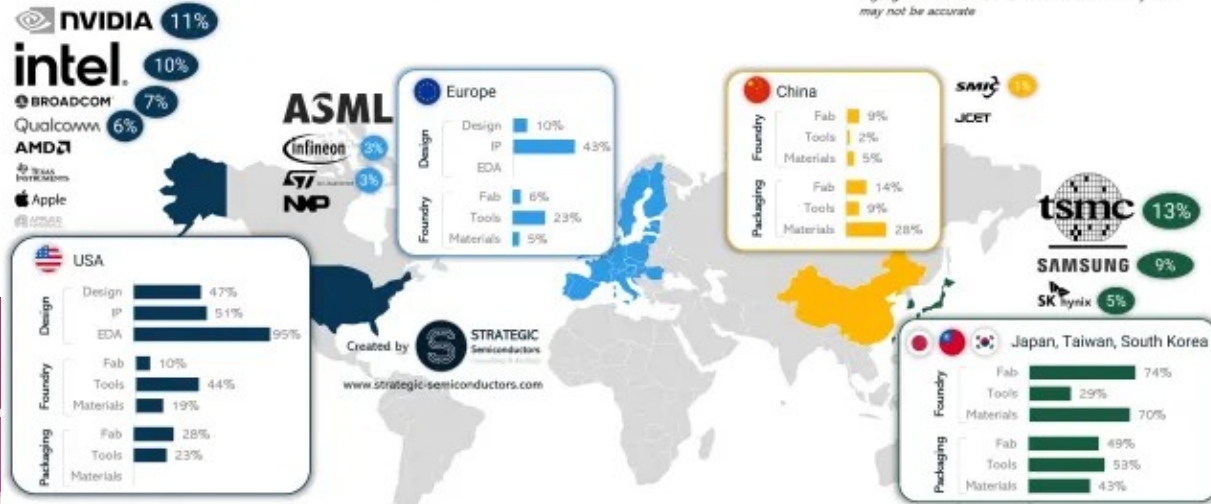
The Innovation Clusters Map from the Department for Science, Innovation and Technology



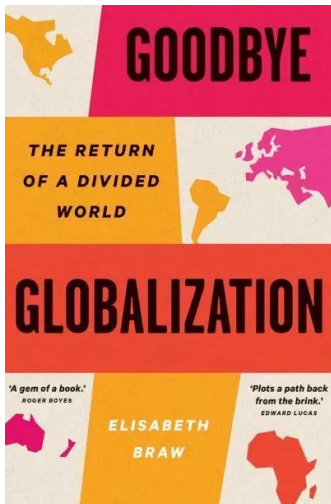
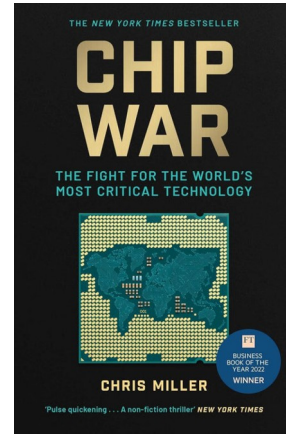
Bristol & Bath Cyber	Cyber East	CyberNorth	CyNam (Cyber Cheltenham)
Cyber London	Cyber Wales	East Midlands Cyber Security Cluster	Kent & Medway Cyber Cluster
Midlands Cyber (West Midlands)	NI (Northern Ireland) Cyber	North West Cyber Security Cluster	OxCyber
ScotlandIS	Surrey Cyber Security Cluster	South West Cyber Security Cluster	Swindon and Wiltshire Cyber Cluster
Yorkshire Cyber Security Cluster			

Global growth of CHERI?

A Global Overview of the Semiconductor Supply Chain in 2023



Adapted from: S&P Global Ratings and Kearney, Bloomberg, Strategic Semiconductors, companies' annual reports
The percentage next to companies' logos represents their market share of the total semiconductor revenues in 2023



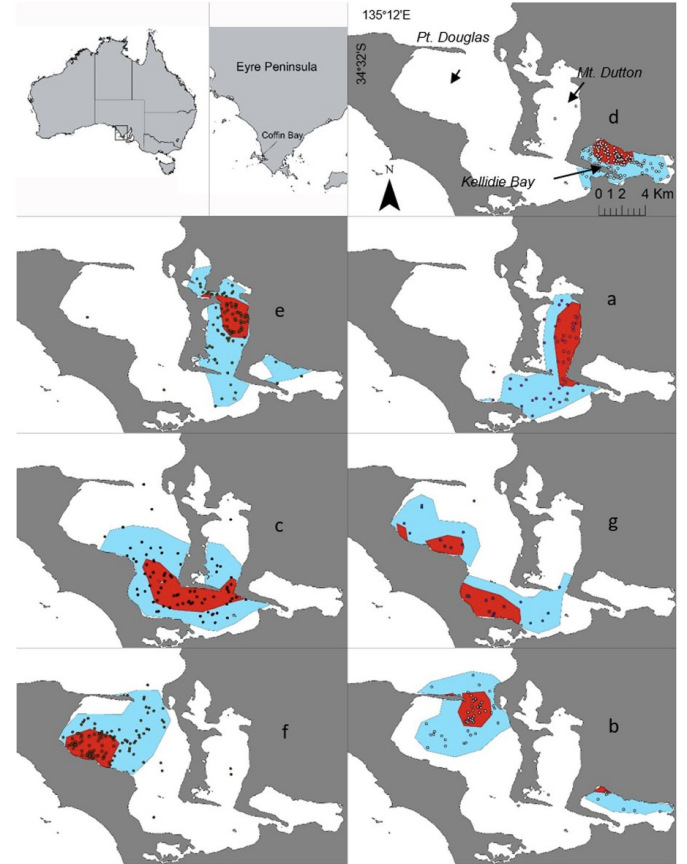
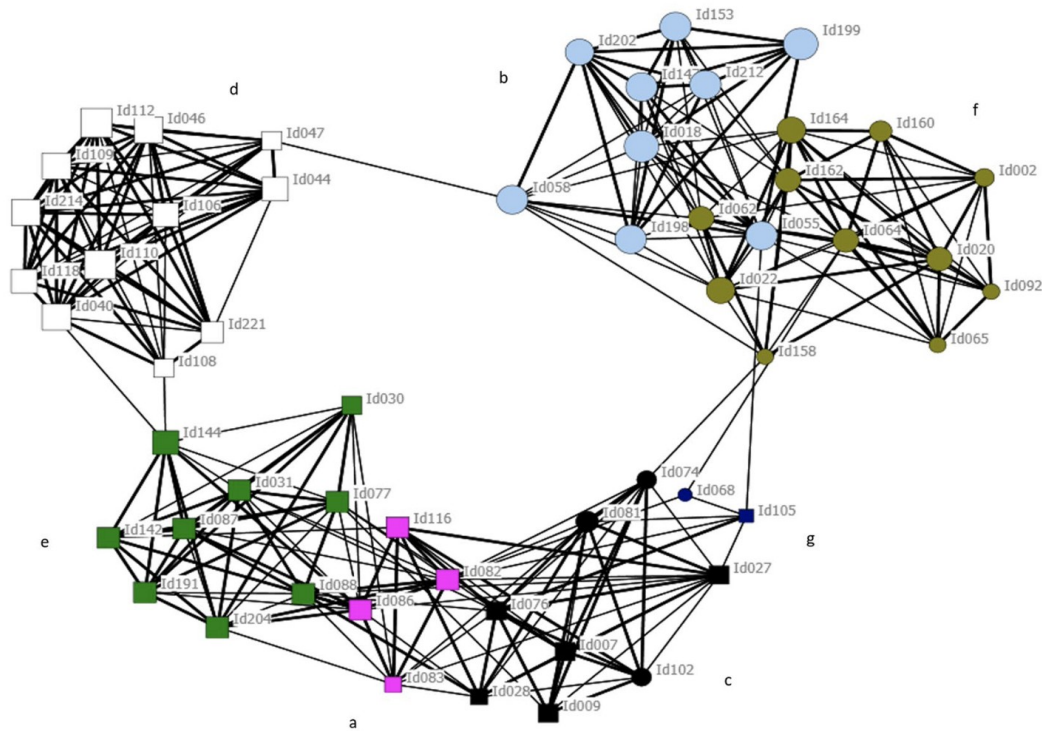
What role will you **play** in building the innovation ecosystem?



Why would dolphins make good ecosystem builders?



Dolphins create social clusters ...



Source: 'Kinship and reproductive condition correlate with affiliation patterns in female southern Australian bottlenose dolphins', Diaz-Aguirre et-al, 2020)

**THANK
YOU!**

