



Aalto University
School of Science

Department of Industrial Engineering and Management

Ecosystems and anti-rival goods – greetings from project ATARCA

*Esko Hakanen
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"Data is the new oil"

Clive Humby





Image: <https://www.theatlantic.com/photo/2013/07/oil-spill-blackens-thai-island-beaches/100564/>



“Natural ecosystems show us the way to efficient, symbiotic relationships”






Esko Hakanen

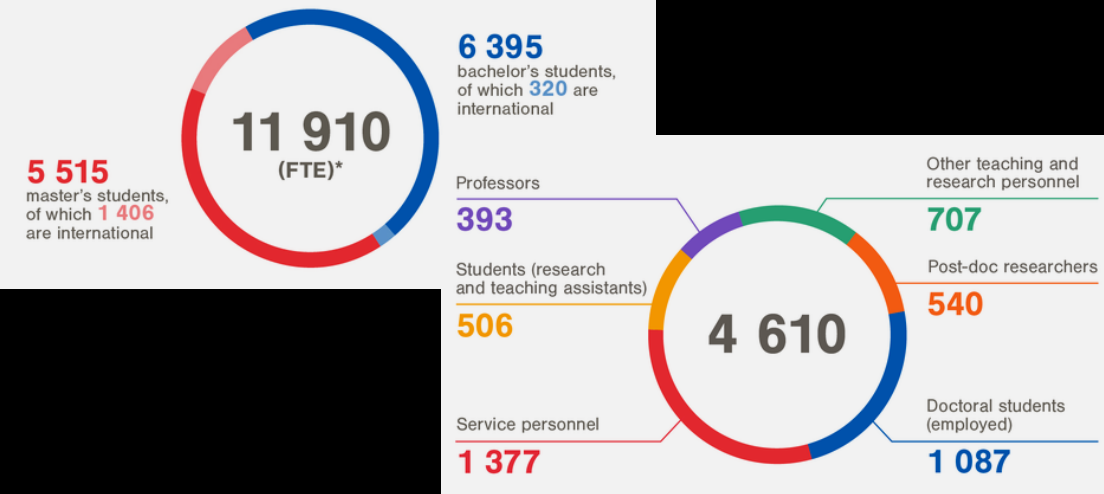
2015 M.Sc., Materials Science
2019 D.Sc., Industrial Engineering and Management

Postdoctoral researcher
Service engineering and management, Aalto University

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ATARCA – Accounting Technologies for Anti-Rival Coordination and Allocation (EU H2020)

Business models
Platforms
Ecosystems
Digital transformation (metals & mining)

Esko Hakanen			
 Postdoctoral researcher, Aalto University School of Science Verified email at aalto.fi material intelligence business models platforms ecosystems industrial services			
ARTICLES			
TITLE	CITED BY	YEAR	
Digital transformation: The interplay of explorative and exploitative capability development S Gao, E Hakanen, R Rajala Proceedings of the 53rd Hawaii International Conference on System Sciences	3	2020	
The resource dependency of data: A prospective on data sharing in supply chains T Seppälä, E Hakanen, I Lahteenmaki, J Mattila, R Niemi Available at SSRN 3493650	2	2019	
Why to collaborate? Three approaches to innovation behind the transition from firms to ecosystems E Hakanen Academy of Management Proceedings 2019 (1), 16859		2019	
Aligning Multilateral Value Creation and Value Capture in Ecosystem-level Business Models V Eloranta, E Hakanen, P Töytäri, TT Turunen Academy of Management Proceedings 2019 (1), 18966	1	2019	
Digital transformation in asset-intensive businesses: Lessons learned from the metals and mining industry S Gao, E Hakanen, P Töytäri, R Rajala Proceedings of the 52nd Hawaii international conference on system sciences	10	2019	
Lectio: Uudet liiketoimintamallit teknologiateollisuudessa E Hakanen Tiedepolitiikka 44 (2), 40-42		2019	
Contemporary perspectives on the strategic role of information in internet of things-driven industrial services T Turunen, V Eloranta, E Hakanen Journal of Business & Industrial Marketing	15	2018	
Material intelligence as a driver for value creation in IoT-enabled business ecosystems E Hakanen, R Rajala Journal of Business & Industrial Marketing	20	2018	
Platforms as brokerage: Future of business models in the manufacturing industry E Hakanen Academy of Management Proceedings 2018 (1), 16212		2018	
How do intelligent goods shape closed-loop systems? R Rajala, E Hakanen, J Mattila, T Seppälä, M Westerlund California Management Review 60 (3), 20-44	32	2018	
Strategic Logics Behind Blockchain Projects: Capturing Value in Decentralized Ecosystems E Hakanen, P Töytäri, T Turunen, V Eloranta Academy of Management Global Proceedings, 409	2	2018	
Platform-based exchange: New business models in technology industries E Hakanen Aalto University	2	2018	
Material Intelligence: Cross-Organizational Collaboration Driven by Detailed Material Data E Hakanen, V Eloranta, P Töytäri, R Rajala, T Turunen Proceedings of the 50th Hawaii International Conference on System Sciences	3	2017	



- Established in 2010, through the merger of three leading universities, Aalto University is a new university with centuries of experience
- Brings together science, art, technology, and business
- Our campus has rapidly grown into a hub of research, education, business, and design
- One of Europe's most international universities
- ShanghaiRanking (2021):
Business administration 25 & Management 31



Key takeaways today...

Takeaway 1:

The crypto space is particularly interesting context/case of (business) ecosystems.

Takeaway 2:

Ecosystems (e.g. data markets), rely on a complex interplay between the firm(s) and the ecosystem, often exhibiting anti-rival network effects.

Takeaway 3:

One of our main goals in ATARCA is to explore blockchains & other DLTs as tools to compensate for producing, processing, and sharing data.

FIRST TAKEAWAY

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Why we talk about ecosystems?

"In a growing number of sectors the firm and even the industry have ceased to be meaningful units of strategic analysis."

Jacobides, 2019

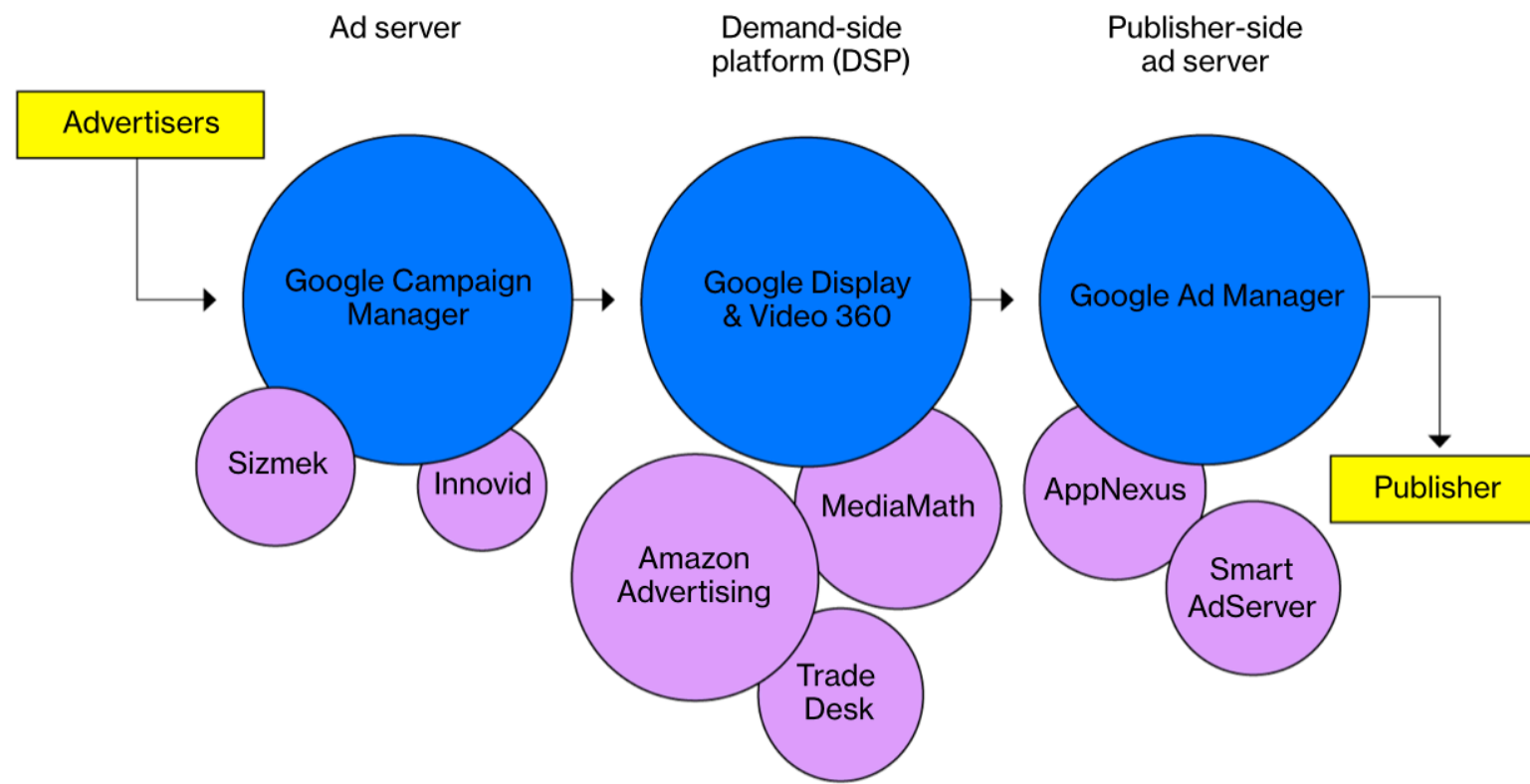
Practice

How Google's Ad Ecosystem Works

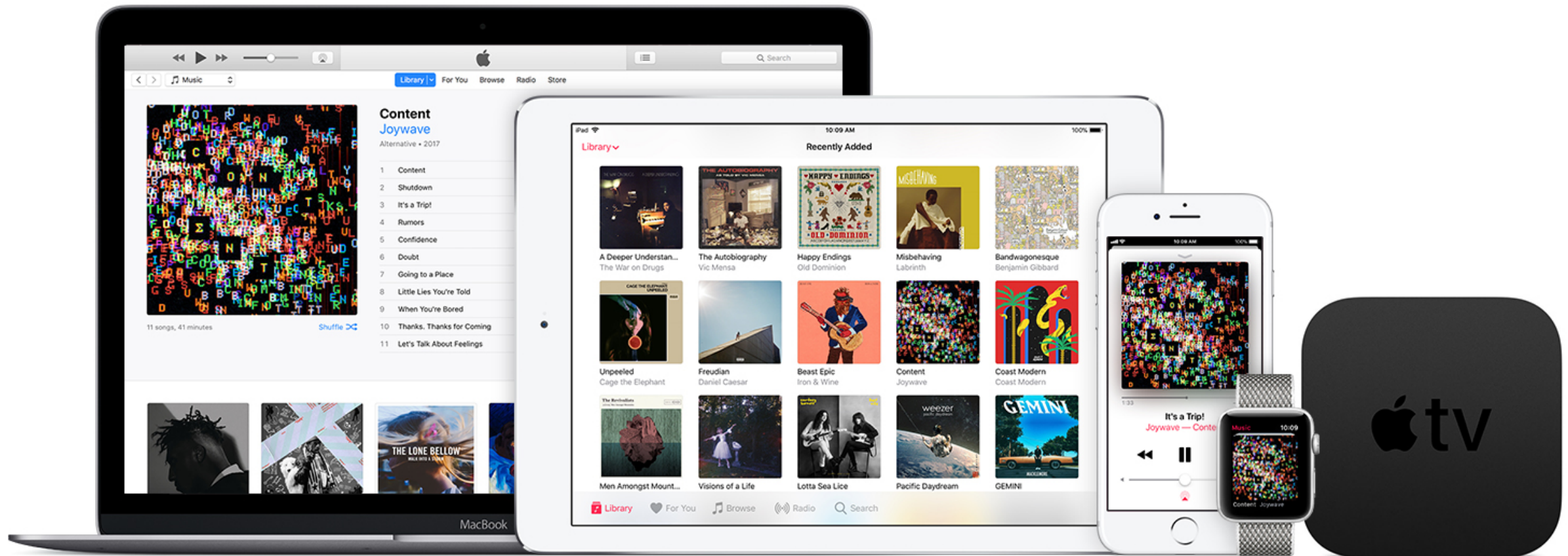
Big advertising-tech acquisitions have made the company the dominant force in the \$330 billion digital ad market.

By Gerrit De Vynck and Naomi Nix

October 24, 2019, 2:00 PM GMT+3



Practice

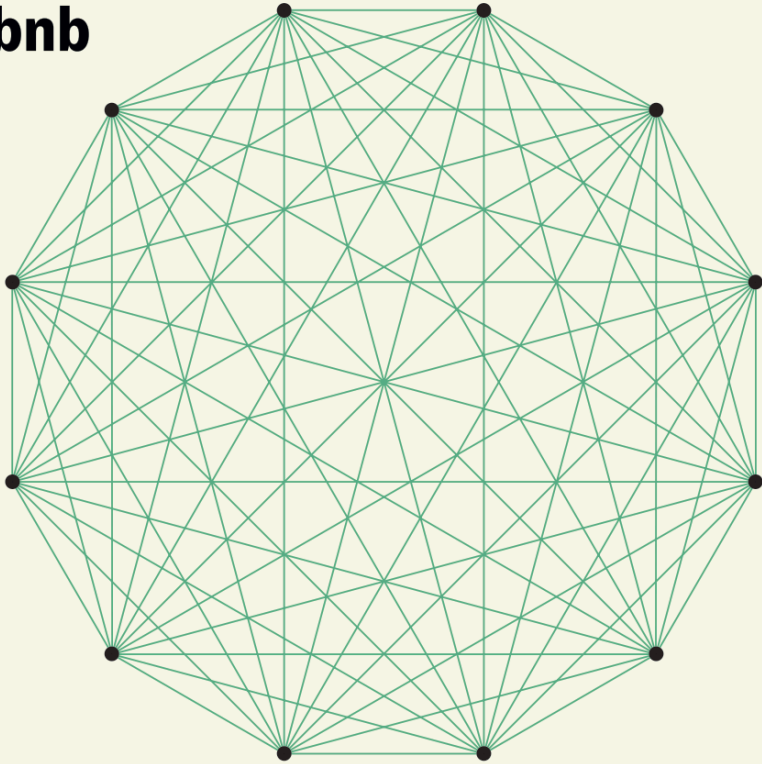


Practice

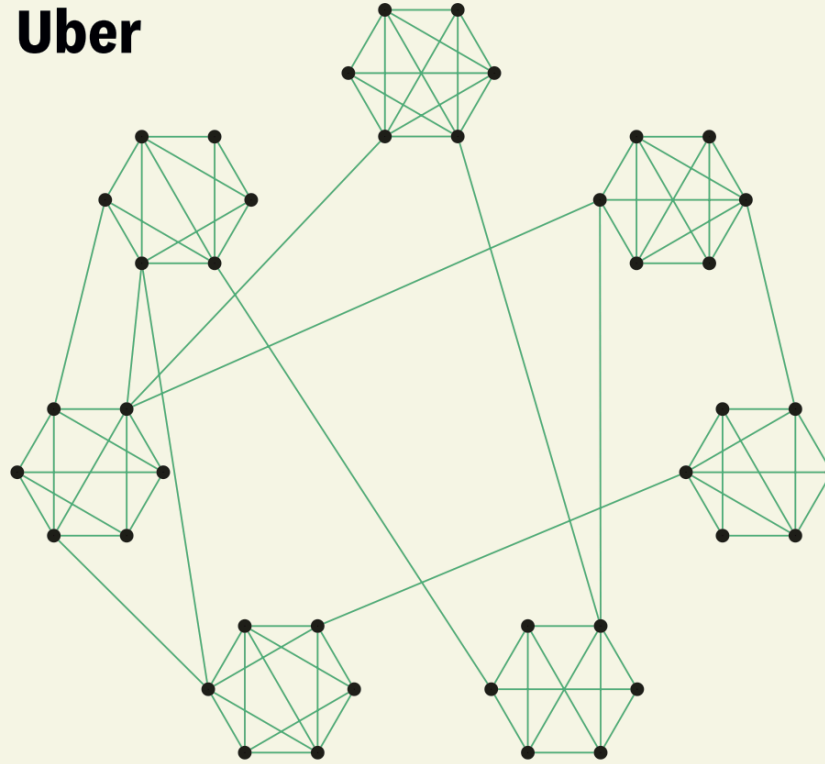


Which Network Structure Is More Defensible?

Airbnb

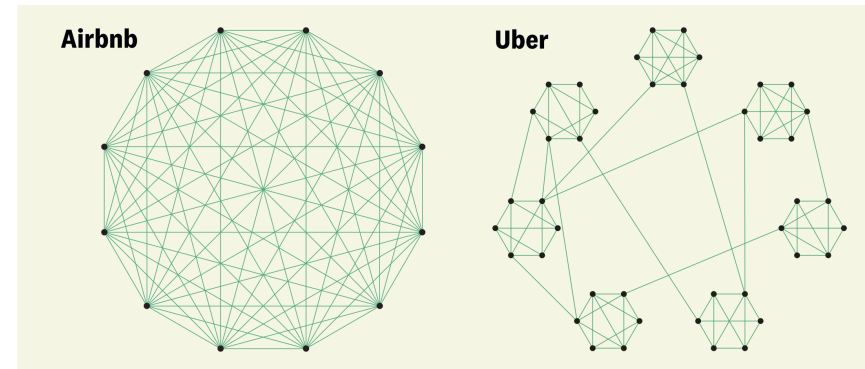


Uber

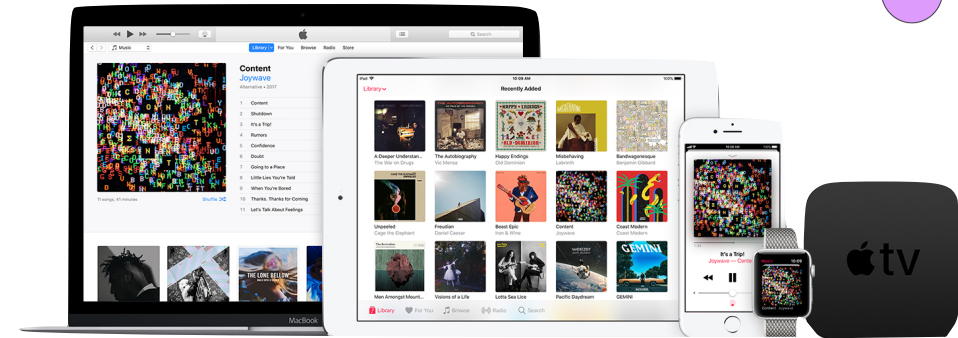
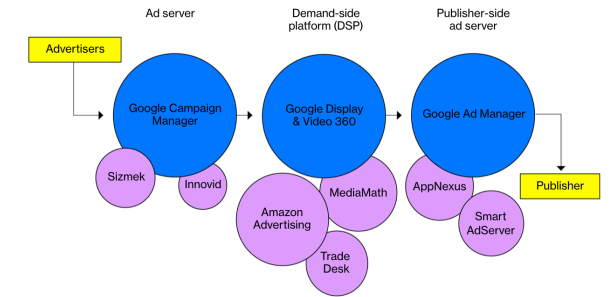


Some digital networks are fragmented into local clusters of users. In Uber's network, riders and drivers interact with network members outside their home cities only occasionally. But other digital networks are global; on Airbnb, visitors regularly connect with hosts around the world.

Platforms on global networks are much less vulnerable to challenges, because it's difficult for new rivals to enter a market on a global scale.



How Google's Ad Ecosystem Works



All of these rely on complex networks for value creation, but are these ecosystems?

"How is this discussion on ecosystems any different from literature on organizational networks?"

And why does it matter?

AOM Annual Meeting, 2017, Chicago

Jacobides

Eisenhardt

Kapoor

Baldwin

Adner

Network

- > Set of *affiliation ties* among firms that *shapes* information and resource flows
- > *Structural holes* (individual vs. collective benefits)

Kathleen Eisenhardt, 2017 AOM Annual Meeting

Ecosystem

- > Organized around **an output**, reflect technological **interdependence** and **not** structure of **ties**
- > **Bottlenecks** (quality, performance, scarcity, ...)

Kathleen Eisenhardt, 2017 AOM Annual Meeting

Network?

Ecosystem?

How would you define...?

What are their key differences?

In what circumstances, which one would you prefer? Why?

"NETWORK"

ECOSYSTEM AS AFFILIATION

"places emphasis on the **breakdown of traditional industry boundaries**, the rise of **interdependence**, and the potential for **symbiotic relationships** in productive ecosystems."

THE DESIGN & GROWTH

"focus on increasing the number of actors that link to a **focal actor or platform**, increasing its **centrality** and expected **power**."

"ECOSYSTEM"

ECOSYSTEM AS STRUCTURE

"Ecosystem—the **alignment structure** of the multilateral set of partners that need to interact in order for a **focal value proposition to materialize**."

THE DESIGN & GROWTH

"**starts with** a value proposition and **seeks to identify** the set of actors **that need to interact** in order for the proposition to come about."

"NETWORK"

ECOSYSTEM AS AFFILIATION

- > Symbiotic, long-term relationships
- > Raising external barriers
- > Influential focal actor/platform
- > Influence by power
- > "Clear" value capture

> **Unit of analysis:** nodes & dyads
(individuals, firms, alliances, etc.)

Who?

Can be defined **ex ante**

"ECOSYSTEM"

ECOSYSTEM AS STRUCTURE

- > Dynamic, evolving set of participants
- > Lowering internal & external barriers
- > Adaptable system, lack of control
- > Influence by incentives
- > "More" value creation

> **Unit of analysis:** groups & cohorts
(offers, partners, innovations, etc.)

What?

Can be defined **ex post**

Network vs. Ecosystem

network

ecosystem



Cisco provides network hardware, Aon provides risk assessment services, while Allianz insures these risks.

Apple also has non-generic complementarities with Adobe, Microsoft, DropBox, or misc app developers

"We need to examine the terms of engagement in ecosystems, how orchestrators and integrators exert their power, what customer data those parties own, and how they interact with complementors."

Jacobides, 2019, p. 137

SECOND TAKEAWAY

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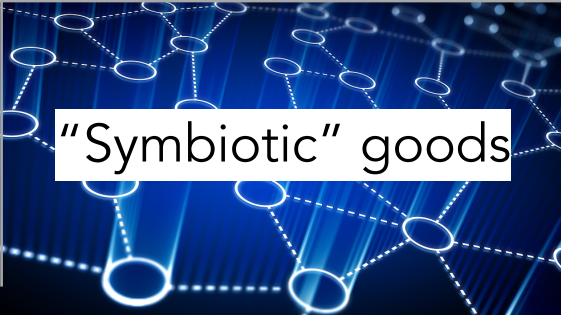


Accounting Technologies for Anti-Rival Coordination and Allocation

Objectives

Who we are

What are anti-rival goods?

	Subtractability (Ostrom, 2009)		
	Rival	Non-rival	Anti-rival
Excludable	 <p>Private goods</p>	 <p>Club goods</p>	 <p>Network goods</p>
Non-excludable	 <p>Common-pool goods</p>	 <p>Public goods</p>	 <p>"Symbiotic" goods</p>

What are anti-rival goods?

	Subtractability (Ostrom, 2009)		Anti-rival
	Rival	Non-rival	
Excludable	Private goods	Club goods	Network goods
Non-excludable	Common-pool goods	Public goods	Data "Symbiotic" goods

Rival compensation	Anti-rival compensation
Unit of account	Unit of account
Medium of exchange	Medium of sharing
Deferred payment	"Eternal" payment
Subtractive	Additive
Scarce	Abundant
Anonymous	Relational

Examples of our recent (and ongoing) studies >>

Academy
of Management

Global Proceedings

Academy of Management Global Proceedings, Vol. Tel Aviv, No. 2018 |

Strategic Logics Behind Blockchain Projects: Capturing Value in Decentralized Ecosystems

Esko Hakanen, Pekka Töytäri, Taija Turunen and Ville Eloranta

Published Online: 28 Jan 2019

Ecosystems.

We (scholars) talk about this...

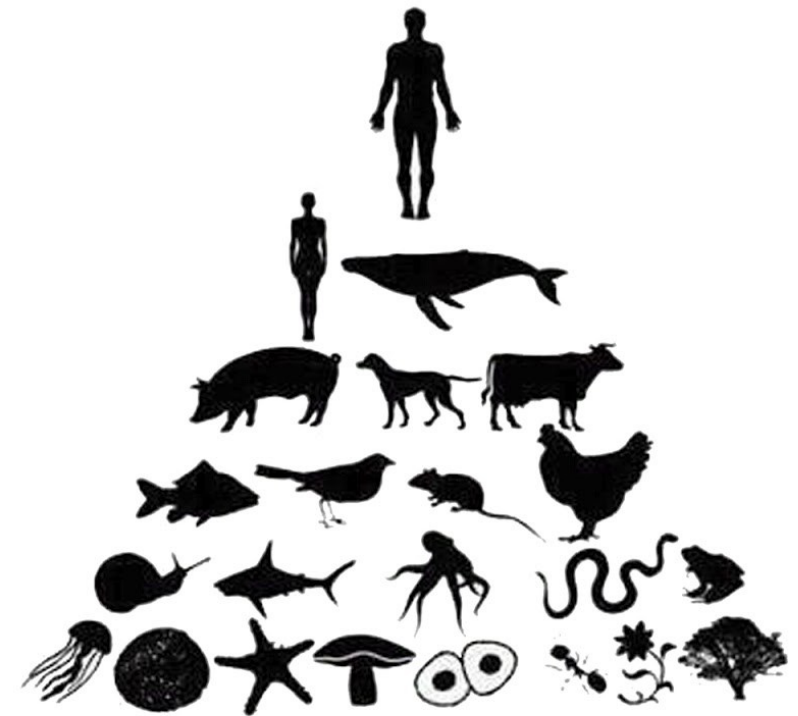
Ecosystems are perceived as interacting organizations, enabled by modularity and complementarity, **not hierarchically** managed, bound together by the nonredeployability of their collective investment elsewhere.



Adner, 2017; Hannah & Eisenhardt, 2018; Jacobides et al., 2018; Kapoor, 2018; Shipilov & Gawer, 2020

... but the reality looks like this.

- Ecosystems (so-called) are usually structured around a **strong focal firm**, (e.g., Apple or Google)
- Highly profitable for the focal companies, as they are most likely to enjoy a **integrative role** or command bottlenecks
- **Smaller players** are encouraged to find a business model that **supports** the focal operations



Adner, 2017; Hannah & Eisenhardt, 2018; Jacobides et al., 2018; Kapoor, 2018; Shipilov & Gawer, 2020

Why?

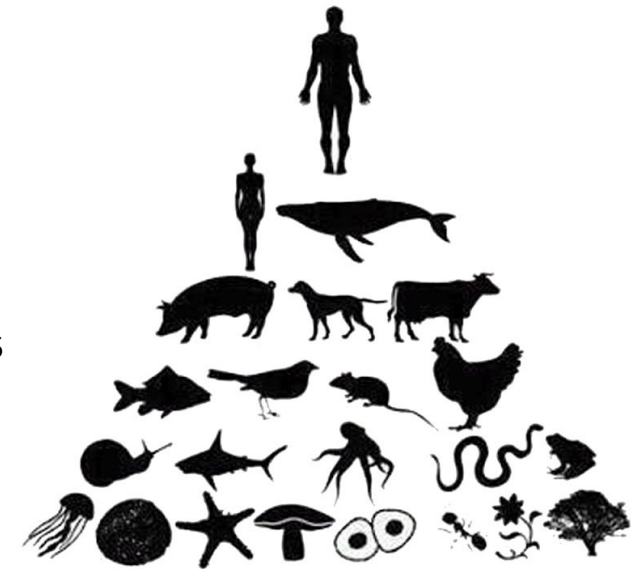
Value creation and value capture are largely decoupled (and stratified) in ecosystem research.

Value creation is seen as an ecosystem-level concept, yet the concept of value capture is analyzed at the individual firm level.

Value creation
in ecosystems



Value capture
in ecosystems



Result: The situation now in many (emerging) ecosystems...

“First we take risk together and create
a lot of potential...

...then the strongest one reaps the profits.”

The problem? **We all are holding back.**

Isn't "business model" connecting value creation & value capture?

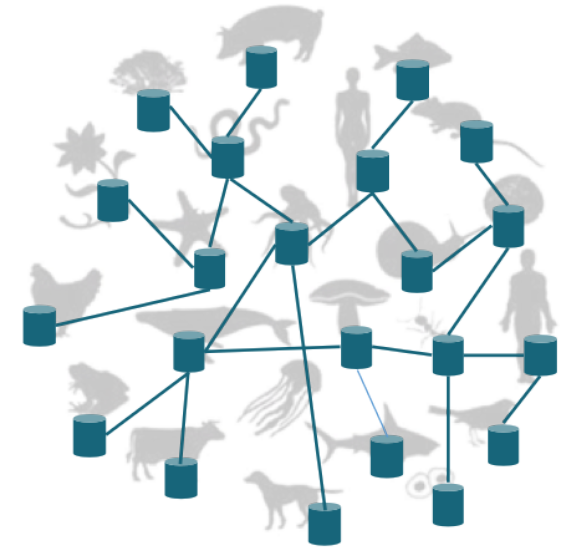
Yes, but "business model",

has predominantly focused on investigating the **firm-level actions** and dyadic agreements between firms

We finally have cases in which exhibit such ecosystem-level governance structures.

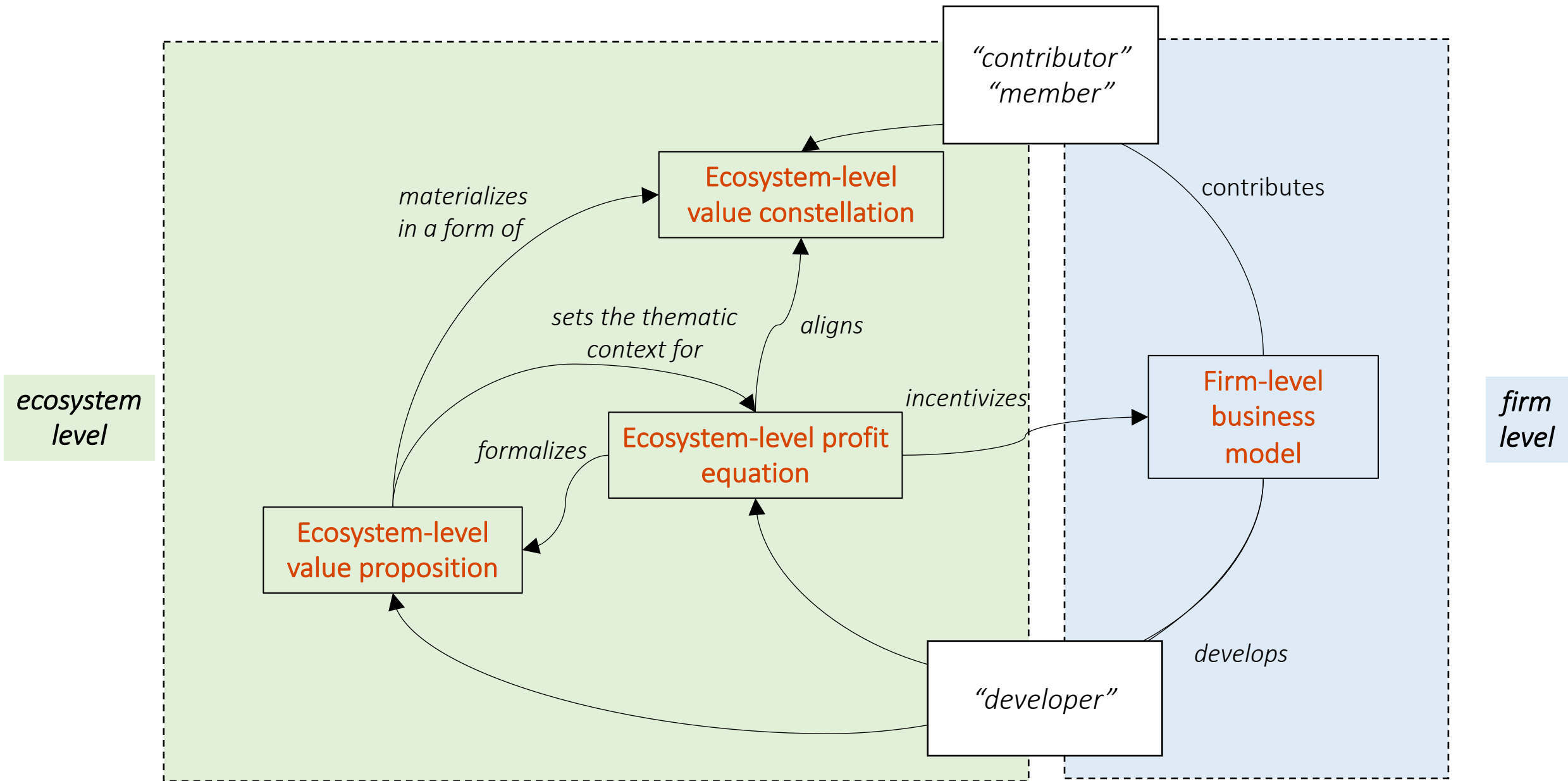
The focus of our study: decentralized ecosystems (blockchains)

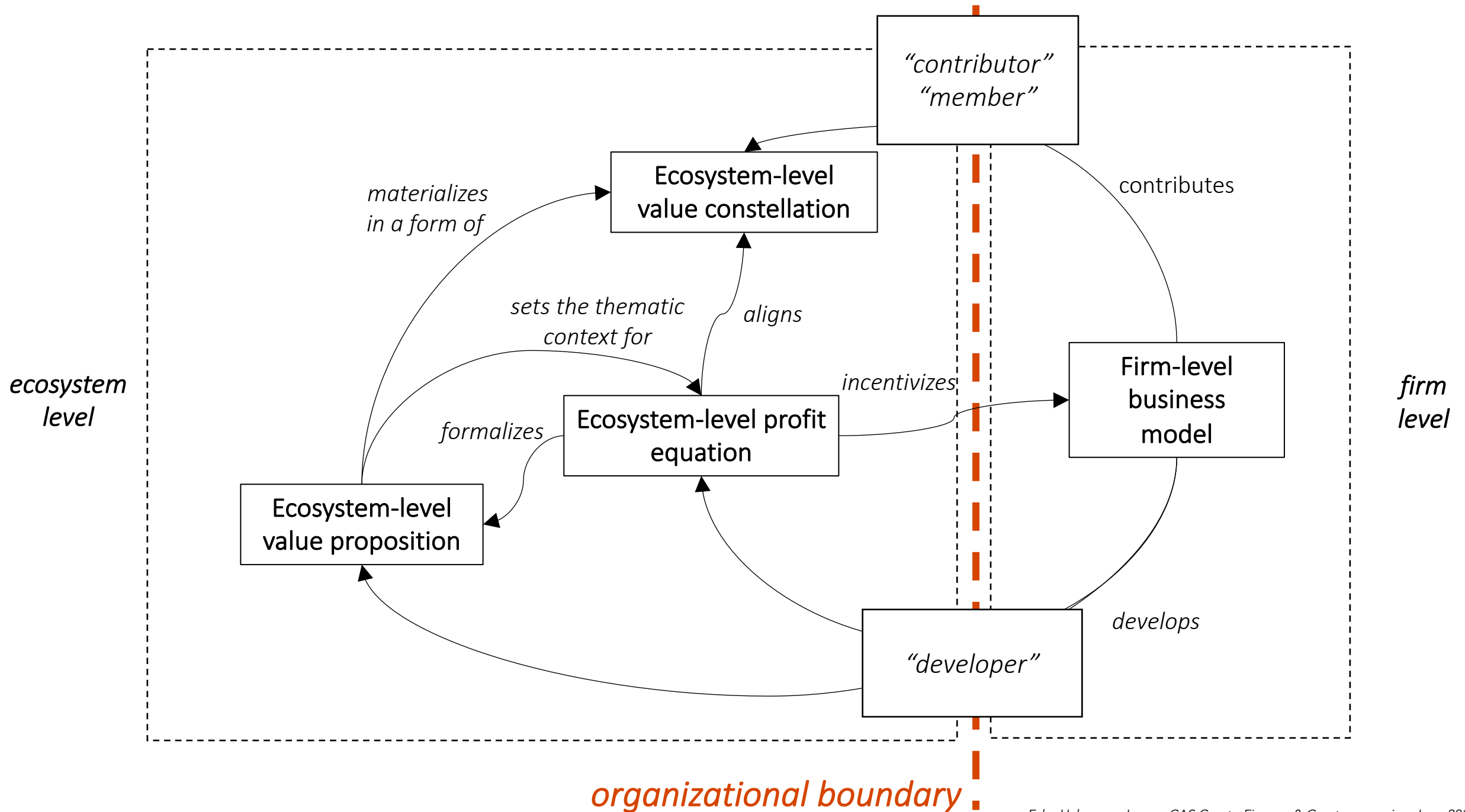
*In this extreme context:
How are multilateral value creation and
value capture aligned in ecosystem-level
business models?*

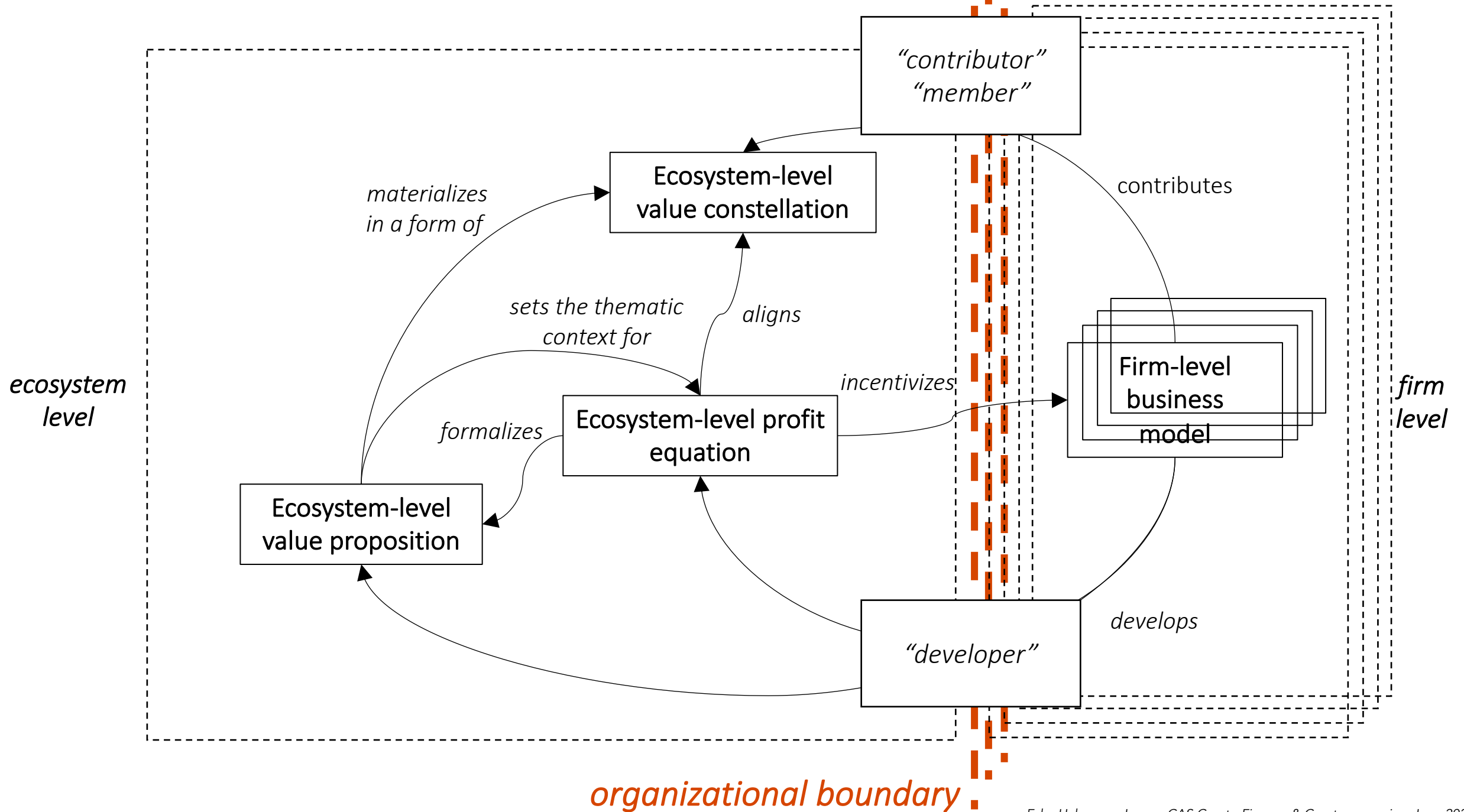


	<i>Alpha</i>	<i>Beta</i>	<i>Gamma</i>
<i>Description</i>	Open source platform for the free and fair exchange of realtime data.	Blockchain data storage and monetization platform	An ecosystem for sharing data and services.
<i>Nationality</i>	Europe	Asia Pacific & Europe	Asia Pacific & Europe
<i>Project started</i>	2014	2017	2017
<i>Total funding (2018)</i>	30 M USD	10 M USD	44 M USD

Findings >>







Seems confusing? Let me elaborate >>

How Do Intelligent Goods Shape Closed-Loop Systems?

**Risto Rajala¹, Esko Hakanen¹, Juri Mattila^{1,2},
Timo Seppälä^{1,2}, and Mika Westerlund³**

California Management Review

2018, Vol. 60(3) 20–44

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DOI: 10.1177/0008125618759685

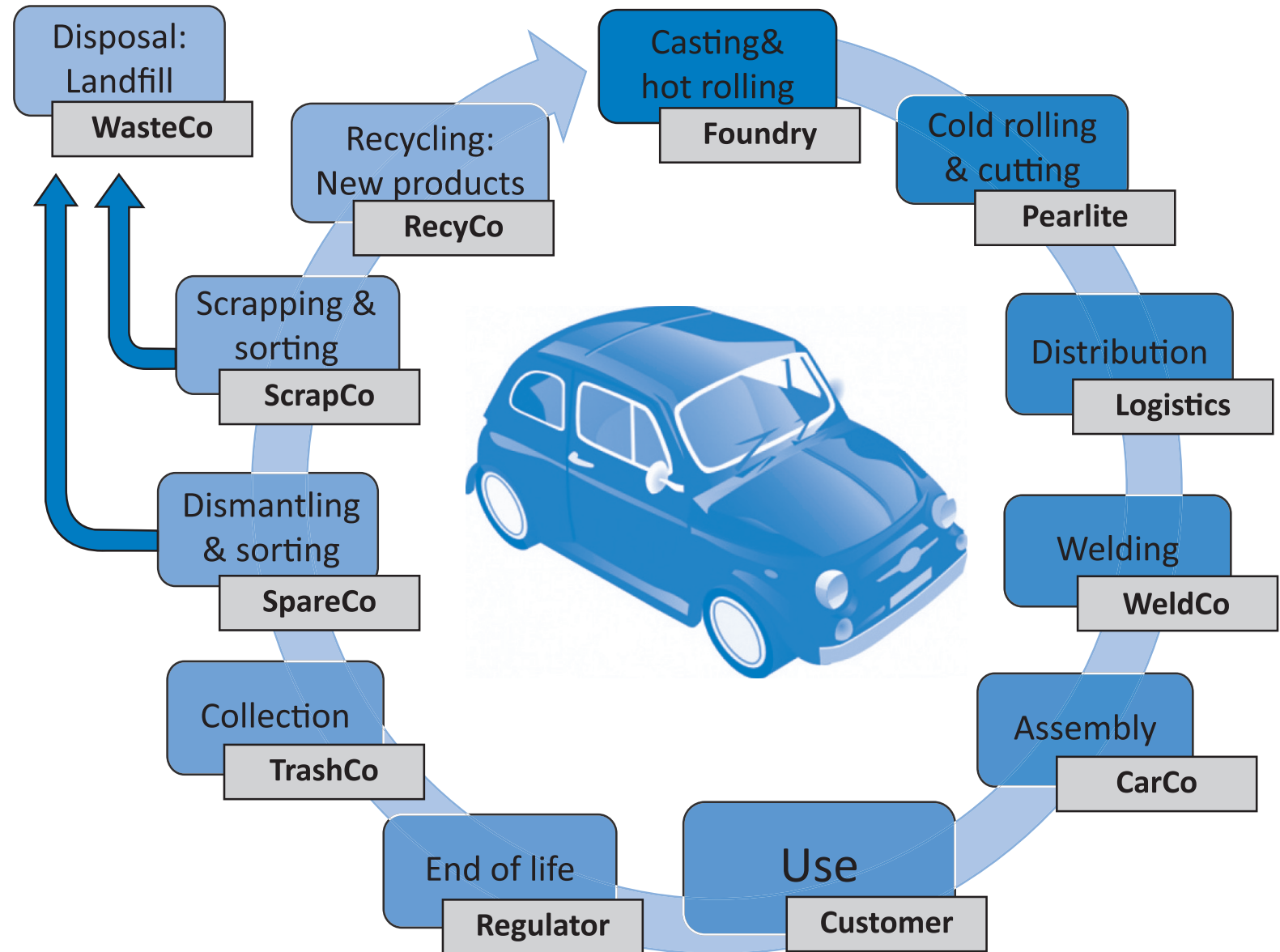
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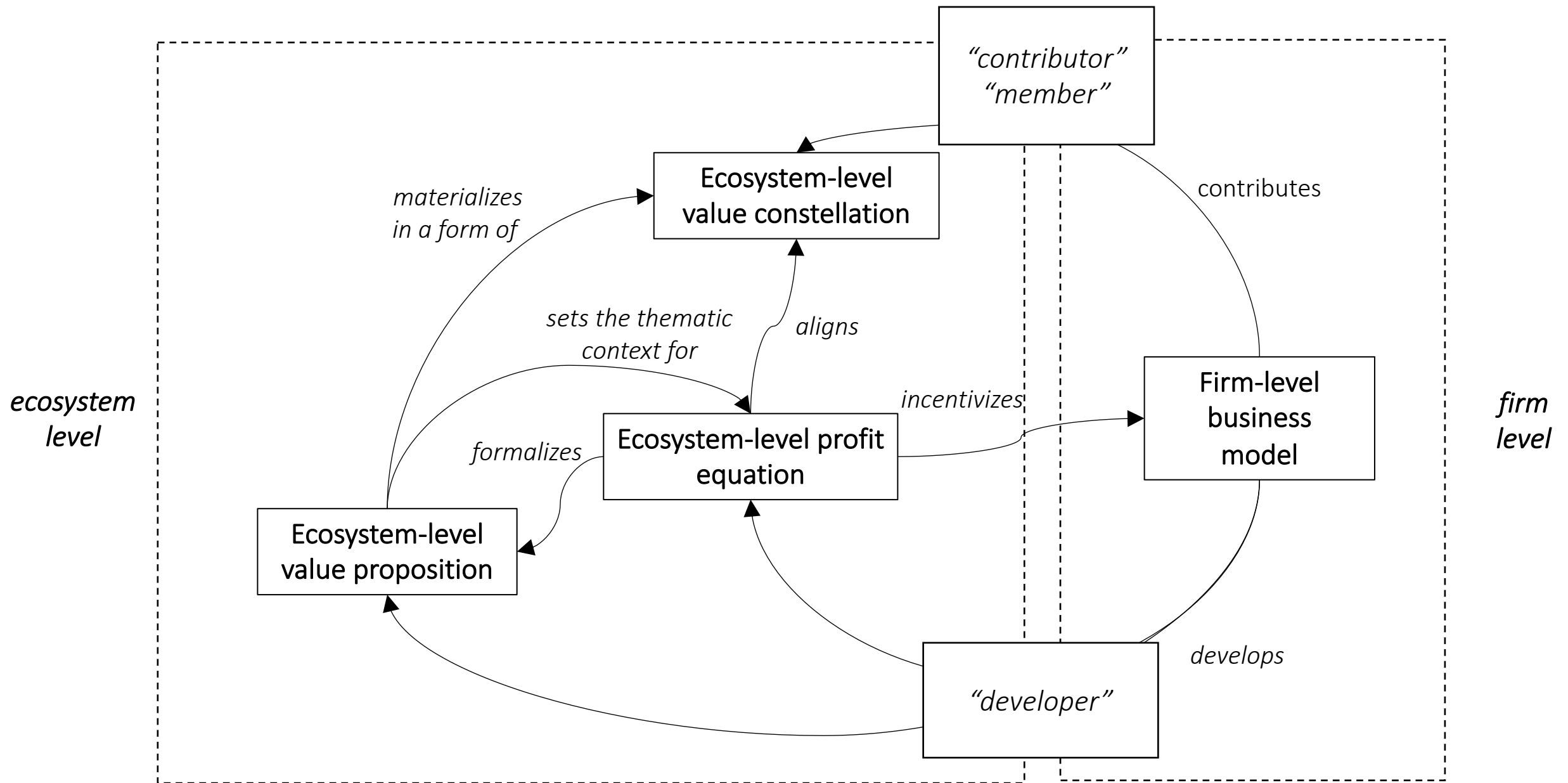
SUMMARY

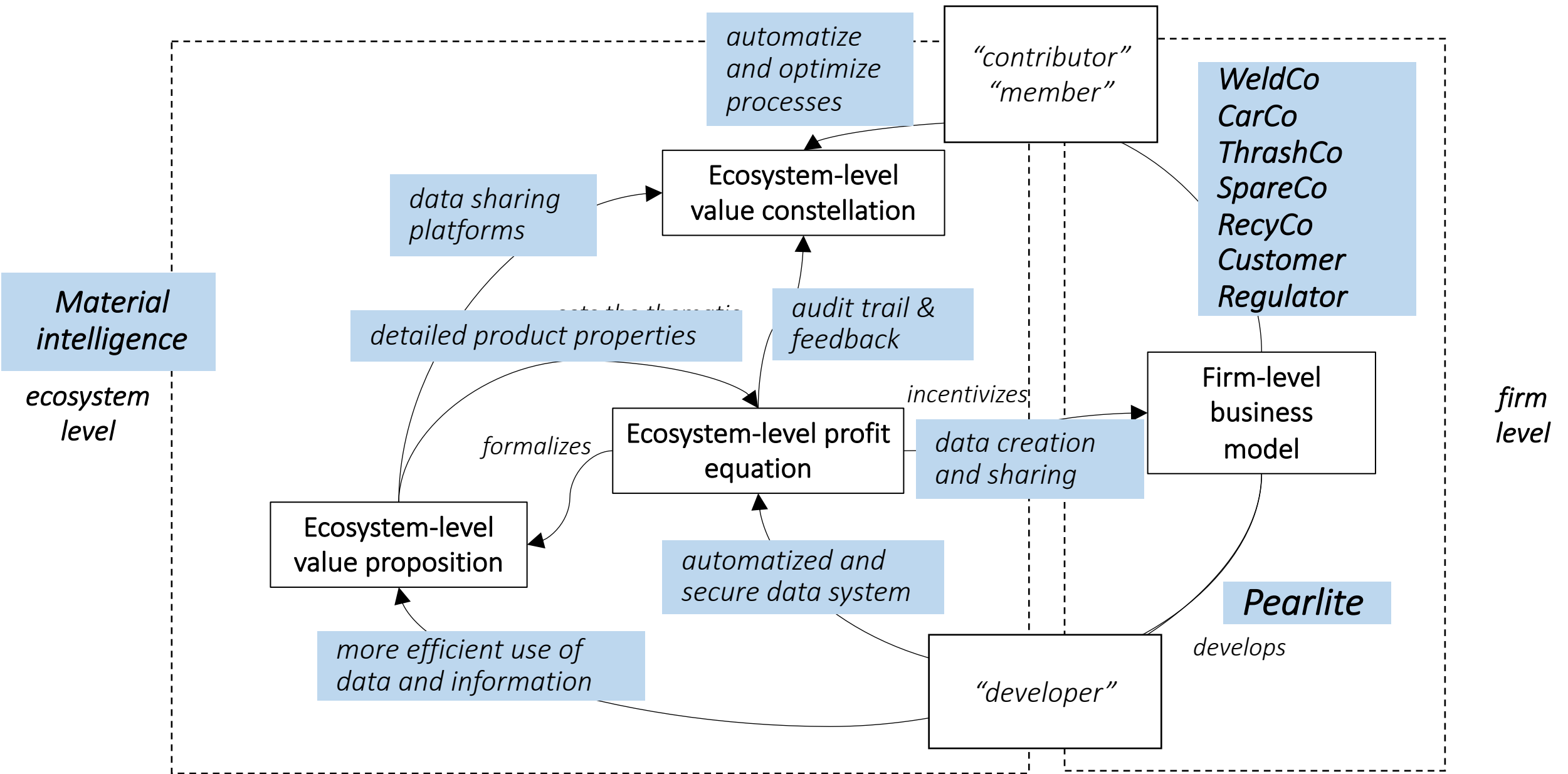
Disruptive technologies can increase the intelligence of goods and revitalize business

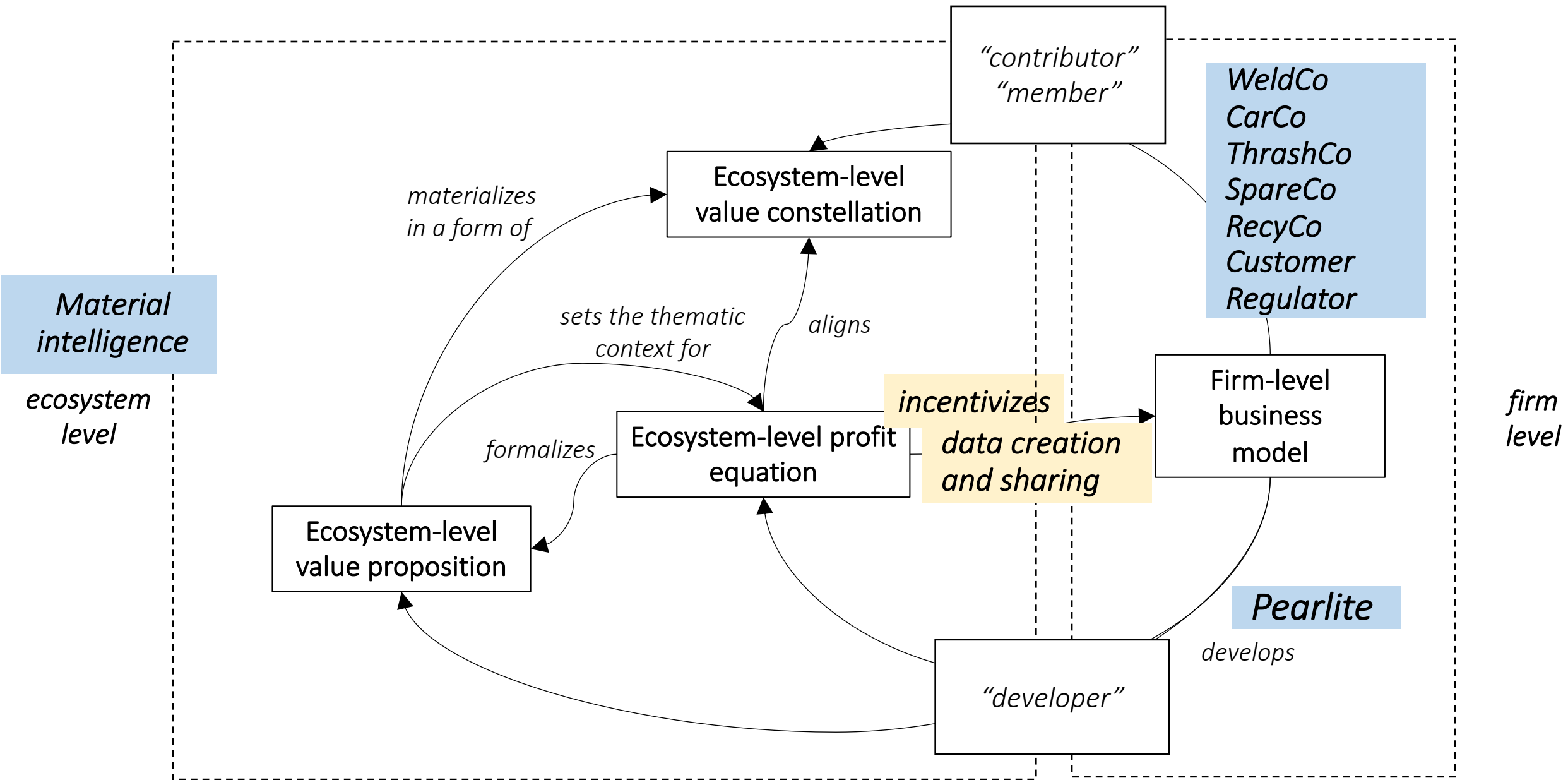
FIGURE I. An example of the life cycle of a car hood plate.



“*Pearlite’s* vision of *material intelligence* is to assign highly detailed *properties* to their *products* in order to automatize and optimize its customers’ processes.”







THIRD TAKEAWAY

Takeaway 1:

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One of our main goals in ATARCA is to explore blockchains & other DLTs as tools to compensate for producing, processing, and sharing data.

Greetings from Dr. Ville Eloranta, ATARCA PI >>



Timeline: 4/2021-3/2023

INCREASING AMOUNT OF GLOBAL ECONOMY IS ABOUT DATA.

DATA ECONOMY IS FLAWED.

**WE DON'T KNOW HOW TO
COMPENSATE FOR PRODUCING,
ANALYZING AND SHARING DATA.**

**WE TRY TO COMPENSATE WITH
MONEY.**

BUT MONEY IS NOT LIKE DATA.

**WE HAVE IDEAS:
LIKE TO COMPENSATE WITH
REPUTATION.**

**NOT STRAIGHT-FORWARD.
MANY RISKS.**

**WE NEED NEW APPROACHES.
RADICAL ONES.**

**WE DON'T KNOW THE SOLUTION.
WE CAN'T SOLVE THE PROBLEM.**

**BUT THE WORLD CAN, IF THEY
HAVE PROPER TOOLS.**

**HOW MIGHT WE FACILITATE
UNDERSTANDING
ON THE TOPIC OF:**

**HOW TO COMPENSATE FOR
PRODUCING, PROCESSING, AND
SHARING DATA?**





*Our vision is to create new decentralized **technology**, “anti-rival **tokens**,” and scientifically founded **proposals** for new **policies** to enable efficient, **decentralized**, market-style trading and **ecosystems for anti-rival goods**.*



The project impact goals include:

- **Practical use cases** that combine anti-rival goods & token engineering
- **Reports:** crypto-economic anti-rival mechanisms & anti-rival business model archetypes
- **Technology:** Open-source technology repositories on GitHub
- **Education:** business model design toolkit, MOOC on anti-rival business models

For example >>

12 data metaphors cards from the IDBM Challenge, Spring 2021

Anton Bykovskykh, Emilia Kiialainen, Joel Sormunen & Karen Visuri



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Cudos to:

Aalto IDBM

Anton Bykovskykh,

Emilia Kiialainen,

Joel Sormunen &

Karen Visuri

and

Ville Eloranta



DATA AS CURRENCY

What if internet users could use their own data as payment?

In traditional currency transactions, people exchange cash for goods and services of equal value. But when data is being exchanged, the transaction benefits one side over the other, at least today. Generators of data get practically nothing. Their data is captured and used to sell them more things in a targeted manner.



DATA AS CAPITAL

Businesses have relied on human, financial and intellectual capital to grow and compete over the last few centuries. Now there is a new form of capital - data, which is essential for businesses today to survive and thrive in the digital age.

The collection and circulation of data is a vital element for an increasing number of sectors of contemporary capitalism.



Cudos to:

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DATA AS LIFEblood

Data flows through organizations or other systems like blood in the circulatory system - and each day, each hour, there is a myriad of touchpoints to that “static” data. To the modern economy, data is the crucial fluid that carries nutrients (information) to those functions that consume it.


Understanding how the body works will help us better understand the vital part data is playing in all the related systems.



DATA AS WATER

There is one thing that living creatures cannot survive without - water. Everyone has access to water - however, it's not always clean, its sources might not be reliable and in many countries, it's used as a means to rule over people.

Water is vital for all lifeforms to survive and grow. In a similar way, for the sustenance and growth of businesses, data is absolutely critical and has no alternative.



DATA AS SUNLIGHT

It is like sunshine — we keep using it, and it keeps regenerating.
- Ruth Porat, CFO of Google

Every second we are generating vast amounts of data - and most of it is wasted. The value that can be derived from this data depends on how well we are able to capture it, the point of capture, and how quickly we can process it to fulfill our needs - just like sunlight.

It is a resource that won't deplete - but without harnessing its power, we're missing out.



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DATA AS SOIL

To be a successful farmer one must first know the nature of the soil. - Xenophon, student of Socrates

In order to harness value out of soil, one has to take constant care of it. It's not simply a raw material to harvest - the history of humankind has survived by cultivating crops on nutrient-rich soil. While soil has little value on its own, it can bring enormous value when something is grown from it.

In the same vein, data brings little value when it's just ones and zeros lying around - it's what flourishes from it that can bring prosperity. Get your hands dirty!



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Aalto IDBM
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 Emilia Kiialainen,
 Joel Sormunen &
 Karen Visuri
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DATA AS LABOR

When it comes to data - are we as individuals able to sufficiently harvest the fruits of our labor?

When looking at data as labor, it's all about fair compensation. All of us supply data to companies in one way or another, yet it's not necessarily something that we are proud of or are properly rewarded for. Were all data suppliers incentivized, they could provide high-quality data for the digital world around us to prosper.

What if the people supplying the data were to form a union?

DATA AS ART

The real value of art is not always revealed by the price set upon it. - Jeffrey Loria, art dealer

It has taken a great amount of creativity to build as many concepts and technological breakthroughs using data as building blocks. Furthermore, both art and data are often perceived as very abstract concepts - something that divides opinions and is difficult to completely understand. Who determines the value of art? Does anybody have the power to say what is good art and what isn't? Can these questions be applied to data?

DATA AS EQUITY

With the growth of data and AI, there should be more equality around us with machines behind the thought processes. However, data is collected, analyzed, interpreted and distributed by people who have their own subjective experiences and potential biases. For example, various forms of interpretation biases can alter our understanding of data, leading us to selectively value or dismiss certain outcomes and explanations over others.

We should, by all means, avoid these biases and ensure that data can provide equity for each individual.



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DATA AS INFORMATION

It is often said that data in itself holds no value - what does is the information that is derived from it. If we get our hands on a pile of data, we couldn't possibly know all the things that could become of it.

Early humans are claimed to have survived and evolved primarily through sharing information and knowledge. Still, when it comes to data, many are hesitant to share it with others, despite being able to keep the original copy to themselves.

If we shared data just like information and knowledge, could our society become faster to evolve? What are all the wicked problems that we could already solve with the data that we possess?



DATA AS INFRASTRUCTURE

To see data as infrastructure (such as road, rail, or energy) holds an inherent value of neutrality. It's accessible for all regardless of age, gender or class and crucial for one's everyday life. People need to power their homes, commute to work and buy groceries. Without infrastructure, even the most basic of everyday tasks become difficult.

Still, a solid, well-functioning infrastructure takes enormous efforts and plenty of resources to build. Who should bear the responsibility and who should take the cost? Have we built a neutral infrastructure around data?



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DATA AS OIL

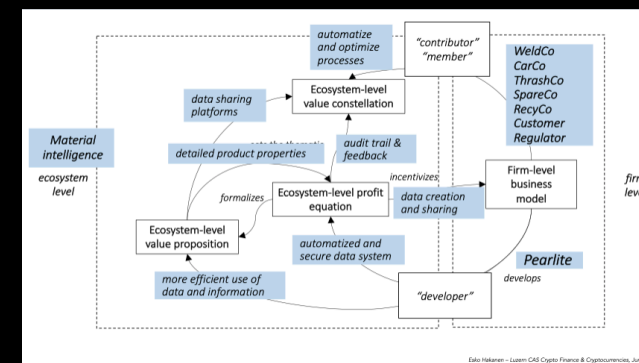
The concept behind “data as oil” is that just like oil, raw data is not inherently valuable - rather the value is created when it's gathered completely and accurately, connected to other relevant data, and done so in a timely manner.

However, the reality about oil is that its supply, as well as its use cases, are finite. The reality with data is the opposite: as long as there are humans around, we will always create more data.

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ECOSYSTEM AS AFFILIATION

- > Symbiotic, long-term relationships
- > Raising external barriers
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> **Unit of analysis:** nodes & dyads (individuals, firms, alliances, etc.)
Who?

Can be defined **ex ante**

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Thank you!

Contact:
esko.hakanen@aalto.fi

