

DIGITALISATION OF INTERNATIONAL TRADE

How can new digital technology contribute to solving the major challenges of containerized international shipping?

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Digitalisation of international trade – Questions addressed by research

How can new digital technology contribute to solving the major challenges of containerized international shipping?

- i. What are the major challenges of international trade?
- ii. What are possible digital technology / solutions?
- iii. How to do the fitting of tasks and the technology / the digital solution?

Digitalisation of international trade - Analysis

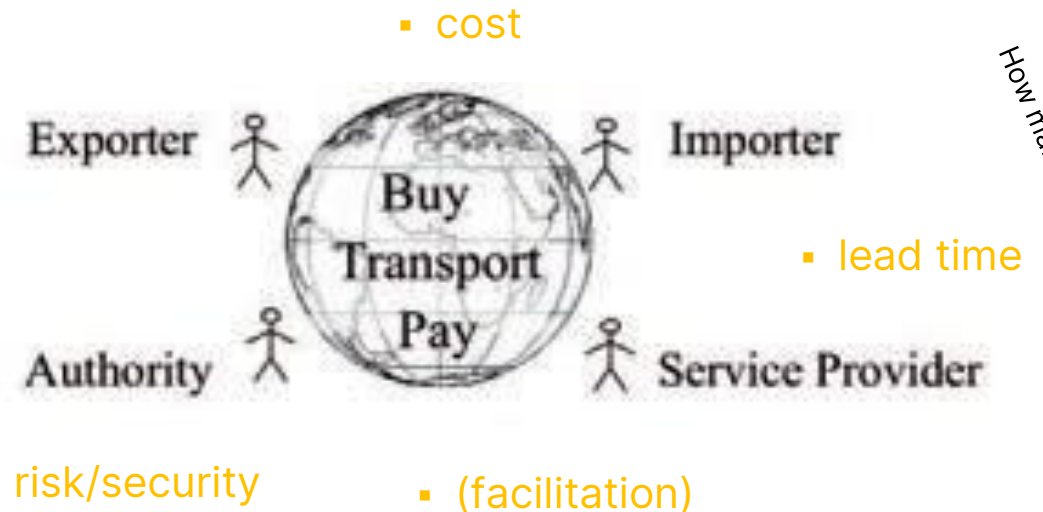
What are the major challenges of international trade?

For the case of containerized shipping across borders

Analysis of eco system of actors for the case of containerized shipping across borders:

Main actors in international trade

United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT)



How many actors?

Analysis of eco system of actors, challenges: risk/security, cost, lead time, (facilitation)

Digitalisation of international trade – Analysis, details

What are the major challenges of international trade?

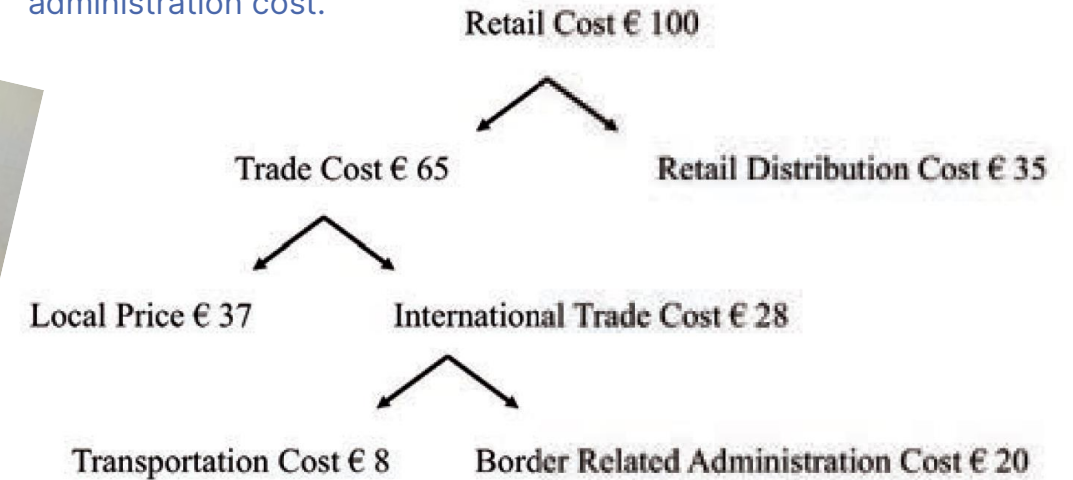
Table 1 – The e-friendliness of present legal framework

Legal Source	Need to Issue Documents	Formal Requirements	Signature Requirements
HR of 1924	Art.10: BL necessary (exception is Art.6)	Art. 3(3),(7): BL is issued upon request	No e-mer
WC of 1929	Art. 6,9: AWB necessary, otherwise full liability	Art. 5,6: written form necessary being an accompanying document	Art. sta
HP of 1955	Art. 6,9: AWB necessary, otherwise full liability	Art. 5,6: written form necessary being an accompanying document	A
CMR of 1956	Art. 4: CN not necessary, but Art. 8,9,12,13,24,34!	Art. 5,6: written form necessary being an accompanying document	
VR of 1968	Art.10: BL necessary (exception is Art.6)	Art. 3(3),(7): BL is issued upon request	stamp
MP4 of 1975	Art.5,9,11: AWB not necessary, but serves as a receipt	Art. 5(2): AWB in written form but any other form is possible	
HamR of 1978	Art. 1(7),18: BL is evidence of contract,	Art. 1(8),14(1): upon request, telex, telegram	Art. 14(3): printed or stamped possible and



The major impediments towards more effective trade can be grouped into three non-tariff trade barriers:

A) International trade cost primarily cross border related administration cost.



B) Lead time and its uncertainty.

C) Security and risk concerns.

Extract from EU Regulation 1960/11, Article 6

Transport documents shall be made out in duplicate and shall be numbered. One copy [an original paper document] shall accompany the goods; the other copy shall be retained by the carrier for two years, reckoned from the date of carriage, and shall be filed in numerical order. The latter copy shall show the full and final transport charges, whatever the form in which they may be made, any other charges and any rebates or other factors affecting the transport rates and conditions.

Digitalisation of international trade – Analysis, across borders

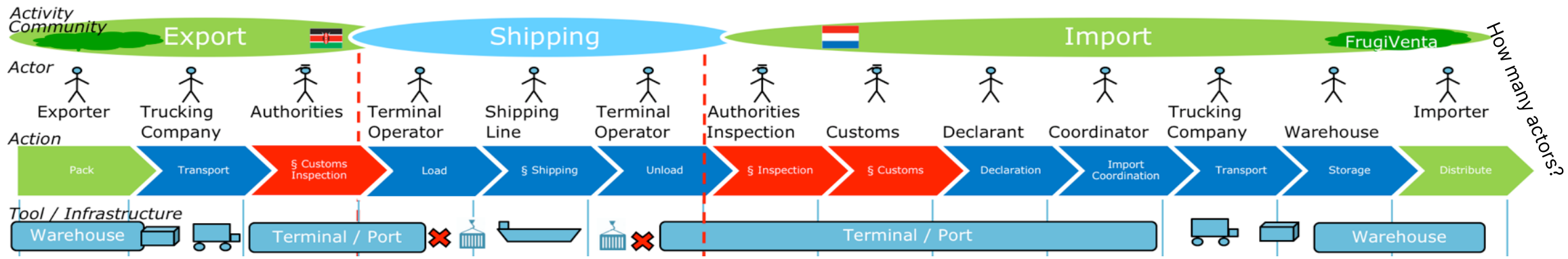
What are the major challenges of international trade?

For the case of containerized shipping across borders

Analysis of actants being 1 shipment of containers with fresh avocados crossing borders:

Findings:

- Actant = 1 shipment/container with fresh produce becomes Run Away Object
- Efficient dedicated physical infrastructure
- Actors plenty, who rely on shipping information, but often Information is missing / not up-to-date
- Hundreds of papers/documents, digitized stored in proprietary IT systems, locally within each organisation
- Fragmented digital eco system with many communication channels, and much more



Digitalisation of international trade – Digital solutions, possibilities

How to do? Information Systems Research

What are possible digital technology / solutions?

Plenty of digital technologies!

Be aware of the meaning and difference:

- ❖ Digital – bits and bytes
- ❖ Digitize – e.g. a document / an object – from analogue to digital (digital twin)
- ❖ Digitization – the technical process of digitizing
- ❖ Digitalization – “a sociotechnical process of applying digitizing techniques to broader social and Institutional contexts that render digital technologies infrastructural”
- ❖ Digitalization across borders of organizations, countries, and regions e.g. along supply chains – can foster value co-creation!

Plenty of possible digital technologies / solutions.

Discussion of digital solutions researched by Information Systems (IS) theories:

- 1) IS research prescribing digitalization with digitization to transform any industry
- 2) IS research recommending collaboration via digital communication by Inter-Organisational Systems (IOS) based on EDI messages. Particularly within containerized shipping report both successful and unsuccessful cases of IOS.
- 3) **IS research calls for increased investigation of utilization of Information Infrastructure, exemplified by the Internet.**
- 4) **Within containerized shipping / trade this is the I3 framework for accelerating global supply chains for trade using IT innovation. Detail by the Shipping Information Pipeline.**
- 5) **IS research propose use of blockchain (BC) e.g. in the case of Tradelens and research it's potential value and prevention of facilitation**
- 6) IS research on Artificial Intelligence (AI)
- 7) What's next?

Digitalisation of international trade – Digital solutions, design principles

How to do? Design Science Research

What are possible digital technology / solutions? What's the design?

Digital objects

- Money – Society for Worldwide Interbank Financial Telecommunications ([Swift](#))
- Vessels – International Maritime Organization ([IMO](#))
- **Container - International Container Bureau ([BIC](#)) and some global data**
- **Shipment - EDIFACT, booking, eBL, etc.**
- **Documents – some e.g. [EU](#)**
- Product – UPC/EAN and e.g. upcoming European Union's Digital Product Passport
- Digital identity, DT – Data Spaces, standard, etc.

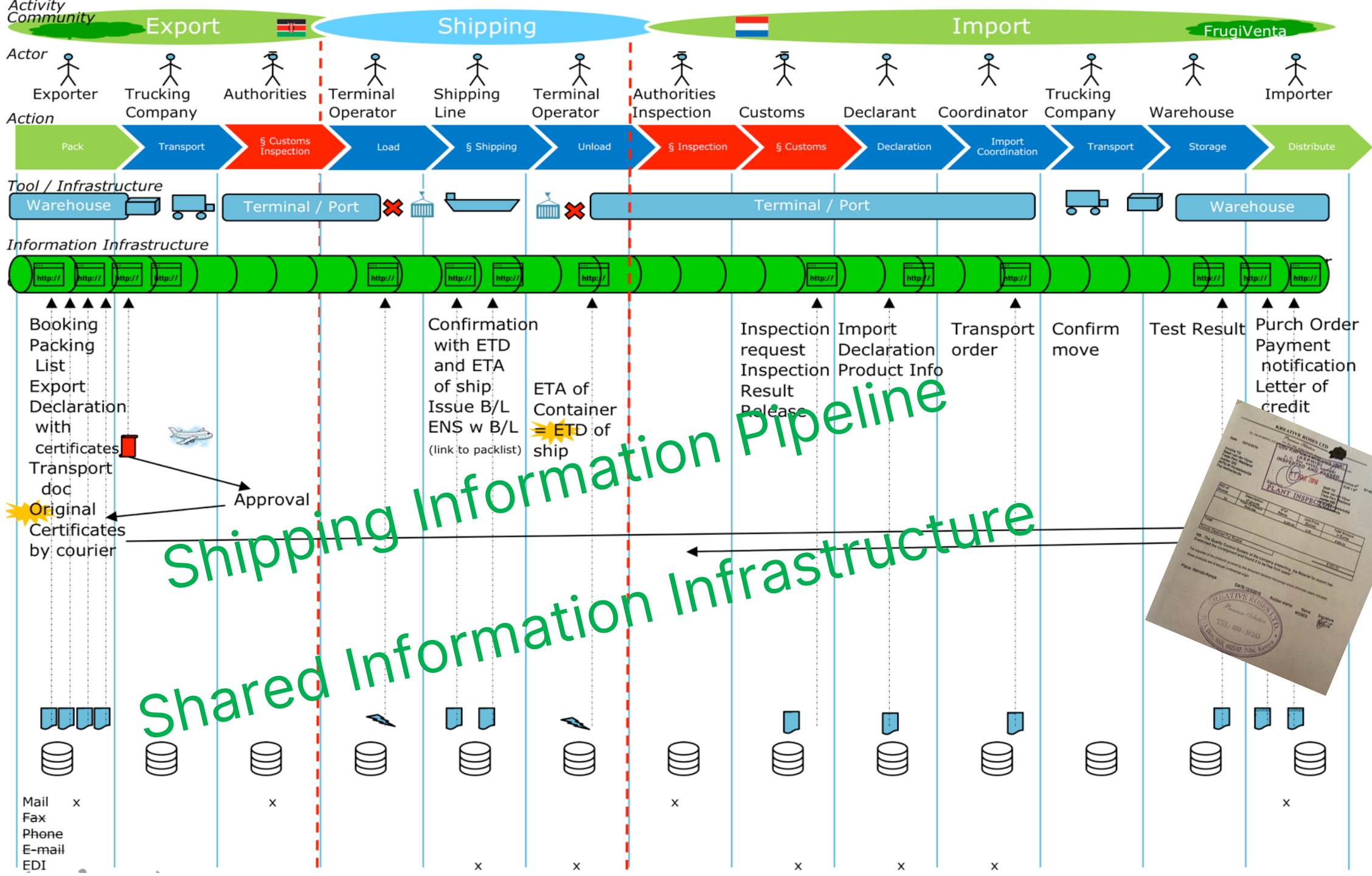
Discussion of digital solutions researched design principles:

Meta-design principles:

- 1) Digitalization ..
- 2) Digital communication
- 3) Utilizing Information Infrastructure (II)
- 4) Shared meta-information only

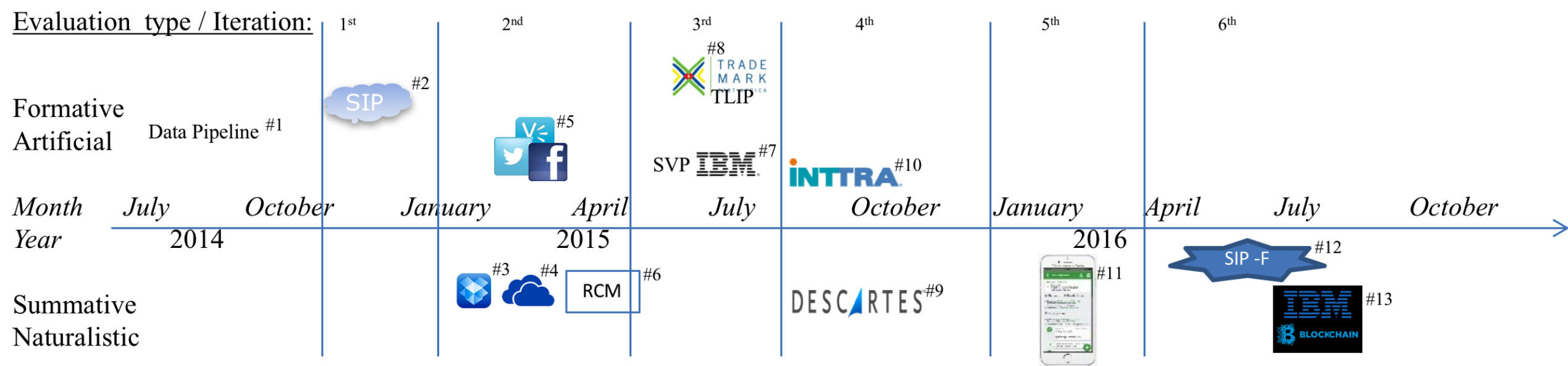
Detailed design principles:

- I) No big brother
- II) Integrate ones
- III) One virtual pipeline
- IV) No commercial
- V) Information direct from source
- VI) Event based
- VII) Separate meta-information
- VIII) Facilitate trust



Digitalisation of international trade – Digital solutions, develop prototypes

How to do? Action Design Research – Build, Intervention and Evaluation



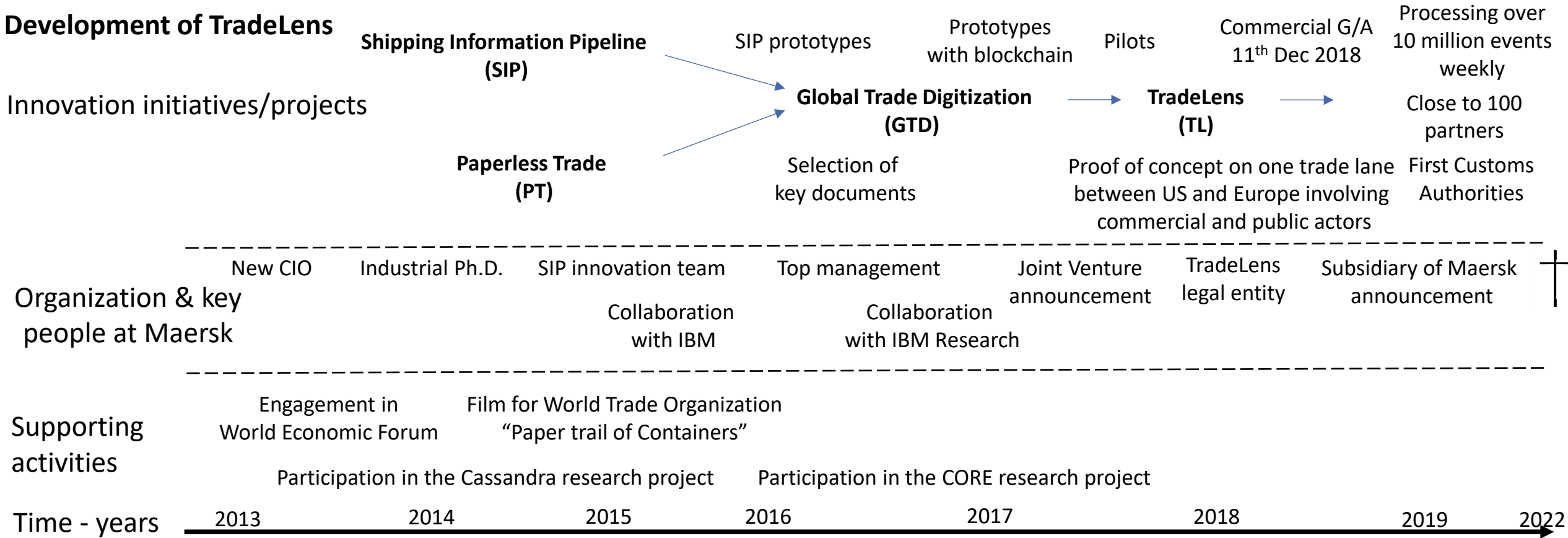
Prototype/Solution name:

#1 Data Pipeline	#2 Shared Information Pipeline	#7 Supply Chain Visibility Platform	#11 Shipping Information Pipeline Application
	#3 Dropbox*	#8 Trade Logistic Information Pipeline	#12 Shipping Information Pipeline Foundation
	#4 OneDrive*	#9 Descartes*	#13 Block chain technology by IBM and #12 joint to Global Trade Digitization
	#5 Facebook*	#10 Intra*	#14 Tradelens
	#6 Remote Container Management*		
	* existing solution		

Digitalisation of international trade – Digital solutions, development

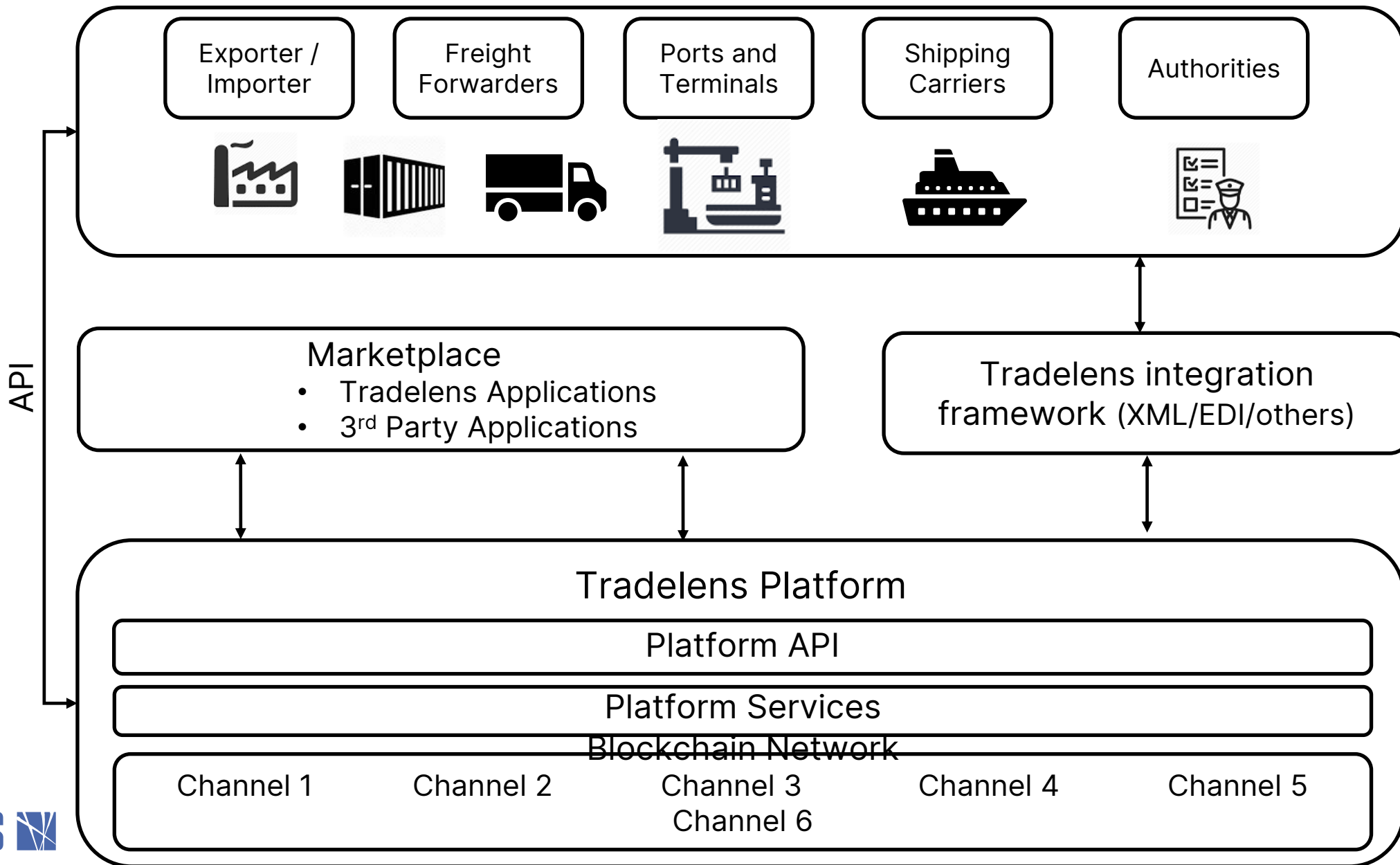
How to do? Timeline of Tradelens

Development of TradeLens

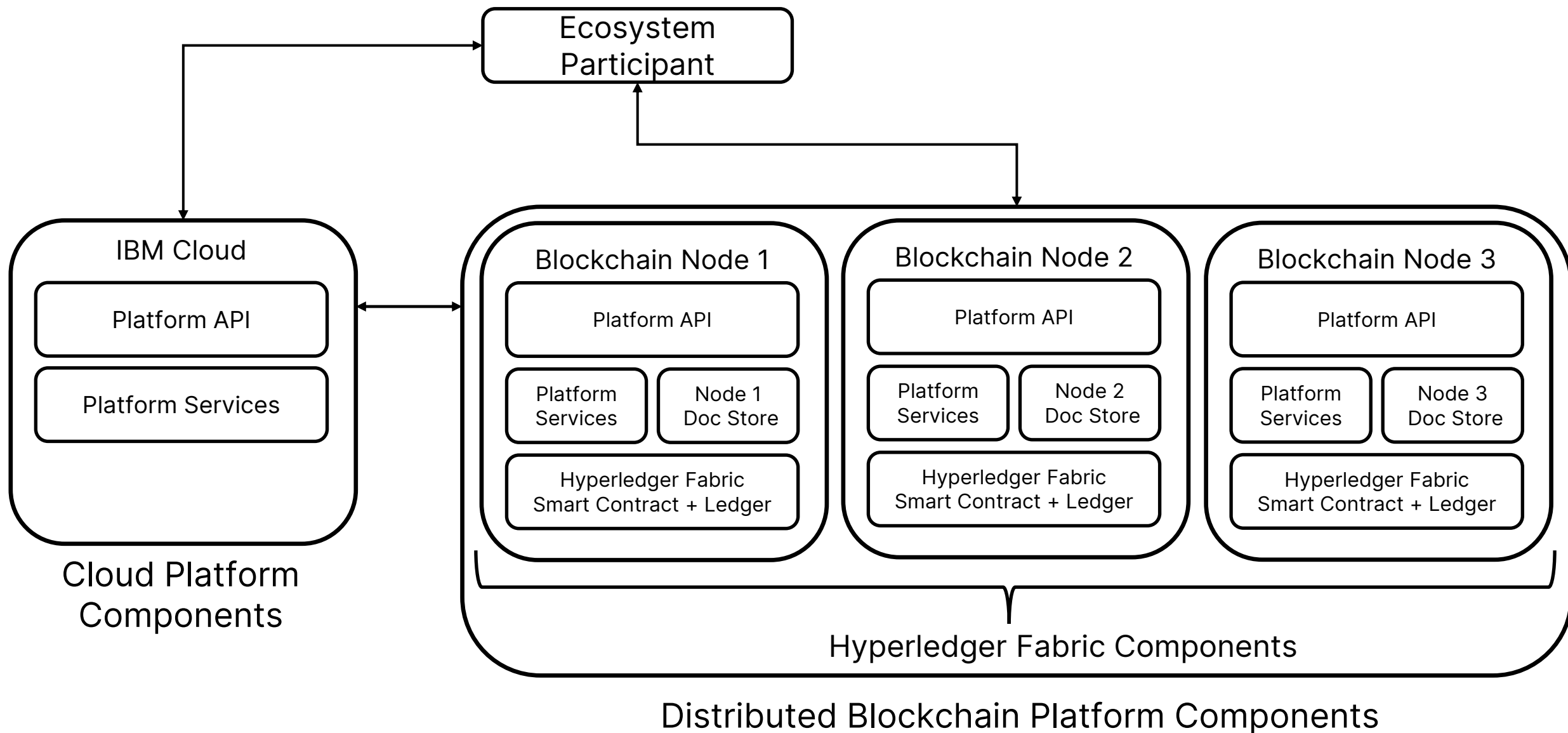


† M.J. Iversen and K. Markhvida, The challenges of digital transformation in a legacy environment: Learning from the failure of Tradelens, forthcoming.

Digitalisation of international trade - Digital solutions, Tradelens ecosystem



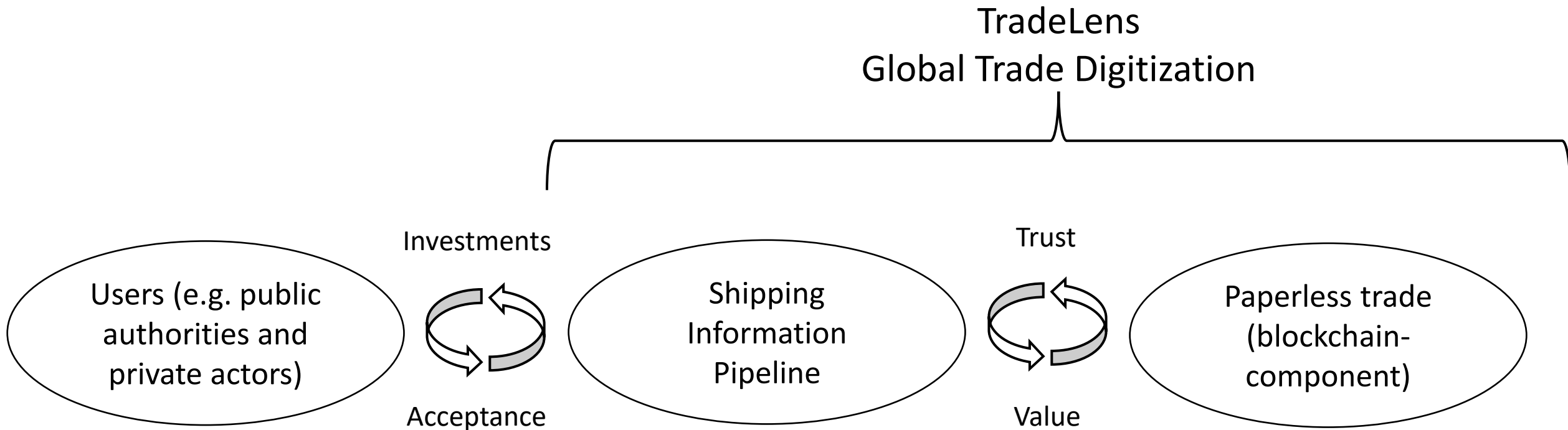
Digitalisation of international trade - Digital solutions, Tradelens blockchain



Digitalisation of international trade – Digital solutions, network effects

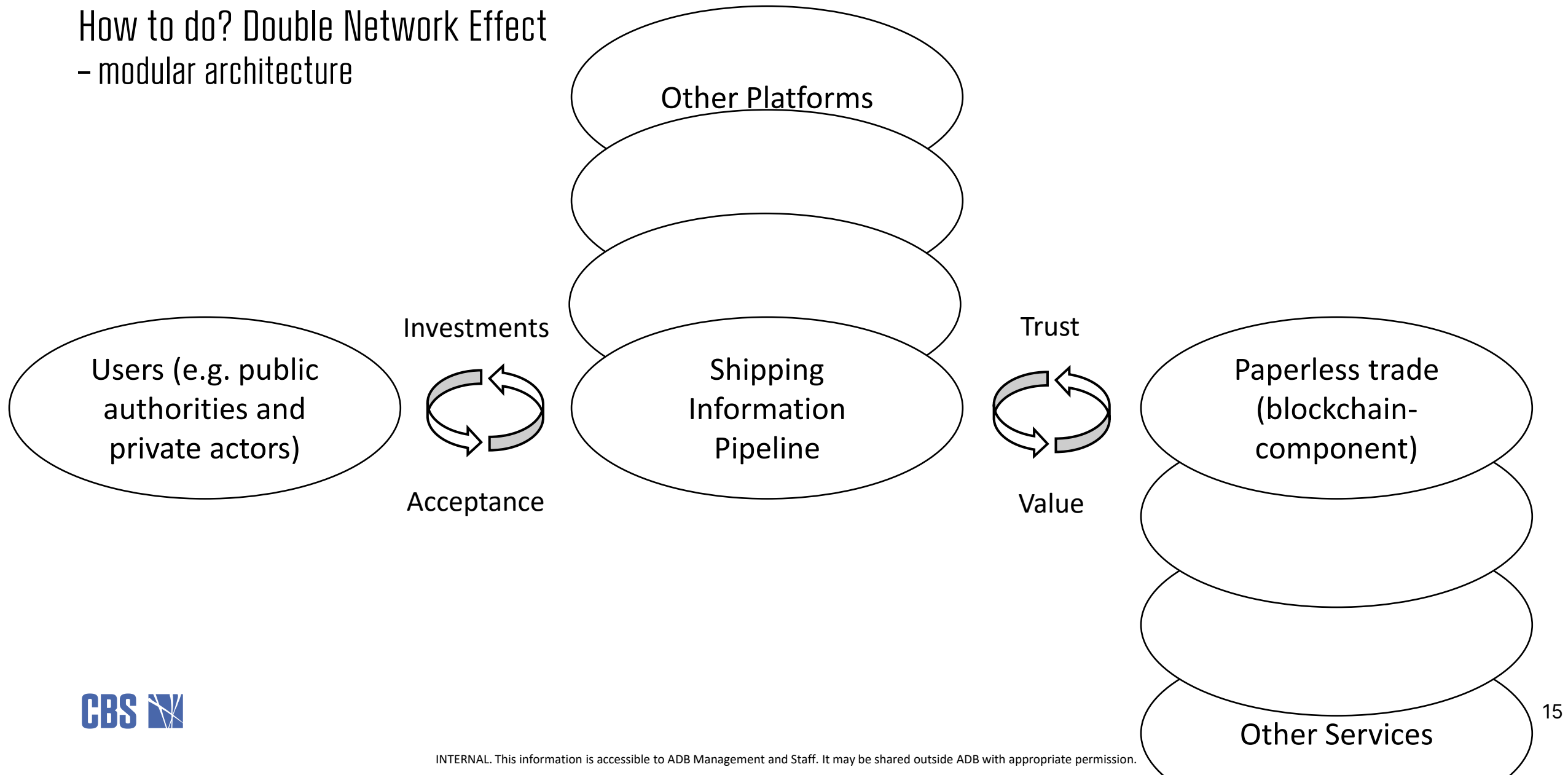
How to do? Double Network Effect

– explains slow adaption is holding back the potential business value of Tradelens



Digitalisation of international trade - Digital solutions, network effects

How to do? Double Network Effect
- modular architecture



Digitalisation of international trade – Approaches & Recommendations

How to do?

Approaches to establish a paperless trade environment

- i. Getting legal instruments e-enabled
- ii. Making a legal bubble around all actors to solve the legal issue
- iii. Integrator (carrier or shipper) – a centralised approach of title registry
- iv. Blockchain Technology – a decentralized approach of title registry

Recommendations for blockchain to deliver business value

1. Think Differently about Strategy
2. Focus on the Vision, Not Return on Investment
3. See Blockchains as Decentralized Technical Solutions to Inter-organizational Problems
4. Build Partnership Trust Before and After Blockchain Trust
5. Use Legitimacy and Political Feasibility to Guide the Starting Point
6. Evolve the Governance Model as Adoption Expands

Digitalisation of international trade – Approaches & Recommendations

How to fit? Why new digital blockchain technology can impact business and value co-creation

Fit of tasks and the digital technology specifically blockchain technology to support value co-creation as expressed by transparency among and across the organizations in the container shipping industry, how?

Perspectives:

- a. Control Tower technology solutions
- b. Decentral solutions e.g. blockchain

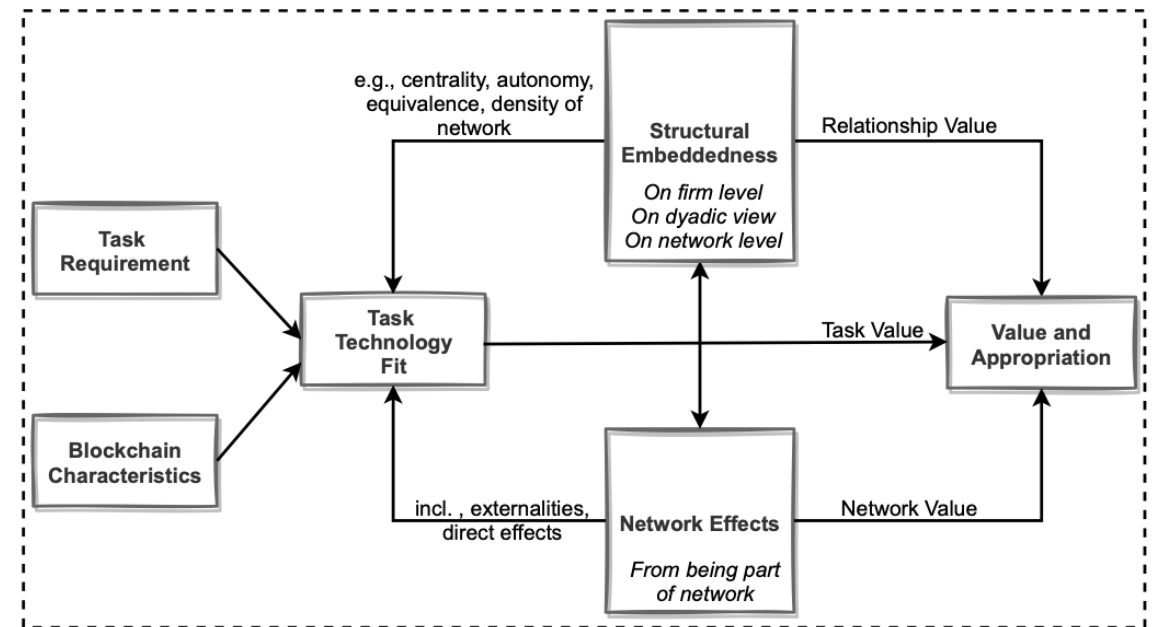
Task-technology fit, 3 building blocks:

- I. Task-digital technology –fit within boundaries
- II. Fit of organisational network and digital infrastructure / network across borders – benefits/sacrifices
- III. The value co-creation fit of governance of the digital solution and its diffusion – balancing diversity and centrality

Case of Tradelens

Beyond Fit of tasks and technology exploring the network value

1. Conceptual framework of value drivers



2. Relationship Value

1. Organization value: Task-technology fit
2. Network value: Industry - Blockchain
3. Relationship value: Industry – Blockchain

Related properties:

- Centrality
- Autonomy
- Equivalence
- Density

Digitalisation of international trade – Conclusion

Answering the initial questions

How can new digital technology contribute to solving the major challenges of containerized international shipping?

- i. What are the major challenges of international trade?

Analysis of the case of containerized shipping across borders:

- a. Analysis¹ of eco system of actors, challenges: risk/security, cost, lead time, (facilitation)⁸
- b. Analysis² of actants in form of shipment of containers with fresh avocados crossing borders⁵:
Actors plenty, Actant = 1 shipment/container and hundreds of papers/documents, efficient physical infrastructure, fragmented digital eco system with many communication channels, and much more.

- ii. What are possible digital technology / solutions?

Discussion of digital solutions researched by Information Systems theories:

1. Inter-Organisational Systems (IOS) as EDI based^{3 & 9}
2. Information Infrastructures (II) as the Internet - Shipping Information Pipeline⁴
3. Blockchain (BC) - Tradelens – it's potential value⁶ and prevention of facilitation⁸
4. Artificial Intelligence (AI)
5. what's next?^{7 & 11}

- iii. How to do the fitting of tasks and the technology / the digital solution?

Discussion of task-technology-fit models for cross border cases:

- Which fit of digital technology specifically blockchain technology supports value co-creation as expressed by transparency among and across the organisations in the containerized shipping industry? The case of Tradelens⁹
- In the case of blockchain technology adaption, what does the fit mean when we investigate from the network point of view? The cases of Tradelens for containerized shipping and of international trade of gemstones¹⁰.

Expand from organizational context to complex invisible phenomena with Run Away Objects²

Digital technologies are available (& keep developing!)

Collaboration & Governance Shared/aligned vision Value co-creation

Read more references

- ¹Jensen et al, 2014a
- ²Jensen et al, 2014b
- ³Jensen et al, 2015
- ⁴Jensen 2017
- ⁵Jensen et al, 2018
- ⁶Jensen et al, 2019
- ⁷Jensen et al, 2021
- ⁸Sarker et al, 2021
- ⁹Prockl et al, 2021
- ¹⁰Prockl et al, 2022
- ¹¹Prockl et al, 2025

References

Google Scholar



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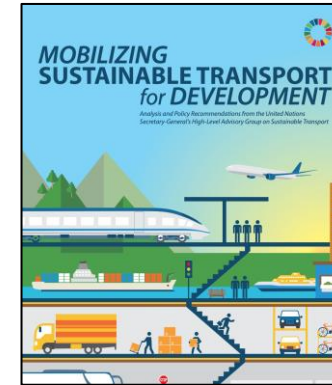
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FØLGER

<input type="checkbox"/>	TITEL	CITERET AF	ÅR
<input type="checkbox"/>	How TradeLens delivers business value with blockchain technology. T Jensen, J Hedman, S Henningsson MIS Quarterly Executive 18 (4)	219	2019
<input type="checkbox"/>	The use of blockchain as a resource for combating corruption in global shipping: an interpretive case study S Sarker, S Henningsson, T Jensen, J Hedman Journal of Management Information Systems 38 (2), 338-373	99	2021
<input type="checkbox"/>	Avocados crossing borders: the missing common information infrastructure for international trade T Jensen, N Bjørn-Andersen, R Vatrapu Proceedings of the 5th ACM international conference on Collaboration across ...	41	2014
<input type="checkbox"/>	Avocados Crossing Borders T Jensen, N Bjørn-Andersen, R Vatrapu Cabs' 14. Proceedings of the 5th Acm International Conference on ...	44	2014
<input type="checkbox"/>	Avocados crossing borders: The problem of runaway objects and the solution of a shipping information pipeline for improving international trade T Jensen, R Vatrapu, N Bjørn-Andersen Information Systems Journal 28 (2), 408-438	36	2018
<input type="checkbox"/>	Ships & roses: a revelatory case study of affordances in international trade T Jensen, R Vatrapu ECIS 2015 Proceedings, 88	17	2015
<input type="checkbox"/>	Key design properties for shipping information pipeline J Thomas, YH Tan Open and Big Data Management and Innovation: 14th IFIP WG 6.11 Conference on ...	15	2015
<input type="checkbox"/>	Unleashing the IT potential in the complex digital business ecosystem of international trade: The case of fresh fruit import to European Union. T Jensen, YH Tan, N Bjørn-Andersen	15	2014



Shipping Information Pipeline



It takes 200 interactions and more than 20 documents to transport a container of avocados from Mombasa, Kenya to Rotterdam in the Netherlands, and the cost of the documentation process equals the cost of the actual shipping. A partnership of public authorities, supply chain operators and information technology corporations is developing a 'Shipping Information Pipeline' (also known as 'Trade Logistics Information Pipeline'). This Pipeline provides a digital infrastructure, in which supply chain partners and authorities can share and access original information required for a trade, creating supply chain transparency and a flow of information that facilitates the flow of goods. The Shipping Information Pipeline is being tested in East Africa, and its potential for trade enhancement and growth is global.

Connected to Recommendations: 2, 4, 7



Video: The paper trail of a container

