Leading Innovation and IP

in Data and AI Driven Economy - Multiple Systemic Options

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September 9, 2018

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Synopsis: Leading Innovation and IP
in Data and AI driven Economy – Multiple Systemic Options

This presentation explores systemic options which can be used to create and share interoperable innovations in different dynamics observed in the ICT industry.

ICT architecture consists of four main clusters and six critical interfaces. Regulation and policies applied to each interface liberate and constrain the business dynamics and control the level and types of network effects companies through their different platforms can create.

New raw material (Data) and new processing technologies (AI) enable new, all digital ecosystems to emerge where value creation, capturing and sharing depends on the rules of openness and other characteristics of the technical and operational collaboration networks and the related network effects.

Companies may choose different portfolio strategies to address multitude of options.

Observation: Successful ecosystem requires that the applied systemic technical and operational approaches in the key interfaces of the ecosystem are either aligned or they operate in isolation (for instance using tunneling). Hybrid models are very challenging.

Managing the power of the network effects provides a simple and dynamic tool for policy makers to achieve desired level of competition and collaboration and consequently balance between value creation, capturing and sharing.

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Leading Innovations and IP

in Data and AI driven economy – Multiple Systemic Options

- ICT driven architecture
- Leadership options
- Platform options
- Corporate strategy options
- Case: Nokia
- Observations

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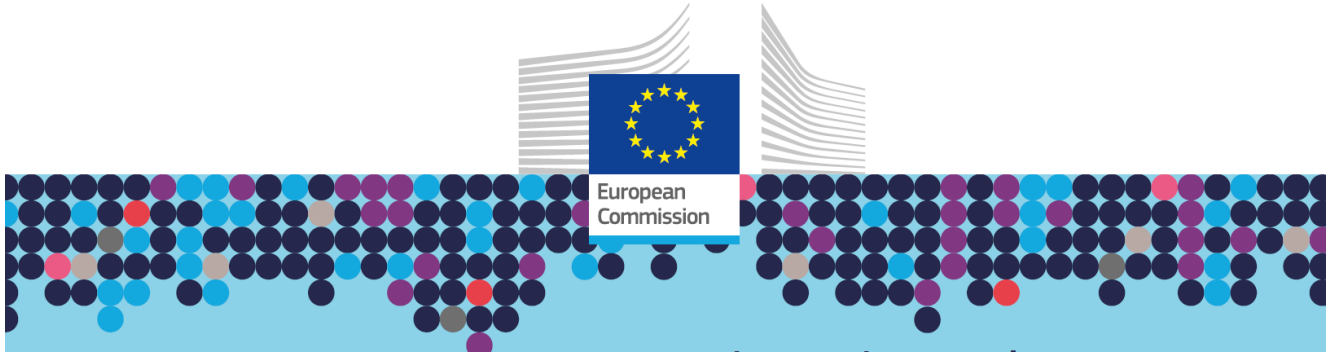
Future is Full of Fun and is Far Better than What we have Today

High expectations

Opportunities may be even bigger



WHAT ARE THE EXPECTED BENEFITS?

BY 2020[2]

- €1.7 billion in cost savings for EU public administrations.
- 7,000 lives potentially saved yearly thanks to quicker emergency responses.
- 629 million hours of waiting time in traffic jams or public transport saved.
- 16 % decrease in gas, electricity, oil and transport fuel consumption thanks to real-time open data on energy use.

BY 2030[3]

- The value of the data for the economy will grow to almost €194 billion (from €52 million in 2018).
- More than 700,000 jobs will be based on public sector data, especially in SMEs and startups.
- The cost of making public sector data available for reuse will decrease by 21%.

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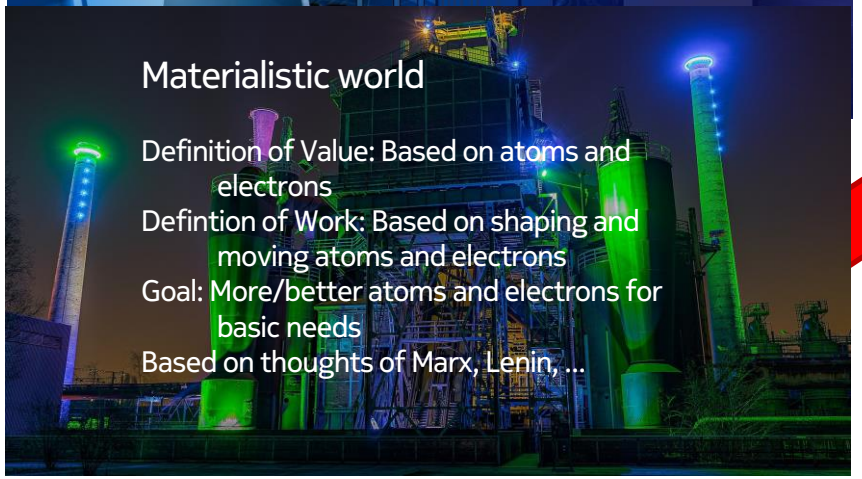
Unifying Bits, Electrons and Atoms



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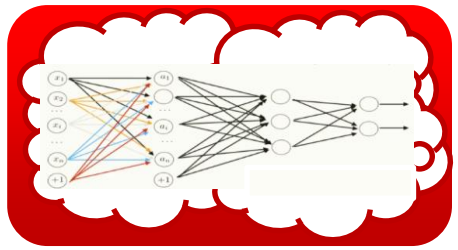
Innovation clusters of the ICT

New Value driven by Innovation

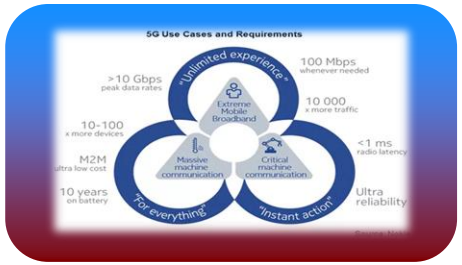
New emerging ICT driven Ecosystems in Health, Transportation, Energy, Smart City Utilize all clusters and their Innovation, IP and Data

Content ~
Cloud ~ AI



Net Neutrality

Network ~ 4G, 5G
Mobile network
Internet



Open Air Interface

User Interface ~
Mobile Device,
AR/VR
Local Connectivity

Open SIM Interface

Things ~ Sensors and Actuators

Openness driven by Regulation

New emerging needs to drive and control the Data based value creation, capturing and sharing

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In Reality: ICT Architeture consists of Four Clusters => Six Interfaces => Six focus points for Ecosystem considerations

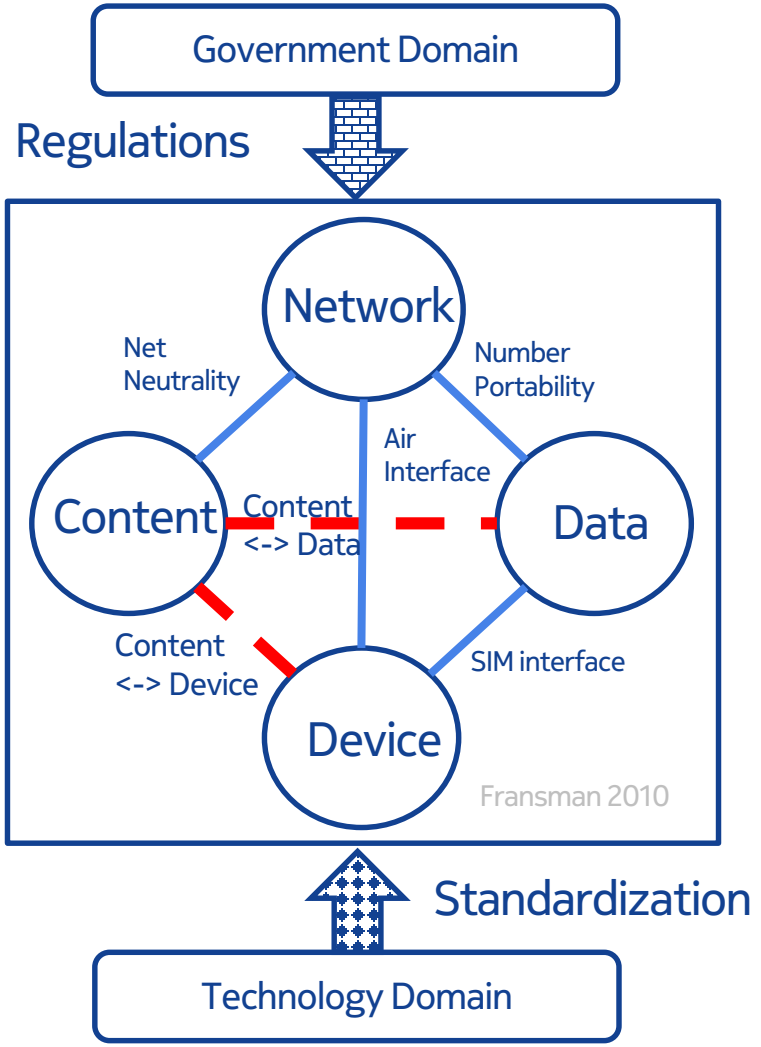
ICT business operates between boundary conditions set by regulations and standards, where companies compete and collaborate while addressing the multiple needs of consumers

- ICT business consists of 4 clusters and 6 critical interfaces
- Regulations related to the key interfaces are different in different ICT driven sectors of society.
  - In telecommunication, four of the six interfaces have been defined and regulated, while for the two remaining interfaces undefined regulated allows bundling possibilities, such as

    Content <-> Device (for instance Android <-> Google Play)

    Content <-> (Personal) Data (for instance Facebook and other social media)
  - In Transportation (e.g. Mobility as a Service), regulations are less developed and ambiguous

Regulation drives the business models of companies that interoperate over the interfaces. Therefore, Innovation processes, including for instance Standardization and Intellectual Property management, are different in each case.



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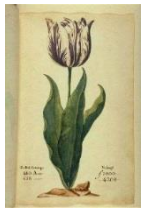
Personal Data (Data and Identity)

The New Scarce Resource!, Does Data create a New bubble of hype also ?

Anything we have seen in the past, related to Tulip mania, gold rush of California or Radio spectrum auctions for next generation mobile systems, we will witness again with access rights to Consumer Personal Data

State of the art:
Catch if you Catch can



State of the art: Spectrum Auctions

State of the art: GDPR & PDS2

In the European Union, GDPR defined rules for management of Personal Data. PSD2 implements data portability regulation for financial sector.

Data is scarce because of

- Data cathering is still expensive
- Data cleaning is expensive
- Data annotation is very expensive
- Access to data is limited by the rules and regulations

Like the spectrum and emission rules and regulations in telecommunication, GDPR and PSD2 directives set baselines for sustainable business in the European Union. Each critical interface of the ICT architecture will need further considerations in Data based economy.

Therefore, Global harmonization, co-existance/ interoperability of all and any data would be similarly beneficial.

Currently we are only in the beginning !

Do we need ”ITU-R” of Data ?

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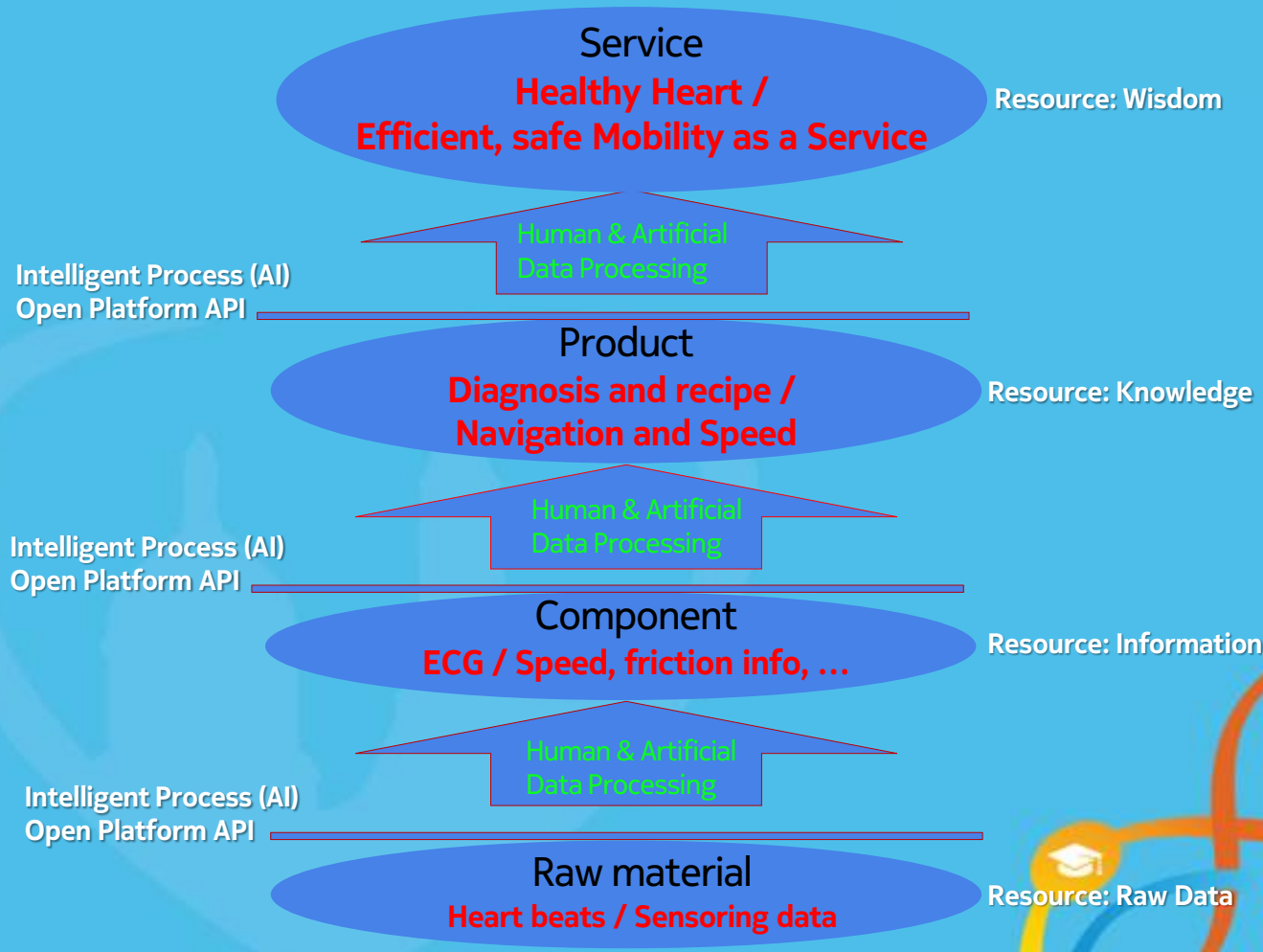
Digital Opportunity – Stairway to Wisdom

Data and Processing are dualistic, How about ownership ?

Observations

- **Total value = Cumulative Value in Data ~ Value of Innovations**
- **Open ≠ For Free**
- **Immaterial value >< Material value**



DIKW: Data, Information, Knowledge, Wisdom

OISPG

Committee of the Regions

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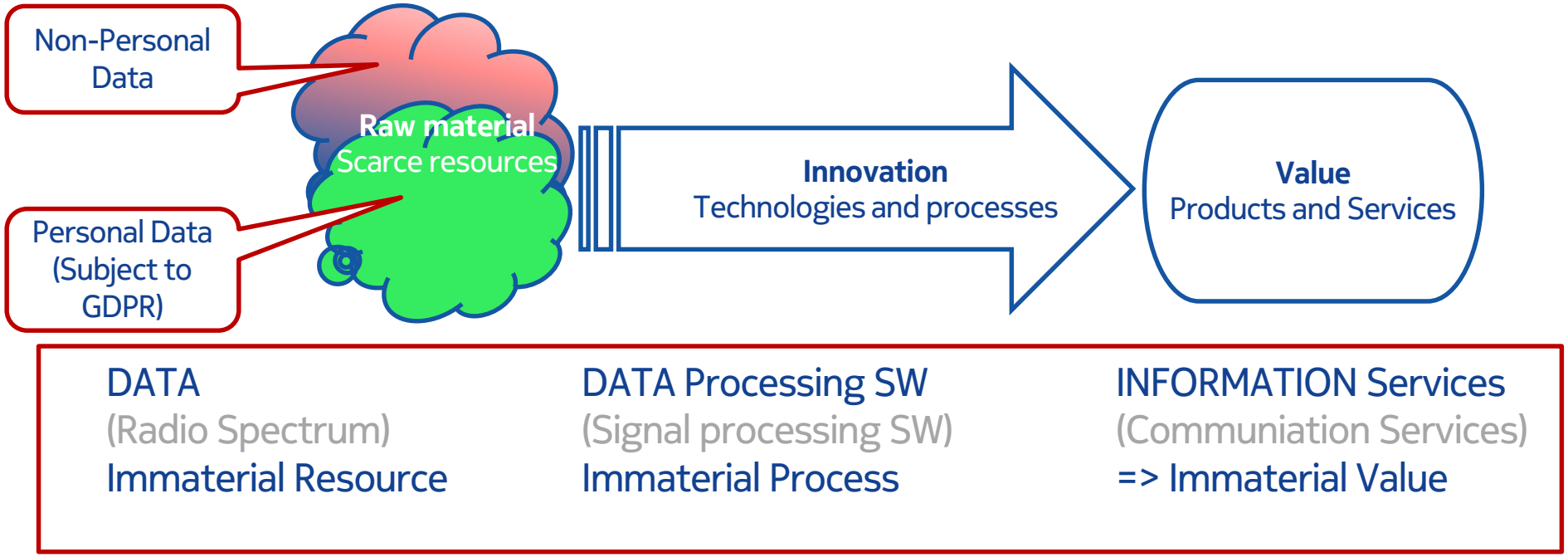
All Digital Industrial approach: Digital raw material and Digital process create all Digital value



- Creating, Capturing, and Sharing of Value are all based on immaterial assets which can be Produced, Processes, Stored, Copied and Transported digitally with virtually zero costs.
- Digital value is not visible in the same way as the value of the physical products.
- Control (Access) and Ownership (Responsibilities) of Data, Process (technologies, innovations) and Products (IP) require clarifications.

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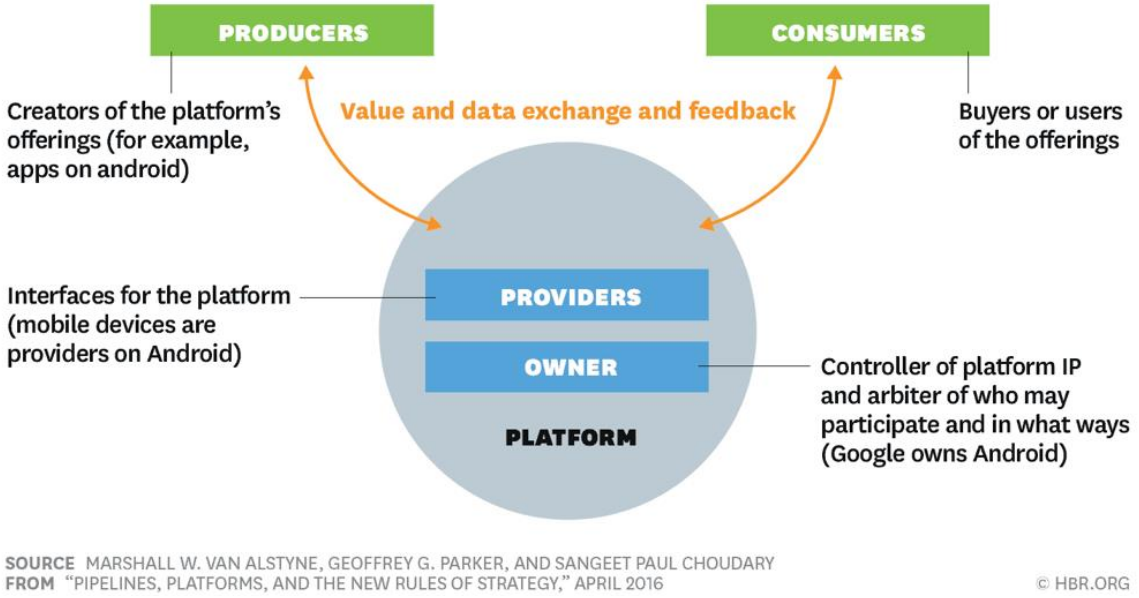
In Digital business Platform wins… always



Two sided platform = Generation 3.0

… by combining network effects of traditionally independent actor groups of the value network

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Four generations of platforms
for ever stronger network effects

- Generation 1: In House Technology Platform (dominant until mid 1990's)
  - Developed to enable re-use of common parts of the design
  - One directional: Platform owner provides the platform as "common good"
  - Examples: DCT - Nokia Mobile Phone's internal product platform, Open public data (Kansalaisen Karttapaikka)
- Generation 2: Internal platform converted for external use (dominant until 2005)
  - Developed by "platform leader" for competing product companies (Katz, Shapiro, Cusumano, Gawer...)
  - Two directional: Platform owner develops the platform in co-operation with platform users on commercial basis
  - Reqired busienss model change, platform leader to divest all competing product offerings
  - Examples: Cellular chip sets, Windows SW, WinTel dual platform
- Generation 3: Two (multi) sided platform (dominant today)
  - Developed specifically to connect two independent sides of the busienss through fully controlled information platform (Tirole, Parker, van Alstyne, ... also Zysman, ...)
  - Platform leader combines the network effects of demand and supply side to archive exponential power gain
  - New roles for developers and end users, Subsidized services
  - Example: Search – Platform – Advetizer
- Generation 4: Multiple Multi-sided markets on one platform (emerging)
  - Developed to connect multiple independent sectors of business into one platform
  - Combining multiple two and multi-sided platform businesses ion one data based platform (....)
  - Examples: Alphabet, Amazon platforms including services for most of the sectors of society
  - Challenging the structures and services of national states
- Generation 5: What next ?

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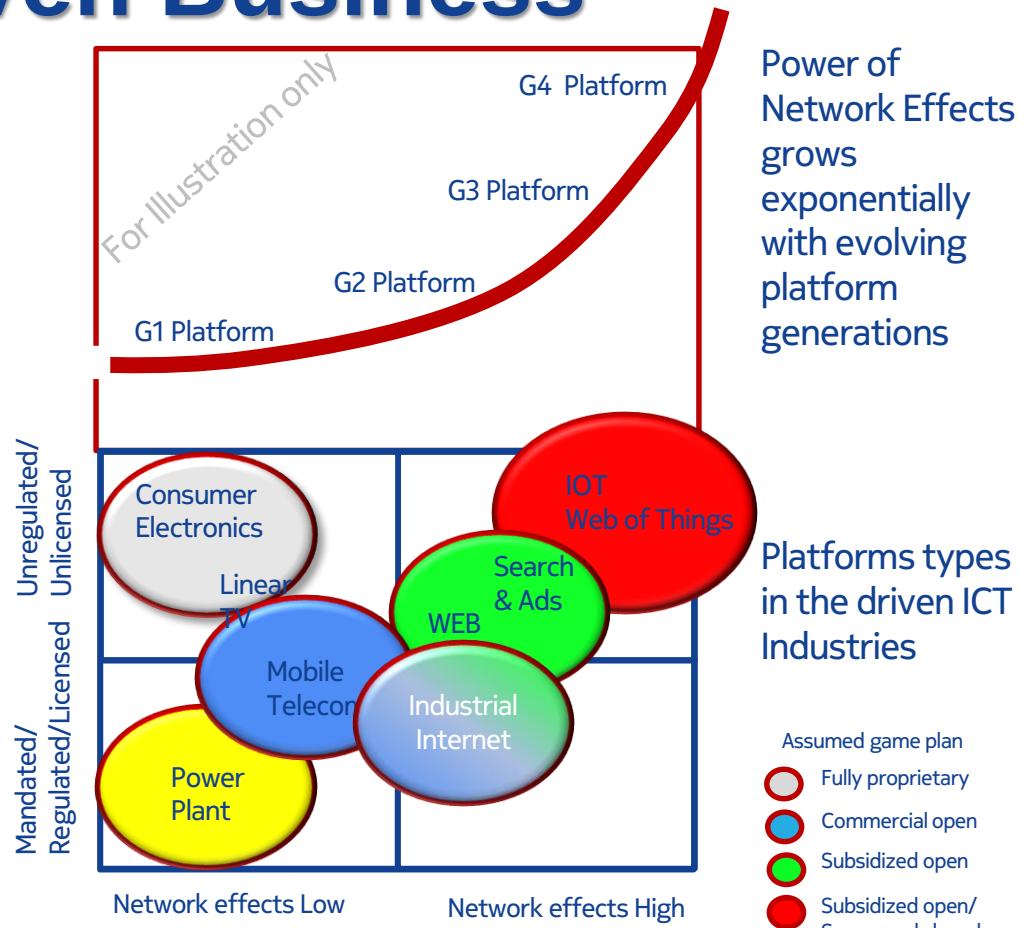
Network effects in Platform driven Business

Network effects drive Platform leadership and its game plan

Network effects depend on:

- Internal factors: Number and characteristics of nodes and links
  - Network Structure
  - Positive and Negative Feedback loops
  - Delays, Pervasiveness in the network

- External factors: Physical and Regulative Limitations
  (=> Control points for regulators to consider)
  - Access to raw materials (Rules for Spectrum, Data, etc.)
  - Competition through mandated open interfaces
  - Collaboration for Interoperability (Standardization requirements)



Expected Network effects drive technology strategies

- Willingness to offer technology for collective use depends on the power of expected network effects
  - Network effects are low in closed and proprietary technologies, Therefore proprietary and closed IP mechanisms are applied
  - When network effects grow ,they creates different levels of incentives to promote technologies and platform growth, including open access, free access, even subsidies.
  - Limited network effects motivate controlled level of collective use of Innovations and Data

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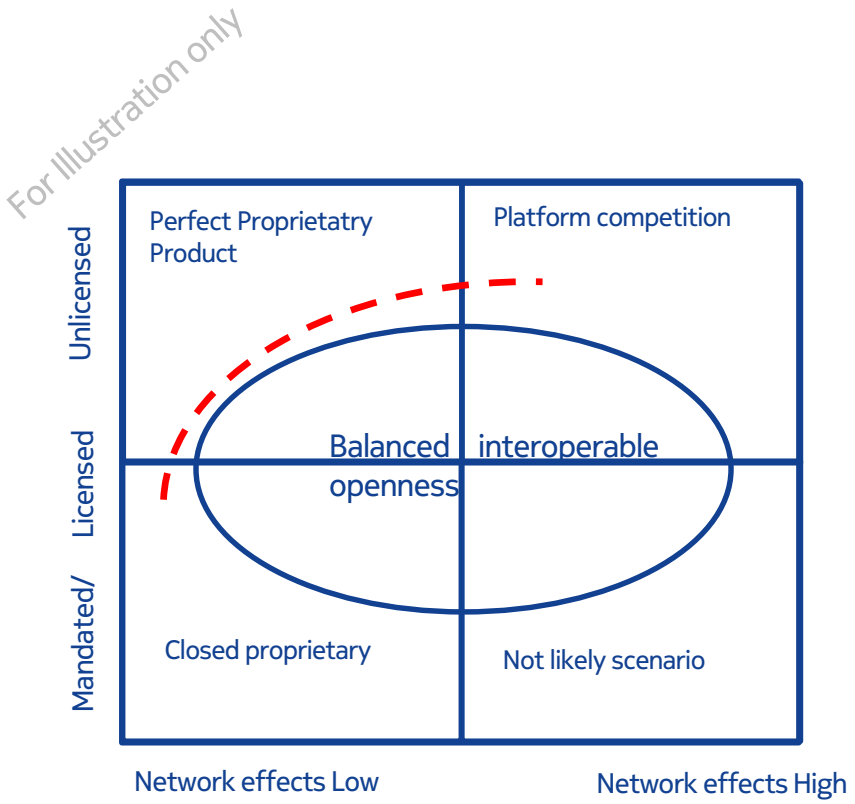
… Define relevant Corporate strategy options

High level strategy process:

- Identify relevant areas for sustainable long term business, Choose your position on the map based on your preferences
- Develop your staregy taking into account the overall ecosystem (including all relevant clusters and interfaces)
- Define your portfolio of busiensses
  - Option 1: Focused strategy
    - One operative model, One critical interface
    - Optimize the choses approach and dilute other options
  - Option 2: Balanced Portfolio of strategies
    - Portfolio of businesses, portfolio of interfaces (using for instance Markowitz portfolio model)
    - Run each approach separately to avoid correlation (like channel conflict)
    - Focus on efficient front of the portfolio



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Case Nokia: Multiple ways to Innovate and Collaborate

Nokia's two way approach

Bridge Program

- Major Corporate renewal requires Social responsibility
  - Bridge program Established 2011
- Business specific innovations become less valuable for the down sized company
  - Existing technical and commercial knowledge is fundamentally important for new business addressing new/different ecosystems

Invent with Nokia

- Leveraging external sources to generate intellectual property
  - 'Invent with Nokia' launched 2011
  - To promote inventions that may be of use to develop new mobility-enabling technologies and solutions for consumers.
  - Inventions may or may not be covered by a patent application, a granted patent or a registered design.

Nokia Innovation Platform (Beta)

- Neutral Platform to emerging vertical businesses
  - Gives access to all the technologies that Nokia and ecosystem partners develop.
  - Facilitating growth of Internet of things
  - High performance, Quality and Security Communication and Computing as key enablers
  - Versatility of 5G, building on 4G TME-M and Narrow band IoT
  - Platform as a Service with Global scope
  - Small scale version "Quja" for MSE's and Start-ups

Open innovation Challenge

- Early technology access to Nokia
- Broad scope, including current businesses, like 4G and 5G
- Providing early global market access to the innovators

Nokia Open innovation 2017 Categories

Benefits and way of working

https://www.nokia.com/en_int/news/releases/2018/07/19/nokia-open-innovation-challenge-2018-seeks-startups-with-disruptive-ideas-to-shape-the-future-of-industrial-automation

Open Ecosystem Network

- Open network to build professional ecosystems
- Sharing information and assets in an open network with respect and legality
- State of the art technology enablers
- Loose pre-defined requirements to maximize innovation
- PPPP approach (quadruple helix)
  - Private (Corporations, Developers)
  - People (Communities, Universities)
  - Personal (Entrepreneurs, Start-ups, Business incubators)
  - Public (Government, Public actors)

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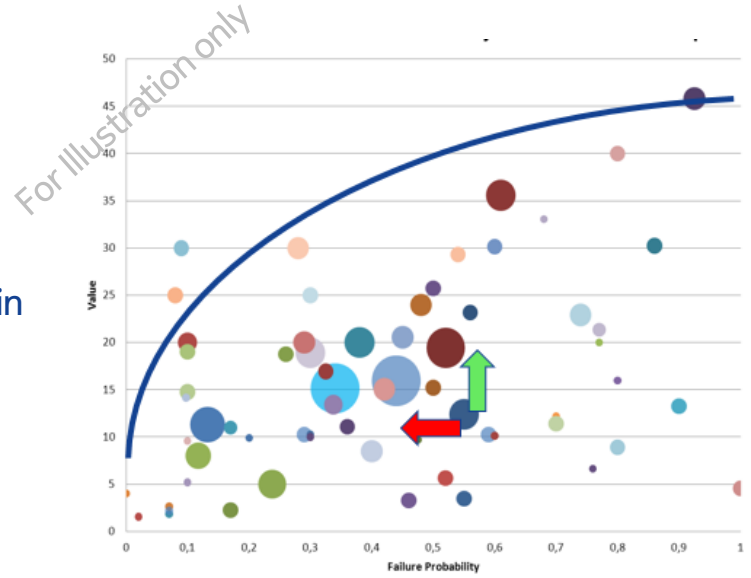
Leadership options for Innovations and IP

- **Internal use only**
  - For the Performance and Cost of the products with Predictable business value, for instance in implementation of proprietary devices and systems
  - Internal scale of economy, no significant network effects
  - Role of IP is low, innovations are often trade secrets

- **Traditional regulated business focusing on balanced openness**
  - For the Interoperability of the regulated (licensed) multivendor markets and interfaces, for instance in mobile telecom.
  - Reasonable but limited network effects, Often implemented through (delegated) de-Jure Standards
  - FRAND based sharing of assets provides incentives to innovators and users

- **Maximizing Rewards and Risks**
  - For Interoperability and for re-use of solutions and technologies over unregulated interfaces and markets, for instance global platform competition
  - More powerful network effects may be achieved, generated through voluntary, self-organized or orchestrated initiatives
  - Different innovation sharing and governance models used, including open sharing

- **Donating and collecting innovations for good purposes**
  - For Innovations where relavant ecosystem is not yet clear.
  - Network effects and scale of economies are ecosystem specific
  - Case by case processing of each innovation and its ownership is required



Portfolio may include multiple different businesses which require multiple different operation points and harmonious balancing of competition and collaboration models for each - in one company.

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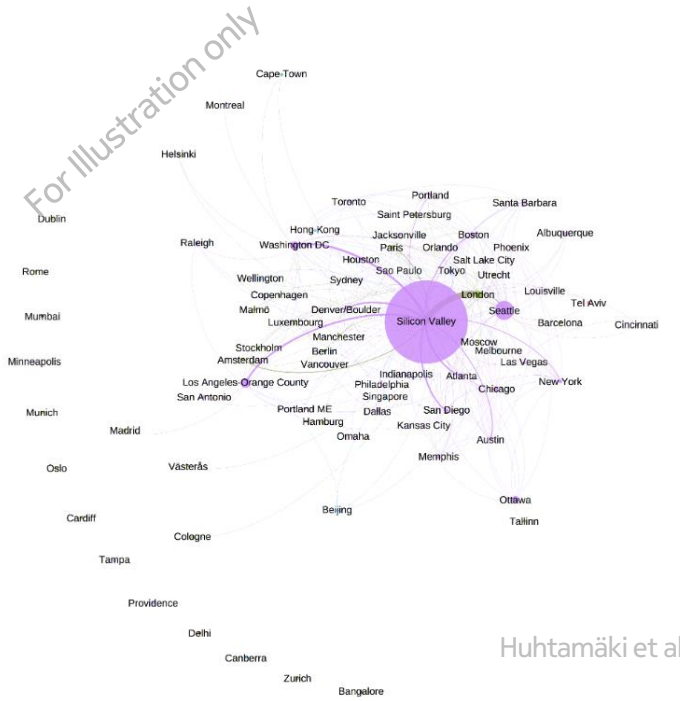
Emerging challenges and Opportunities:
API Economy – another option for Interoperability

API Economy is a fractal network of collaboration that creates a network of interoperability

- Open and less open APIs provide access to Open and less open Data
- Variety of data processing services provide further APIs using variable sets of rules
- Services and applications evolve infinitely
- Loosely regulated networks are growing based on preferential attachment, yielding a scale free network of value creation
- Ambiguous ownership rules of the API's (i.e. provided information and knowledge) may cause problems in ecosystems



Huhtamäki et al.

Observations

- API Economy may become substitute to traditional standardization of interoperable interfaces
- Implementation of functionalities behind the APIs is often proprietary for optimum performance.

API economy ! => It is all about the Governance
API economy where Governance rules are not clear throughtout the network is not an ecosystem

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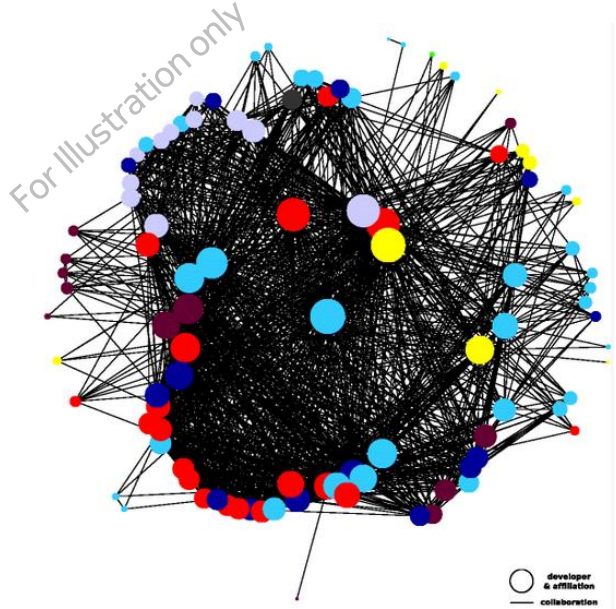
Emerging challenges and Opportunities:
Open source – another option to implement functional modules

Open source is an efficient way to create commodity software.

- Often Open source SW is used to implement solutions based on common knowledge while state of the art implementation are typically proprietary
- Value proposition: Mutual Sharing of non-critical technology assets to gain economies of scale in the ecosystem of likeminded companies and other actors
- Open source SW projects focus on modules, not interfaces

Observations

- Problems arise when open source implementations dilute the role of critical interfaces, potentially diluting role of critical interfaces and success of regulative measures.
- Open source software may dilute the competitiveness of proprietary implementation and hence, create a concern of anti-trust in case of less open governance of the overall ecosystem.



Teixeira et al.

Open Source Software ! => It is all about the Governance
Open source with and without community ! => Two Different innovation (IP and Data) processes !

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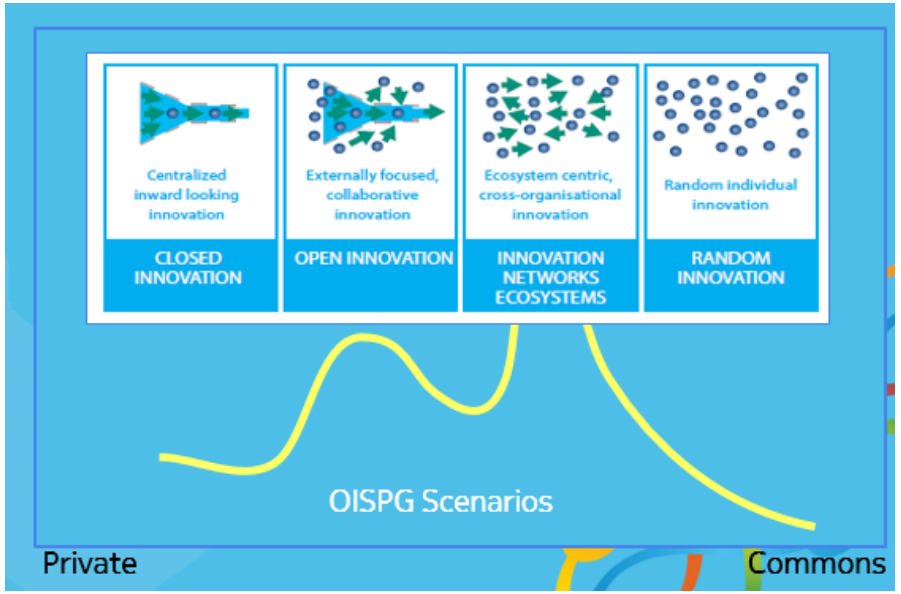
Concluding Observations

For ICT, System level considerations are needed, Always.

- Four fundamental ways of collaborative Innovation processes
- All options may be used for interoperability at any of the six key interfaces of the ICT architecture
- However, Misalignment of the innovation process principles in the ecosystem may cause serious confusion. Therefore:
  - Instead of one ”average” ecosystem thinking, Successful Companies make concious choices between Multiple competing ecosystems and implement one harmonised view in each chosen ecosystem



Sharing of Innovation assets is not a silver bullet. Collaborative use of Innovations and IP requires similar considerations as any other collaboration between competing companies. Key consideratins relate to:

- ✓ Availability of the critical resources, like radio spectrum, personal data, road capacity, real estate..
- ✓ Dynamic Rules for competition and collaboration of the busiensses and in case of data, specifically to consumer rights, such as portability of myData and Identity
- ✓ Well defined requirements for local and global interoperability, which can be implemented in standards
- ✓ Agility of the Control mechanisms, Speed of regulation has to be in a reasonable relationship to Speed of Innovation

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Leading Innovation in ICT driven ecosystems is like gardening:

Harmony and compatibility between available resources, competion and collaboration

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Thank you

Time for Discussion