THE AUGMENTED INFRASTRUCTURE

NEW VALUE CREATION LEVERS FOR
INFRASTRUCTURE IN THE CONNECTIVITY ERA

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Why do we release this kind of work for free?
Our job is to help large organizations think and act like startups. We believe this can only be achieved by encouraging people to innovate and explore new business models. We aim to inspire you by giving you the keys to understanding new markets, new business drivers like APIs or successful companies like Apple, Amazon, Facebook or LinkedIn.

Foreword
-

Mathias Burghardt
Head of Ardian Infrastructure

"Infrastructure is the tipping point in the transformation towards a fully digitized economy.

> **Technological innovations and data management should allow infrastructure to be more efficient, resilient and enable it to adapt its model to better serve user needs.**

In a world seeking sustainability, it should drive the new dynamics of the sharing economy and hence improve its social and environmental impact.

Several frameworks need to be rethought in order to support the transformation from a traditional infrastructure to an augmented infrastructure, fully equipped to serve the needs of the economy of tomorrow. What will be the usage of infrastructure in the future?

> **How can we foster innovation? How could regulation be adapted in order to maximize the positive impact of infrastructure and allowing the sector to respond to the numerous changes ahead of us?"**

"The advent and supremacy of innovative services and business models mean traditional players are now forced to transform. And thus they are leading the way.

> **These new players bring together the long-term vision and strategic decisions that will shape the future of infrastructures.**

I wholeheartedly agree with Doug Cutting, founder of Hadoop, the infrastructure software for the development of Big Data applications, who famously said: 'Google is living a few years in the future and sending the rest of us messages'.
The game has most definitely changed. And new games mean new rules.

> **It is our responsibility to create and promote a scoring system that can ensure future investments have a global positive impact.**
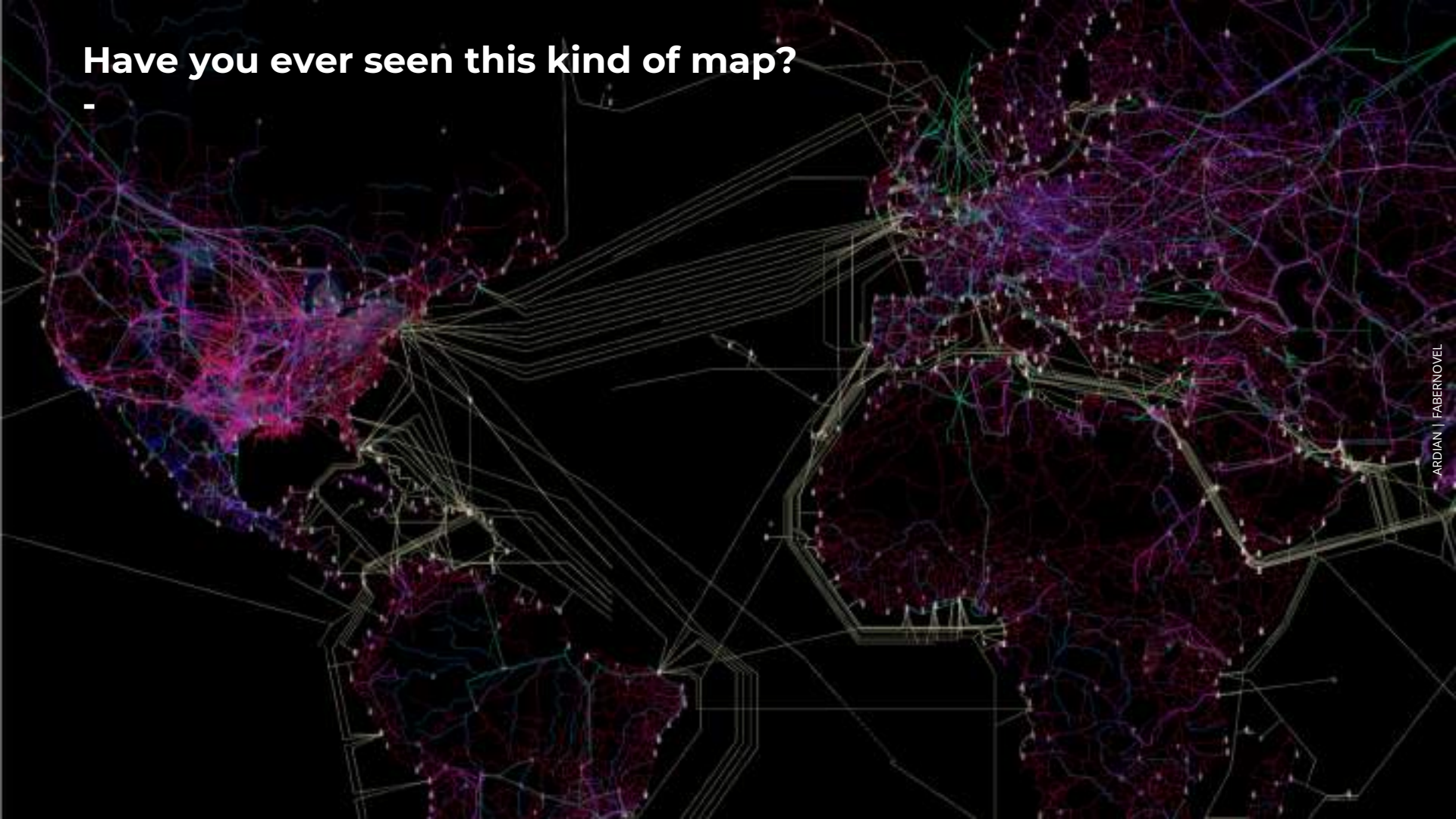
It goes without saying that this scoring model must also take into account sovereignty and sustainability issues to responsibly build and share tomorrow's augmented infrastructures."
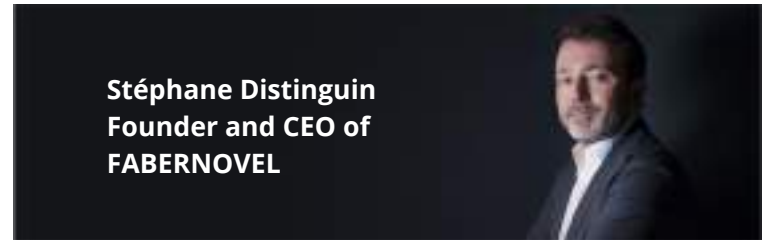
Stéphane Distinguin
Founder and CEO of
FABERNOVEL

Have you ever seen this kind of map?
-

Connectography: the new geography
-

This map shows who is connected to whom via functional geography:

4

billion people around the world using the internet in 2018

4.1

billion passengers transported by plane in 2017

3

billion people around the world use social media every month

10.3

billion tons of goods shipped by the world seaborne trade in 2016

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Geography used to be destiny but now...
-

"Connectivity is destiny"

Parag Khanna
Mapping the Future of Global Civilization
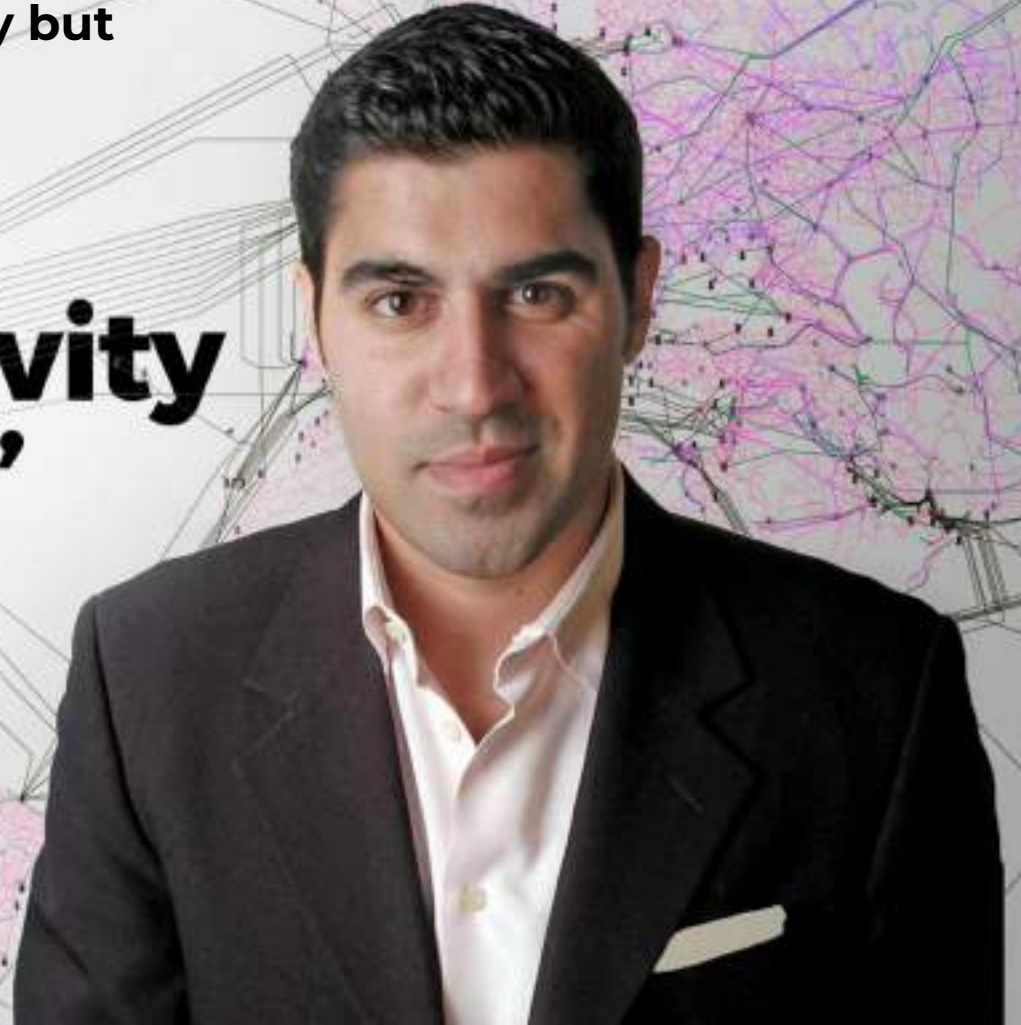
Every step of our history enriches our world view
-

Natural Geography

Political Geography

Functional Geography

A functional geography powered by infrastructure
-

Communications
Internet cables
1.1 million kilometers
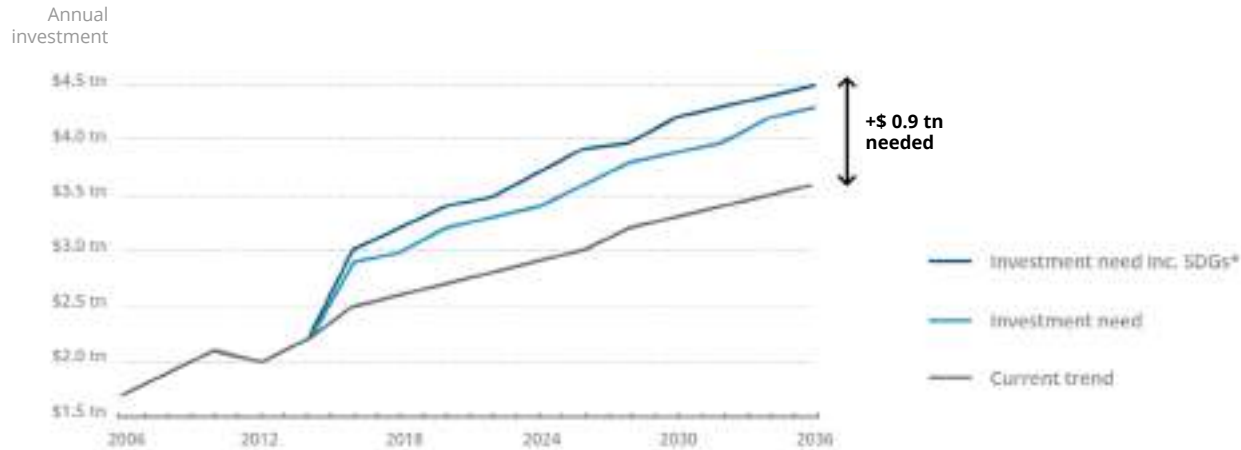
Energy
Gas / oil pipelines, electricity
3.5 million kilometers

Transportation
Roads, ports, airports, railways
65.2 million kilometers

Sources: The world fact book CIA
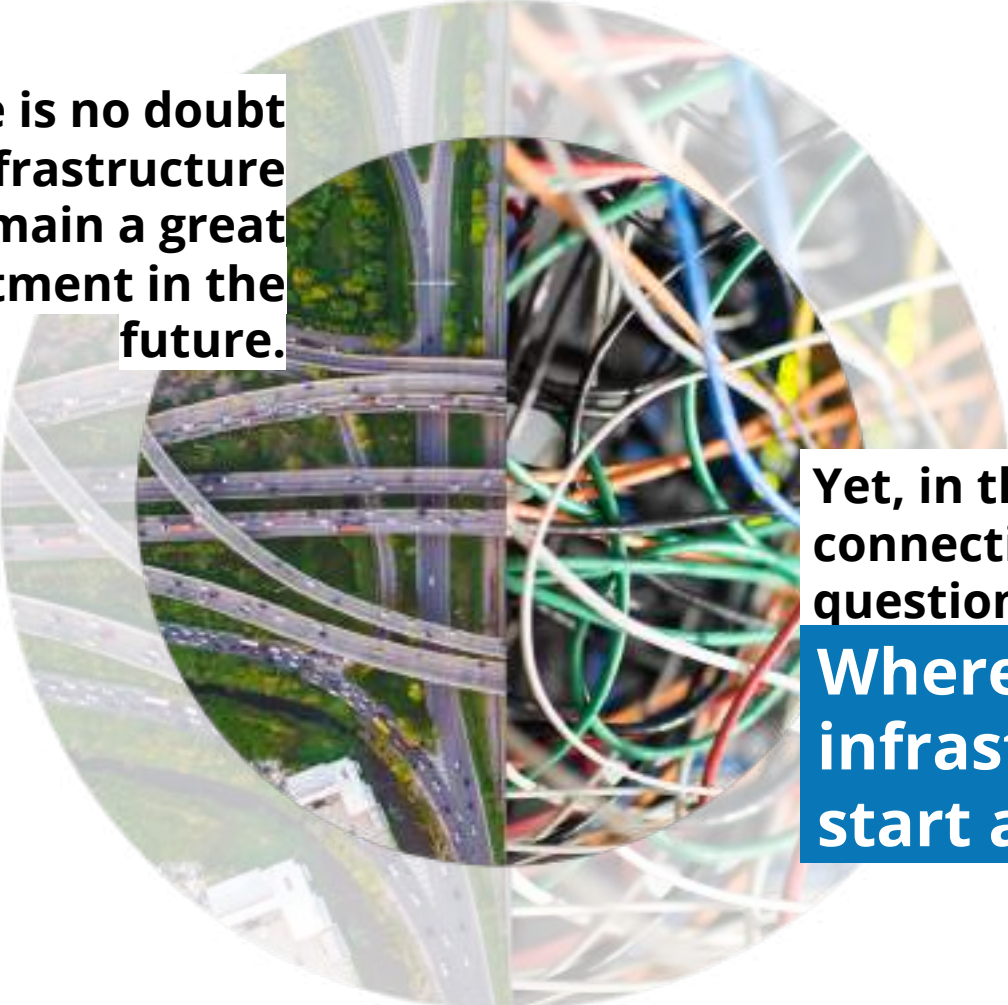
More infrastructures will be built in the next 40 years than in the past 4000!

-

Annual investment

+$ 0.9 tn needed

— Investment need inc. SDGs*
— Investment need
— Current trend

$4.5 tn
$4.0 tn
$3.5 tn
$3.0 tn
$2.5 tn
$2.0 tn
$1.5 tn

2006 2012 2018 2024 2030 2036

To keep pace with projected growth, the world needs to invest an average* of $3.6 trillion in economic infrastructure annually through to 2035. This need could increase further in order to meet the United Nations' sustainable development goals.

Sources: McKinsey *Projection cover 19 years (2016-2035) *SDG - UN Sustainable Development Goals

There is no doubt that infrastructure will remain a great investment in the future.

Yet, in the era of connectivity, the real question is:

Where does infrastructure start and end?

Google "organizes the world's information to make it universally accessible and useful."

From...
a powerful search engine

...to
the digital information infrastructure

Search:

Google

90%
share of search engine use*

Ads Infrastructure:

Google Ads

Essential Services:

Chrome   Drive   YouTube

Mail   Calendar   Maps

Developers Infrastructure:

Developers   Play Store   Play Store

Google Cloud Platform   **Google** Fiber

13 undersea cabling system investment

100+ points of presence

7500+ edge node locations

90+ cloud CDN locations

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amazon organizes the world's door-to-door logistics between businesses, retailers and customers.

From...
an e-commerce platform

49.1 %
share of online
Retail sales*

Ads infrastructure:
amazon advertising

Retail infrastructure:
amazon payments   amazon webstore   amazon dash

Last mile delivery infrastructure:
amazon key   amazon locker

Customer Services:
amazon prime video   amazon home services   amazon storywriter
amazon alexa   amazon Appstore

...to
the physical and digital delivery infrastructure

amazon web services
34 %
cloud market share

amazon Prime
prime now
328
warehouses and
fulfillment centers

300
semi-trucks

amazon Prime Air
1 cargo hub
in Cincinnati

35 cargo
planes

amazon fresh
472
stores
(Whole Foods)

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DiDi aims to organize the world's mobility for everyone through mobile internet.

From...
A ride sharing platform
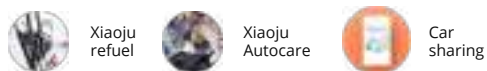
90% of e-hailing trip market share in China

Mobility services:

- Taxis
- Entreprise
- Driving services
- Luxe
- Premier
- Qingju Bike
- ofo
- Express
- Hitch
- Bus

Financial infrastructure:

- Car insurance
- Health insurance plan for car owners

Car infrastructure:

- Xiaoju refuel
- Xiaoju Autocare
- Car sharing

...to
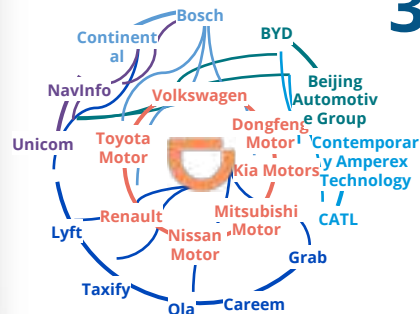### The future transportation infrastructure

7,500 partners and distributors

400 cities covered

The Didi Auto Alliance: the car operator platform
The goal is to have **1 million electric vehicles in Didi's network by 2020** and 10 million by 2028.

31 auto industry partners

Bosch
Continental
BYD
NavInfo
Volkswagen
Beijing Automotive Group
Unicom
Toyota Motor
Dongfeng Motor
Contemporary Amperex Technology
Kia Motors
Renault
Mitsubishi Motor
CATL
Lyft
Nissan Motor
Grab
Taxify
Ola
Careem

Car maker

Ride sharing platform

Automotive suppliers

Electric vehicle maker

Battery maker

Digital developer

Today infrastructure means something entirely new -

Infrastructure is a set of **interconnected structural elements**

that provide **an ubiquitous and unreplicable framework, underpinning essential services for users**.

Connectivity
Infrastructure is composed of differents nodes (producing, distributing and consuming) which are interconnected within a network.

Strategic
Infrastructure is everywhere and complicated to duplicate, and is therefore monopolistic or benefiting from a strong competitive advantage or driver.

Enabler
Infrastructure facilitates the development and distribution of essential goods as well as the availability of essential services.

More than question the word "infrastructure"

This study aims to

[1.] **Understand** how connectivity is shaking up the infrastructure value chain

[2.] **Develop** a new scoring model:
THE AUGMENTED INFRASTRUCTURE

[3.] **Apply** a new value creation scheme articulated around innovation

1

Connectivity is shaking up the infrastructure value chain

Connectivity is the new infrastructure order. As a result, all stakeholders of the infrastructure value chain have initiated strategic transformations to meet end-user expectations and accelerate value creation.

Shaking up the value chain? Definitely
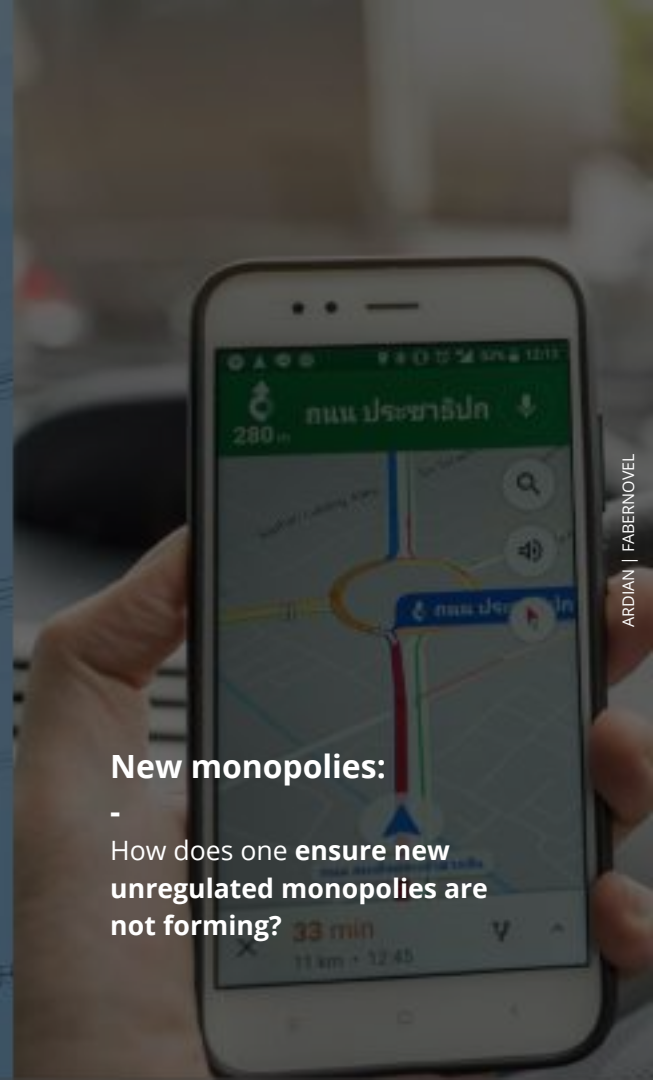-
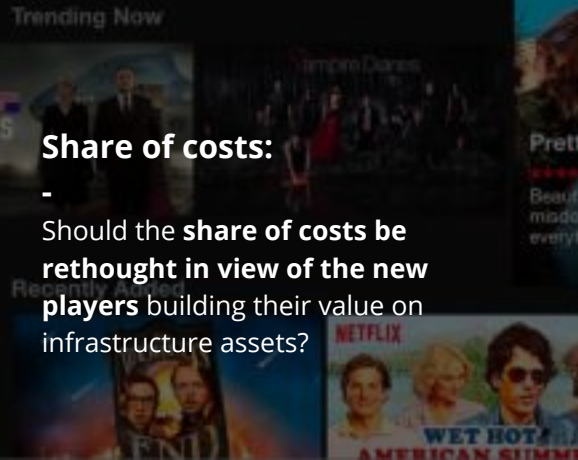
Share of costs:

-

Should the **share of costs be rethought in view of the new players** building their value on infrastructure assets?

Bundle/unbundle:

-

Should the European **unbundling regulation on energy assets be applied to new infrastructure players?**

New monopolies:

-

How does one **ensure new unregulated monopolies are not forming?**

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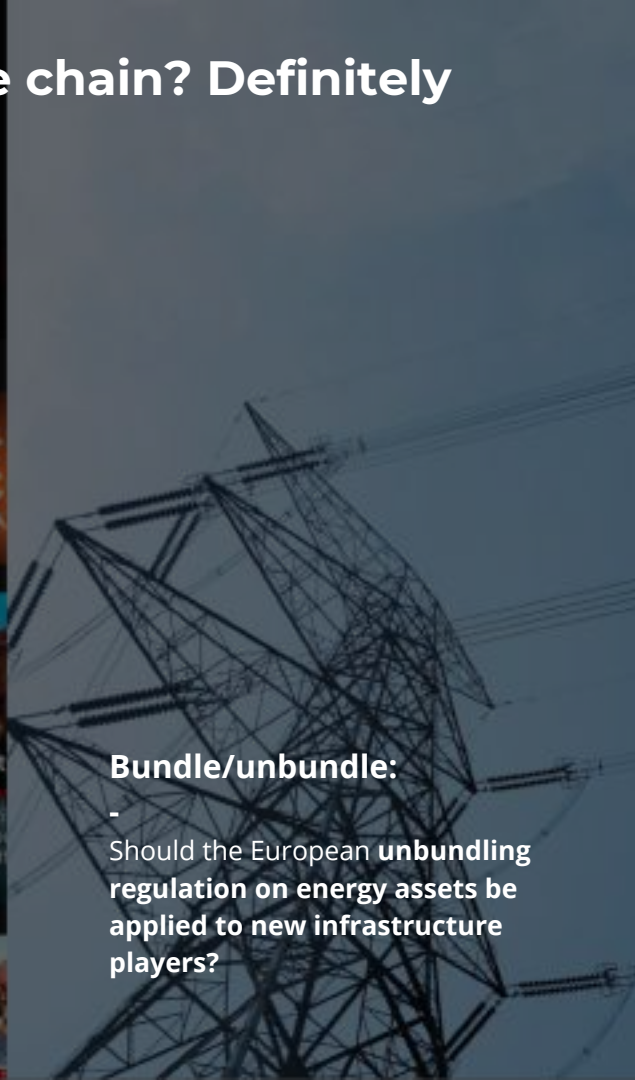
During peak hours, **NETFLIX** accounts for more than

37% **of US internet traffic**

Remember the 2014 Netflix Verizon smackdown -

In 2014, Netflix displayed a pop up message about **slow video speeds** blaming **Verizon for refusing to upgrade its infrastructure** to boost lagging streaming speeds.

By prioritizing network traffic, **Verizon was accused of throttling Netflix, provoking the wrath of users and raising the question of Net Neutrality...**

What finally happened
-

Netflix ensured its service reliability
-

Due to its very large scale, Netflix congests the Verizon Network, and asks Verizon to invest in its infrastructure to support its services.

To ensure reliability of its service, **Netflix reached paid connection deals in 2014 with Verizon and Comcast.** Netflix is paying to boost streaming speeds by connecting directly to Verizon's network.

Verizon expanded into streaming service
-

Verizon leveraged its large user base to expand into streaming services, with Go90, and directly compete with Netflix.

In 2018, the network is finally offering a year of free Netflix if you sign up online for a FiOS "triple play" (internet, TV and phone) at $80 per month.

Unbundling: the strict separation of the natural monopoly at all energy levels, from power generation to distribution

Energy infrastructures are traditionally regulated

-

Unbundling regulation

-

The separation of energy supply and generation from the operation of transmission and distribution networks was introduced to guarantee efficient access to the infrastructures for all operators without any discrimination.

Unbundling in the EU energy market was intended to create an anti-monopolistic set of rules.

The scheme proposed by the European Union includes three different models: **owner unbundling (OU)**, **independent transmission operator (ITO)** and **independent system operator (ISO)**. Each member state has the right to adopt the most suitable model for its specific market conditions.

Should this regulation be applied to Tech Giants' investments?

-

Tech Giants are taking control over infrastructures that are crucial for their business

As their global bandwidth needs to grow and in order to tackle the future net neutrality issues, Google, Apple, Facebook, Amazon and Microsoft (GAFAM) invest heavily in their own intercontinental undersea cables. This strategic move is jeopardizing Europe's unbundling regulation.

Google owns 63,605 miles and 8.5% of submarine cables worldwide

Google claims to drive 25% of global internet traffic. From 2015 to 2017, **Google has invested $30bn in its infrastructure (11% of its revenue).** So far, Google claims to have directly invested in 11 undersea cables.

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'Don't be evil'... until...
In 13 years, Google Maps went from being completely free, to partially free and very expensive today

Rolf F. Katzenberger 🇪🇺
@PragmTeams

Thank you @googlemaps for providing your service for free to me. Now, you have announced a price increase of ~1400%, reduced free API calls from 750K to 25K/month and want me to open a billing account w/ my credit card data. As a long-term supporter of @openstreetmap, I'll switch

11:50 AM - May 3, 2018

♡ 30   ◯ 20 people are talking about this

How does one ensure new unregulated monopolies are not forming?

-

Google Maps

Billing for all: Google Maps API price rise

Google has recently announced the launch of its new Google Maps Platform, which "introduces changes to their products, pricing, and support to provide...greater flexibility, transparency, and control."

The Standard (no access to customer support) and Premium plans are being merged into one pay-as-you-go pricing plan. And the new fee structure means that:
Google is raising its prices by more than 1,400%.

Small businesses, which used to rely on Google Maps, cannot absorb the costs anymore and will have to switch to less expensive solutions such as Here, OSM, Leaflet, MapBox.
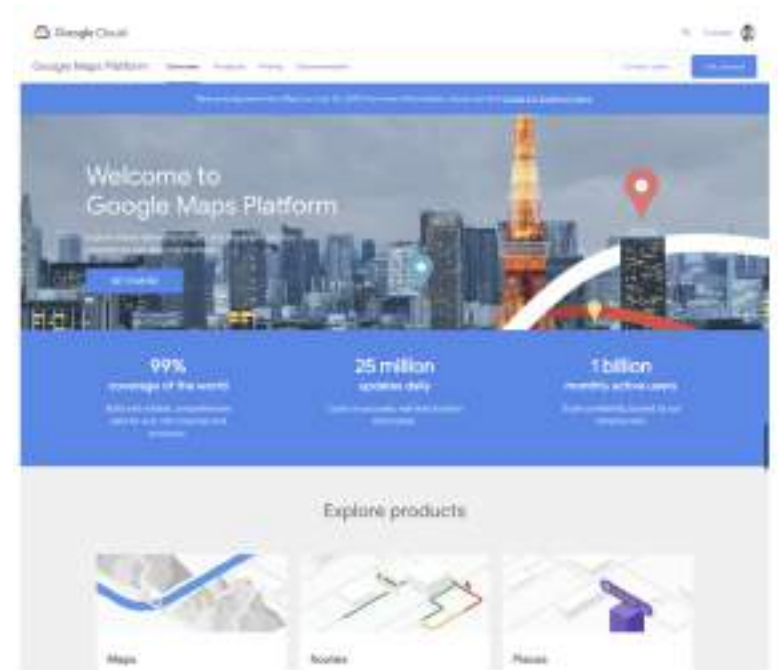
How does this shaken up value chain look?

-

The convergence trend, catalyzed by connectivity, disrupts the overall value chain and changes the way value is distributed and captured by the different players.
Infrastructure used to be planned with a top-down approach, **but now access to the end-user is becoming the driving force for the entire value chain.**

Infrastructure
Owner

Access
Operator

Service
Provider

End User

INFRASTRUCTURE
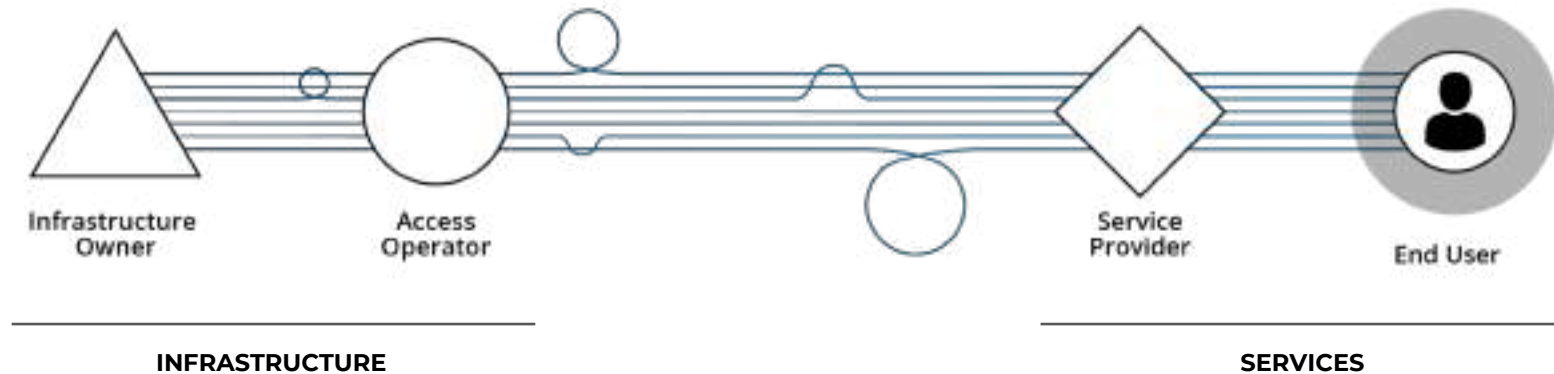
SERVICES

How did we get here?

-

INFRASTRUCTURE OWNERS

Key reasons to converge

Optimize asset utilization

Gain direct contact with customers

Gather data to improve customer experience

Defend their position

Capture new and more value

Connectivity

SERVICE PROVIDERS

Key reasons to converge

Optimize their services

Maintain their quality standards

Better control/reliability of usage

Secure their independence

...illustrated by 4 strategic flows in the value chain

-

All players are invited to rethink their strategic positions along the value chain to reach the end-user.
Four user-facing strategic flows can impact the value chain:

Connection
Both infrastructure and digital stakeholders expect to improve business performance and leverage asset value thanks to collaborative efforts.

Infrastructure Owner — Access Operator — Service Provider — End User

Substitution
Obsolescence and change of uses can lead some players to disrupt traditional infrastructure and destroy part of the generated value.

Infrastructure Owner — Access Operator — Service Provider — End User

Bundle/Unbundle
Infrastructure and digital stakeholders capture new value through investments closer to the end-user.

Infrastructure Owner — Access Operator — Service Provider — End User

Re-intermediation
By building a strong relationship with the final customer, new intermediaries end up distanciating the infrastructure owner from the end customer.

Infrastructure Owner — Access Operator — Service Provider — End User

Win-win value creation

-

Different stakeholders of the value chain who were not necessarily directly linked before, improve business performance and leverage asset value through collaboration and value co-creation.

Key reasons for the strategic transformation:

For infrastructure stakeholders:
· To update their functional and digital knowledge
· To optimize the infrastructure operations and usage
· To improve current activity and customer experience

For digital stakeholders:
· To improve current activity and customer experience
· To explore new business models
· To show solution expertise

City of Toronto announces partnership with traffic app Waze

Toronto will be formally working with Waze to improve the app's traffic and navigation data in the city

A two-way partnership between Toronto and Waze:

· **Toronto** shares its traffic data, including road closures, events and incidents , while Waze creates a better navigation experience for Waze's users.
· **Waze** shares its community-generated traffic data with the Toronto authorities to help the city with infrastructure planning and traffic operations.

Beyond improved operations and better customer experience, this collaboration enables the City to reduce its negative footprint on the environment.

Sources: CBC

Bundle/Unbundle
Capture new and more value
-

Infrastructure and digital stakeholders capture new value through investments across the value chain, changing the traditional distribution of added value.

Key reasons for the strategic transformation:

For infrastructure stakeholders:
• To capture new value
• To catch up with rivals
• To improve customer experience

For digital stakeholders:
• To ensure service reliability
• To maintain their quality of standards
• To secure their independence

Indigo chooses OPnGO and enhances its digital offer:

Ardian's portfolio company Indigo has launched a new digital parking service to offer users real-time, hands-free access to the best available parking.
At the same time, Indigo benefits from better use of its assets by optimizing parking availability and enhancing user satisfaction.

Since the launch of OPnGO in France in September 2016, its number of active users has increased from 27,000 to 110,000 (x3) +172% new users.

Substitution
Destroy part of generated value

-

Technical obsolescence and change of uses enable some players to disrupt traditional infrastructure by capturing a portion of its added value, or replacing it completely.

Key reasons for the strategic transformation:

For infrastructure stakeholders:
- To adapt to new uses
- To remove the barriers to entry
- To create new business models
- To reduce dependence on external factors
- To increase infrastructure performance

The public switched telephone network is becoming obsolete:

Telecommunication infrastructure is about to see the end of Public Switched Telephone Network (PSTN) driven by its gradual obsolescence and the development of the all-digital communication tools.

The French Operator, Orange, plans to close its fixed telephone network to migrate onto IP network, more flexible and cheaper to operate and maintain - 90% less than for PSTN.
From November, 15th 2018, customers will have to purchase digital subscription and get a box, replacing the traditional T-telephone jacks.

Sources: Forbes

Re-intermediation

-

New intermediaries, between the infrastructure operator and users, offer added value services in order to leverage the full infrastructure capabilities and to capture the customer relationship.

Key reasons for the strategic transformation:

For digital stakeholders:
• To sabotage the traditional relationship between traditional infrastructure owners and users
• To develop new business model

For infrastructure stakeholders:
• To delegate the distribution and optimization of its assets
• To focus only on its core value
• To guarantee traffic on its infrastructure

New user-friendly interfaces re-intermediate train operators:

The UK's largest train booking platform, Trainline, which bought the French equivalent Captain Train, is a new intermediary between train operators and travellers, offering them a user-friendly one-stop shop for all their train journeys.

Train operators may be limited to their rail infrastructure losing all their added-value and customer relationship.

Trainline covers 35 countries and has more than 28 million customers per month. In 2016, its sales volume reached €2.7 billion, with more than 100,000 trips purchased daily.

2

A new scoring model:
THE AUGMENTED INFRASTRUCTURE

Convergence trends are redefining a new infrastructure paradigm, putting user needs at the heart of a strategic transformation. Connectivity lead us to reshape a new infrastructure scoring model: the augmented infrastructure, articulated around 5 customer-facing patterns.

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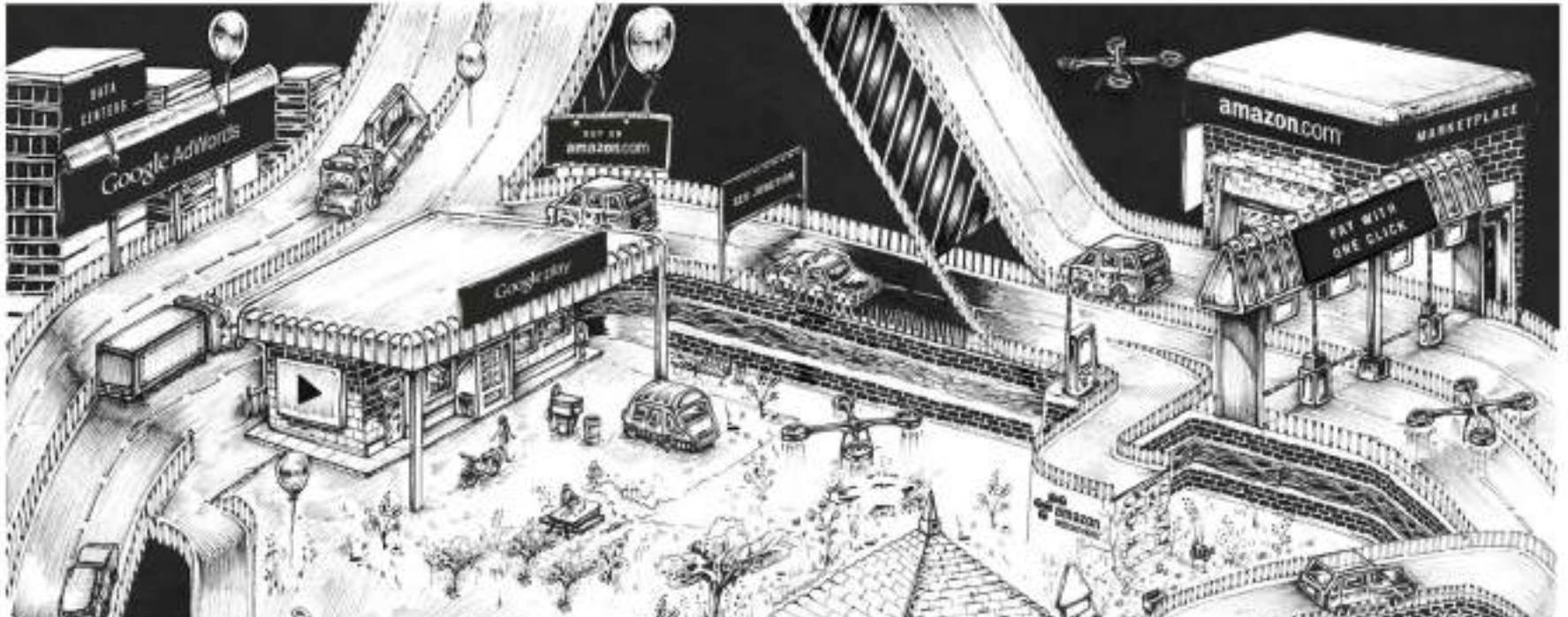
GAFA Highways

GAFA have fundamentally changed the established rules of business strategy: they ignore classic concepts of market, competition, positioning or plain goods. **Instead, they have achieved a copernican revolution which truly places the customer at the center of their strategy.**

THE **AUGMENTED** INFRASTRUCTURE

Intelligent
Open
Prolific
Resilient
Impactful

5 attributes of an overperforming infrastructure in the new economy -

Intelligent

Improving performance continuously for your customers
The ability to continuously update its functional knowledge in order to improve its operation efficiency and customer satisfaction, in both normal and critical situations.

Open

Opening widely onto the exterior
The ability to create and control entry and exit points that provide users with appropriate access to infrastructure services.

Prolific

Maximizing potential usages
The ability to turn itself into a service platform offering use cases in abundance and with a potential for monetisation.

Resilient

Withstanding shocks
The ability to absorb and prevent shocks and changes, thus ensuring long-term durability.

Impactful

Controlling collateral effects
The ability for infrastructure to have a broader mission for the world by improving its positive influence or limiting its negative impact on its surrounding environment.

Intelligent

Improving performance continuously for your customer

An intelligent infrastructure has the ability to update its functional knowledge continuously in order to **improve its operation efficiency and customer satisfaction**, in both normal and critical situations.

The infrastructure is able to prevent bugs, reduce losses, maintain security, improve quality, and increase productivity to maximize the performance of its overall operations.

Intelligent
Fundamentals
-

User-centric
Gaining a better understanding of how its users make use of infrastructure
In order to predict operational performance and improve user experience.

Omniscient
Becoming more aware and having a better understanding of itself
In order to improve and adapt its operational processes.
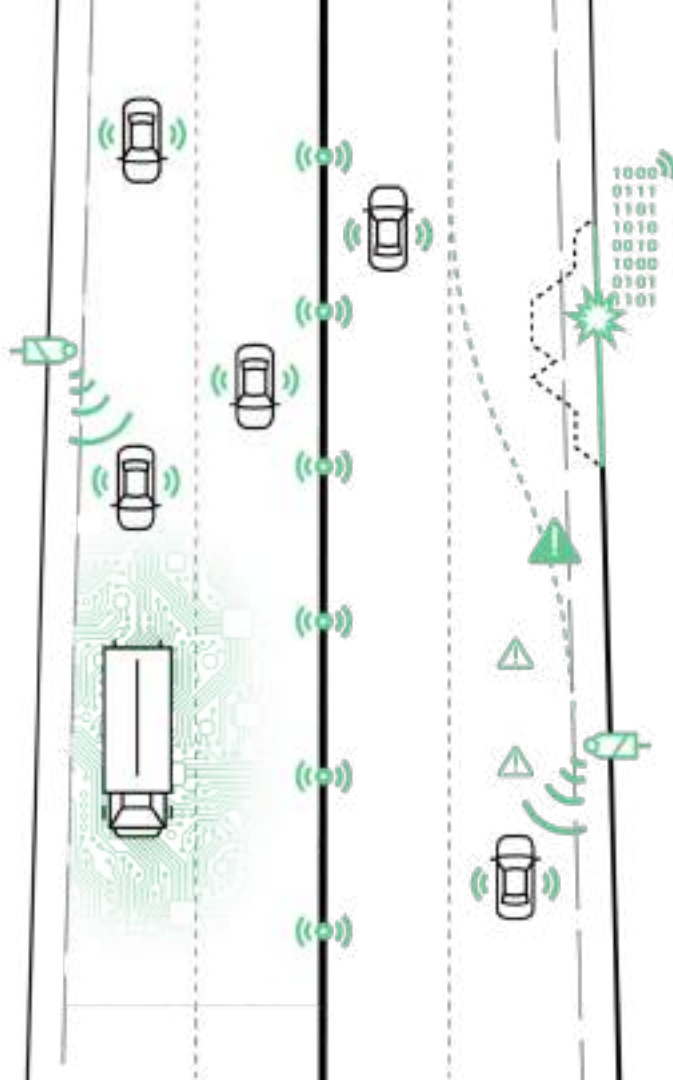
Proactive
Maintaining its state of operation
In order to keep up its performance through predictive maintenance.

Associated KPIs:
Opex efficiency, client acquisition cost, quality accreditations.

Intelligent

[Case] Personalizing and controlling the overall infrastructure

-

Digital Twin Farm by GE Renewable Energy

General Electric creates a digital twin of the turbines (based on real-time sensor and system data) on its wind farms to:

1. **Design more efficient and personalized turbines**, thus increasing farm output

2. **Streamline operations** and optimize day-to-day performance

3. **Enable predictive maintenance** and improve asset management

"We can do things because we understand the physics – we build turbines – but also because we write softwares."
Bell, Chief Digital Officer at GE Power & Water

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Sources: GE
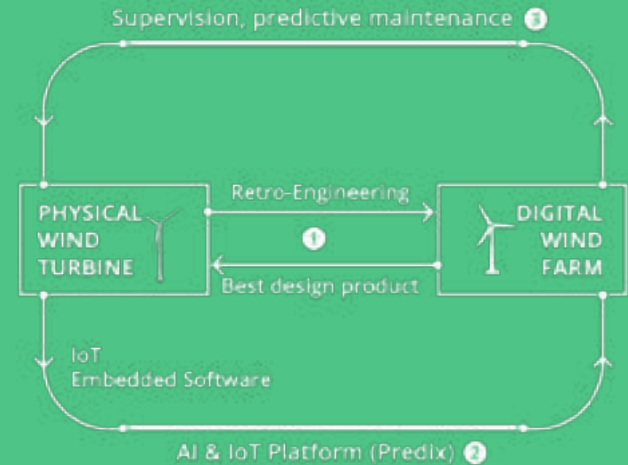
Intelligent

[Case] Ensuring infrastructure preservation at Ascendi

-

Maintenance monitoring by Ardian's portfolio company Ascendi

As a motorway operator facing critical infrastructure maintenance challenges, Ascendi partnered with two Portuguese universities to design an integrated system that optimizes the maintenance operations of its infrastructure.

The system offers numerous benefits:
1. **Maximize planning & execution:**
   Visual Inspection scheduler for technicians
1. **Administrative overhead reduction:**
   Reporting services, risk assessment computation
1. **Quality of information:**
   Monitoring system detecting incidents in real-time via sensors placed on the roads
1. **Minimize risk of infrastructure damage:**
   Modelling of future maintenance costs, infrastructure degradation

7.000 Ascendi infrastructures components are now managed by SustIMS.
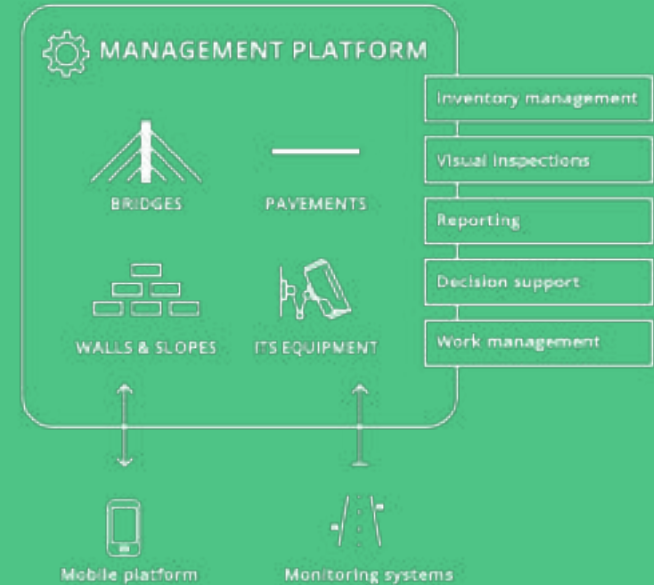
Slope sensors

Intelligent

Monetizing demand-side flexibility in infrastructure

-

Real-time electricity management by BeeBryte

"By leveraging cloud-based AI, IoT and patented optimization algorithms, BeeBryte provides automated control of electric equipment in infrastructure to reduce carbon footprint and deliver up to 40% utility bill savings, without changing process or affecting users' comfort." Frédéric Crampé, CEO of BeeBryte

Savings come from:
1. **Energy efficiency** (adjust setpoints in anticipation of changing conditions to reduce kWh)
2. **Peak shaving** (reduce contracted capacity)
3. **Grid services** (demand-response)
4. **Real-time price arbitrage** (buy cheaper kWh)

In addition to addressing consumers directly, BeeBryte is also partnering with utilities companies to help them reduce wholesale electricity purchase costs by controlling their customers' flexibility.

Sells electricity at discounted rates

~~Sells electricity on.off peak rates~~

-15 to 40% SAVINGS

Buy electricity on spot market

Sources: BeeBryte, Medium

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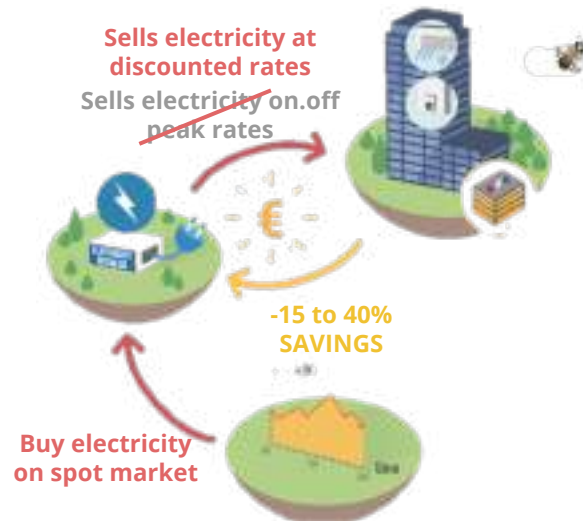
Open

Opening widely onto the exterior

An open infrastructure has the ability to create and fluidify links with end users, third parties or other infrastructure assets.

The infrastructure is able to **create and control entry and exit points** that **provide users with appropriate** (faster, more prominent, more flexible, cheaper) **access** to infrastructure services.
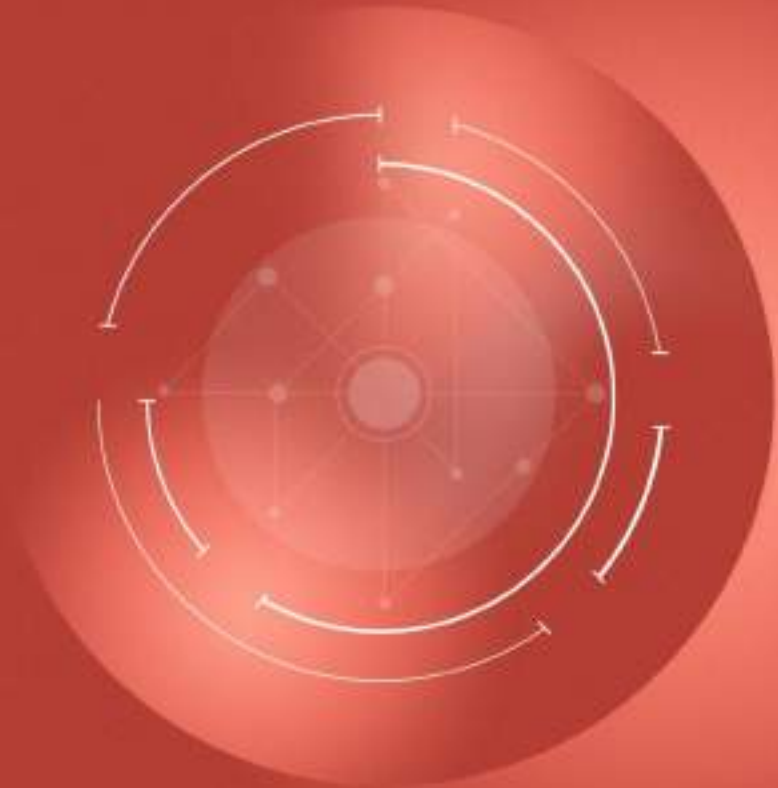
Open
Fundamentals
-

Accessible
Achieving maximum access for users
In order to be easily accessible, faster, cheaper, everywhere and everytime for the users.

Total Control
Controlling and managing access points
In order to retain control over entry and exit points, giving access or not to users depending on their uses and the state of operation of the infrastructure.

Associated KPIs:
Client base growth, retention rate, proportion of clients through partners, breakdown
in the type of access.

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Open

[Case] Making freight accessible everywhere and for everything

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The container, the first API of freight history

The container is the unit of value providing a common set of building blocks:
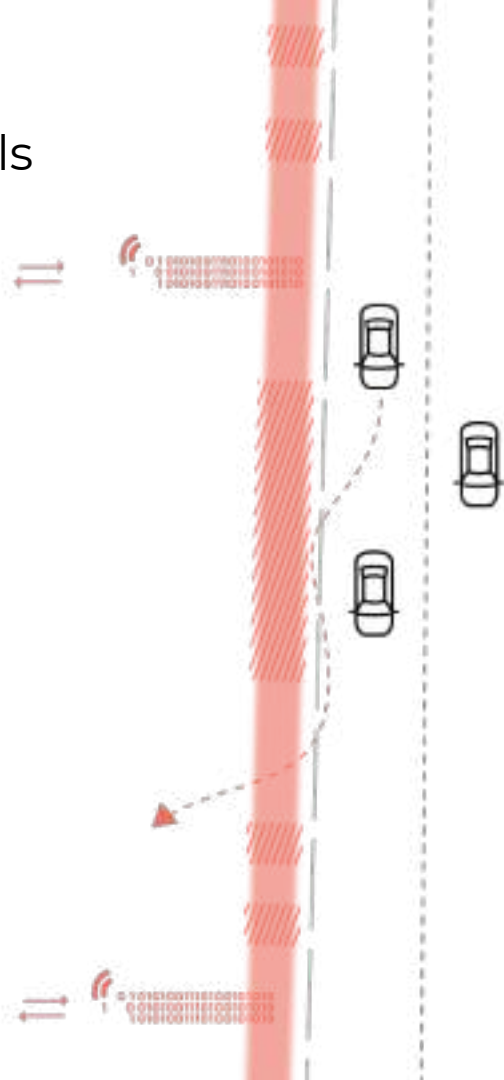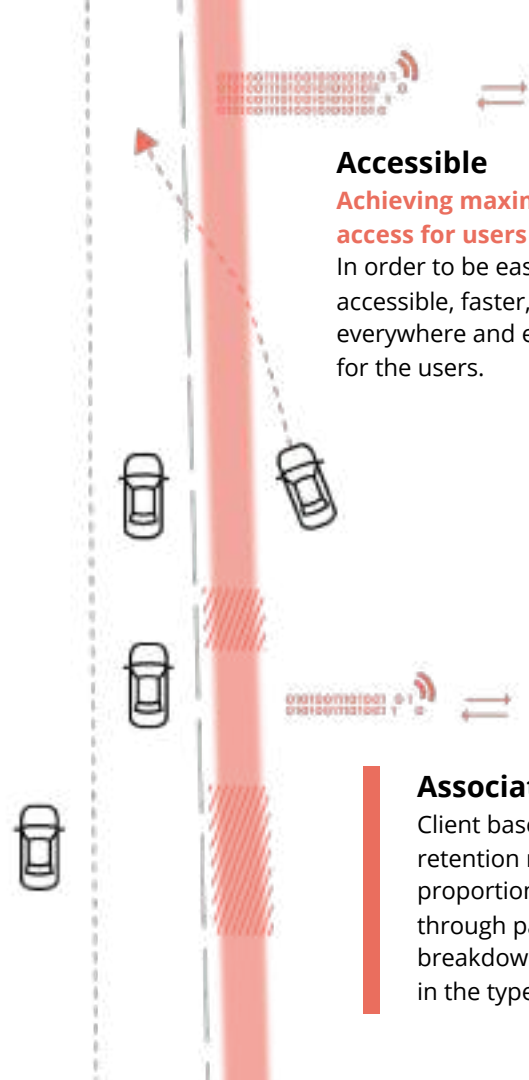
1. **Uniform and configurable:**
    The same container can be adapted to ship everything - refrigerated, ventilated, insulated, tank, housing, etc.
2. **Easy to use:** in 1965 dock labour could move only 1.7 tonnes per hour onto a cargo ship; five years later, it is possible to load 30 tonnes per hour.
3. **Intermodal:** The same container can be transferred from one mode of transport to another - trains, ships, trucks, plane - without being opened.

"The container is at the core of a highly-automated system for moving goods across the world, at a minimum cost and level of complexity on the way. The container made shipping cheap, and by doing so reshaped the global economy."
Marc Levinson, The Box

World merchandise trade
2012 prices, $tm

INTERNATIONAL ADOPTION OF CONTAINERS

1948 60 70 80 90 2000 12

20
15
10
5
0

Sources: World Trade Organisation; US Bureau of Labour Statistics; Daniel Vernhofen et al
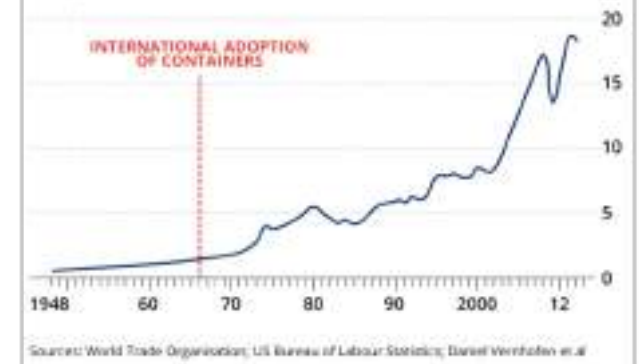
Sources: Economist, World Trade Organisation

Open

[Case] Enhancing and upgrading infrastructure services with crowd creation -

APIs broaden the infrastructure horizons

Amsterdam's Schiphol Airport opens its API platform offering access to business data for external developers in order to improve user experience for both Schiphol customers and their own. Navigation services such as TomTom and FLIO - one-stop app - have already expressed their interest in Schiphol APIs.
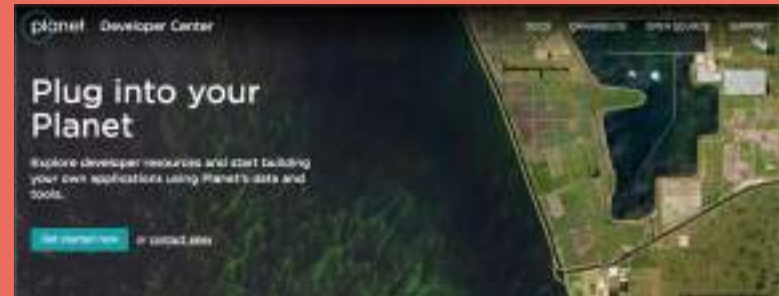
One of the most prominent imagery providers, Planet, builds and operates a constellation of satellites which take images of the earth every day. It gives developers access to this imagery through its API platform. Applications to measure agricultural yields, monitore natural resources, or help first responders after natural disasters could be derived from it.

Open

[Case] Ensuring infrastructure security with third party data

-

Monitoring roads conditions with Waze connected citizens program

Designed by Waze as a free, two-data share of traffic information, Connected Citizens program teams up with 500+ public partners around the world **to help them make data-driven infrastructure decisions.**

For example, **Rio de Janeiro and Waze created a heat map of potholes** based on 42,000 reports, and identified the areas where they had the worst traffic impact.

This initiative enabled to:
1. **Locate in real time potholes with a precise heat map**
2. **Prioritize the maintenance requests according to the traffic impact**
3. **Save lives while maintaining a fluid traffic**

Sources: Waze website, connected citizens program

Prolific

Expanding potential use cases

A prolific infrastructure have the ability to turn itself into a service platform offering use cases in abundance and with a potential for monetisation.

Such infrastructure is able to **optimise and facilitate user experience**, to **complement and enrich its first utility** by developing and mastering complementary and new usages **on its own**, driven by the customer's needs and value creation.

Prolific
Fundamentals
-

Associated KPIs:
ARPU, Average client lifetime, Revenue diversification

Owner
Developing and mastering essential uses on its own
In order to keep control of the added value.

Abundant
Withstanding a maximum of uses
In order to enhance its utility, diversify revenue sources and create new synergies with other infrastructure assets.

Personalised
Adapting offer to needs
In order to give choices and improve user experience.

Prolific

Becoming inevitable with an abundance of apps

-

The more apps available, the more attractive the iPhone gets

In a decade, Apple has managed to create an ecosystem around its flagship iPhone: there are now **more than 700 million iPhones currently in use worldwide and 2.2 million applications are available**.

Apple, through its iOS Developer Program, has created a prolific platform for developers to create new apps. Companies such as studios that develop games have enjoyed unprecedented prosperity since the launch of the App Store. For example, Imangi Studios has created 10 games since 2008, including Temple Run with over a billion downloads.
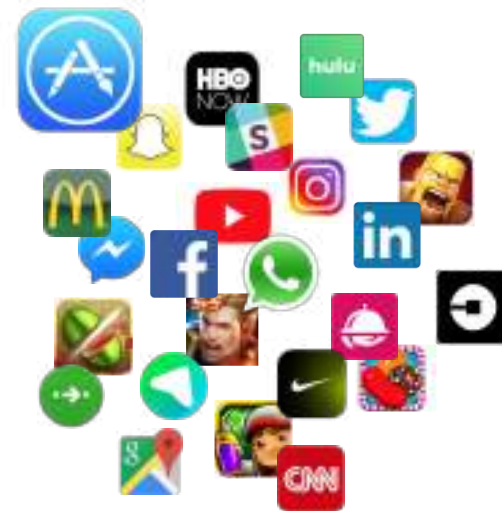
4.5
million
apps since
launch

$130
billion
In consumer
spending

170
billion
apps
downloaded

Sources: Fortune, App Annie

ARDIAN | FABERNOVEL

Prolific

[Case] Ensuring connectivity
for everything, everywhere

-

**5G is paving the way for new uses and
consumer-technology interactions**

The internet will have the potential to become the « platform of
platforms » that provides the basic infrastructure to enable a hyper-
connected environment.

Capacity enhancement

1 + Gbps

>10x

80 Mbps

4G   5G
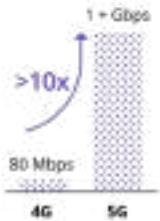
Ubiquitous
connectivity,
Mobile
everywhere

Massive connectivity

10x

100k/km²   1M/km²

4G   5G
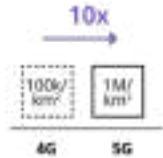
IoT, Industry 4.0,
Smart city,
Smart homes

Reduced latency

10

10x

1ms

4G   5G
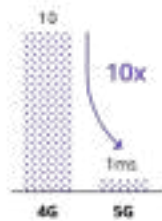
Cloud based
computation for
driverless car,
VR/AR,
Telemedicine

Low power

1,0

100x
0,01 mj
for 1 kbit
data packet
transfer

4G   5G
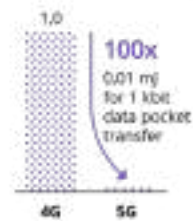
Energy saving,
Power per use

2G Digital voice Text   1G Analog voice

1993   1980's

3G Voice, Text, Multimedia, Internet

2001

5G   4G Voice, Text, Multimedia, Internet, Gaming, Cloud computing

2020 ?   2009

Sources: Forbes, Bain & Company

Prolific

-
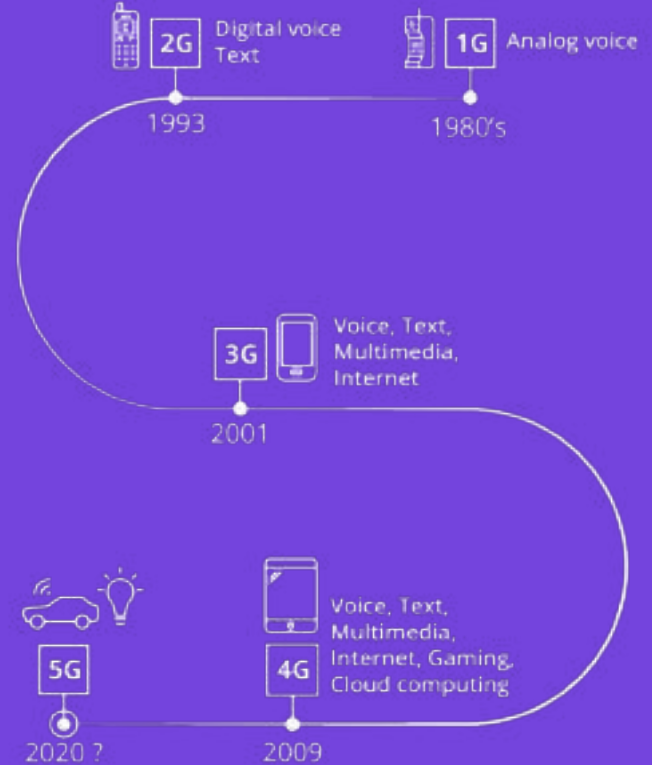
Internet providers are starting to split the net into packages: the rebundled infrastructure

Portuguese mobile and fixed broadband provider MEO and Vodafone have been selling add-on to general-purpose mobile subscriptions, which let customers access specific services, including several big-name entertainment and social apps. Subscribers can pay for unlimited access to it without using their monthly data.
Is it the end of net neutrality ?

Sources: The Verge

Resilient

Withstanding shocks and changes

A resilient infrastructure has the ability to absorb and prevent **potential economic, technological, regulatory and environmental shocks or slow-onset impacts,** thus ensuring its long-term durability.

Such infrastructure is able to adapt to changes in infrastructure use and to withstand the scaling up of multiple uses.

Resilient
Fundamentals
-

Associated KPIs:
Cash conversion, CAGR sales and net profit over 10-15 years, Change in risks cartography
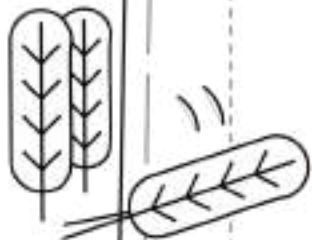
Foolproof
Preventing and absorbing external shocks - environmental, regulation, social
In order to ensure the functionality of the infrastructure and improve internal recovery capacity.

Agile
Adjusting to changes in infrastructure use
In order to extend the customer lifetime value.

Scalable
Withstanding the scaling up of multiple uses
In order to ensure a high level of performance.

Resilient

[Case] Experimenting with the future

-

Digital Twin to Plan for large-scale infrastructure changes

The 4D city simulation application developed by ForCity helps cities and operators achieve their much-needed energy transition by allowing them to **anticipate and plan according to their future:**

1. **Simulate** development plans and communicate the most relevant scenarios.

2. **Predict** the emergence of collective behavior arising from cascading effects due to disasters or infrastructure failures.

3. **Adjust** infrastructure model to scale changes - such as new regulations, climate change, energy transition requirements, shifts in consumption.

ForCity recently was awarded the first prize in the Intelligent Grids, Platforms and Cyber Security category at the Startup Energy Transition Award 2018.

Resilient

-

L'Alternatif - Car park conversion by Ardian's portfolio company Indigo

In 2017, Defacto, the public agency in charge of running and promoting La Défense and Indigo, the car-park operator has **transformed 1,600m2 of car parks into an alternative space** - co-working, events and exhibitions.

The resilience of the infrastructure is highlighted in:

1. **Meeting new needs of the district:** quality of life, new working paradigm, entertainment

2. **Converting an oversized parking offer** compared to the request of the residents: especially since the emergence of public transport in the district

3. **Ensuring the long-term FCF equilibrium**: Extension of the car park concession for Indigo, monthly rental income from the space operator

INDIGO

The conversion of the car park into an alternative space open to the public required:
• Creating new access
• Being compliant with fire regulations
• Increasing structure robustness

Resilient

Reconfiguring infrastructure to meet ever changing needs

-

The dynamic street by Google Sidewalk Lab Toronto and CRA

Alphabet's Sidewalk labs and CRA Carlo Ratti Associati partnered to prototype dynamic streets capable to be transformed by citizens in a short time.

The system is **a modular and reconfigurable paving system** that makes possible to adapt urban landscape to people's needs. The pavement is made of blocks that can be picked up and replaced **to change the function of the urban environment** : road, playing field, basketball court, pick-up zone, bike lanes, block party, etc.

"With this project, we aim to create a streetscape that responds to citizens' ever-changing needs. As autonomous vehicles are likely to start running on streets soon, we can start to imagine a more adaptable road infrastructure."
Professor Carlo Ratti, Director of the Senseable City Lab at the Massachusetts Institute of Technology (MIT)

Basketball hoop · Pull-up bar · Bollard · Bike rack · Microphone

Bike lane light · Sidewalk light · Basketball court light

Porous paver · Concrete paver · Rubber paver

Paver base

Steel plug

Plug and play paving system

Resilient

[Case] Scalable but unsustainable infrastructure

-

Blockchain and Bitcoin consume an exorbitant amount of energy

If blockchain technology is going to support promising decentralized applications - banking, insurance or healthcare- **one big problem remains: it consumes a lot of energy.**

Engineers are currently trying to change that by creating differentiation from bitcoin such as ethereum.

Bitcoin mining used approximately

73TWh / year

Equivalent to almost:

Austria's annual energy usage

10%
of China's annual energy usage

Every bitcoin transaction is equivalent to:

34 U.S. household power consumption for one day

x **1000** the cost of a credit card transaction

Sources: Digiconomist June 2018

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Impactful

Mastering the collateral effects

An impactful infrastructure can have a broader mission for the world, including environmental, social, societal, or economic factors.

The infrastructure is able **to have a positive influence or limit its negative impact on its surrounding environment**: from employees through to suppliers and biodiversity.

Impactful
Fundamentals
-

Radiant
Improving the positive impact
In order to create value above and beyond financial factors - respect of human rights, community development, social mobility, inclusion, energy mix development.
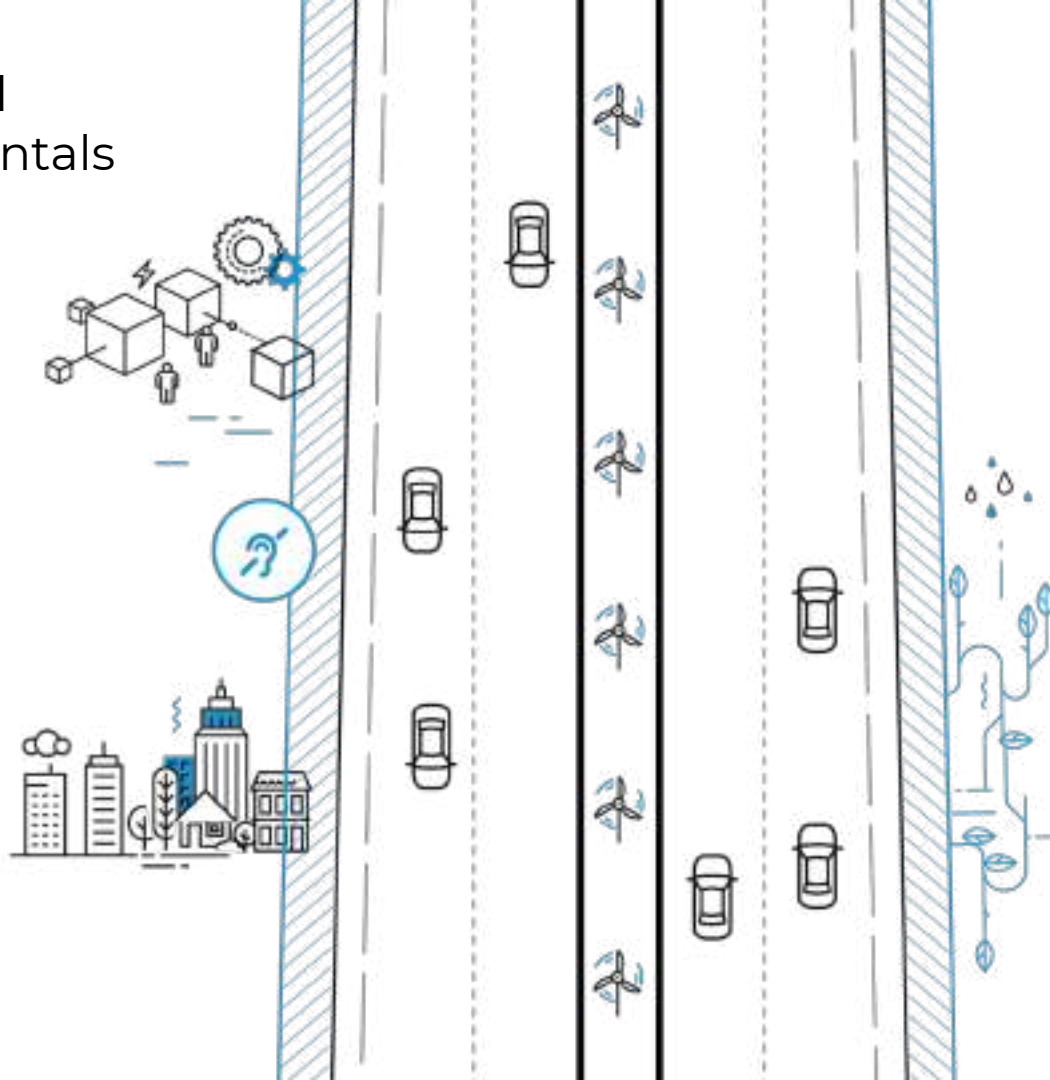
Healing
Reducing the negative externalities
In order to enhance its desirability - compliance, diversity, ethical, environmental and social commitment.

Impactful

Sustainable investing is entering the mainstream

-

The largest digital infrastructure companies are rethinking their mission in society

Because digital infrastructure, such as data centers and cloud technology, are energy-intensive, leaders have been forced to act to fix their infrastructure sustainability reputation. ESG - environmental, social and governance- standards are becoming fundamental to business performance.

In 2016, Google signed a Power Purchase Agreement (PPA) for 10 years with the Ardian Infrastructure portfolio company, Lyrestad Holding AB, a Swedish wind farm, thus ensuring future procurement of clean energy.

"Apple is proud to lead the industry by powering our data centers with 100 percent renewable energy for more than a year now." said spokesman Chris Gaither

"Investing in renewable energy is a win-win-win-win – it's right for our customers, our communities, our business, and our planet." Kara Hurst, Amazon's worldwide director of sustainability

"Our ultimate goal is to create a world where everyone — not just Google — has access to clean energy." Google Energy

Impactful

Providing value for everyone

-

Positive externalities can improve the desirability of infrastructure

The global leading producer of ingredients derived from plant-based chemistry, DRT - a portfolio company of Ardian - has co-invested significantly in green energy, with a biomass cogeneration plant in France satisfying the vast majority of its energy needs.

The plant has been financed by the consortium, Cofely Services, DRT and Caisse des Dépôts. The goal of which is **to produce steam from renewable resources for DRT** industrial needs, **as well as producing green electricity sold back to the overall grid**, managed by ERDF.

This investment of **€50mn** in Landes has allowed for **the creation of 50 non-relocatable direct and indirect jobs** and **a saving of 400,000 tonnes of CO² over 20 operating years**.

DRT is at the forefront of sustainable growth and development. This is a key value for Ardian, acting as a responsible investor.

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Impactful
[Case] The renewables' virtuous cycle
-

Renewable energy infrastructure positively impacts end users and local environment

Ardian's renewable portfolio in Italy originates from a **strategic partnership** between **Ardian Infrastructure** and **Tozzi Group, an Italian energy company.**

Successive investments into the platform have allowed for a **sector diversification** from **Wind** (2007) to **Hydro** (2009), **Solar** (2011) and **Biomass** (2016).

Through successive build-ups and internal development, multiplying its **size x10 from 41MW to c. 461 MW.**

Through its positive externalities such as job creation and green energy supply for thousands of families, **3New embodies the ESG principles that are essential to Ardian's investment strategy.**

Wind, Hydro, Solar

810 GWh / year

Renewable energy produced

Allows to supply energy to:

1.1m people

more than the whole city of Naples

Biomass (AgriTRE)

180 GWh produced per annum (250k people supplied)

350 jobs created

80 farmers supplying straw and wood to the plant

20 ha could be cultivated through district heating should cogeneration be developed

THE AUGMENTED INFRASTRUCTURE :
A compass for your strategy and a new scoring model

-

Potential level

Current level

3

A new value creation scheme

In the era of augmented infrastructure, **innovation is quickly becoming the key driver of value**. Backed by substantial investments, innovation enhances the functionality of current infrastructure assets, which generates significant value. To best facilitate these changes, a different regulatory framework should be developed.

Optimize value creation through the investment scheme

Invest
More capital allocated

Transform
More earnings, better external impact

Engage
New optionalities considered

Increase long term value
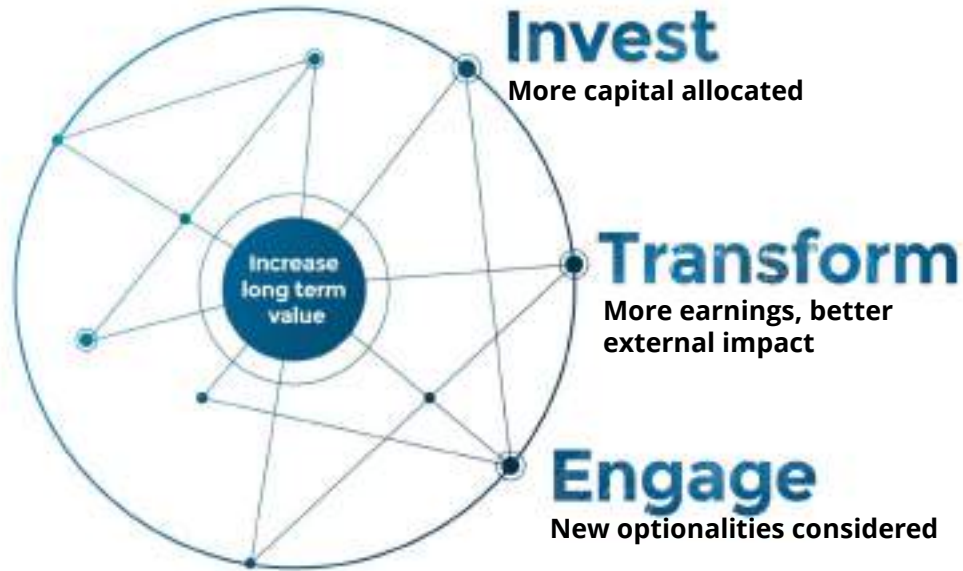
Invest

In the augmented infrastructure ecosystem, investment may be less predictable in the long term.

Nurtured by their vision, investors should adapt their analytical framework to identify the value creation potential of their assets' digital opportunities.

A changing investment paradigm
-

More industrial buyers with significant financial capacity

Increasing strategic importance of data control

Highly disruptive tech industry

General awareness of social and environmental imperatives

A faster moving market shortening length of investment visibility

Accelerating shift in assets value
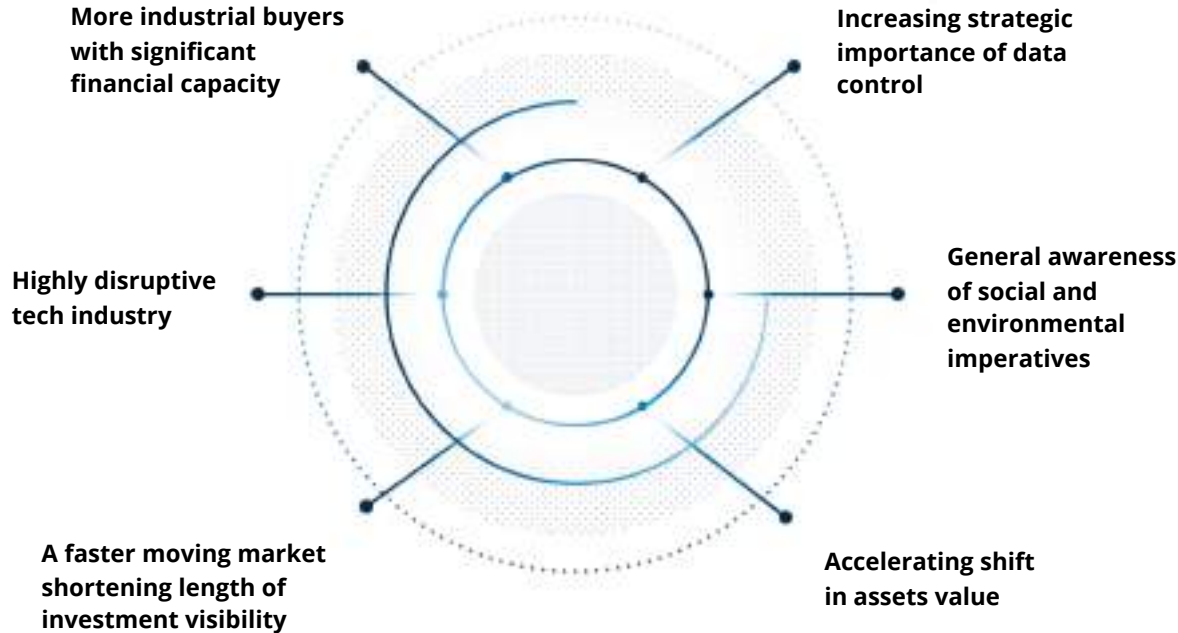
Increased focus on the capacity of infrastructure to transform in a sustainable way

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... Implying a dual challenge
-

Investing in a company in a transformation context means:

Assess the existing assets

- Current stage of digitalization
- Level of technological and regulatory risks
- ESG impact

Identify digital opportunities

- Scan the potential of transformation
- Estimate the related value creation
- Assess the capacity to make the legacy business move forward

Funds are a key sponsor of their assets on their path to the augmented infrastructure model driven by a sustainable value creation strategy.

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... And increasing the need to monitor closely the long term return

-

Investing in infrastructure has meant for investment funds to secure an **attractive risk return profile based on a long term horizon and a sustainable yield, forming the majority of total return.**

What may change in the augmented infrastructure era?

• New revenues and maintenance optimization should have a positive impact on FCF

• Consideration of optionality may maximise exit value

• However, yield regularity and financial leverage optimisation may be challenged by accelerated investments and new risks

• And the presence of new type of buyers may inflate entry multiples

Overall, the composition of the return may be less predictable

Financial benefits

High cash flow generation and regular yield

Growth potential

Low correlation to economic cycles

Inflation hedging

Intrinsic strategic characteristics

Essential service

High barriers to entry

Long term visibility

Room for leverage

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In this context, which pillars should be central in the investment process?

-

INVESTORS

POLICY MAKERS

Follow a long term vision

**Crystalise the value
for innovation**

PARTNERS

CONCESSION HOLDERS
AND OPERATORS

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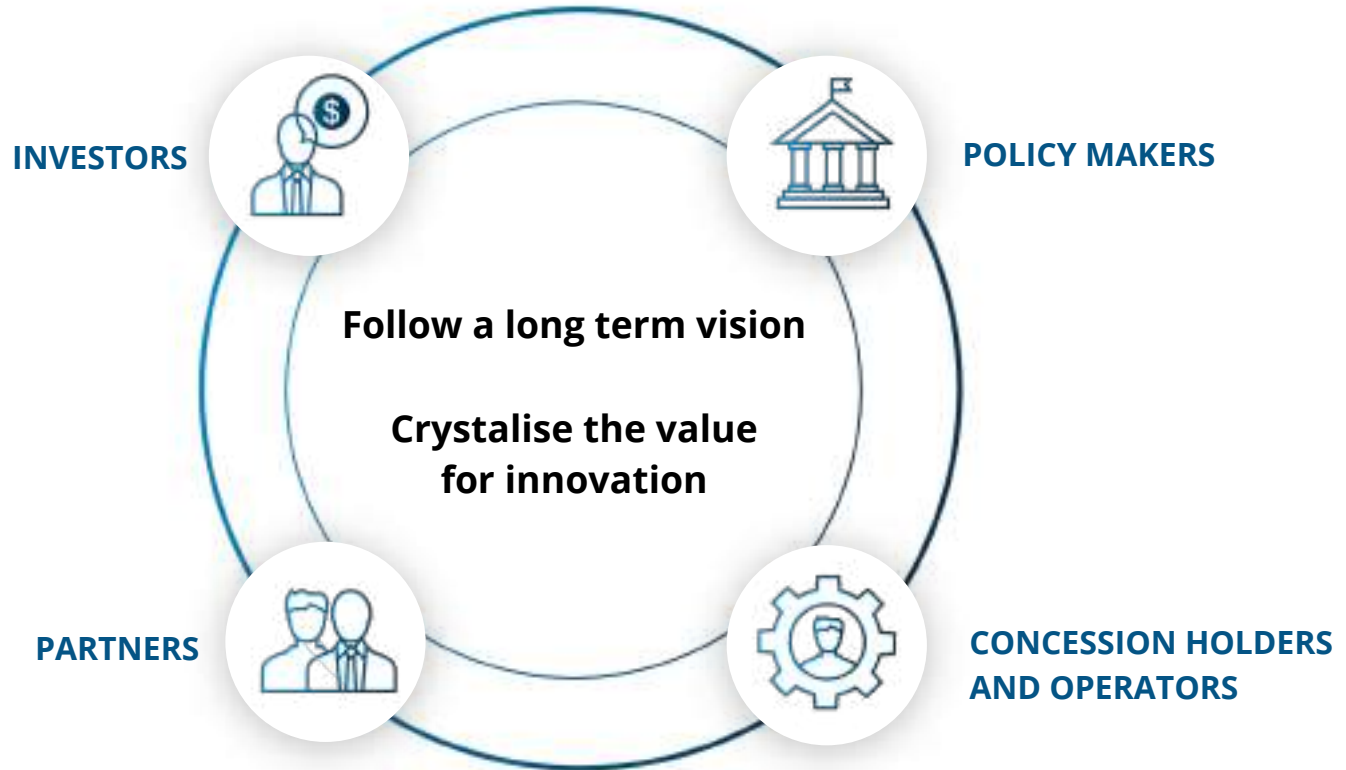
A vision to shape the future of infrastructure -

"There is significant change underway, as we move from centralised energy production, to decentralised and bidirectional production, dominated by renewable sources.

This shift requires a radical change from our current transmission and distribution grids, into a smart grid infrastructure." Mathias Burghardt, Head of Ardian Infrastructure

Driven by this vision, Ardian has supported its portfolio company Kallista in its work as a member of the SER*, assessing with the French government a possible regulation amendment to allow, among others:
• electric vehicles' charging stations directly connected to wind turbines' grid connections
• a more flexible repowering permit process to double wind energy production with the same number of turbines.

*SER (French Renewable Energy Association)

This is also driven by a long term vision that industrials like Google have strengthened their positions on infrastructure.

Over 2015-17, **Google invested $30bn in data centers and submarine cables to:**
• keep the control of an essential infrastructure,
• move up the value chain.

"These investments underscore (...) our confidence and clarity about future opportunities, with our focus on proprietary solutions that enable us to

deliver the secure, reliable, high - performing compute infrastructure to support new and emerging products and services". Ruth Porat, Google Chief Financial Officer

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Balance long term vision with short term action -

The significant increase of infrastructure buyers, funds and industrial buyers, confirms its **status as a strategic asset class.** Having a long-term vision is more than ever critical to pilot in a changing investment context.

It is a long-term plan, based on **what will be the next winning and sustainable business model** and **in which type of regulation framework it will operate.**

Thereafter, it needs to be articulated around short term actions.

Vision has to be enlightened, nurtured and articulated.

Innovation leads to value
-

In this ever-changing context, the investment framework may be impacted with a lowered visibility on FCF and a rebalancing of the return's composition between yield and exit value, the latter being maximised by the consideration of optionality.

Thus, the capacity to crystallize the value for innovation and immaterial investment is essential.

Valuation
OF INNOVATION

$=$

Earnings
TRANSFORM
Revenue boost / new streams
Operating efficiency
Fruitful alliances

$\times$

Multiple
ENGAGE
Trust & magnetism
Business mix
New optionalities

Transformation to the augmented infrastructure model needs to be well monetized and promoted.

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If supported by a forward-looking regulation -

The high level of investments in innovation needed to build an augmented infrastructure should be rewarded beyond short-term economic metrix.

Today

Infrastructure operators are mainly driven by:
1. Their long-term vision
2. Their estimated cost of standing still
3. Their consideration of optionality to maximize long term value

However, the regulatory incentives for infrastructure operators to invest in innovation can be very low.

For certain regulated assets, there might even be a disincentive to innovate. Current regulations can often reward more the deployment of "mortar based" capex than the increase in the infrastructure's flexibility and capabilities through digital innovation.

Tomorrow

Infrastructure regulation should aim to:

• Adopt a more user-centric approach

• Reward innovative investments needed to prepare infrastructure assets for future needs

• Take into account the five key levers of the augmented infrastructure

Transform

In our valuation equation, **the transformation path to augmented infrastructure is the driver for more earnings through both revenue and margins.** To be really accretive it has to be well operated and monitored.

There is almost no choice. If they do not respond to changing environment, infrastructure face an **increasing risks of being disrupted and destroying value**.

Transform to drive more earnings in the long term -

Valuation
OF INNOVATION

=

Earnings
TRANSFORM
Revenue boost / new streams
Operating efficiency
Fruitful alliances

1. **Anticipate risk of disruption**

1. **Monitor with the right approach and KPI's**

2. **Activate key levers of the augmented infrastructure**

3. **Optimise capital allocation**

×

Multiple
ENGAGE
Trust & magnetism
Business mix
New optionalities

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1. Anticipate disruption risks
-

Infrastructure follows a PUSH & PULL logic:
a new service can lead to the creation of a new infrastructure which in turn can lead to the emergence of new services and functions.

This changing environment calls for responsiveness from key players, otherwise there is a great risk of being disrupted.
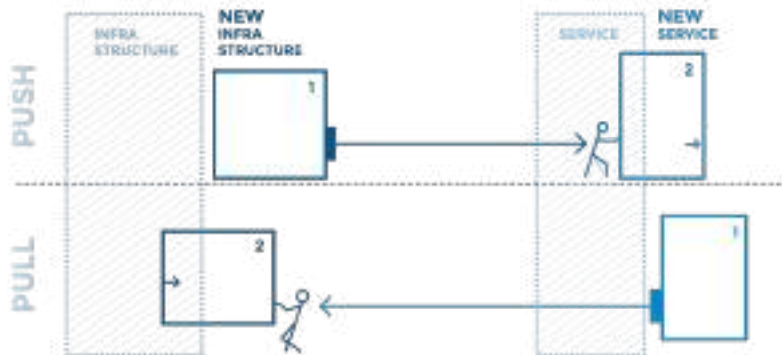
Fabio Pacelli
Chief Innovation Officer, Naples International Airport, Ardian Infrastructure portfolio company

"**Disrupt or be disrupted.** Digital technology gives us the opportunity to cope with strong traffic growth. We must have the courage to rethink the whole process, changing the business model, putting the passenger at the center of this transformation and making this growth more sustainable for the future generation. **Digital transformation is not a choice, we must change if we want to survive**".

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Mobility revolution will imply a high cost of standing still

Multimodal

Autonomous

Electric
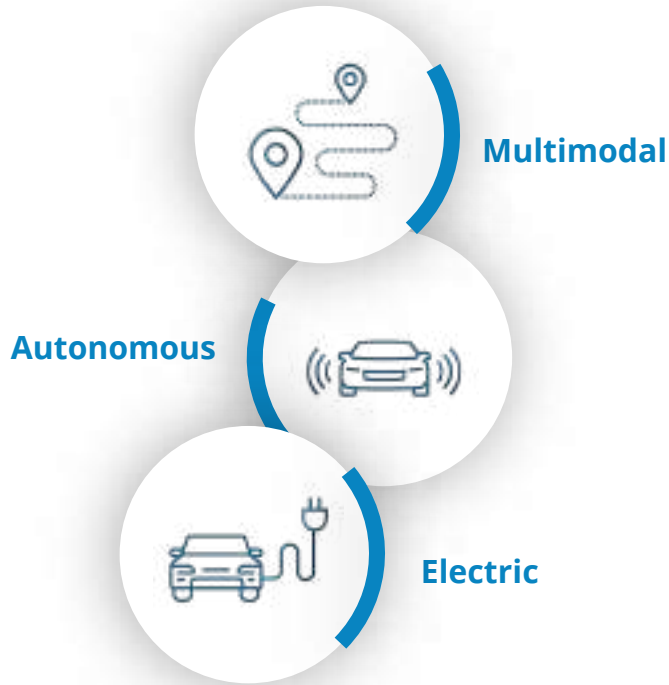
Fewer cars & higher utilization rate threaten the profitability of historic parking business model

Business model risk

New nodes and hubs of mobility threaten market fit of existing assets

Asset risk

Parking operators need to adapt their infrastructure to electric mobility with charging stations

Asset risk

Regulation to forbid cars in city center to face congestion and pollution

Asset risk

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[case] Anticipe parking transformation
Parking operators will have to adapt

From parking to drop off

As new means of transportation become more interconnected, on demand, parking will extend to an ubiquitous drop off & pick up areas.

From B2C to B2B

When autonomous robotaxis are here, the likes of Uber & Google will become new prescribers and parking will increasingly have to serve B2B customers.

From parking to services

Autonomous & electric vehicles will be driven by asset utilization rate, reducing number of vehicles & parking time. Value will reside in maintenance & services to those vehicles.

From central to peripheral

Fleet of autonomous taxis will require relay-parkings near city centers where land is cheaper, and the flow of people is intense. Central locations will service micro mobility offers.

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Reshape services in line with mobility challenges -

Luis Silva Santos,
CEO Ascendi

"Highways are part of one of the ecosystems that will be most disrupted by digital: mobility. As a mobility platform, highways will have to take up a great challenge earlier than we think: self-driving and connected cars and digital-minded end-users demanding new services are already a reality."

Serge Clemente,
CEO Indigo

"In the future, Indigo's mobility solutions will be appropriate according to the time, day or even the country in which the user is located. A digital, simple and user-friendly platform will combine these offers for a freedom of choice and a completely fluid customer experience. The entire Indigo Group is already engaged in this process."

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2. Monitor with the right approach and KPIs -

Switch to a client approach

Augmented infrastructure is above all a user centric infrastructure and should be monitored through more usernomics. Corporates should adapt their reporting from a product to a client approach.

This switch will favor the adoption of **new valuation methods, like Client Value.**

Adopt a 360° vision

Business models also have to be monitored on a 360° scope giving great focus, beyond clients, to employees, partners, environment and society.

Culture and mindset have to be in line with the vision and the strategy. This is essential and that's why it has to be monitored since the beginning.

KPIs tracking efficiency and operating leverage

KPIs tracking volume activity on the client base

KPIs tracking the value part of the activity per client

KPIs tracking risks and investments necessary to fuel the model transformation

KPIs tracking the impact on environment, society and people

3. Activate key levers of the augmented infrastructure -

PROLIFIC
Develop and monetize new services offered to clients
Improve user experience and increase client retention
Target client specific needs and **segment the client's base**

OPEN
Ease the access
Enlarge client base to make the business model more scalable

RESILIENT
Maintain high FCF generation despite increasing investment needs, changing technology and regulation
Anticipate and **monitor** new risks

ARPU / retention rate / average lifetime

Client base

FCF Capex

INCREASE CUSTOMER LIFETIME VALUATION

Opex / CAC

ESG incidents Employees loyalty

INTELLIGENT
Increase efficiency (data management, operational optimisation)
Potentially **reinvest** savings
Optimise client acquisition cost
Improve customer/employee satisfaction

IMPACTFUL
Create value through a positive impact on environment and society
Increase desirability

Transforming car parks by enhancing driver experience

Transform

PROLIFIC **Combining** into a universal parking app, on-street and off-street parking offer into single comprehensive experience.

OPEN

Initiated by Indigo but **open to every car park operator** and owner - more than 114 actors; **Accessible** on mobile and web devices.

RESILIENT

Optimising the asset utilisation by reducing the cyclicality of the business and providing a solution to operate in the low activity phases.

OPnGO

INTELLIGENT

Manage occupancy rate of car park in real-time
Manage pricing mechanism: creating various different parking zones and changing the pricing dynamically.

IMPACTFUL

Improving mobility in the city and reducing the carbon footprint
Digitalizing the parking environment allows for greater transparency and wiser mobility policy decisions.

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Transforming car parks by enhancing driver experience
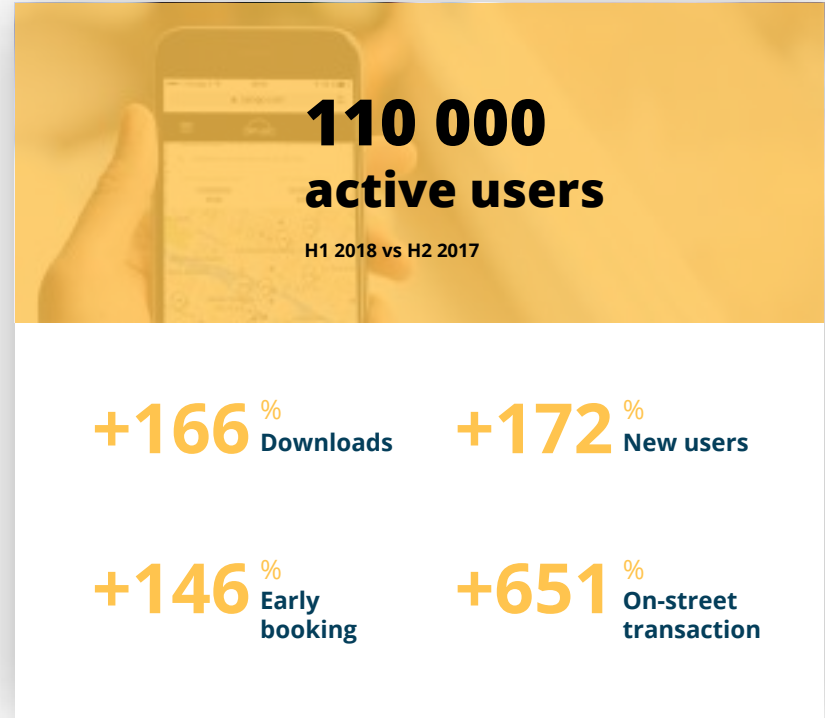
A strategy based on **a strong dynamic in client acquisition and a focus on business mix improvement**:

- Clients clusterization around the 4 offers
  - Client acquisition strategy through on-street (lower price)
    - Tracking of the cohorts to increase conversion rate to booking

An accretive strategy:

- **For OPnGo**, with a positive impact of the change in clients mix on earnings
- **For park operators** with an increase in penetration rate on long term parking (the most profitable)
- **For cities**, with a reduction in traffic and its negative societal and environmental impact

110 000 active users

H1 2018 vs H2 2017

+166 % Downloads

+172 % New users

+146 % Early booking

+651 % On-street transaction

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4. Optimise capital allocation
-
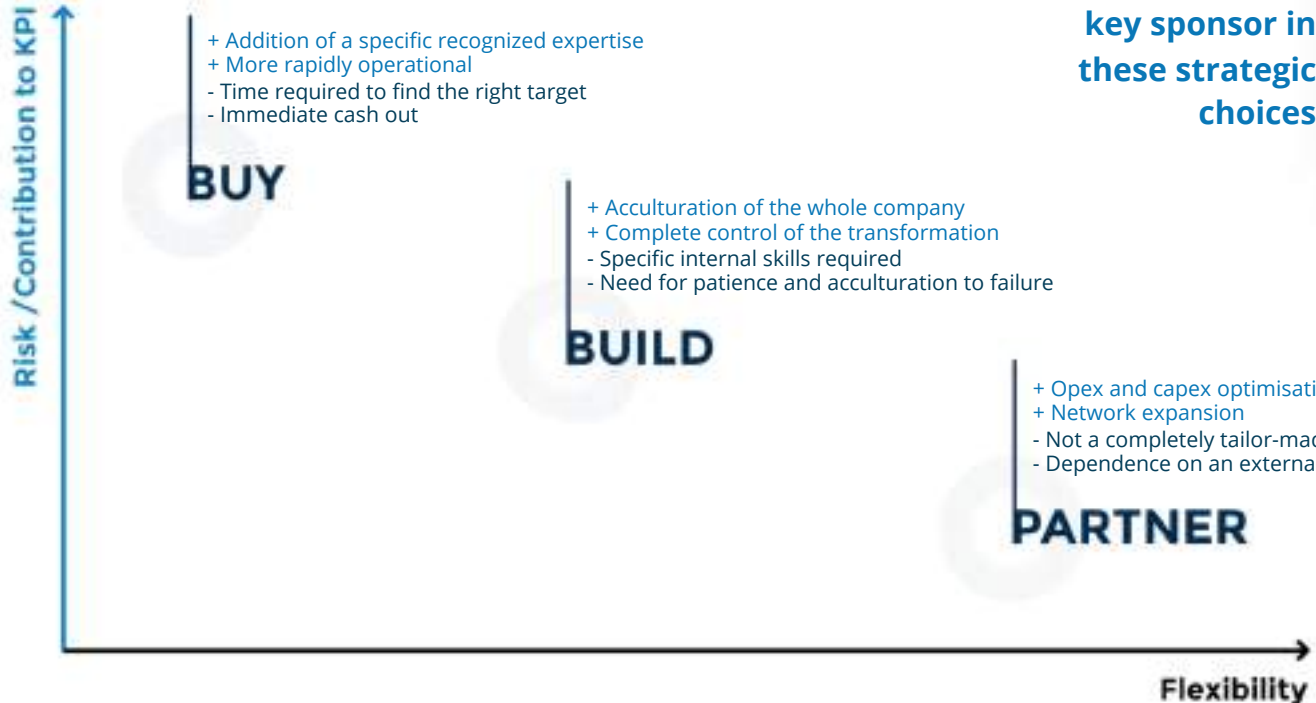
Investor is a key sponsor in these strategic choices

Use its vision to arbitrate

Bring the right expertise

Help its holdings to get the adapted organisation

Risk /Contribution to KPI

BUY
+ Addition of a specific recognized expertise
+ More rapidly operational
- Time required to find the right target
- Immediate cash out

BUILD
+ Acculturation of the whole company
+ Complete control of the transformation
- Specific internal skills required
- Need for patience and acculturation to failure

PARTNER
+ Opex and capex optimisation
+ Network expansion
- Not a completely tailor-made solution
- Dependence on an external actor

Flexibility

Engage

Beyond generating additional earnings, the augmented infrastructure needs to promote its transformation.
That means engaging its stakeholders, convincing them about the vision and capacity to operate sustainably while monitoring new risks.
Engaged stakeholders will be in a better position to **consider optionality.**

How to value investments in transformation?
-

Valuation
OF INNOVATION

$=$

Earnings
TRANSFORM
Revenue boost / new streams
Operating efficiency
Fruitful alliances

$\times$

Multiple
ENGAGE
Trust & magnetism
Business mix
New optionalities

1. **Closely involve all stakeholders**

2. **Monitor risk profile**

3. **Value externalities**

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1. Closely involve all stakeholders

Salvatore Landolina

Chief Financial Officer at Torino Airport
Digital Transformation Director

"For a **regional airport**, a customer-centric approach is a challenge.
Digital transformation is a *must* to improve the customer experience of our passengers, **creating value.**"

Key strategic pillars

Identify its specific **challenges, as a regional airport**

Understand better customer needs and create adapted new businesses to **boost non-aeronautical revenues**

Put technology at the service of passengers and employees

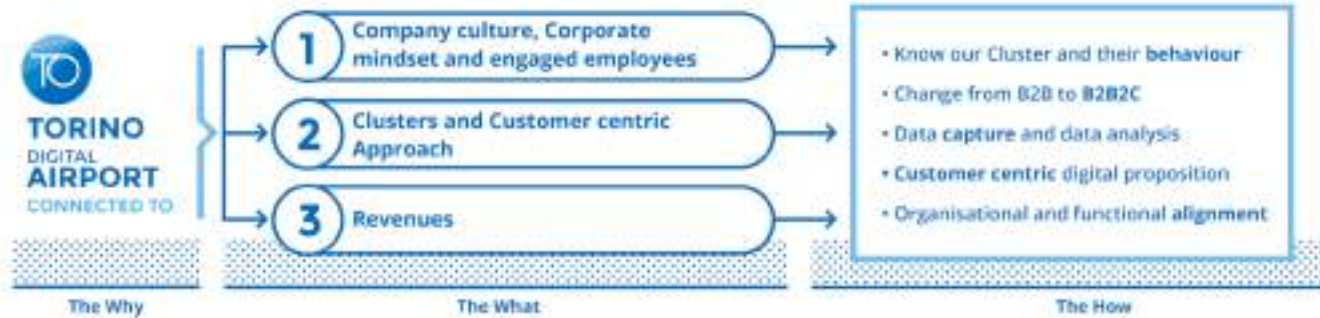**Integrate its regional business partners** and their digital strategy

Key impacts on the business model

Double the percentage of e-channel sales

Drive additional margins

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1. Closely involve all stakeholders

Digital transformation is not a project...
...it's a Process of transformation across all Departments

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That's key to convince that transformation is backed by a good mastering of operations. Increased efficiency generates operational gains which can be partly reinvested in additional development and change, creating a virtuous circle.

1. Closely involve all stakeholders

Engage

It's critical to explain **how the infrastructure leverages its client base both now and in the future.**

That means using the right KPI's and giving enough visibility **to crystallize optionality.**

To maximise Customer Experience value, Torino Airport relies on a **strong CRM and analytics system**, highlighting how the efficiency of the operating model is the first major step of the transformation.

Done

- Wi-Fi enhancement
- Web APP
- Innovation Lab
- Face Recognition
- Vip Lounge Locker
- Vip Lounge Monitor
- Digital ADV Gates area
- New payment channel
- Pax Profiling Model
- Shop View
- Queue Management
- Distress Report
- Safety Management System (SMS)
- Automatic E-gates for validation boarding pass

In progress

- Native APP
- Locker Order & pick-up
- New E-commerce platform
- Pax Flow & Proximity Marketing
- Locker: Shop & collect
- APP merchant
- Digital Parking
- Mobility services

What's next...

- Security Automatic Gates
- Self Bag Drop
- Mobile Baggage Tracking
- Loyalty - Blockchain

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2. Monitor the risk profile
-

The question of valuation will be highly correlated to the **capacity for the infrastructure to make the legacy system change while limiting the impact on risk profile** which is one of the funds' key investment criteria.

Anticipate potential impacts on FCF

• Increasing digital costs or capex in a rapidly changing technological environment

• Ramp-up of new risks: cybersecurity? new environmental risks? reputation risk?

Adapt to regulation

• Transform in a regulated framework (limited revenue upside in certain concession scheme)

• Anticipate potential change in regulation (to the extreme, from a public and centralised, to a decentralised and local one) which could be seen as an opportunity but will go through a phase of adaptation

Cope with limited resources

Find solutions to build, maintain and operate infrastructure in an environment where resources are limited

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3. Value externalities

-
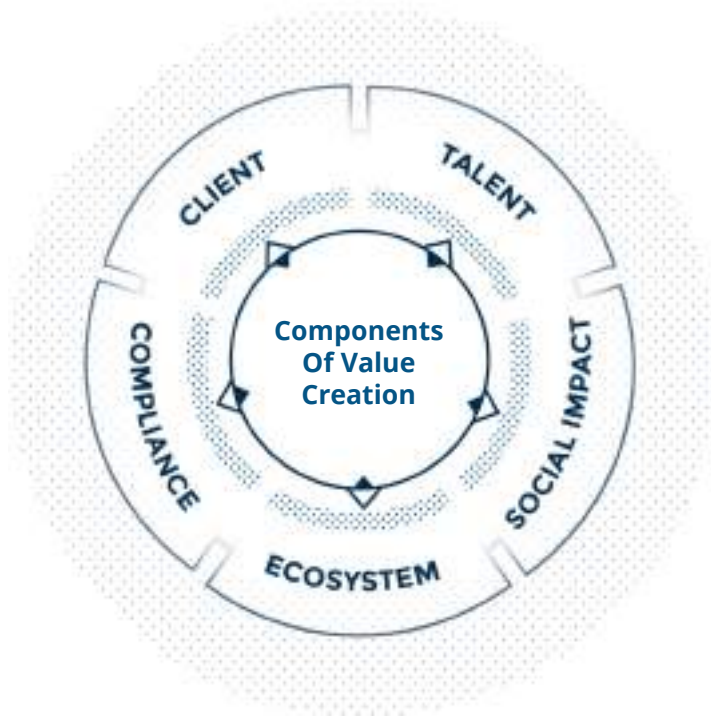
We are convinced that an infrastructure has to be valued on a 360° approach.

Because there should be a link between, on one hand the resilience of the infrastructure and its capacity to integrate sustainably its ecosystem, and on the other hand its financial performance.

But also as it **plays on its desirability for all stakeholders.**

That is particularly true for infrastructure.

We can assess that **the optimisation of the operating model ("Intelligent infrastructure") will help to predict and reduce this impact**.
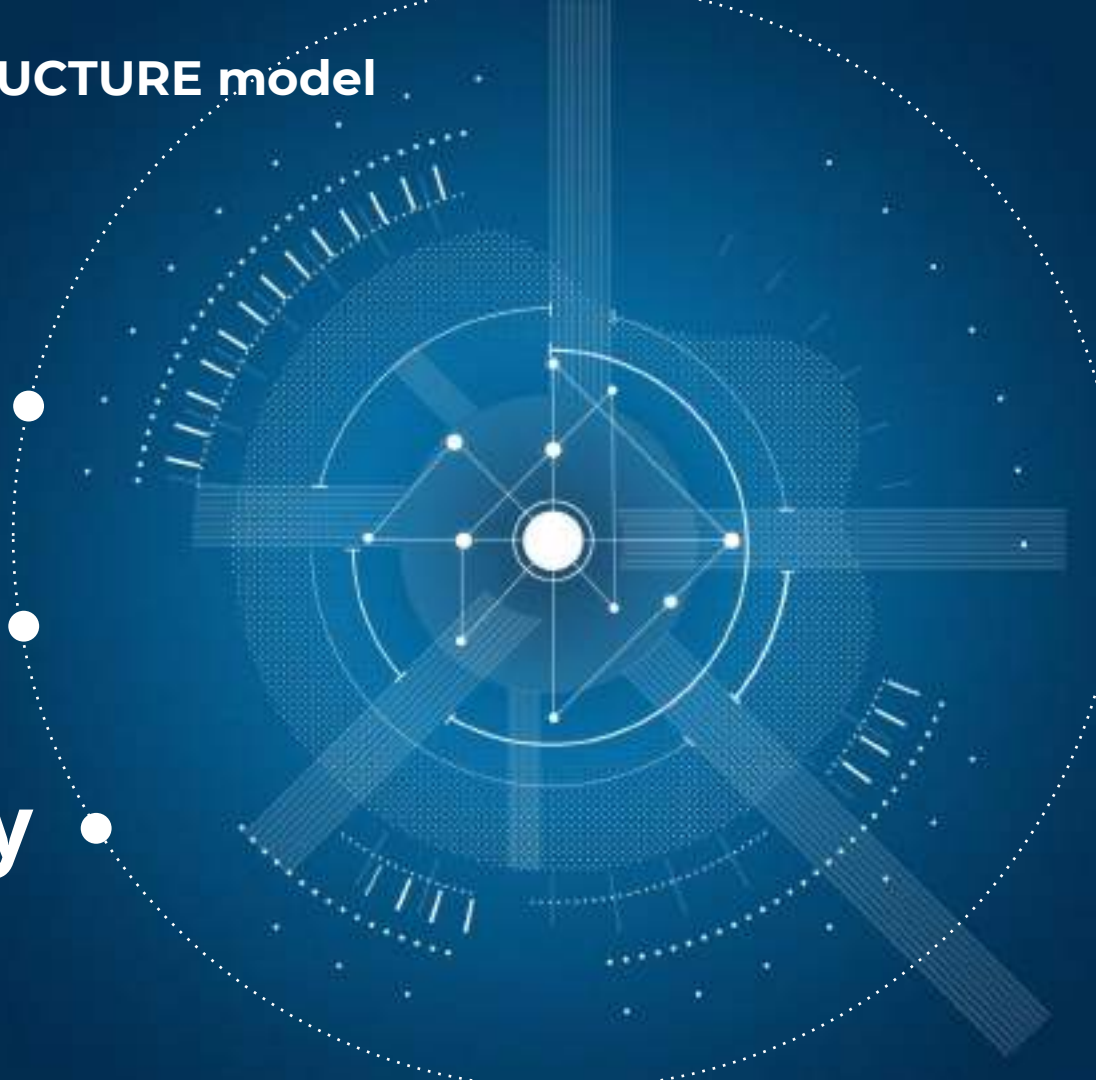
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THE AUGMENTED INFRASTRUCTURE model
-

New rules •

New scoring •

More optionality •

Let's take a step back!
-

A new infrastructure model that must resonate with our meta-infrastructure:

Earth

Credits
-

Research

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Credits

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Who we are

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FABERNOVEL

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Distributing the future since 2003

Founded in 2003 by Stéphane Distinguin, **FABERNOVEL** is a full-stack consulting and creation group for digital products and services that has been working for 15 years with major international groups in their cultural and digital transformation and innovation trajectory. **FABERNOVEL**'s Designers, Engineers, Developers, Data Scientists and Analysts all enact their values and solutions to develop their clients' business and offer users, customers and collaborators simple, high-tech and engaging experiences that respect their personal data. **FABERNOVEL** also creates and supports start-ups such as Digitick, KissKissBankBank, Share your Office and, more recently, Urban Campus. In a world that is changing ever-faster and in which a "winner takes all" attitude is the default setting, **FABERNOVEL**'s mission is simple: to distribute the future in the most open and equitable way.

15 YEARS
distributing the future, working with worldwide top companies and organizations

400 EMPLOYEES
designing and developing innovative solutions, across 6 offices in Europe, the US and Asia

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$9BN
managed
and/or advised

33
INVESTMENTS
since 2005 across
Europe, the US
and Latin America

40
PROFESSIONALS
dedicated to
infrastructure
investment across
six offices in
Europe and the
US

ARDIAN INFRASTRUCTURE

-

Thirteen years at the heart of infrastructure

ARDIAN INFRASTRUCTURE part of ARDIAN group managing circa $70bn, invests in a comprehensive range of infrastructure assets, focusing in particular on energy (gas, electricity transmission, distribution, storage assets and renewable energy), transport (rail, road, parking and airports) and other public infrastructure (health, environmental). This offers investors a diversified portfolio generating consistent returns with measured risks.

ARDIAN's INFRASTRUCTURE team works closely with major international industrial, utility and construction companies, as well as infrastructure operators. This network provides the team with privileged access to transactions, often through bilateral negotiations where the stakes are both financial and industrial. **ARDIAN's INFRASTRUCTURE team** also monitors closely and supports the digital transformation of its portfolio assets with several team members dedicated to this topic.

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