



# LIBERTY, EQUALITY, ... RESPONSIBILITY?

IIOT FOR PEOPLE, A DRIVER OF VALUE CREATION  
IN FRANCE

**WAVESTONE**

A study carried out by Wavestone, in partnership with  
Group Caisse des Dépôts and La Poste.

GRUPE



LA POSTE

The Internet of Things (IoT) can create economic and social value, for local communities throughout the country: a useful development for both citizens and businesses. The Caisse des Dépôts Group and La Poste aim to play a role in supporting these developments as trusted third parties and players who are committed to innovative ecosystems in France. Being at crossroads with three different parties – businesses, local communities and citizens, it is possible to invent solutions that will simplify everyday life. Based on a framework that respects the interests of these parties, La Poste and the Caisse des Dépôts Group offer “citizen compliant” models, as an alternative to those of the tech giants. They are already engaged in several projects that supports a responsible IoT: digital safe, IoT infrastructures for smart cities, social smart housing, digital health platform for all...

As a result, La Poste and Caisse des Dépôts Group have appointed consulting firm Wavestone, to carry out a study which aims to show the impact of the IoT and the creation of value it has around 3 areas of everyday life:

- / Travel and receiving deliveries
- / Housing and work
- / Healthcare and aging better

This study aims to identify and analyze the value of the IoT, as well as its associated obstacles and risks. Additionally, it offers an analysis of the stakeholders’ interplay that the introduction of the technology induces on in each sector.

# INTRODUCTION

Transform your transport time into leisure time, witness your home or office adapt to your tastes in real time, make deliveries with ease, grow old more comfortably at home, ... The Internet of Things (the IoT) offers new opportunities for all.

Bridge medical gaps, transform the aesthetic of homes for the better, grant access to transport in rural areas, ... The IoT is a driver of equality for all.

## A promising value potential

Through permanently changing people's everyday lives, the IoT leaves the gadget era behind and embraces the new era of professional applications. The IoT is now synonymous with value: business value, as it allows for the creation of new markets, and general and societal value, as it is a source of public economy and favors across the board access to services.

The IoT transforms French people's everyday lives. Travel and receiving deliveries, living and working, healthcare and aging more comfortably; so many rapidly changing needs.

/ To make transport less cumbersome, energy efficient, and secure, the IoT allow us to address our infrastructures, roads or vehicles. It does this through engaging in the progressive transformation of the way in which we travel, turning it into a travel experience for the user. It will also allow for deliveries to be carried out more

quickly, shorten time schedules, even in the absence of the recipient, and it allows for the quality control of merchandise. It even permits a more efficient flow of collections and returns.

/ Improving how we harness energy in built-up areas is a major issue in France. The IoT could assume this role, as is already the case in the service sector. The markets at the forefront in the residential sector are those of security and comfort. In the long run, however, the IoT is poised to be a key player in adapting homes to various situations in real time. It may also play this role in shared spaces, transforming homes to make them more affordable.

/ The IoT also offers solutions to the issues faced by the French healthcare system: financial pressure and overwhelmed staff, as well as the growing needs of patients. The IoT will progressively change our health system. It will do this by improving ambulance services and the conditions for a more comfortable aging-at-home experience. It automates patient monitoring which in turn minimalizes professional intervention. As it is more widely adopted, the health solutions linked with IoT will also allow for a transition towards a preventative approach, as opposed to a curative approach.

## Integrating the development of IoT services into a company's business plan

There are many value sources in which the IoT can act as a powerful driver. It presents clear potential for development. Nevertheless, company managers wishing to exploit the IoT must build an investment and cooperation strategy with other subsidiary stakeholders, in order to realize the best possible benefits from it. The impacts on value chains are often rather pronounced. Among these include strategic repositioning that allows for the use of the IoT, the risk of disintermediation, as well as new digital players who tend to take over client relations.

While making the most of these value sources, it would be best however to develop the IoT in line with the general interest of the citizen in order to anticipate any new emerging services. Misuse or data theft that accompanies it, system corruption directly impacting everyday life, health, and even people's lives are all affected by allowing smart devices that are connected to one another to make decisions. This compromises our individual freedoms and our digital sovereignty. There are many aspects to be controlled.

The IoT is now synonymous with value: business value, general and societal value.

## IoT for people as a decisive competitive edge for French industry

For connected everyday solutions to be massively adopted, they must meet the needs and concerns of as many people as possible. Mistrust displayed towards the digital giants, fueled by the announcement of the use of citizens' data without their knowledge, may represent an axis of strategic development for the French IoT industry. Digital sovereignty, cybersecurity, transparency of algorithms and systems, design in compliance with ethical rules, possibility for users to simply manage their confidentiality, decision control mechanisms, and human links in addition to connected solutions are levers of the IoT for people that need to be developed, and will likely represent decisive competitive advantages.

**Introducing a responsible and sustainable sectoral dynamic is essential, the IoT will be what we make of it.**

**Advocate for an IoT for people, a driver of value creation in France!**

## AUTHORS



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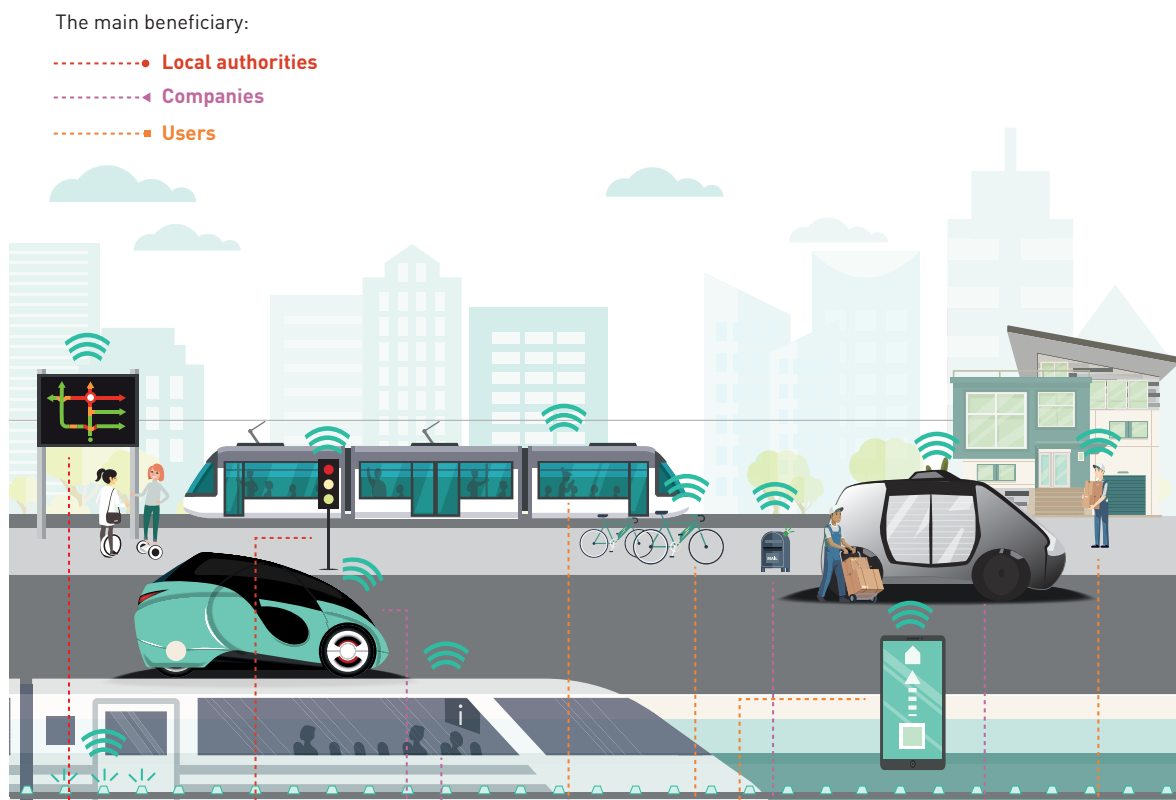
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THE IOT'S 21 VALUE SOURCES THAT TRANSFORM FRENCH PEOPLE'S DAILY LIFE

TRAVEL & RECEIVING DELIVERIES



The main beneficiary:  
 - Local authorities  
 - Companies  
 - Users

TIME TO MARKET

- 0-2 years**
  - #2 Enabling predictive maintenance and infrastructure management
  - #5 Refining fleet management and vehicle maintenance
  - #6 Enhancing transport services
  - #8 Improving the quality of goods deliveries
  - #9 Enabling better management of collection and return flows
- 2-7 years**
  - #3 Adapting the road network to its uses, in real time
  - #4 Developing enhanced transport services by communicating with infrastructures
  - #7 Developing a customized, multi-modal transport
  - #10 Pooling storage and delivery capacities
  - #11 Delivering parcels in H+ without the need to be home
- >7 ans**
  - #1 Guiding local authorities in managing mobility

HOUSING & WORK HEALTH CARE & AGING BETTER



- 0-2 years**
  - #12 Controlling equipments in the home
  - #13 Customizing daily-life scenarios
  - #14 Improving the operational management of buildings
  - #15 Facilitating space sharing to make housing affordable
  - #16 Playing a part in energy exchange at local level
  - #17 Taking outpatient care to a new level
  - #18 Improving the monitoring of chronic illness
  - #19 Enabling better access to health-care throughout the country
  - #20 Helping people to age better at home
  - #21 Developing preventive care in the French health system

# LET'S TRY TO DEFINE THE IOT!

A connected device is characterized by its ability to gather and transmit information from its immediate environment, as well as by its ability to carry out certain tasks under remote control. The current generation of IoT systems is based on the capacities of central platforms and on the information analysis of all kinds of devices. *Edge Computing* tends to make devices smart and capable of analysis. It also enables them to communicate with other devices. This has led to the creation of what is commonly known

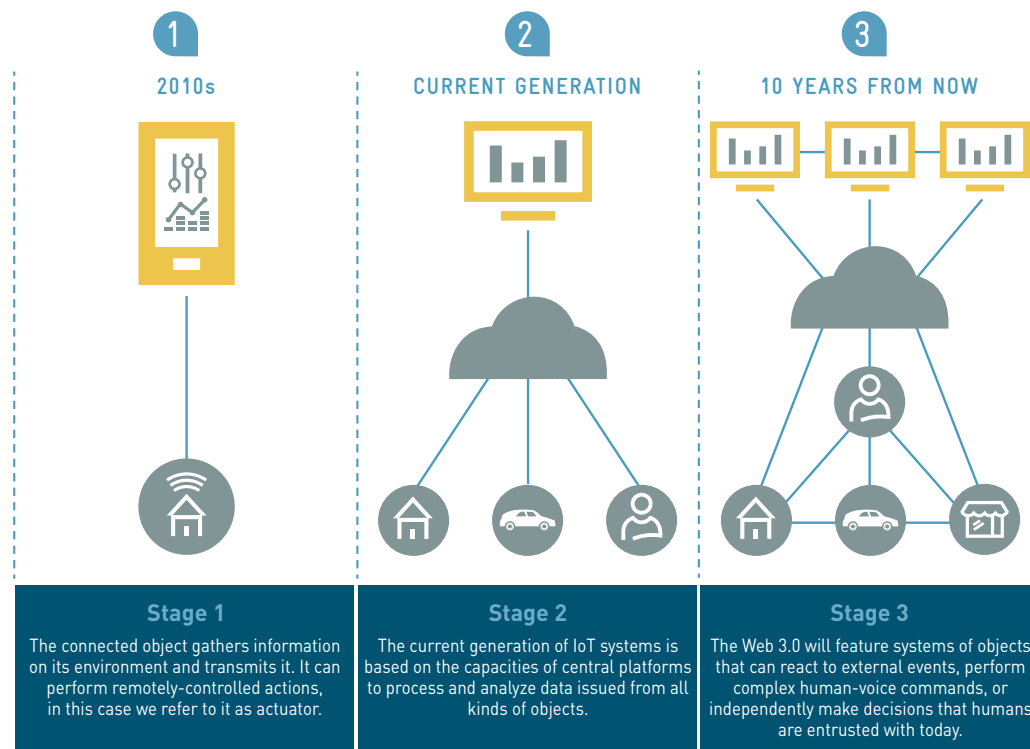
as the Web 3.0. Web 3.0 consists of devices able to react to an external environment, to carry out complex human voice commands or to make decisions that are currently entrusted to humans. There are therefore many potential associated services, and we can only envisage a tiny fraction of these transformations. Bearing witness to autonomous transport vehicles or to homes that transform themselves in real time to life situations will probably no longer be a thing of pure science fiction.

The IoT's technological chain can be broken down into 3 major parts:

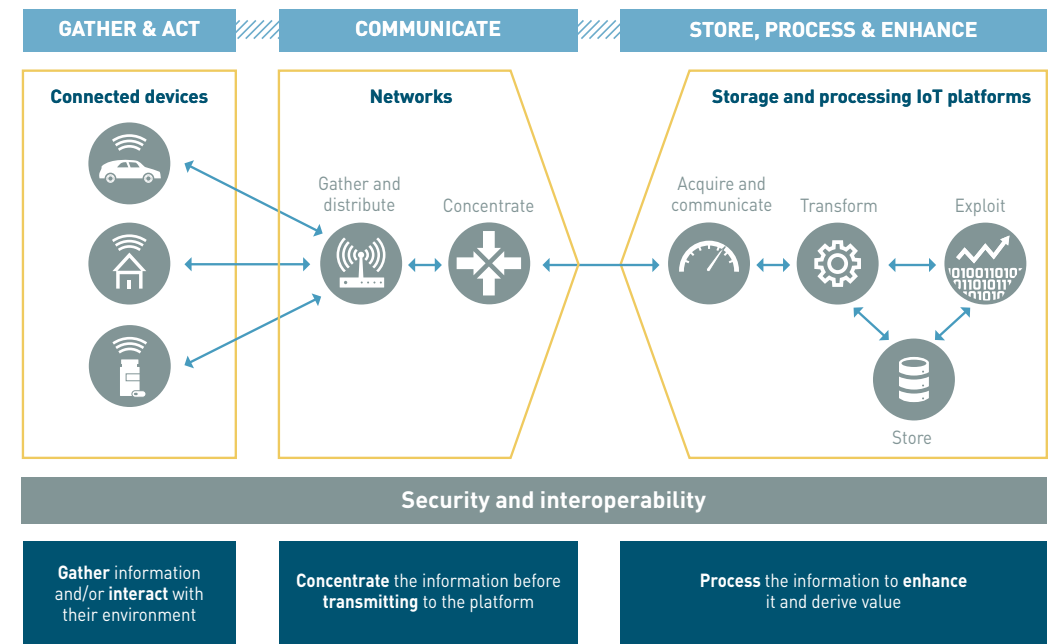
- / **Sensors or Connected Devices:** entry points for the IoT's value chain. Sensors are devices in contact with their immediate environment capable of measuring any physical variable (indeed, thanks to a small-sized device, we can measure anything today). Some of these systems can also carry out remote controlled orders, referred to as actuators.

- / **Connectivity:** this refers to all technologies (based on radio waves most of the time) that allow for information transmission between devices and data platforms and, soon, between devices themselves.
- / **Data Platforms:** the heart of the system, these platforms aggregate, clean, and then analyze data gathered by devices in order to create new services.

## THE IOT'S THREE MATURITY LEVELS



## THE IOT'S CHAIN TECHNOLOGY



All these elements must be secured. Exchanges must be encrypted, and systems reinforced against attacks.

Such security management is still a weak point today, on which solution providers are working hard.

# KEY FINDING N°1

## The IoT belongs to the now!

### The acceleration of services based on IoT has started in France

#### The lights finally turn green

The IoT arrived in France during the 2010s with its first batch of devices. One of these devices, the connected bracelet, remains exemplary. Since then, companies have been constantly experimenting and flexing their imaginations on how to create services based on this very technology. At the start of 2018, the number of large-scale service industry roll outs based on IoT technology remains low and is restricted to a few dozen across all sectors.

There are two main reasons behind this:

- / The first is linked to the difficulty of financing projects in the domain, the main reason is often the fact that sensors are still rather expensive.
- / The second reason stems from company manager's distrust of these new technologies, they deem their reliability and security to be insufficient.

Nevertheless, since 2017, France is the leading capital destination in Europe for IoT (source Dealroom, 2017); a very sharp rise was observed during the second half of the year. To add to this, for 94% of investors the French are the most qualified talents in the world for Deep Tech (products or services based on breakthrough innovations) (source Wavestone, 2017). French companies are preparing for this acceleration as many of them integrate the IoT in their strategic development plans (launching IoT programs, creation of dedicated entities, etc.) in order to go beyond the experimentation phase.

Another factor supporting this projection is that we already see this acceleration of IoT based services outside of our borders, in countries that are ahead of the game in terms of digital services. By way of illustration, the number of smart homes (a home with at least one connected device) increased in the US from 2.5% of all homes in 2016 to 7.5% in 2017 (source Netatmo, 2018), and health services increased their connectivity from 10% in 2015 to 21% in 2016 (source Ipsos International, 2017).

This inevitable spread of IoT solutions in the services of the future may well indeed lead to mass orders of devices, which in turn may trigger a significant reduction in their price. In that respect, these strategic decisions will progressively rid us of the cost constraint of sensors, not the other way around.

Since 2017, France is the leading capital destination in Europe For IoT.

(Dealroom, 2017)

#### As of now the IoT boosts two areas of value: operational performance and services to clients

The demonstration of value has begun; the IoT now presents rapid gains in two areas: operational performance and offer to users (new services, customer experience).

- / In terms of operational performance, this study shows the supplementary value brought about by the IoT in the maintenance of infrastructures and of railway equipment, as well as in the operational management of buildings.
- / When it comes to offer to users, significant advances have been carried out in healthcare in terms of the development of ambulance services or even in monitoring chronic illnesses.

These innovations are now reaching advanced stages of development, in real environments, and their proliferation is a marker of the take-off of these services in France.

Furthermore, the acceleration of the IoT's development began in France and all players that fail to integrate the IoT in their business plans, risk lagging behind which, in the long term, could hinder their development.



# KEY FINDING N°2

## The IoT's potential value is certain: this technology is going to make a lasting change to the way in which we travel, live and make use of our healthcare in the short term

### The IoT will be everywhere, at all times: to date, 1% of its potential has been realized

In 2017, the number of connected devices surpassed the number of people on earth, this gap is only set to widen. The IoT is slowly but surely converting our environment into one of communication. We, in real time, have increasingly accurate knowledge of the state of our towns and countries, our transport systems, our public spaces and our homes. The services of the future will emerge from the use and intelligent blending of these data.

In a few years, progress made in terms of miniaturization and computing calculating, will give way for a little device (of a few millimeters in length) to possess analytical capacities. Such a device will be able to communicate with its peers, and be able to make decisions. Today we can implement 100 million transistors of 2mm, this allows for concepts such as smart dust (a network of micro-sensors) to see the light of day. Such progress may well lead to connecting the most minute of devices. Most of these devices share a remarkable trait: the continuity of their connectivity. We can therefore speak of omni-connectivity, even hyper-connectivity.

### New freedoms in everyday life

The IoT, combined with other Deep Tech (artificial intelligence, biotechnologies, etc), will experience a paradigm shift: our environment will adapt itself to our lives, to our everyday behavior, our whimsical desires, and not the other way around as it is today.

**As for mobility**, your means of transport will come to you, they will adapt to traffic conditions, be safer, and all of this will be amplified as cities grow in size. We are currently seeing changes driven primarily by the IoT, such as streets adapting in real time (multi-lane allocation) or transport means coming directly to the user (on call shuttles).

- / Users: these service-orientated changes will grant users more comfort and flexibility when traveling, the same applies to deliveries.
- / Economic stakeholders: they will be in the position to optimize fleets and improve their service for their clients by finely analyzing their delivery service.
- / Local authorities: the IoT allows for better territory management. It also grants opportunity to improve town and country planning legislation (rural integration, environment quality, etc.).

**As for property**, buildings will be hybrid and self-adapting to change (e.g. presence detection). Our accommodation will ensure both comfort and security. They will adapt themselves to the time of day, to our moods... a real virtual butler!

- / Users: comfort, security, energy, entertainment, so many services to be piloted and automated in line with our daily habits.

These devices share a remarkable trait: the continuity of their connectivity. We can therefore speak of omni-connectivity, even hyper-connectivity.

- / Economic stakeholders: technical management of buildings will be optimized, over time it will be possible for them to develop a relationship with their clients.
- / Local authorities: the IoT allows for the optimum use of building's energy in any given neighborhood. Furthermore, sharing connected spaces fosters affordable accommodation.

**As for health**, the link between family doctors will be closer and more remote. A practitioner will be able to access our health data at any time, allowing for more effective consultations (e.g. connected patches). In the long term, it is highly likely that we will have sensors connected inside our bodies for on-the-spot diagnostics and for regular monitoring of physiological measurements (e.g. diagnosis capsules).

- / Users: constant patient monitoring of health will significantly improve the patients follow up. Patients will become more involved in their health. For the elderly, this technology offers encouraging perspectives in terms of prolonging their independence at home.
- / Health professionals: subject to the creation of a standard to gain the trust of professionals, they will have a deeper understanding of their patients and their medical histories.
- / Local authorities: connected services could lead to the creation of a more across-the-board offer of health services to the elderly all over the country.





# KEY FINDING N°3

## The IoT opens up value chains by inducing more appetite for control of connected environments

Understanding users' needs, mastering client relations, the ability to unify and manipulate end-to-end services, are all decisive weapons for developing new B2C and B2B2C services.

### **The most interesting aspect for tech giants: an increasingly acute knowledge of our lifestyles**

In this battle, digital giants will be tough opponents. They are currently engaging in a bitter fight to control communicative environments and the data associated with them: smart phones and smart cars for mobility; smart homes for housing. The battle that is cur-

rently raging on smart speakers between GAFA (Google, Apple, Facebook, Amazon) clearly illustrates this competition to control connected environments.

Hidden behind this mastering of communicative environments and the relationship with the user, of their connected devices and their data, are of course a number of very lucrative markets. These include product and services sales as well as the sale of personal data and digital advertising. That is why digital giants are willing to invest colossal sums to penetrate our collective or individual means of transport, our housing and our health systems.

### **Traditional players are poised to remain market leaders in their fields, they are also set to conquer more**

French stakeholders in mobility, buildings, housing and healthcare are not inactive when faced with the competition of digital giants. They are multiplying initiatives and partnerships, among themselves and with start-up.

- / The mobility market is opening up, pushing stakeholders to build various partnerships to develop the connected services of the future (the autonomous vehicle PSA alliance with Vinci Autoroutes). Car manufacturers, infrastructure and transport operators, as well as route planners, have a complex concern. Local authorities are organically becoming the regulators for the construction of smart and durable playing fields.
- / In terms of buildings, builders and promoters are promising pre-connected buildings (Bouygues Immobilier). They themselves are even proposing services to clients (seen by Nexity in their ambitious initiative 'Eugenie' in conjunction with Somfy). In terms of housing, we are witnessing the interplay of alliances or indeed clashes between landlords, electricians, equipment manufacturers and digital stakeholders. All of whom are rushing to offer IoT services for comfort, energy and security, as well as for entertainment and centralized management of the home.
- / The newcomer phenomenon is utterly remarkable in the healthcare market. The

French stakeholders in mobility, buildings, housing and healthcare are multiplying initiatives and partnerships when faced with the competition of digital giants.

IoT has allowed for the birth of a new market of 'wearable' health solutions (Nokia, Terrillon). The 'wearable' market wreaked havoc on the competitive medical devices market which traditionally favored professionals. Furthermore, software stakeholders are placing themselves in user interfaces to try and get their hands on their sensitive data. Sensitive data requires regulators and paying bodies to play a key role. Their decisions could allow for the transition of a connected health system from few to all.

Moving beyond this proliferation period, a number of strategic questions arise: What will be the winning movements? Is there a need for battle against digital giants in order to control client relations? What are the keys to avoiding damaging domination? Is intermediation intrinsically linked to profit?

A number of trends seem to emerge. Promote the strategic assets of national companies (digital sovereignty, trusted third-party, proximity) in response to digital giants. Anticipate and benefit from the opening of value chains brought about by the IoT with particular focus on the final user. Reinforce leading market positions to improve performance and innovative services.



# KEY FINDING N°4

## Protecting citizens and defending public interest does not hinder but rather encourages the development of a French IoT

Like all forms of technology, there are hopes and fears associated with the IoT; there is promise, and there are risks. As for the optimistic technophiles, the IoT offers new solutions to our major environmental and societal challenges: sustainable mobility, allowing for the elderly to remain at home, collaborative building services and affordable housing. It can grant new freedoms (transport facilities, remote healthcare, etc.) and reestablish equality in areas such as access to healthcare and housing. It can provide rural areas with transport connections. There is then the “Black Mirror” argument. The dystopian series Black Mirror portrays tech giants in total control of our connected environments exclusively for financial gain. They use data to manipulate citizens and the IoT as a way of ridding themselves of the elderly whom they imprison in houses equipped with sensors.

IoT for people will grant a competitive edge as the market’s tool for adopting these solutions. It provides reassuring answers to the ethical questions (delegation of decision-making, humans maintaining control, confidentiality management, societal cohesion, job retention, etc.), legal and regulatory questions (personal data, assurance, traceability, material and immaterial property rights, legislative frameworks of concerned sectors, etc.), technologies (system interoperability, links with artificial intelligence systems, telephone network coverage, cybersecurity, transparency of algorithms and systems, etc.), or even economic questions (the dynamism of the IoT industry in France, production costs of sensors and systems and large scale projects etc.). The IoT will be what we make of it. Only through medium term use will see its benefits and the

faults that need tending to. It is therefore necessary to get involved, particularly with 4 specific aspects.

### Citizens and local authorities mastering IoT solutions, as close as possible to the uses

Beyond politics, it is digital maturity and citizens’ and local authorities’ behavior that will guarantee the sustainable use of IoT and its solutions. As an example, we imagine that public authorities will raise awareness among citizens of the uses and associated risks of IoT, they may even set up support services and councils for professionals. Service providers, on the other hand, must produce solutions that work in a transparent way and leave users the choice of their own privacy rules.

### Interoperability and opening up systems to avoid monopolization

An update to regulatory framework seems necessary to allow for data sharing, but legislating or imposing a legal standard similar to that of telecommunications is something that requires careful consideration so as to avoid stalling innovation and company creation in the sector. It is often the market itself that sets the standard, and French and European companies have every interest in collaborating to reach a critical size or master a value chain, and thus counter the aggressive strategies of American or Asian giants.

### Delegation of decision-making, but under human control

Certain future IoT applications will give way to devices and their systems making decisions that will impact users. In order to accept such delegation, we would do well to make these decisions clear and understandable; particularly in terms of algorithm transparency, we must ensure that human rights are well respected always. Furthermore, overall control

IoT for people will grant a competitive edge as the market’s tool for adopting these solutions. It provides reassuring answers to the ethical questions, legal and regulatory questions, technologies, or even economic questions.

must remain in the hands of humans so as to take charge of any potential runaway system.

### The definition of a balanced legislative and political framework

Even if it might seem a bit restrictive, the European Union, through the General Data Protection Regulation (GDPR), provides a reliable and favorable framework. In general terms, the EU’s size is of importance in terms of harnessing tech giants’ power. French political powers must ensure that France is well represented in these debates. They must also ensure that the directives are properly transposed at home.

The IoT could expose individuals to significant risks. Taking that into consideration, it is essential to identify minimum principles in order to protect the individual, while fostering innovation. By raising social issues, these debates could attract citizen involvement. It is worth noting that these principles may vary sector to sector. Here are some examples:

- / Defining a clear and complete legal framework to encourage cooperation between numerous stakeholders involved in connected automobiles.
- / Providing an exclusive point of contact and include all users to allow for the creation of a truly smart and integrated city.
- / Assist the boom in connected housing by proposing flexible legislation that covers the low-sensitivity data needed to pilot equipment.
- / Guarantee a high level of transparency in the e-health sector considering the highly sensitive and personal nature of the data involved.



# TRAVEL AND RECEIVING DELIVERIES

The IoT allows us to act on 3 major components of mobility: continuous surveillance of territories and infrastructures, geolocation of vehicles and equipments, and communication between systems.



## WHAT CHALLENGES?

**Autonomous mobility, a hopeful revolution against mobility challenges in France: urbanization, territory integration, ecological transition, opening up to competition**

As we approach 2040, it's likely that autonomous vehicles will replace manually driven vehicles and will safely transport merchandise seamlessly while saving on energy. As symbolized by the emergence of autonomous cars today, the seismic shift towards autonomous vehicles affects all areas involved in mobility: territory, streets, transport and energy infrastructures, and vehicles. In France, all stakeholders affected must, under the eye of public authorities and local authorities, coordinate their developments to try deliver on this promise of autonomous mobility across the country, whether it be in urban or rural areas.

In order to guide this progress, the Assizes of mobility (2017) set ecological transition as their main challenge. Transport represented almost 40% of CO2 emissions and a third of energy consumption in France in 2015 (source ADEME, 2015). France agreed to a reduction of 30% of greenhouse gas emissions between now and 2030 at the COP21 (source COP21, 2015).

Urbanization, symbolized by the development of megacities, is a significant trend in France, where the figure of 80% of the population living in cities was exceeded in 2016 (source The World Bank, 2016). This densification, which is a global phenomenon (according to IPCC, 2/3 of the world's population will be urban by 2050),

In France, the last-mile delivery market revenue will reach €1 billion in 2018, and €2.6 billion in 2025 (Les Echos Etudes, 2017) which will foster traffic flows.

puts pressure on those in built-up areas already experiencing major social and economic hardships to offer high performing mobility solutions within a 10-kilometer radius. The explosion of E-commerce and the supplementary influx of circulation that accompanies it, particularly for individual motorists, accentuates this performance requirement.

Areas between 10km and 100km outside of cities, what we call intra-regional areas in France, offer the less diversified means of transport nowadays. 80% of trips are carried out in cars (source Le Club Les Echos, 2017). To successfully manage the development of areas around small cities, a useful approach would be to increase shared transport systems in order to reduce the gap between transport provisions and low populations.

Opening up the rail system to competition reinforces a demand on railway management and railway transport operator performance in France by putting pressure on operational maintenance and use.

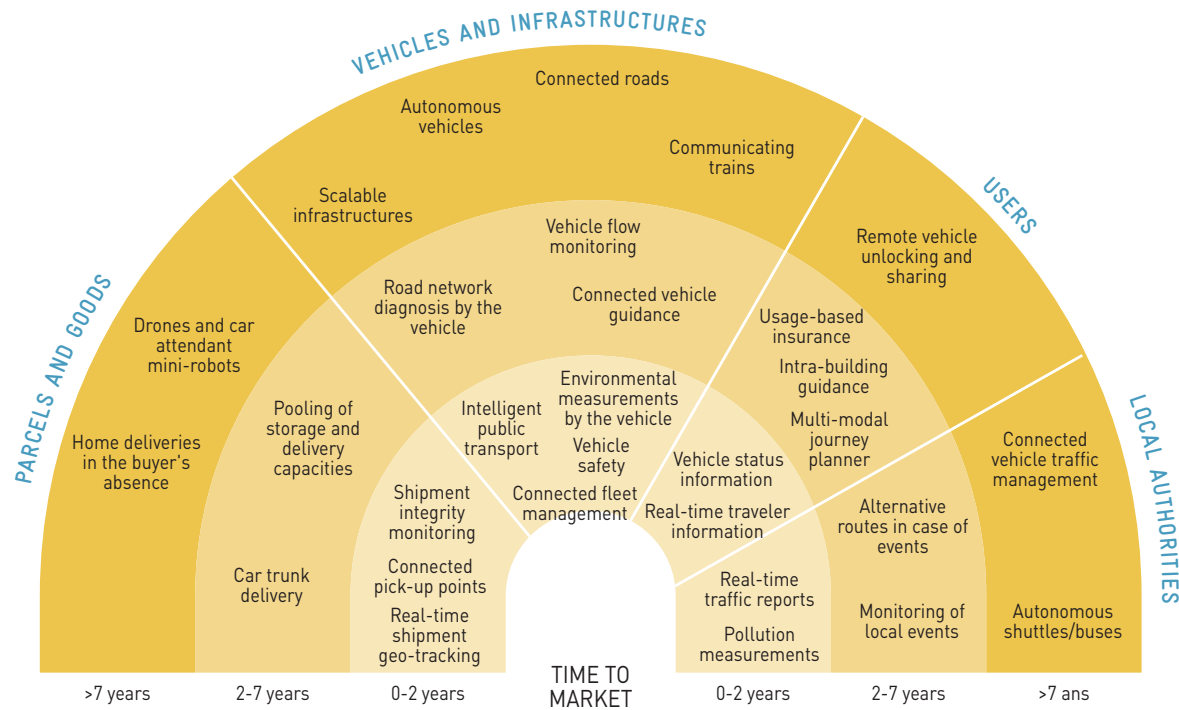
The SNCF plans to merely deploy 20,000 sensors between now and 2020 (source Keynote SNCF SidO, 2018). By then, almost 20% of cars in France will be connected (source Statista, 2017). Transformation of the sector, which is just at its outset, will be progressive.

## WHAT CONTRIBUTION FOR IOT?

Diagnostics, Turning products into services, Sharing: the promise of reinvented mobility which places the citizen at its core

Transport digitalization is seen as an imperative solution to this transformation. The IoT, along with Open Data, is one of the main pillars of this transformation. Essentially, the IoT allows us to

act on 3 major components of mobility: continuous surveillance of land and infrastructure, geolocation of vehicles and equipment, and communication between intelligent systems.



### TRAVEL AND RECEIVING DELIVERIES: MATURITY OF NEW SERVICES BASED ON IOT

The IoT allows for the quick measuring of the effects of a decision or development on user transport, which will greatly expedite public policy improvement.

### Well-informed public policies inspired by acute supervision across the country

Simply being able to continuously monitor all activity on any type of infrastructure or vehicle, on the ground, in the air, or indeed underground, allows us to control events on the ground and to anticipate any type of congestion. One enduring aspect of value will be the ability to quickly measure in real time the effects of a decision or development on user transport, which will greatly expedite public policy improvement. As the spearhead of communication for market stakeholders, the autonomous vehicle is in fact underpinned by the growing phenomenon of intelligent communications between systems, and their ability to make navigation decisions in real time. All this gives way to legislative, ethical, and legal questions that will have to be dealt with in the years to come.

LEARNING MORE ABOUT THE VALUE SOURCE  
N° 1 Guiding local authorities in managing mobility (p. 53)

### Moving towards self-repairing, adaptable and communicative land infrastructure

The first source of value on which the IoT will have a stark influence is land infrastructure, both rail and road. It will make them smarter and improve their performances.

- / Due to the IoT's ability to precisely locate and to inform us of a vehicle's state, the time for broken down vehicle repair will be cut. This, together with the development of predictive repair algorithms based on the analysis of new and more plentiful data, are two current experiments for most infrastructure operators in France.
- / Longer term research by road mobility environment stakeholders aims to adapt streets to their users in real time. Picture the roads on Saint-Nazaire Bridge, or indeed toll booths on motorways that are congested at different times in the day. The IoT allows us to conceive adaptable roads, giving way to better traffic management (multi-purpose roads). Relieving the burden on existing infrastructures through the IoT is a start in tackling the stark reduction in budgets allocated to the maintenance and development of infrastructures.
- / These innovations will be reinforced by the coupling of vehicles and infrastructures. We can thus foresee automated driving assistance information services, accident prevention, and less traffic congestion (experts estimate reductions in traffic jams, once the number of connected cars surpasses 15%), well ahead of the advent of the 100% unmanned car.

### Preventative maintenance and IoT for SNCF trains in the Île-de-France region

In order to reduce maintenance costs and improve punctuality, the SNCF installed sensors on 200 trains on their Transilien lines. Basing itself on the IoT Watson cloud platform developed by IBM, the train operator can also use information gathered from the 2,000 sensors



that all new generation trains are equipped with. Data is collected in real time so as to remotely detect potential technical problems on the trains while they are in use. These could include door opening and closing or the AC system.

#### LEARNING MORE ABOUT THE VALUE SOURCES

- N°2 Enabling predictive maintenance for infrastructures and optimizing their operational management (p. 54)
- N°3 Adapting the road network to its uses, in real time (p. 55)
- N°4 Developing enhanced transport services by communicating with infrastructures (p. 56)
- N°5 Refining fleet management and facilitate vehicle maintenance (p. 57)

### Place the user back into the heart of mobility: a multi-purpose and service-rich travel experience

The first beneficiary of these safer vehicles and infrastructures and less congested roads will of course be the user. Furthermore, the IoT allows public transport operators to gather transport service user data and to improve customer knowledge. They can also optimize their organization to increase user satisfaction.

Beyond these evolutions there is a revolution going on. The decades to come will bear witness to a shift from an era of transport convenience to an era of transport as an experience, and the IoT will be one of the chief drivers of this shift.

/ Today the IoT allows vehicle manufacturers to consider business models for a service based on the kilometer capacity of vehicles, as opposed to the sale of the vehicle. Such a business model will eventually extrapolate a service using autonomous and pooled vehicles.

A revolution is underway for the user. We are moving from an era of transport comfort to transport experience.

### Mobility as a Service with the Maas Global's app Whim

The Whim app, developed by the pioneer of Mobility as a Service MaaS Global, offers an integrated mobility service deployed in Helsinki, Finland, whose objective is to ultimately replace car ownership with a service covering all modes of transport, public and private, via a monthly subscription.



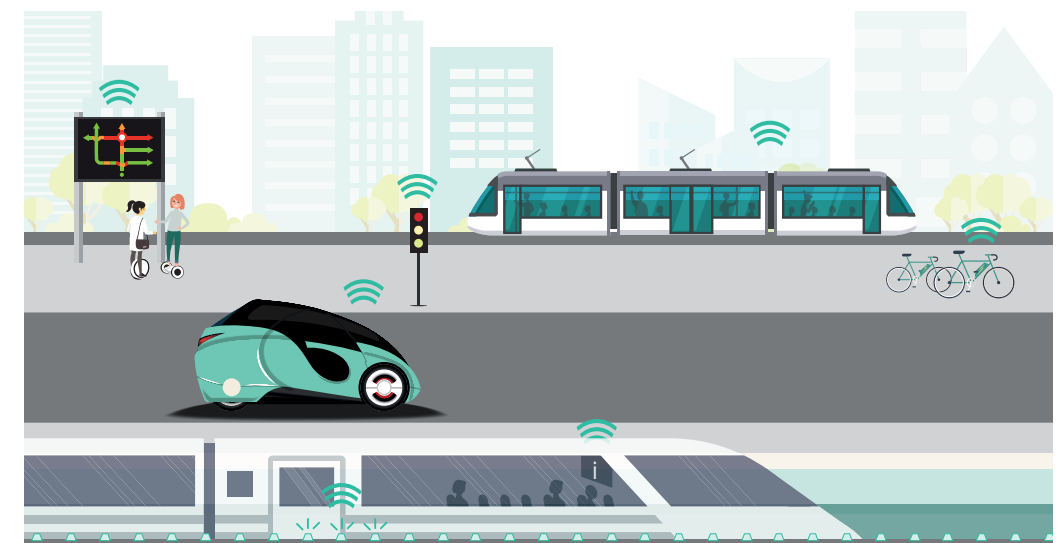
The means of transport available are geolocalized and visible in the user's app. In the not too distant future, the large-scale deployment of IoT solutions will allow transport vehicles to be located in real time, allowing us to offer real inter-modally adaptive connection options.

/ The personal vehicle turned into services falls under a more global trend known as Mobility as a Service (MaaS). This progressively places the user at the heart of a multi-purpose, multi-faceted and personalized offer in both rural and urban areas. By pushing the theory that a transport user (as opposed to owner) will want more choice over their means of transport, the IoT allows a more precise comparison of what is available, leading to a more objective and well-informed choice by users. Furthermore, from the precise and constant flow of information that it generates, the IoT will be one of MaaS's pillars. It will not be long until modes of transport come looking for users and not the other way around.

#### LEARNING MORE ABOUT THE VALUE SOURCES

- N°6 New standards in quality for transport services delivered to passengers (p. 58)
- N°7 Helping develop a customized, multimodal transport solution (p. 59)

/ The implementation of autonomous shuttle services in low density areas is a good example of a means of transport that seeks the user. There is an urgent need to reinvent transport, especially in rural areas, as conventional public transport does not adequately cater to needs with a viable business plan. Moving beyond shared solutions such as car-sharing, autonomous shuttles offer an on-demand service that allows us to cheaply link up users to an inter-modal network. We can imagine that implementing such a service is not exactly futuristic considering that circulation in low density areas is, in some ways, less complex than it is in cities. Therefore, it may not require the most sophisticated technology.



The IoT reduces harmful risks in logistics through mastering real time and geolocation.

### Optimize logistical operations right to the doorstep

Spurred by e-commerce, the merchandise delivery and collection sector is growing at a fast rate. The sector has an estimated annual turnover of one billion euros for 2018, 1.5 in 2020 and 2.6 in 2015 (source Les Echos Studies, 2017). High Quality, Same Day Delivery will become the norm and represent 1/4 of all deliveries in 2050 according to this same source. When costs reduction is sustained, new tactics emerge: reducing delivery time, mastering the fail rate during the first trip, and return flow management.

/ The IoT reduces harmful risks in logistics through mastering real time and geolocation at a low cost.

LEARNING MORE ABOUT THE VALUE SOURCE

N° 8 Improving the quality of goods deliveries (p. 60)

/ This technology is capable of evaluating storage and delivery spaces at any given time. It can do the same for containers, allowing workers to optimize their operations. In this context, another important aspect is delivery pooling. On one hand, the e-commerce boom leads to a rise in the number of deliveries for an individual. Yet, for comfort reasons, customers cannot sign for various deliveries each week at different collection points (at home, lockers etc). On the other hand, local authorities will be obliged to regulate to reduce the number of vehicles, especially in urban areas. Therefore, the pooling of transport will be increased and the IoT will be at the heart of this transition: it can identify, for example, storage capacities and packages that are to be pooled and adapt its itinerary, all automated and in real time. The IoT is therefore an essential tool for organizing all links in the logistical supply chain: shippers, warehouse operators, transport operators and the final customer.

LEARNING MORE ABOUT THE VALUE SOURCES

N°9 Enabling better management of collection and return flows (p. 61)

N°10 Pooling storage and delivery capacities (p. 62)

/ The IoT is also the technology underpinning the 'safe-place' concept. It allows for delivery points to be opened remotely and securely. A connected camera allows for quality control by delivery staff. We can therefore say that controlling IoT means controlling last-meter delivery!

LEARNING MORE ABOUT THE VALUE SOURCE

N° 11 Delivering parcels in the space of a few hours, without the consumer having to be at home (p. 63)

Grouped deliveries, choice of collection point and time: these evolutions are not just going to vastly improve e-customers' experience, they will also revolutionize vehicle flow. Urban planning schemes are directly impacted, emphasizing the need to integrate logistics in territory development and in urban and regional economic development plans. It is worth noting that one in five French cities uses a city planning document that frames urban logistics (source French Logistics Association, 2017).

"August Access", refrigerator delivery by Wall Mart & August Home

The American distribution giant, Walmart, worked together with the home automation company, August Home, to test August Access, an unmanned delivery service direct to the home.



The door locks connected to August Home allow Walmart delivery staff to open house doors through the use of a unique code. The customer, via their smartphone, receives a notification

the moment their door is opened, and when it is closed. They can observe the operation via camera, ensuring totally secure delivery.

After this test phase, the service August Access opened up to all distributors. This particular strategy grants a competitive edge over the competitor's service Amazon Key.

Controlling IoT means controlling last-meter delivery!

Two prerequisites for inclusive and ethical connected mobility are user protection and digital coverage

It is clear that the IoT can generate many new sources of value. It is in everyone's interest to get our heads around any potential obstacles.

/ Beyond the common questions on confidentiality on the circulation of personal data, the legal and the ethical questions are those in most need of addressing. In terms of the use of personal data, acute supervision across our country will allegedly not infringe upon our individual freedoms. Years of fine tuning are needed to properly address the question of decision delegation and, in the case of an accident, of responsibility allocation to an autonomous vehicle.

/ Many questions related to the technology's weaknesses and to its access must be investigated. Our country's network coverage, especially in rural areas, essentially remains too weak for an all-out deployment of such services. This technological unreliability, coupled with a lack proper bodies to minimize data loss, are getting in the way of mass development today. Working groups on vehicle infrastructure connection systems consider this question fundamental. Effectively securing these systems against attacks is considered equally important.



## STAKEHOLDER INTERPLAY

A traditional industry that plays the cooperation game seeks to position itself at the user's interface

The IoT is a key to structural change in the transport industry: moving from transport convenience to individualized and contextualized travel experiences. Younger generations today are not as attached to the notion of car-ownership, they are however very demanding in terms of service information and quality in all modes of transport. Industry stakeholders take this very much on board and are rethinking their offer with a keen eye on traveler service, particularly on roads.

**Moving from a closed-off industry to a system of alliances, particularly encouraged by vehicle manufacturers.**

Thanks to the development of their connected vehicles, the two main car manufacturing alliances in France, PSA and Renault-Nissan, are considering offering per kilometer vehicles and reducing the range size (range of vehicles, service levels), up to the adjustment of tire pressure levels during office hours.

These manufacturers, under the heading of developing automobile security and assistance services, work with infrastructure operators. Such collaboration exists between PSA and Vinci Autoroutes and can be seen at Saint-Arnoult toll barrier. Accentuated by the introduction of the autonomous vehicle, the phenomenon of vehicles turned into services forces industry stakeholders to collaborate more effectively. This is a profound change in stakeholder interplay in a traditionally closed-off industry.

Another example of collaboration can be seen among manufacturers and local authorities.

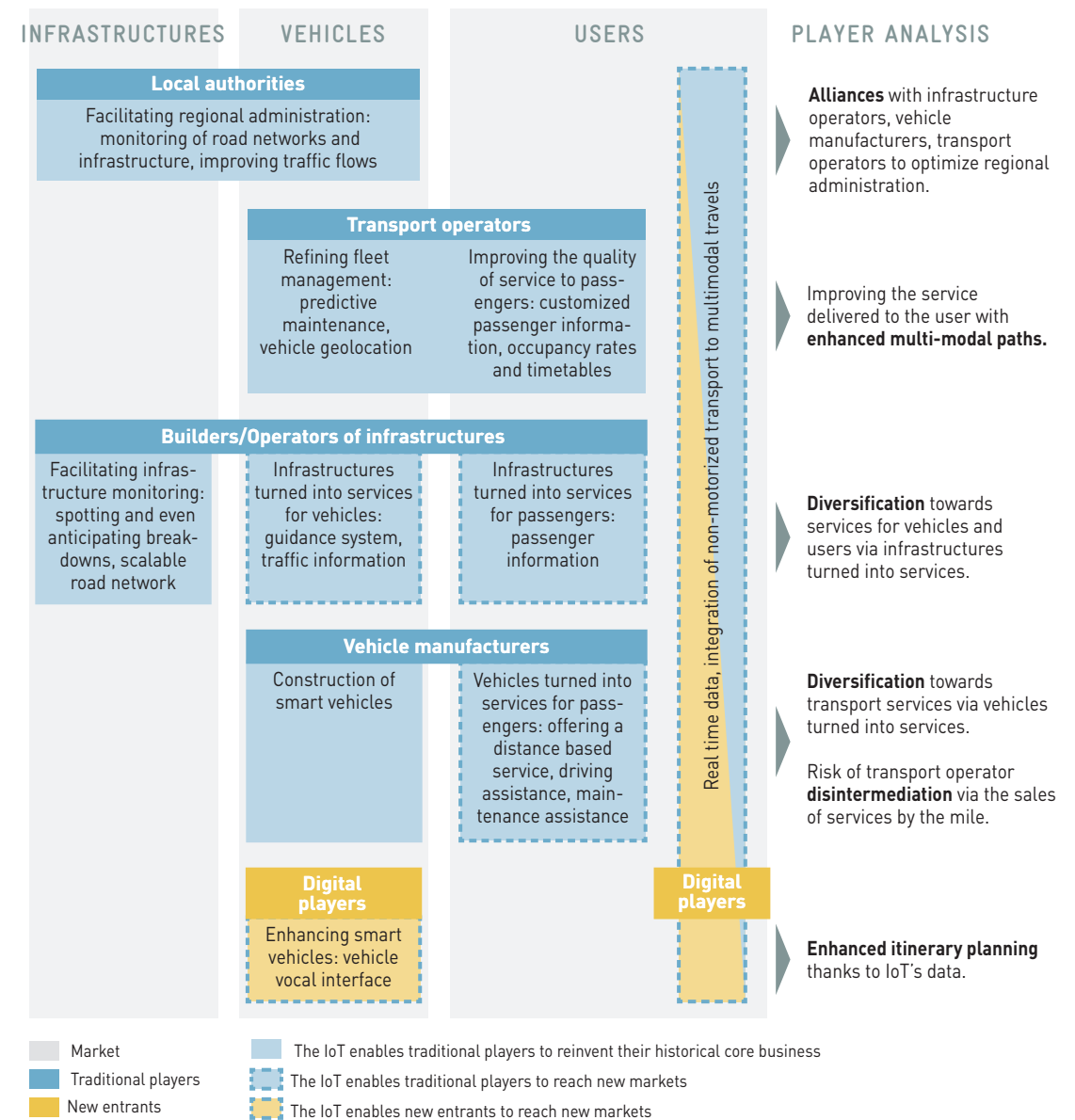
Audi and the State of Nevada or Renault-Nissan at the mayor's office in Paris, are setting up common research programs to supervise road conditions.

Digital stakeholders are also naturally involved. Orange and Vinci are developing connected service-stations, Renault-Nissan are collaborating with Microsoft and PSA with Huawei to develop the landing platform (an off-board central system in vehicles) in their vehicles, Alexa, Amazon's vocal interface equips Ford cars, etc.

Public transport operators and their users have already seen a shakeup of their sector through the introduction of car-sharing and car-pooling. This is a significant trend which is set to last, we just need to look at the decisions taken by car manufacturers. PSA wants to shift its business plan to sales of kilometers and not vehicles. This is a clear indication of their desire to compete with renters and public transport operators.

MaaS is today a major competitive issue: the current trend aims at combining public transport, individual transport and route planning within a single integrated urban transport offer. Historical players are facing new competition from mobility pure players (eg: Whim), GAFA (eg: Google/Waze) and automotive industry players (eg: Daimler/Moovel) on solutions with low IoT impact. In response, public transport players follow various strategies: internal developments (eg: Deutsche Bahn with QIXXIT), investments and partnerships (eg: Via ou Moovit) or the development of service offerings and advice to local authorities (eg: IXXI for RATP).

## TRAVEL AND RECEIVING DELIVERIES: STRATEGIC MOVES AS SEEN ON THE FRENCH MARKET



This diagram illustrates the movements allowed by the IoT and operated by the players in the mobility sector on the French market. It represents the different strategic options available to the sector's players.

**Note:** We do not observe any major movement related to IoT on the value chain of last mile logistics players. The major movement is related to the integration of several links of the chain by a single actor (eg: Amazon) but this is globally independent of the IoT.

**Data and user interfaces: a bitter battlefield leading to all sorts of partnerships**

In terms of mobility, we have distinguished 3 types of data:

- / Public data (transport timetables, traffic and travel time estimations, etc.).
- / Personal user data (geolocation, journey habits and, of course, purchasing habits, etc.).
- / Data that is classified as professional (information on local events, transport management information, etc.) is mostly accepted by the IoT. This represents but a mere 5% of all data, but is of added value to a punctual and high-performing transport system.

Tech giants have made conquering user data a strategic priority and have allocated excessive

The stakeholders must value the assets they have, which are not immediately within tech giant's reach when developing their IoT strategies.

sums for the development of the user interfaces and applications of the future. What about the stakeholders already in the industry? How can we make the most of their know-how by using their professional data? Would it be fatal to manipulate and to deliberately adopt a second-class strategy for user interfaces? What are the innovative strategies with start-up? Especially the start-up that are developing disruptive transport interfaces?

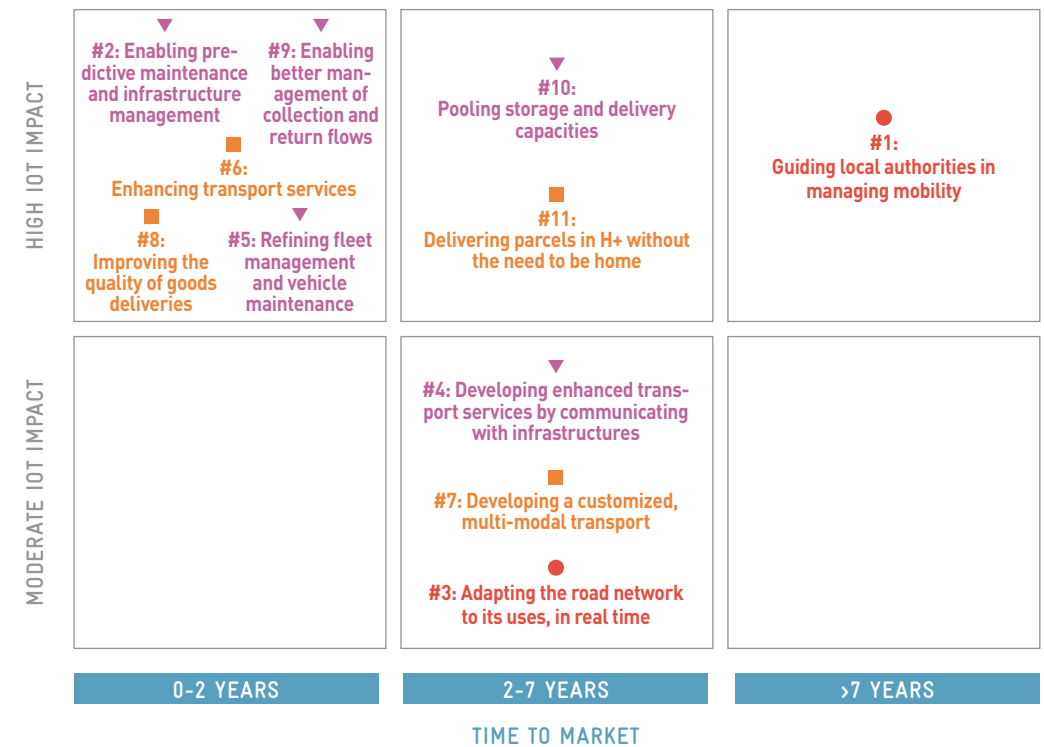
These stakeholders must value the assets they have, which are not immediately within tech giant's reach when developing their strategies



and when researching new IoT services with sectoral start-up. A public transport operator could, for example, control their vehicle fleet (occupancy rate, real-time adjusted timetables, etc.) and drivers could become a precious source of information for the traveler's experience. Their links with other operators with whom they can interconnect, or even design

inter-operator services, are also to be developed, in a logic of industry cooperation (open innovation). Multi-stakeholder mobility is organized across the country under the watchful eye of local authorities, who must implement governance that guarantees optimum balance between business stakeholders' interests and the quality of services provided to users.

**TRAVEL AND RECEIVING DELIVERIES:  
THE IOT'S IMPACT ON SOURCES OF VALUE**



The main beneficiary:

- Local authorities
- ▼ Companies
- Users

For further information on the evaluation of IoT's potential and Time To Market, see methodology p.52.



# HOUSING AND WORK

The IoT allows us to work on comfort metrics, tenant services, and operation of equipment: prospects for usage or exploitation of automated scenarios are emerging, combining various home and office equipment together; they adapt buildings to their occupants' needs.



## WHAT CHALLENGES?

**Ecological transition, social inclusion, collaborative lifestyles: Considering the age of the buildings in France, there are 3 challenges to note**

The house is a strong socio-economic indicator and office spaces are an important showcase for companies. These spaces are progressively getting smart through the construction of new buildings and renovation of old ones. It is necessary to consider how the IoT contributes to solve the major challenges facing the construction industry.

- / The construction industry represents 47% of energy consumption in France, this figure has risen by more than 10% since 2012 (source General Commission for Sustainable Development, 2016). making it a key target of public policies regarding environmental concerns.
- / The demand on social housing, which represents 1 in 5 houses in France (source National Institute of Statistics and Economic Studies, 2017), far exceeds the supply. Globally speaking, and especially in cities, affordable housing is an important issue.
- / A new trend that emerged from the tertiary sector (offices) is now making its way into housing: shared spaces and collaboration (office spaces management is key in the tertiary sector).

Most of our buildings in 2050 have already been erected. The thrive of smart buildings lies on the importance of smart renovation.

(French Housing Department, 2015)

The smart buildings market is just starting to take off in France. Currently less than 3% of apartment buildings is equipped with at least one connected device (source Netatmo, 2018). Authorities are developing numerous initiatives to promote smart buildings, the most notable one being a charter entitled "Smart Building, social and human building" signed by the government and 60 other stakeholders at the end of 2017 encouraging cooperation in the industry. Its objective is to build in a more energy efficient, convenient and more cost-effective manner. However, most of our buildings in 2050 however have already been erected today (source French Housing Department, 2015), and only 400,000 homes are built every year on average (source SDES, 2018). That is why it is imperative to promote the importance of smart renovation.

The return on investment in smart building is estimated between 2 and 10 years.

(DRIEE, 2015)

## WHAT CONTRIBUTION FOR IOT?

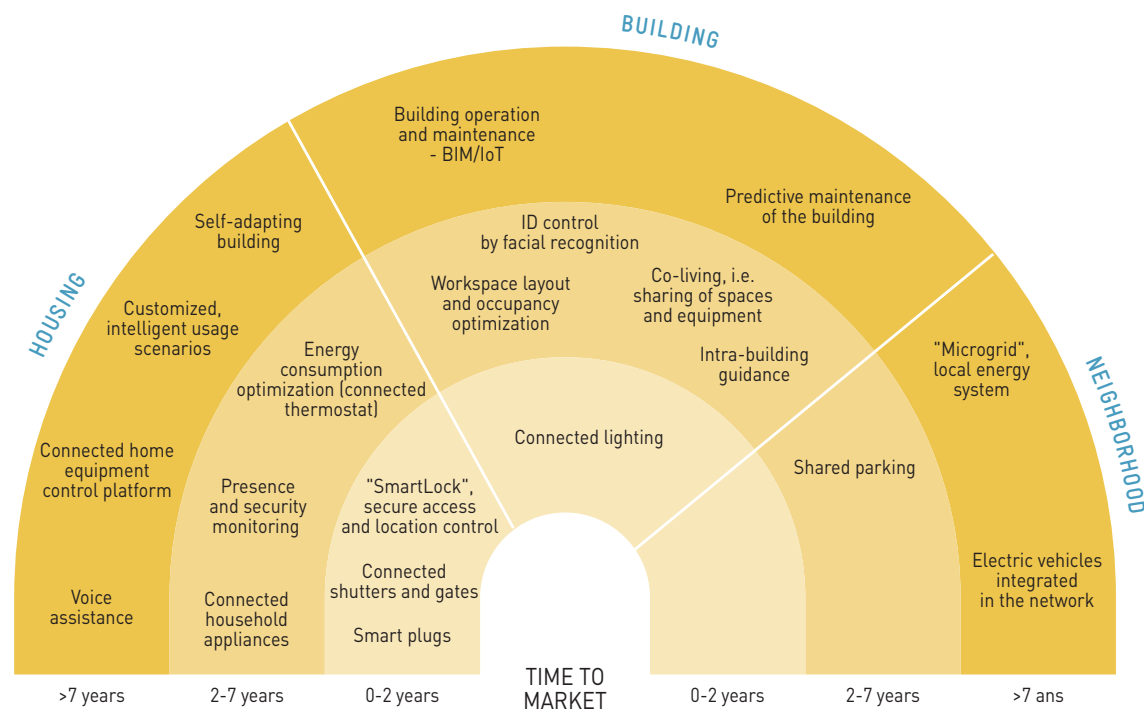
### Vocal control, operational management, shared spaces: a progressive development of smart building driven by the service sector and housing

In terms of housing or offices, the IoT allows us to act on three main aspects:

- / Comfort (temperature, lighting, humidity, noise levels)
- / Tenant services (occupancy rate, movements, density)
- / Managing equipments (consumption, maintenance, adjustments) and openings

It enables to gather data in real time and to act upon this information. Furthermore, prospects for usage or exploitation of automated scenarios (for buildings), combining every equipment together (security systems, comfort, gas/water/electricity installations), are emerging; they adapt buildings to their occupants' needs.

The IoT also allows occupants to connect with one another and to offer collaborative services (incident reporting, events, shared facilities etc.).




### HOUSING AND WORK: MATURITY OF NEW SERVICES BASED ON IOT

### Interoperability and vocal interfaces, two evolutions opening up the smart home market to the masses

Initially, the home automation technical solution industry was not standardized. Thus, equipment manufacturers over the past few years has been built around alliances competing to impose their service (known as protocol). Additionally, 2 to 3 standards (Z-Wave and Zigbee being the choice of big industry) are taking over today and seem to be able to coexist. The arrival of Google and Amazon into the home with their vocal interfaces will monopolize the user relationship. It will re-center the question of interoperability solely among devices and interfaces to that of interoperability among devices themselves.

Within two years these shifts are going to simplify the installation, integration and the use of these tech solutions. The market will move from the experts to the masses.

#### Defining simply user scenarios in housing with IFTTT

 Using a few simple instructions, IFTTT (If This Then That), a free web service allows users to create their own user scenarios.

For the most part, it allows for connected devices' interoperability problems to be overcome. IFTTT can connect physical objects to one another but can also connect them to applications. For example, Google home can help you find your phone.

LEARNING MORE ABOUT THE VALUE SOURCES  
N° 12 Controlling equipments in the home (p. 64)  
N° 13 Customized daily-life scenarios (p. 65)

Within 2 years, interoperability and the advent of vocal interfaces will open the smart home market to the masses.

### The digital transition, in which the IoT is a main pillar, is an accelerator of the energy transition

In terms of buildings, the main IoT type applications that will emerge in the short term are based on improving buildings' technical management. Essentially 75% of buildings' costs come from building operations and maintenance (source cross-government mission on public construction quality, 2006). Building operators today are developing proper energy efficiency and environmental quality management as well as operational maintenance optimization and facility management (real time reports on actions to be taken, monitoring subcontractors through improved operational service traceability, etc.).

It is worth noting that the IoT will foster the digitalization of twin (prototype BIM for Building Information Modeling). This is another big technological trend in the sector which optimizes, automates and facilitates operational management. It goes so far as to offer predictive maintenance for the entire building.

LEARNING MORE ABOUT THE VALUE SOURCE  
N° 14. Improving the operational management of tertiary buildings (p.66)

### Connecting existing buildings with Icade and CDC Habitat

Icade wanted to implement a connected and communicative space in an existing building. In other words, convert old building to smart buildings with a 'Ready to Service' certification. Set up in 1983 on the La Défense site, the Tour PB5 was chosen for this experiment and has two main goals:

- Develop buildings' attractiveness by improving their performance and also come up with service offers that are simple and attractive for occupants (indoor guiding systems, dynamic planning, predictive space management, shared parking etc.).
- Improve energy efficiency and building management based on acquired assets and data use.
- Designing a contractual framework of digital trust for new relationships between landlords and clients, as well as the documentation related to smart buildings.

As for housing, social landlord CDC Habitat is currently investigating on how to offer smart

homes to its tenants. Its '350 000 digital homes' project aims at defining a minimum base of connected equipment for existing buildings, relying particularly on residents' needs and existing appliances. The three main services of the base connection would be:

- Water consumption management
- Secured and simplified access to buildings
- Alerts and automated interventions in case of malfunction on home equipments (eg: heating shutdown) or common area equipments (eg: elevator shutdown, online self-diagnostic, etc.).

Beyond this basic offer, and consistently with its social orientation, CDC Habitat considers offering well-being at home related services, particularly for isolated or dependent people.



### Allocating parking spaces with Yespark

The French company Yespark offers its services to parking managers, hotels and landlords. By connecting garage doors, it can remotely grant access to users for their rental period and monitor the occupancy rate.



#### LEARNING MORE ABOUT THE VALUE SOURCES

N° 15 Facilitating space sharing to make housing more affordable (p. 67)

N° 16 Playing a part in energy exchange at local level (p. 68)

### Moving from technology driven by profit to technology driven by users: High demand from the market

We can see that the IoT is an important driver of change in both the service sector and housing. It also responds to our society's main concerns. Nevertheless, users have not yet fully accepted these solutions: the French electric smart meter "Linky" is a good example. It is not really used although it is well known and gives food for thought on the state of play in the sector. At the end of 2017, just 1.5% of Linky users checked their consumption (source Court of Audit reports of 2018). Are the options available addressing customers' needs? Which services would customers pay for? What safe-guards need implementing to ensure data confidentiality and to reassure people that technology is harmless? So many aspects for the industry to consider.

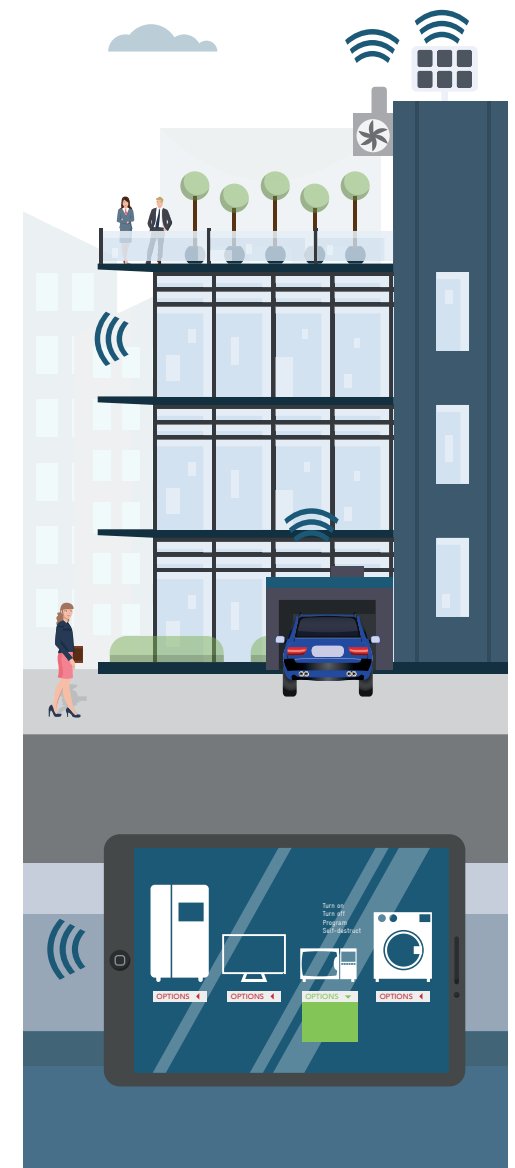
### Moving towards shared spaces and progressive housing to boost housing value in the long term

Office buildings are of course focusing more and more on comfort conditions (including air quality) and occupancy optimization for the people working in them. The IoT will also play a leading role in assisting the evolution of spaces sharing further down the line. Firstly, the idea of hybrid buildings is being thrown around today and in many different sectors. These include accommodation, the labor market, in trade and in leisure among others. These are set to evolve over time (optimizing living spaces instead of working spaces throughout the day, etc).

Space sharing within a building or a neighborhood in a densely populated area is also push-

ing sectoral professionals to reflect; it is seen as an opportunity to lower the cost of housing, to create a social link between occupants and to generate more revenue. For example, parking spots are a much sought-after area in some neighborhoods, while the capacity of residential parking is important. In 2014 the average vacancy rate was between 20% and 30% (source Zenpark, 2014). In this same spirit of collaboration, we are seeing the introduction of neighborhood energy sharing and the development of local energy systems.

Space sharing is seen as an opportunity to lower the cost of housing and to create a social link between occupants as well as generating supplementary revenue.



## STAKEHOLDER INTERPLAY

### A new everyday closeness with occupants, revamping the competitive landscape

The construction and housing industry perfectly illustrate the IoT's impact on shaking up stakeholder interplay. By multiplying data, by making buildings controllable and communicative, the IoT transforms both how buildings are built but also how they are used. A shift in stakeholders is inevitable.

What are the current strengths? What are the risks? How to react to them?

#### The building industry can now build up a relationship with occupants

Let's begin with the building industry. Designers, promoters and builders must embrace the reality of IoT integrated buildings and the fact that the IoT has also become a service platform. They must get involved and experiment on 3 different levels:

- / Delivering connected buildings that are dynamic but above all inter-operable.
- / Taking a position on managing the technical and energy side of buildings. Going forward, they must constantly manage active buildings. This opens up the notion of buildings being connected to smart local networks.
- / Creating a relationship with occupants by offering them services.

For promoters that are used to disappearing after handing over the key, this new trend is truly revolutionary. Companies such as Bouygues Immobilier ("Flexom" package which equips new housings and allows the resident to choose whether to activate it or not) or even

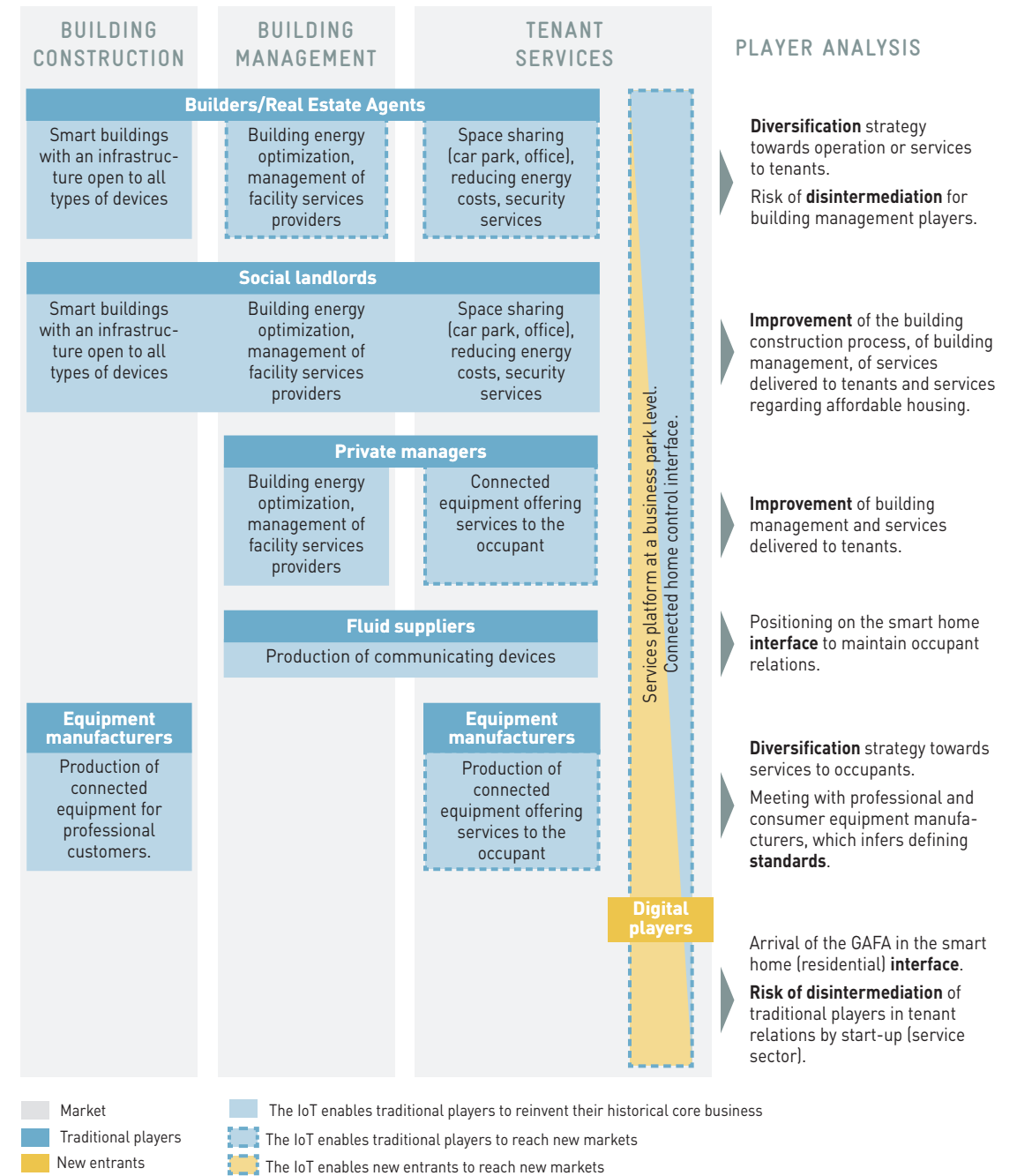
Nexity (with "Eugenie", the service platform in partnership with Somfy) are already laying the groundwork.

Social housing, which already involves construction, use and occupant relations shall develop connected affordable housing which will allow for the reduction of overall usage costs while simultaneously improving the quality and the running of houses. In terms of stakeholder interplay, those involved in social housing have two ace cards up their sleeves:

- / Their use of and ability to act on existing buildings. This is an important factor when it comes to branching out, and those in social housing are seen as forerunners by industry stakeholders. A role that is ever more evident today when it comes to energy renovation in housing. Social housing is particularly targeted as implementation is sometimes easier in social housing than it is in private. This is equally applicable to the roll out of connected devices across the building.
- / The relationship with occupants, and the role that is entrusted to trusted third parties in social housing. This is of utmost importance in the data age; whether to interact with tenants or with local authorities.

Social housing, which already involves construction, use and occupant relations shall develop connected affordable housing.

## HOUSING AND WORK: STRATEGIC MOVEMENTS OBSERVED ON THE FRENCH MARKET



This diagram illustrates the movements allowed by the IoT and operated by the players in the mobility sector on the French market. It represents the different strategic options available to the sector's players.

### 3 other types of stakeholders starting wide-ranging initiatives and grasping IoT and digital based services on the ground

The equipment industry encompassing industrials, installers and after sale services are integrating connected devices into electronic infrastructure, in lighting, heating, comfort, image and sound. The challenges are to optimize equipment installation/maintenance, to offer usage-based services, as well as to find the right position in the orchestration of different segments. Big players in electrics (Schneider Electric and Legrand) have clear advantages. They are either taking on or joining up with various stakeholders in energy, comfort, security and entertainment, to offer IoT solutions and home control hubs. Netatmo and Somfy remain forerunners among the French players. One of their main advantages lies in after sale service and their ability to maintain their connected devices.

### Mastering vocal interFaces allows digital giants to enter our homes.

Electricity, water and gas suppliers see the IoT as a disintermediation threat and are therefore planning on mastering their client relationship to foster loyalty and upscale their turnovers. Apart from smart meters, they are starting to offer smart homes like those of EDF with Sowe or even Engie with Vertuoz.

The 3rd category of course focuses on digital stakeholders. Their motive is clear: they want to dominate connected environments and capture as much client data as possible. So far, they have a rather limited knowledge of our living habits when we are at home, and mastering vocal interfaces allows Amazon or Apple to enter our homes and collect new data.

Can all stakeholders claim to be 1st class competitors while also managing their services?

### Perspective: the battle on smart speakers, or the rush to master housing



Taking a position on pioneering and research is of strategic interest for Apple and Amazon. They wish to challenge Google's dominance which essentially lies in mastering on-line text searches.

The home will become the main source of competition for smart personal digital assistants:

- Amazon took the lead with Amazon Echo and Alexa. They also have partnerships with Cortana and Microsoft.

- Google Home, Apple Home Pod and Facebook's voice assistance project are the remaining GAFA members' attempts to get in on this Trojan horse of AI dominance.

- On the French side there is Orange with Djingo which will of course lead to some pioneering of connected devices. The recent partnership between Leroy Merlin, Auchan and Boulanger shows large distributors desire to set foot in connected homes by playing the proximity card to set them apart from Apple, Amazon and Google.

What are the good 2nd or 3rd class strategies? What's the winning formula? By segment or by profession? Which alliances should be prioritized? Those with historical stakeholders? Start-up? On-line giants? What role is there for associations like Smart Buildings Alliance or EnOcean Alliance?

From the above, we see the importance and diversity of the players in the game. We are witnessing considerable activity and several initiatives. Understanding client user relationships and end-to-end service management will be the decisive factors.

## HOUSING AND WORK: THE IoT'S IMPACT ON SOURCES OF VALUE



The main beneficiary:

● Local authorities    ▼ Companies    ■ Users

For further information on the evaluation of IoT's potential and Time To Market, see methodology p.52.

# HEALTH CARE AND AGING BETTER

The IoT reinforces the link between patients and professionals, the elderly and their careers both at home and on site. It helps improve our health system by offering concrete responses to medical issues and the aging population.



## WHAT CHALLENGES?

**A health care model under pressure to evolve to guarantee sustainability, quality and universality**

The French health care system is facing a complex situation.

- / According to the Ministry of Health, public spending for dependent persons are going to increase significantly. This is driven by the aging population. They are expected to reach 2.07 GDP points by 2060, versus 1.11 GDP points in 2014 (source Ministry of Health, 2016)
- / Furthermore, in 2020 France is expected to have 548,000 more people than in 2015 requiring long term treatment (source National Health Insurance Fund for Workers, 2017).
- / We are also seeing disparities across the country in terms of the offer of health care as well as pressure on hospitals. This is triggered from the lack of coherent links

Our ability to shift the health care paradigm to the home will be a key to guaranteeing quality and universality in the French health care system.

between cities, hospitals, and the medico social services.

- / Finally, France is experimenting with new aspirations that must be taken on board. One of the main focuses is the notion of remaining or returning home. 83% of French people are in favor of greater care for the elderly at home (source CSA/FEPEM survey, 2016), and 78% prefer to be at home when recovering from surgery (source OpinionWay/La Poste study, 2017).

How can the IoT serve the public interest and contribute to solving these problems? In other words, how can we shift the health care paradigm to the home while maintaining the conditions that patients are currently under?

Across the world, investments in the connected health sector are estimated to reach 410 billion US dollars in 2022. In 2015, the market represented 46 billion.

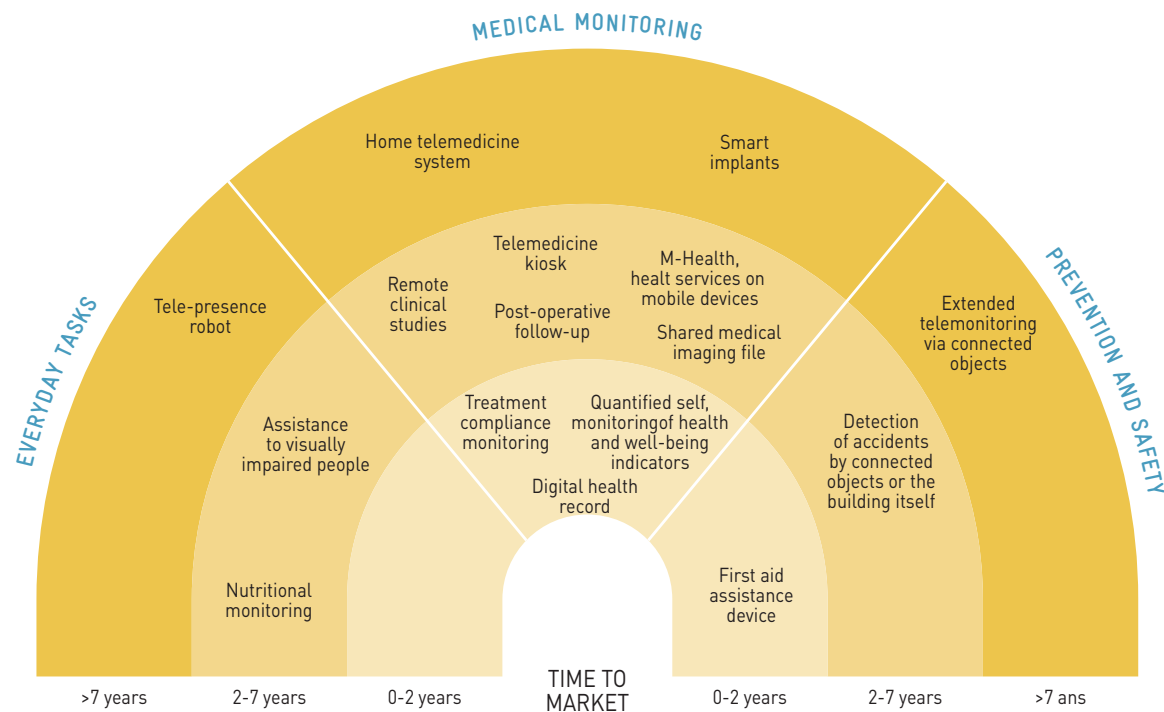
(Grand View Research, 2016)

## WHAT CONTRIBUTION FOR IOT?

Personal monitoring, remote care, independence: improved health care quality and relieved pressure on professionals and establishments

Thanks to connected health care equipment and body sensors, vital and physiological parameters can be monitored in a less invasive way. By equipping buildings with sensors, the IoT can help in prevention and the safety among the

elderly. There are a number of examples that prove that the IoT can help respond to French people's ambitions in terms of health care and assistance.



### HEALTH CARE AND AGING BETTER: MATURITY OF NEW SERVICES BASED ON IOT

The IoT will assist developments in medicine to reach the ambitious 70% ambulatory operation level by 2022.

(French Health Department, 2017)

### The introduction of the IoT is another positive step for ambulatory treatment as it improves patient monitoring after surgery

80% of French people want to be able to return home as quickly as possible following an operation (source OpinionWay/La Poste study, 2017). 54% of surgical interventions in 2016 did not involve an overnight stay for patients (source French Association of Surgeons, 2017) and the national goal is to reach 70% outpatient operations by 2022 (source Ministry for Health, 2017). Technological solutions, the IoT principally, will complement the progress of surgical techniques to reach this ambitious milestone of allowing for patient monitoring at home. An analysis of information collected (questionnaires, patient surveillance etc) will reduce the risk of incidents. These devices can be deployed in homes or also in surveillance type premises such as hospitals rooms (or long-term care homes).

LEARNING MORE ABOUT THE VALUE SOURCE  
N° 17 Taking outpatient care to a new level (p. 69)

### Towards more accurate monitoring of chronic illnesses

Thanks to connected systems, patient monitoring can be carried outside of traditional settings, and 59% of French people favor this option (source OpinionWay/La Poste study, 2017). The key to successful treatment is to carry out the monitoring of treatment at home, just as it is in-house, and the data gathered by the IoT helps to verify this. Doctors will receive alerts about patient monitoring which allows them to prioritize appointments accordingly.

Real time monitoring provided by the IoT also helps patients to better anticipate incidents, and to avoid hospitalization where possible.

### Digital monitoring of patients at the Ruppiner Clinic, Germany



In association with Microsoft Cloud, the Ruppiner Clinic's cardiology department launched an at-home patient monitoring service for those with chronic illnesses.

The system gathers chronic patients' data (electrocardiogram etc.) via connected devices. It then sends this data to the cloud platform to be consulted by health professionals.

LEARNING MORE ABOUT THE VALUE SOURCE  
N° 18 Improving the monitoring of chronic illness (p. 70)

### Bridging medical gaps via enriched teleconsultations

In the medium term, it is likely that the IoT will contribute to improving access to health care in rural areas. Teleconsultations will develop in line with the provision of telemedical booths across the country. A movement towards a more pronounced instrument of delegation could come about thanks to the coupling of devices and teleconsultation. As a result, patients will be able to reach doctors and provide updates, allowing for improved and reliable diagnosis.

It is worth noting that the French social security law of 2018 foresees reimbursement of teleconsultation.

**LEARNING MORE ABOUT THE VALUE SOURCE**

N° 19 Enabling better access to healthcare throughout the country (p. 71)

**Momentum to be seized over the next decade thanks to connected devices**

Ways in which the IoT can contribute to a more favorable aging experience at home are changing.

- / The systems developed over the past few years have sometimes been rejected by the elderly. This is mainly because they were designed to reassure caretakers and families, but too much emphasis was placed on surveillance. The solutions currently being developed are less invasive, giving users the option of switching them off.
- / Another explanation for this rejection is sociological. The elderly generation receiving care today did not grow up with technology and have a deep connection with the health establishment and their family doctors, or recognized figures of excellence. Caretakers (who will need assistance in the future) are the first generation to have lived a significant part of their lives, including their professional lives, with these technologies and therefore accept them more readily than the elderly. We can therefore envisage a mass adoption in 10 years.
- / Residential security: it is one of nursing homes' main promises. It is not at all surprising that connected preventative devices are popular with professionals in the sector. If priority is given to implementing security devices in rooms or common areas to prevent risks (eg: falls, room intrusion), then new non-stigmatized solutions such

The next elderly generation will be the first one to have lived daily with connected devices.

as patches emerge and are incorporated into everyday health care. For example, Korian, the European player in the senior care sector, systematically connects devices in new or renovated buildings. The IoT helps to alert caregivers when necessary, which lowers stress and unnecessary visits; and is an encouraging way of improving working conditions and the service that residents receive.

**Aging more comfortably at home, La Poste's bet**

La Poste is testing out a new way to preserve home autonomy for elderly people, by combining new technologies and human support (provided by a dedicated and trained postman). A first experiment has been launched in the Landes French department to test this offer with around forty people. After evaluating their needs, they were offered a personalized package of services with, depending on the case: a simplified digital tablet, online cognitive games, actimetry remote assistance or automated night lighting for the bedroom. The IoT-related data analysis contribute to easing human support and follow-up of needs over time.



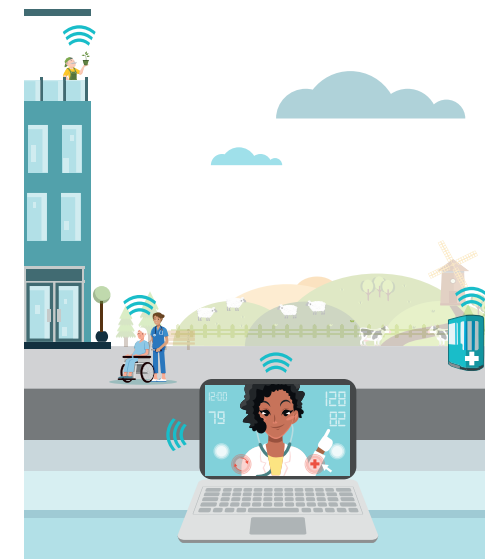
**LEARNING MORE ABOUT THE VALUE SOURCE**

N° 20 Helping people to age better at home (p. 72)

**A chance to take the preventative approach**

Another aspect of the public interest is that of developing the preventative approach and readjusting the French health care system's scope, which today heavily focuses on the curative treatment. In light of the rising number of chronic illness cases, the High Council for Public Health supports a 'preventative approach'. Backed by public health and retirement insurance funds, new initiatives are emerging to promote good practices: information and training to stimulate physical activity, advice to prevent risks but also non-invasive systems for regular health monitoring based on the IoT.

These new technologies must prove themselves as reliable and convincing in terms of the accuracy of their data and be standardized to gain the trust of professionals.



**'Ignilife' a platform focused on the preventative**



Through a mobile and web platform on health coaching, the French company Ignilife offers

general assistance to matters of health by taking physical conditions into account and to the same extent as psychological conditions.

The platform, designed to be compatible with all connected devices, aims to individualize the preventative approach and to make it enjoyable and sociable in order to improve its performance.

**LEARNING MORE ABOUT THE VALUE SOURCE**

N° 21 Developing preventative care in the French health system (p. 73)

**Connected health care systems must gain the trust of professionals**

The variety of stakeholders in the French health care system makes the question of finance rather arduous. It therefore needs strong political backing. Trust must be earned to ensure professionals' belief in the reliability of these solutions. These technologies must prove themselves to professionals in order to win them over. To avoid being overwhelmed with unnecessary notifications and to ensure proper patient care, professionals are demanding reference certifications from high level health authorities. The reliability of devices, the integrity of their data and standardization are essential, because a hospital will be able to make life-saving decisions based on information delivered by devices, whose reliability cannot be questioned.



## HEALTH CARE AND AGING BETTER: STRATEGIC MOVEMENTS OBSERVED ON THE FRENCH MARKET

### STAKEHOLDER INTERPLAY

Connected health is a question of centralization and standardization. Growing old more comfortably needs to be a cross country approach anchored in the people

#### Connected health devices expose those in this historical industry to the pressure of new market players

The IoT can be a mediator between health and homecare institutions on one hand and health and technological professionals on the other. This individualized and technological approach is the fruit of meetings between historical stakeholders in health and new stakeholders from the B2C (consumer markets) and/or the digital sector. The first to be affected will more than likely be the equipment and materials sector both technical and medicinal.

- / Health supervisory and therapy industries (cardiac monitoring, blood pressure, respiration, temperature monitoring etc) will witness the arrival of large public industries such as Nokia or Terrailon which offer connected health devices and apps that are patient orientated.
- / New arrivals such as Visomed with Be-well Connect offer patients and seniors connected medical devices (electrocardiograms, oximeters etc.) as well as a platform and an application. They also offer access to health professionals and prom-

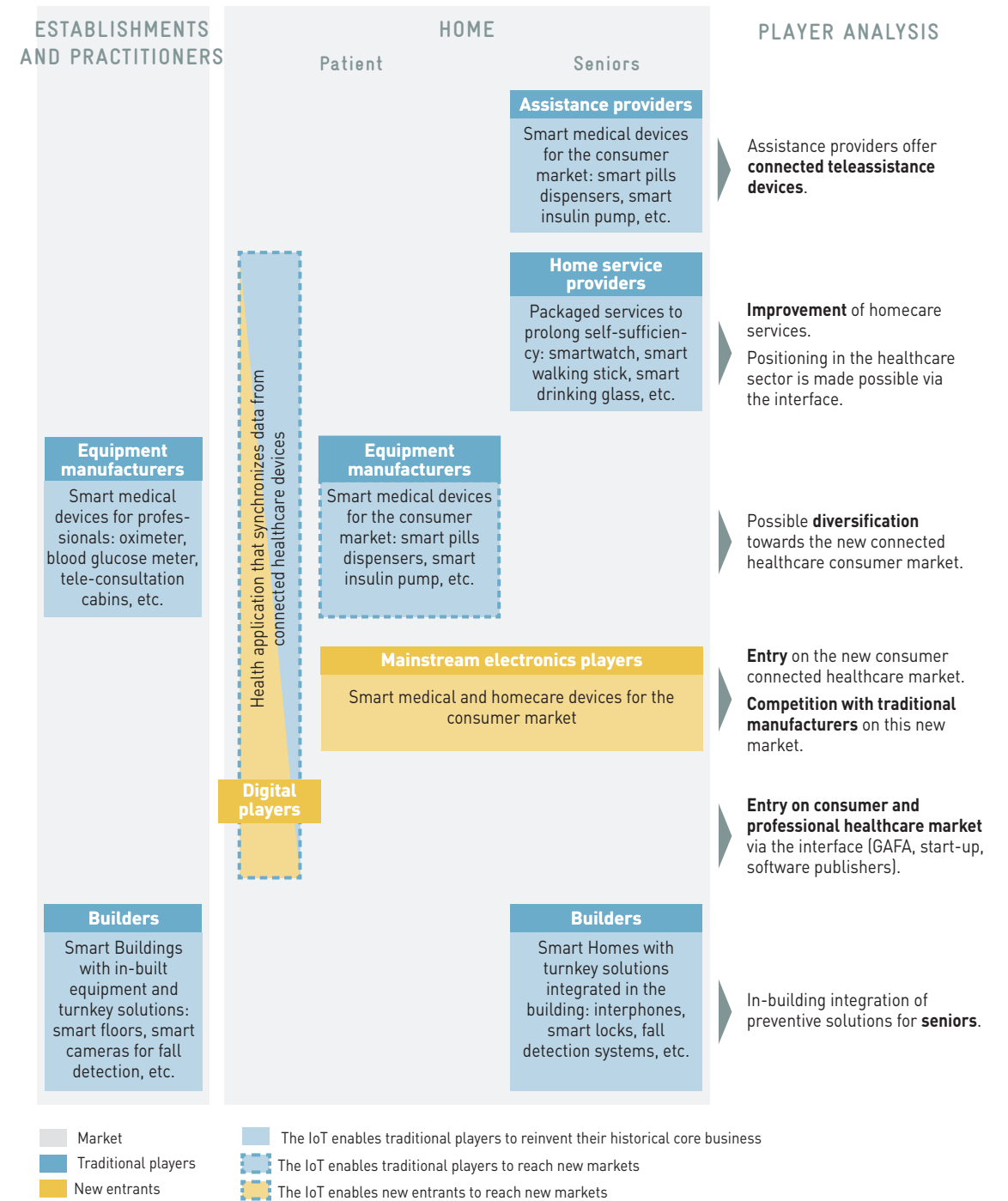
Tech giants wish to control the relationship with the general public in both mobility and housing markets, while being present on health.

ise to grant patients control over their own monitoring favoring predictive health). Other patient-orientated applications also emerge, positioning themselves as health butlers and offering synchronization to all connected devices, then processing data through algorithms.

#### Digital stakeholders are becoming managers of health data

It's not just start-up, tech giants are also taking the initiative: Verily, Calico, Cityblock with Google, the 'Health' application and Apple's 'Healthcare' offering are examples of this. It is about controlling both the housing market and the relationship with the general public, while being present on health. They are aiming to change the world by playing a major role in medical research: Apple relies on cloud-based Machine Learning and Deep Learning, while Google acts locally through connected medical appliances.

We must also keep a very close eye on software editors. InterSystem's HealthShare consists of an IT platform dedicated to connected health and to platforms that develop applications. HealthShare is designed first and foremost for health professionals, it allows them to gather data from all stakeholders in the health process. It then processes and shares this data, allowing for improved and more efficient health care.



This diagram illustrates the movements allowed by the IoT and operated by the players in the mobility sector on the French market. It represents the different strategic options available to the sector's players.

**The assistance providers' movement is not to be overlooked**

Finally, in the meeting of two different worlds, it is necessary to mention assistance providers, some of which have subsidiaries to carry out medical follow-ups. This is the case with Bien Être Assistance, who are involved in medical monitoring, but the majority of which are specialized in remote assistance such as Assystel or Allovie. In terms of the senior market, these stakeholders are very well positioned to be front-runners over the next few years. Supported by public authorities and in a mature market, some of these stakeholders such as Assystel offer non-stigmatizing connected teleconferencing solutions that put the elderly in contact with a consultant.

**Supporting the elderly will take place at local levels**

The senior market is characterized above all by its youth. Many different stakeholders and services are experienced to help the aging. Furthermore, traditional structures for the care of the elderly operate at a local level: at the department level, associations to maintain social links at a community level, personal assistance companies etc. Taking all these players into account, anyone daring enough to enter this market must not just offer personalized

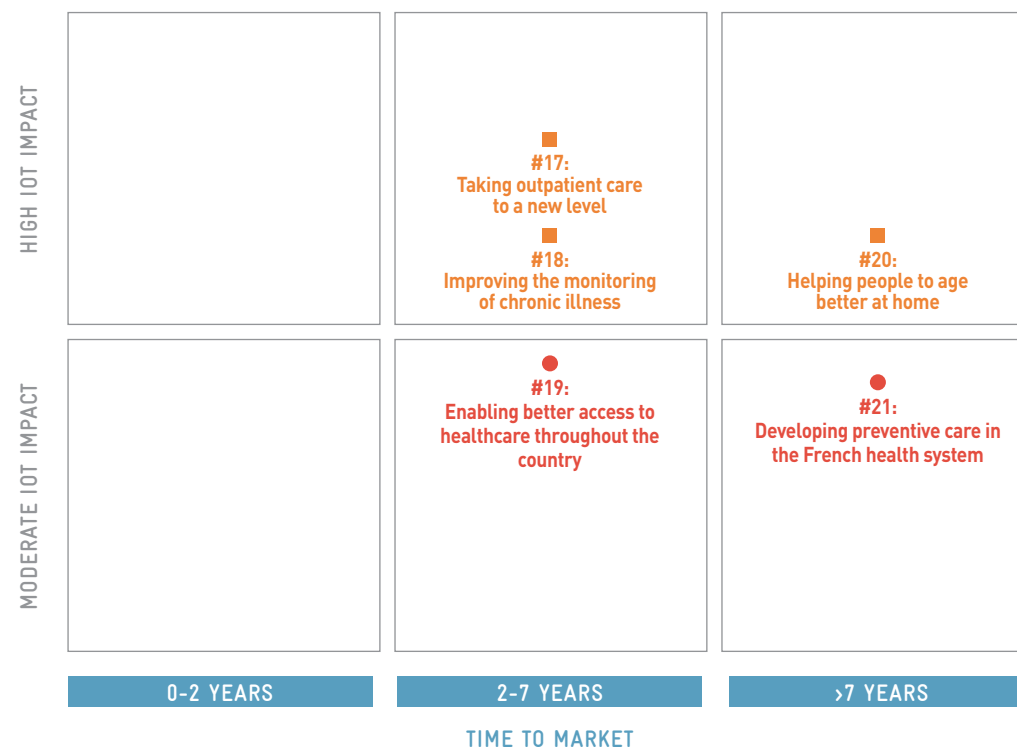
The stakeholders who will emerge will be those offering a useful and complementary service offer based on the local authorities' resources.

packages (each senior has their own needs, it is not possible to offer one standardized package) but also suggest services and manage to fit themselves into the existing local businesses. In terms of elderly carers' services, the stages of development essentially differ across the country, and the stakeholders who will emerge will be those offering a useful and complementary service offer based on the local authorities' resources.

It is worth noting that the main users of these connected medical devices will likely be connected seniors. Connected medical device stakeholders can thus consider surfing the generational wave to be able to offer a natural and strategic diversification into the aging market.

Now is the time for movements and the proliferation of initiatives that announce rearrangements, battles and alliances among stakeholders of different origins. Legislators' and paying bodies' positions and their decisions on financing models will have a large influence on these big changes.

**HEALTH CARE AND AGING BETTER:  
THE IOT'S IMPACT ON SOURCES OF VALUE**



The main beneficiary:

- Local authorities
- ▼ Companies
- Users

For further information on the evaluation of IoT's potential and Time To Market, see methodology p.52.

# THE IOT'S 21 VALUE SOURCES

## METHODOLOGY

### A value-based approach

This study aims to identify and analyze the sources of added-value for which the IoT is a major lever. Such sources may involve optimizing operations, so the improvement of the offer to users, both in terms of client experience and the creation of new services. The study aims to assess how IoT-based solutions can exploit the potential of each of these sources. To do this, it used a systemic analysis (covering use value and market acceptability, the growth in IoT-based services, the competitive environment, the regulatory framework, and obstacles to progress).

### The identification and analysis of sources of added-value

We conducted interviews with some thirty experts to identify the sources of value for which the IoT is a major lever. These sources provide concrete answers to the major sectoral issues discussed throughout the study; each is detailed in an appendix by means of a summary sheet.

Each sheet is structured in four parts:

- / The issues associated with the source of added-value
- / What IoT solutions can offer in terms of exploiting the source of added-value
- / An analysis of the IoT's potential in the source of added-value, using four broad themes:

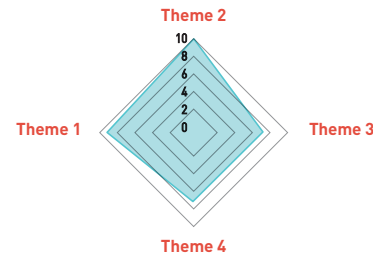
**Theme 1.** Use value and market acceptability: which measures the willingness of the market to accept IoT-based services according to their utility and the

associated social and ethical effects. The cost/benefit ratio: which conditions the purchasing act; this provides an additional criterion for BtoC-oriented value pockets.

**Theme 2.** The growth in IoT-based services: which assesses the number of such services being developed and marketed.

**Theme 3.** The competitive environment: which assesses the ability of the market to absorb new players.

**Theme 4.** Regulatory flexibility and scalability: this evaluates the extent to which legislation tends to promote the marketing of IoT-based solutions.



/ An innovative initiative that illustrates the part that IoT-based solutions might play in the sources

This analysis of the IoT's potential is complemented by three additional pieces of information:

- The main beneficiary: users, businesses, and local authorities/geographical areas.
- The estimated time to market for the implementation of IoT-based services: 0-2 years, 2-7 years, >7 years.
- The main obstacles to be overcome to unlock this potential



### WHAT CHALLENGES?

**The growth of urban populations.** By 2050, the world will have about six billion people living in urban areas: this will be more than 80% of the population<sup>1</sup>.

**Promoting mobility.** In order to provide mobility for all, local authorities have a role to promote it both in increasingly densely-populated cities and in rural areas.



### WHAT CONTRIBUTION FOR IOT?

**Analyze and assessing the impact of transport flows, in the short-term, in order to continuously optimize mobility.**

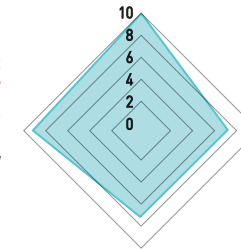
- The IoT can provide reliable measurements of transport flows and could enable communities to better manage the growing impacts of transport on urban areas and the environment.
- For example, the large-scale deployment of vehicles fitted with sensors that measure air quality could provide a more reliable estimate of particle levels than conventional measurement stations.

**20% OF URBAN TRAFFIC IS CAUSED BY DRIVERS LOOKING FOR PARKING SPOTS?.**

### POTENTIAL: A promising medium-term opportunity conditioned by a broad coverage of the territory

**The growth in new IoT-based services**  
The IoT enables the continuous measurement of mobility-related data. The number and type of measurements that can be made in this environment are virtually unlimited.

**Use value and market acceptability**  
The value gained lies in the shortening of the cycle of measured effects/political decisions.



**Competitive environment**  
Today's stakeholder thinking underestimates the IoT's potential.

**Flexibility and regulatory scalability**  
There are no strong regulatory constraints since collecting data on passenger flows takes place anonymously.



**>7 years**  
The financing of short-life-cycle technologies may come up against medium and long-term public-policy plans.



**Local-authority investments.**

See Methodology p.52.

### Monitoring parking spaces with ParkingMap



The French start-up, ParkingMap, offers a digital service that facilitates urban parking; it is based on a network of video sensors that map parking spaces available

on a street in real time. Users are guided to available spaces and the data collected allows parking controllers to better manage parking in a city.

1: World Bank - 2017

2: Caisse des Dépôts (a French public-sector vehicle for long-term investments) - 2018

## Enabling predictive maintenance for infrastructures and optimizing their operational management

### WHAT CHALLENGES?

**The quality of France's transport infrastructure.** France ranks 8th in the world in terms of the overall quality of its transport infrastructure. In particular, it ranks 7th for the quality of its roads and 5th for its railways. It invests more in domestic transport infrastructure than its near European neighbors<sup>1</sup>.

#### Maintenance and operating costs.

While these represent the main items of expenditure for infrastructure operators, maintenance and operational activities can generally be optimized.



### WHAT CONTRIBUTION FOR IOT?

**Increasing the reliability and availability rate of transport infrastructure.**

- The infrastructures and their associated sensor-fitted equipment offers managers the possibility of more accurately pinpointing the location of breakdowns and degraded assets. This makes it possible to improve the sophistication of assessments, and the responsiveness of maintenance activities that have to be carried out, in particular, on roads—which can deteriorate rapidly.
- The ever-increasing number of connected vehicles also represents a source of data that remains little used by infrastructure managers.

**10 MILLION CONNECTED CARS IN FRANCE IN 2021 (VS 1.9 IN 2016)<sup>2</sup>.**

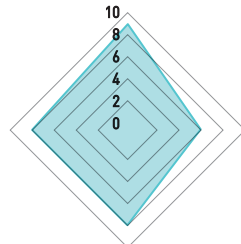
### POTENTIAL: A proven and effective lever to deliver savings for infrastructure managers

#### The growth in new IoT-based services

Given the inherent difficulties involved in infrastructure maintenance, there are numerous use cases that offer a high return on investment.

#### Use value and market acceptability

A strong return on investment, in many cases, because the cost of the solutions is much lower than the costs of repair and service interruption.



#### Flexibility and regulatory scalability

There are no additional regulatory constraints that affect these services.

#### Competitive environment

The competition is moderate, and the progress of current projects is highly variable—depending on the players involved.



**TIME TO MARKET**

0-2 years



**MAIN OBSTACLES**

The costs of fitting sensors to infrastructure that covers large areas.

See Methodology p.52.

### Simplifying road maintenance thanks to Eurovia's connected road.



Eurovia, one of the world's leading players in transport-infrastructure construction, has developed a connected road that collects information on the road's condition, thus preventing advanced degradation and avoiding the need for major auscultation operations.

Using a set of sensors installed under the highway surface, the connected road analyzes road damage in real time by measuring temperature, pressure, humidity, and deformation. The data is collected via a patrol vehicle, equipped with an RFID reader, which travels along the road.

1: The Global Competitiveness Report 2017 - 2018

2: Statista, Projection of the number of connected cars in circulation in France from 2015 to 2021 - 2017



## Adapting the road network to its uses, in real time

### WHAT CHALLENGES?

**Improving the fluidity of traffic in cities.** As well as inconveniencing road users, traffic slowdowns have economic consequences. The total direct costs (such as wasted fuel, lost employee productivity due to delays, and additional costs for road hauliers) and indirect costs could reach €22bn by 2030 in France<sup>1</sup>.



### WHAT CONTRIBUTION FOR IOT?

**Reporting real-time traffic data in order to adapt infrastructures to their uses.**

- New forms of mobility, as well as the ever-increasing number of vehicles, requires local authorities to think of new ways that allow all users of the same transport infrastructure to coexist in the same space.
- In particular, the IoT makes it possible to collect data on road usage.

**64 HOURS: THE AVERAGE TIME SPENT BY A PARISIAN DRIVER IN TRAFFIC CONGESTION IN 2016<sup>2</sup>.**

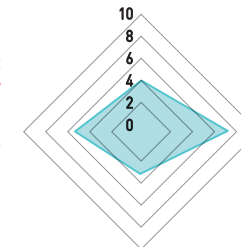
### POTENTIAL: Potential remains embryonic and requires both technological and regulatory maturity in order to be fully realized

#### The growth in new IoT-based services

The IoT offers a platform for adaptability solutions, but there are other technologies that can achieve the same outcomes in this source of value (for example, real-time image analysis).

#### Use value and market acceptability

In order to improve transport fluidity, solutions have to be implemented at large scale.



#### Competitive environment

Current thinking and experiments are more about vehicles than roads.

#### Flexibility and regulatory scalability

The modification of town-planning schemes and traffic rules has to comply with a binding set of rules.



**TIME TO MARKET**

2-7 years

Experiments show that a period of behavior adaptation is needed.



**MAIN OBSTACLES**

Large scale implementation.

See Methodology p.52.

### A dynamic, bus-corridor experiment in the Greater Lyon area, in partnership with Egis



Lyon has experienced a sharp drop in traffic congestion as a result of investments such as the Smart City Lyon project and the Optimod Lyon program, which are aimed at streamlining traffic.

In particular, Egis has experimented with a dynamic bus corridor that allows temporary bus lanes to be created.

Its creation takes place dynamically, by lighting up LEDs on the road, and lighting panels that direct road users to the appropriate lane when a bus is approaching.

The experiment has highlighted the time needed to optimize the solution's settings, if traffic flows are to be streamlined.

1: Centre for Economics and Business Research, congestion costs in Europe and in USA - 2014

2: INRIX Global Traffic Scorecard - 2017



## Developing enhanced transport services by communicating with infrastructures

### WHAT CHALLENGES?

**More and more connected cars.** In 2016, the connected car market was worth €213m in France to reach €2.5bn in 2021, when there will be more than 10m connected vehicles in France<sup>1</sup>.

**From convenient transport to a travel experience.** Passengers are no longer just looking for any means of transport: they are turning to transport solutions that better meet their needs. Thus, vehicle manufacturers are beginning to sell services to position themselves as mobility providers, offering their customers a complete, and practical, set of mobility solutions to meet their needs.



### WHAT CONTRIBUTION FOR IOT?

#### Communicating between vehicles and infrastructure.

- The development of Vehicle-to-Infrastructure (V2I) communications in recent years opens up possibilities for a large number of applications.
- For example, the Scoop project, co-financed by the European Commission, aims to equip roads and vehicles to exchange a variety of information, in particular with regard to safety, traffic conditions, and the services on offer to users.

**90% OF ROAD TRAFFIC ACCIDENTS WITH BODY INJURIES IN FRANCE ARE CAUSED BY HUMAN ERROR<sup>2</sup>.**

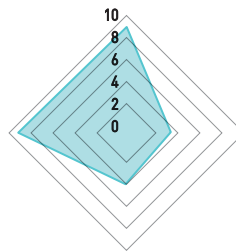
### POTENTIAL: A key market differentiator based on alliances at various scales between infrastructure and vehicle actors

#### The growth in new IoT-based services

Many use cases have been identified, based on communication between vehicles and infrastructure.

#### Use value and market acceptability

V2I services are likely to become market differentiators for transport services.



#### Flexibility and regulatory scalability

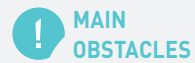
Regulation needs to better anticipate the developments in these services.



**TIME TO MARKET**

**2-7 years**

Service development and the generalization of connected cars and infrastructure will be simultaneous.



**MAIN OBSTACLES**

**The complexity associated with implementing and standardizing solutions.**

See Methodology p.52.

### Guiding a PSA autonomous car as it arrives at a toll barrier



In collaboration with Vinci Autoroutes, PSA managed to steer one of its prototype autonomous vehicles through a toll barrier by using a vehicle-infrastructure communication

system. This begins to guide the vehicle from a position 500 meters upstream of the Saint-Arnoult Toll Barrier and directs it in terms of the appropriate lane to use.

1: Statista, Projection of the number of connected cars in circulation in France from 2015 to 2021 - 2017

2: Bilan annuel de l'accidentalité routière en France [Annual review of road accidents in France] - 2016



## Refining fleet management and facilitate vehicle maintenance

### WHAT CHALLENGES?

**The high costs of maintenance and management.** Corrective maintenance expenditure and interruptions to associated services are among transport operators' major cost items.

**Toward predictive maintenance.** Predictive maintenance could significantly reduce maintenance costs for transport services, in particular by predicting the service life of certain critical elements, and, thus, anticipating maintenance requirements.



### WHAT CONTRIBUTION FOR IOT?

#### Increasing the accuracy of assessments both in terms of location and the nature of maintenance needed.

Effective management of a vehicle fleet must incorporate a range of variables such as preventive-maintenance management (maintenance performed at a scheduled mileage), and the management of regulatory roadworthiness checks. In many cases, the IoT enables these parameters to be more effectively monitored for vehicle fleets.

**\$24.7 BILLION: THE ESTIMATED GLOBAL MARKET FOR PREDICTIVE MAINTENANCE IN 2019<sup>1</sup>.**

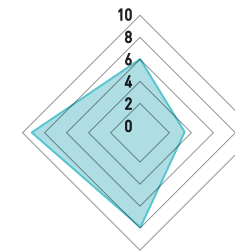
### POTENTIAL: A market that is already well defined and whose potential will increase tenfold as a result of advances in artificial intelligence

#### The growth in new IoT-based services

Many fleet management services exist already, but, as a result of artificial intelligence, there is strong potential for new maintenance services.

#### Use value and market acceptability

Improvements to maintenance operations (in terms of timescales and costs) make it possible to reduce the time that vehicles are unavailable.



#### Flexibility and regulatory scalability

There are no additional regulatory constraints that affect these services



**TIME TO MARKET**

**0-2 years**



**MAIN OBSTACLES**

**Cost and integration of sensors.**

See Methodology p.52.

### The Michelin connected tire used to monitor a vehicle fleet

The French manufacturer, Michelin, has recently unveiled a range of connected tires equipped with RFID chips; these transmit information about tire wear, pressure, and temperature.

According to Michelin, a third of truck failures are tire-related, and 90% of these could be avoided with

better tire-pressure monitoring. Michelin has unveiled new digital services based on its connected tire, which can reduce maintenance costs, and, in particular, optimize the management of truck fleets.



1: ABI Research, Maintenance analytics - 2014

## New standards in quality for transport services delivered to passengers

### WHAT CHALLENGES?

**Private cars, a favored mode of transport.** The car remains the favored means of transport for the French—for almost all daily journeys. 67% say they use it to travel to work or their place of study (compared with 61% for the average European)<sup>1</sup>.

**The difficulties in accessing multimodal transport.** In France, the use of cars as the favored means of transport can be explained by the difficulties in accessing public transport, as well as insufficient development in transport intermodality<sup>1</sup>.



### WHAT CONTRIBUTION FOR IOT?

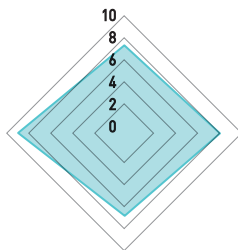
**Providing concrete, accurate, and reliable data on actual passenger numbers.**

The IoT enables operators to collect data on the use of transport services and act quickly to maintain user comfort, ensure the speed of services, and supply information to passengers in order to provide a quality user experience. It enables operators to optimize the organization and profitability of transport services.

#### POTENTIAL: Strong expectations from users and a favorable market

##### The growth in new IoT-based services

The IoT makes it possible to monitor large amounts of data about passenger and vehicle flows.



##### Use value and market acceptability

Users are increasingly demanding when it comes to quality of transport services.

##### Competitive environment

Competitive intensity is modest and is mostly between start-up.

##### Flexibility and regulatory scalability

Particular attention will be paid to the handling of users' personal data.

**TIME TO MARKET**  
0-2 years

**! MAIN OBSTACLES**

Barriers to entry are high due to the number of sensors required to provide the service (financial barriers).

See Methodology p.52.

#### Car@scol, the innovative solution that makes school transport more reliable

The start-up, Groupeer, working in partnership with Transdev, offers a solution that counts the number of children, checks if they have been picked up/dropped off at the right stop, and ensures that none has been left on board. To do this, it needs only (non-geolocalized) connected bracelets and a mobile application for both driver and parents.

The system makes children safer by using real-time counting techniques while they are on the bus. This makes it possible to take into account absences, reserve places on board, and send messages of reassurance to parents. If a problem arises, the operator is alerted immediately allowing it to respond more quickly.



1: IPSOS study - 2017



## Helping develop a customized, multimodal transport solution

### WHAT CHALLENGES?

**Mobility as a Service: a new way to travel.** The concept of Mobility as a Service (MaaS) is a new way of thinking about a service-oriented transport system for users. It translates into transparent cooperation between various transport stakeholders to offer a door-to-door transport service, and the personalization of services offered by transport operators, with the aim of offering inexpensive services that meet the mobility needs of users.



### WHAT CONTRIBUTION FOR IOT?

**Playing a part in developing genuine intermodality via large-scale deployment.**

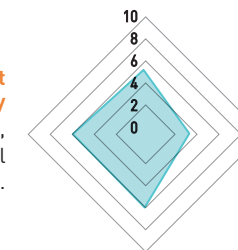
- While the geolocation of transportation is nothing new, it's the large-scale deployment of real-time location methods that makes it possible to consider adaptive intermodal connection solutions.
- The IoT could help in the development of new services, such as on-demand buses, or help improve the supply of free-floating bicycles.

**88% OF DOWNTOWN RESIDENTS OF OSLO, IN THE NEW ONE MILE PEDESTRIAN ZONE, DON'T HAVE A CAR<sup>1</sup>.**

#### POTENTIAL: The IoT will have limited impact in an already well-exploited market

##### The growth in new IoT-based services

The main value comes from the exploitation of data, part of which is provided by the IoT.



##### Use value and market acceptability

A considerable benefit, but also a cultural change for users.

##### Competitive environment

Business models must take into account the fact that transport data is commonly provided free of charge.

##### Flexibility and regulatory scalability

The public policies of many big cities will limit the use of cars and hence accelerate the adoption of MaaS.

**TIME TO MARKET**

2-7 years

In the medium term, restrictions on the number of private vehicles in urban areas will foster multimodal solution development.

**! MAIN OBSTACLES**

The interoperability of different transport operators' systems.

See Methodology p.52.

#### Optymod: new mobility services for the Greater Lyon area



In France, the Greater Lyon area has set up a mobility database and is carrying out a range of experiments. Among these, the Optymod application provides users with an innovative digital guidance service which differentiates itself from others by offering:

- Full multimodal coverage for public transport, sustainable transport, and personal cars (in terms of routes, guidance, car parking information, etc.).
- Predictive and comparative information on means of transport, depending on road traffic.

1: Norwegian Centre for Transport Research - 2017



WHAT CHALLENGES?

**The number of package deliveries is growing strongly.** In 2016, more than 460m packages were delivered in France, an increase of 14% compared with 2015<sup>1</sup>.

**There are numerous difficulties with such deliveries.** 70% of online shoppers have already faced delivery problems: the most frequent among them being delays, damage, and lost parcels<sup>2</sup>.



WHAT CONTRIBUTION FOR IOT?

**Improving the accuracy of delivery time slots.**

- Geolocation will enable consumers to track their orders, and be informed about possible delays.
- Coupled with fine-tuned route planning, geolocation can reduce the size of a planned time slot to the space of a few minutes, and review it in real time.

**Verifying the integrity of goods during transport.**

- The information that the IoT can provide makes it possible to automate, and ensure the reliability of, cold chains for food products and sensitive goods, such as drugs and organs in transit. Moreover, the IoT can detect whether high-value items have suffered shocks.
- In the longer term, the use of such sensors could be extended to all types of shipment, even integrating them into packages to assure recipients that they have not been tampered with.

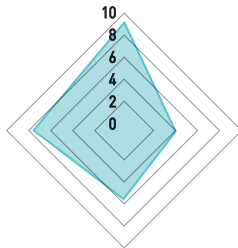
**POTENTIAL: A strong differentiator in a highly competitive market that will be increasingly adopted as sensor costs fall**

**The growth in new IoT-based services**

Demands for ever-higher quality are driving companies to implement more effective and accurate solutions in an effort to retain their customers.

**Use value and market acceptability**

The cost/benefit ratio of these premium services decreases as the cost of the sensors decreases.



**Competitive environment**

Logistics players are experimenting extensively with connected logistics solutions.

**Flexibility and regulatory scalability**

Consumer rights in contracts need to be adapted to new approaches to delivery (by incorporating last kilometer or even last meter considerations).



**TIME TO MARKET**  
0-2 years



**MAIN OBSTACLES**  
The identification of robust ROI to launch projects.

See Methodology p.52.

**Diageo and thinfilm test their connected bottle**

**thinfilm** The British spirits company Diageo, and the Norwegian electronics company Thinfilm, have collaborated on the development of a prototype connected label for Johnny Walker Blue Label whiskey bottles. By passing their

smartphone over it, consumers can check the integrity of a bottle, thus ensuring it has not been opened during transport; they can also gather promotional information and ideas for cocktails.

1: FEVAD (The French federation of companies involved in e-commerce and distance selling) - 2017  
2: IntiSell/Ipsos - 2016



WHAT CHALLENGES?

**The high rate of returns.**

In 2016, the average rate of e-commerce returns in France was 10%<sup>1</sup>.

**A robust regulatory framework that encourages returns.**

The 2014 Consumer Protection Law (known as "Hamon Law") allows French consumers a 14-day cooling-off period during which they can change their mind about a purchase without having to provide a reason.



WHAT CONTRIBUTION FOR IOT?

**Connecting new collection points.**

- Users deposit their items directly using a connected mailbox, connected locker, or the trunk of their vehicle, without having to wait in the post office.
- Carriers can optimize their collection routes according to information being provided by the connected collection points. They no longer need to manually check whether the collection points contain items or not.
- In waste management, connected sensors are appearing on dumpsters to facilitate their collection by garbage trucks. In the long-term, forecasting models will be developed to better adjust collection routes to actual needs.

**10% IT IS THE AVERAGE RATE OF E-COMMERCE RETURNS IN FRANCE IN 2016<sup>1</sup>.**

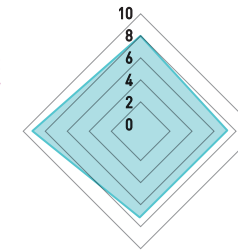
**POTENTIAL: A lever of operational performance that needs to be activated quickly as the market environment is favorable.**

**The growth in new IoT-based services**

Putting in place well-organized logistics for returns is becoming an imperative for companies. However, deploying and managing such systems remain complex. This is why the IoT is linked to numerous services for process automation and package tracking.

**Use value and market acceptability**

The proper handling of returns is becoming an imperative in the e-commerce sector.



**Competitive environment**

The market is in an emerging phase and numerous start-up are appearing.

**Flexibility and regulatory scalability**

As with the Hamon Law on the cooling-off period, regulations seem to be adapting well.



**TIME TO MARKET**  
0-2 years



**MAIN OBSTACLES**  
**Redesigning operational processes**  
Redesigning collection processes requires important investments from providers, which will only be amortized in the long run.

See Methodology p.52.

**Domino: sending a package from your own mailbox**



La Poste (the French mail service) has created Domino, a connected button used for sending parcels without the need to carry it around or wrap it. This small magnetic

item is installed directly inside personal mailboxes: it is sufficient for the user to drop the package in the mailbox and press the button to send it. The postman is informed and will collect the parcel and wrap it himself.

1: Ecommerce Europe - 2016



WHAT CHALLENGES?

**Last mile logistics involve significant costs.**  
20% of logistics costs are dedicated to last mile logistics<sup>1</sup>.

**The growth of last mile logistics is resulting in traffic congestion.**  
In France, urban logistics are responsible for 32% of traffic in city centers<sup>2</sup>.



WHAT CONTRIBUTION FOR IOT?

**Monitoring storage and delivery capacity.**

- The information collected (fulness sensors for warehouses and vehicles) enables delivery vehicles to be pooled and warehouses to be optimized.
- Ultimately, it will be possible to pay for a premium service that uses the residual capacity of vehicles already engaged in tours—as soon as they cease to be full.
- Delivery times become shorter, costs are reduced, and the number of vehicles decreases.

**20% OF LOGISTIC COSTS ARE DEDICATED TO LAST MILE LOGISTICS<sup>1</sup>.**

**Tracking packages by company.**

- Pairing a package's tracking device with the vehicle enables optimal monitoring. In technological terms, it's also possible to directly geolocate packages.

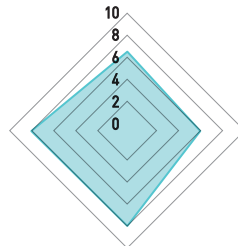
POTENTIAL: A lever for optimizing flows whose potential is determined by the maturity of the solutions

**The growth in new IoT-based services**

Numerous pooling service platforms based on the IoT are developing, such as the pairing of parcels with vehicle and warehouse capacities, etc.).

**Use value and market acceptability**

Pooling enables the effectiveness of the logistics process to be optimized. The potential deployment of a premium service could provide a source of value for logistics professionals.



**Flexibility and regulatory scalability**  
No strong regulatory constraints.



**2-7 years**  
No robust IoT solutions dedicated to storage and delivery capacity pooling.



**Set-up costs.**  
Developing systems in connection with tour planners.

See Methodology p.52.

FM Logistic: pooling in the hygiene-beauty sector

**FM LOGISTIC** French company, FM Logistic, has put in place a pooling system which groups the flows of pools of companies in the same sector. For example, the pool at its Château-Thierry site allows it to

manage the distribution logistics of five major players in the hygiene-beauty sector: Colgate, Henkel, GSK, Sara Lee, and Eugène Parma.

1: PIPAME - 2009  
2: Centre-Ville en Mouvement [City Centers in Motion] - 2018



WHAT CHALLENGES?

**Deliveries are considered a major issue.**

In 2015, in France, 81% of people considered deliveries as a "headache" subject to numerous recurrent problems such as unspecified and missed delivery slots, non-contactable carriers, and dead time as a result of waiting<sup>1</sup>.



WHAT CONTRIBUTION FOR IOT?

**Connecting new delivery points.**

- The IoT connects new delivery points that can be easily accessed by carriers, making delivery possible in H+ (i.e. within hours of ordering).
- Consumers no longer have to wait for orders at home, and delivery personnel don't have to wait outside the door to find out whether the buyer is at home.
- Among these new delivery points are: connected lockers and mailboxes, home delivery—without the customer being present—using a connected lock and placing the delivery directly into the trunk of their vehicle.

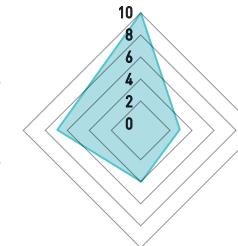
POTENTIAL: A means of optimizing operations and providing major customer satisfaction in the h+ segment; likely to explode in the medium term

**The growth in new IoT-based services**

Services delivered by connected points are proliferating (home deliveries with no customer present, deliveries directly into vehicle trunks, etc.).

**Use value and market acceptability**

A massive market achievable with simple solutions, but security matters remain an issue.



**Flexibility and regulatory scalability**

Third-party interventions involving individuals' property need to be properly thought through.



**2-7 years**  
Consumers do not tend to perceive a piece of connected equipment as being a mere "gadget". The emergence of concrete use cases and the users' familiarity with the technology mean a short time to market.



**The acceptability and security** of deliveries at home and in the private vehicle.

See Methodology p.52.

Amazon Key In-Car, delivering directly into the trunks of individuals' vehicles



Amazon launched on April 24 2018 their new service Amazon Key In-Car in more than 37 cities in the United States, allowing Prime Members to have their orders delivered directly into the trunk of their vehicle. The service is currently only

available for owners with a compatible Chevrolet, Buick, GMC, Volvo, or Cadillac, 2015 or newer, with an active OnStar or Volvo On Call account. The delivery system relies on the Internet connection of the vehicle granting a temporary access to delivery personnel.

1: Opinion Way for GLS - 2015





WHAT CHALLENGES?

**Energy prices are rising.**  
Electricity rates have increased by 0.8% since February 1, 2018, for domestic customers; and this follows a 1.7% increase in 2017<sup>1</sup>.

**The demand for home security is rising.**  
In 2017, in France, the connected-housing security segment was worth US\$240m. This is expected to triple in the next five years<sup>2</sup>.



WHAT CONTRIBUTION FOR IOT?

- Monitoring housing, remotely controlling access, and alerting users to abnormal situations.**
- Security equipment (such as cameras, motion detectors, and smart locks) can be remotely controlled and coordinated.
  - Smart locks that allow remote access control, have been of particular interest since the arrival of Airbnb in France.
- Controlling equipment through simple interfaces that enable energy consumption to be monitored and improve comfort.**
- The control of energy and other equipment associated with comfort in the home (such as automatic window shutters, gates, and lighting) enables consumption to be managed and the automation of repetitive tasks.
  - On the other hand, the cost/benefit ratio of current solutions isn't attractive enough to cause a shift from niche to consumer markets: costs are still high and management by segment is sometimes not very user-friendly.

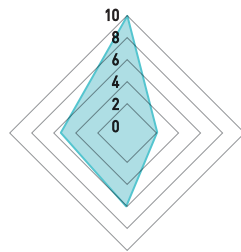
**POTENTIAL:** There are numerous proven IoT solutions, but also fears related to the exploitation of data in a market dominated by the digital giants

The growth in new IoT-based services

The IoT is linked to the development of many services in each home-product segment: connected thermostats and appliances, smart light bulbs and locks, etc.

Use value and market acceptability

Solutions are being considered less and less as mere "gadgets", and are beginning to become widespread even though data privacy remains a central issue. In addition, the fact that the associated waves are not harmful remains to be demonstrated.



Flexibility and regulatory scalability

The right to erase your own data, and to know how it is being used, has not yet been put in place.

Competitive environment

A very dynamic market with many types of players (manufacturers, energy players, the GAFSA companies, start-up) but largely dominated by the digital giants.



TIME TO MARKET

2-7 years

The appearance of concrete use cases and lower equipment prices.



MAIN OBSTACLES

- The protection of private data.
- Worries about the harmfulness of waves.
- The interoperability of connected equipment.
- Ease of installation.

See Methodology p.52.

Vinvi Smarthome: allowing owners to speak to intruders to frighten them off

**vinvi.SmartHome** The American company Vivint Smart Home offers security cameras that allow householders to speak to potential intruders. As soon as an abnormal

situation is detected, the camera sends an alert to the owner who can then directly speak to the unwelcome visitor to encourage them to leave.

1: ADEME - 2011  
2: Statista Smart Home - 2017



WHAT CHALLENGES?

**An increasing interest in voice assistance.**  
One in ten people in France is very interested in home voice assistance<sup>1</sup>. 45 million smart speakers were sold worldwide between 2015 and 2017<sup>2</sup>.

**Consumers lack information.**  
Half of connected-device manufacturers don't provide consumers with a list of compatible objects<sup>3</sup>.



WHAT CONTRIBUTION FOR IOT?

- Unified management of equipment in homes through use scenarios.**
- The value of connected housing consists of going beyond compartmentalized control of equipment by segment (comfort, safety, energy, leisure, etc.) to offer householders unified and simplified home management—by means of unique and ergonomic interfaces.
  - Today, the most common interface is the intelligent speaker, which allows voice control of all equipment in a home. They are mostly used today to manage music and TV.
  - Combined with the development of artificial intelligence, the data collected by the connected equipment will eventually provide a high-value service: the creation of intelligent-use scenarios—adapted to the lifestyle of each householder.
  - For instance, equipment might detect when no one is home and close shutters, switch off appliances in standby, turn off the lights, activate both alarm and surveillance cameras.

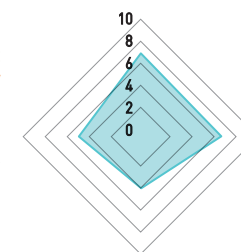
**POTENTIAL:** Potential for services to be developed, based on the progress of artificial intelligence, but it is data protection issues that are currently driving commercialization

The growth in new IoT-based services

Thanks to AI, customized daily-life scenarios linked to the monitoring of individuals' behavior and changes in the climate are developing at pace (opening of shutters in a case of fire, etc.).

Use value and market acceptability

Non-intrusive and easy-to-use solutions tailored to householders' needs could appeal to a growing number of users.



Thinking about inclusive solutions is now starting.

Flexibility and regulatory scalability

The right to erase your own data, and to know how it is being used, has not yet been put in place. The large amount of personal data required for usage scenarios is particularly sensitive.



TIME TO MARKET

>7 years

Manufacturers are considering numerous use cases, but connected personal data is sensitive and the technology is not yet sufficiently.



MAIN OBSTACLES

- The protection of personal data.
- Worries about the harmfulness of waves.
- Pertinence of the results of the algorithms.

See Methodology p.52.

Arkadea: use scenarios for householders

**ARKADEA** The real estate developer Arkadea, born of a partnership between Poste Immo and Icade Promotion, offers a set of connected objects (thermostat, presence sensor, camera, light bulb, electric shutters, etc.) linked to the service platform "Hub Numérique" allowing objects to interact with each other

and scenarios to be configured according to the householder's needs. For example, it's possible to alert parents when their children have arrived home from school, reduce electricity consumption for a short period when nobody is at home, and prevent the use of dangerous devices when parents are not present.

1: GFK - 2017. 2: Consumer Intelligence Research Partners - 2018. 3: UFC Que Choisir (a French consumer goods testing organization) - 2017



WHAT CHALLENGES?

In buildings, 75% of management costs relate to their operation and maintenance<sup>1</sup>.

Significant costs for businesses.

In France, in 2017, each office square meter has cost in average 822€ when rent and insurance, taxes, building operation, services, equipment, and HR costs related to managing workplaces are considered<sup>2</sup>.

WHAT CONTRIBUTION FOR IOT?

Improving the technical management of the building.

- The IoT makes it possible to manage energy, the quality of the environment, and the predictive maintenance of equipment.
- Sensors provide information on the operation of building equipment (such as heating, ventilation, and air conditioning), helping managers make the right decisions and ensure the traceability of facilities-management providers from the point where an intervention is requested to the completion of the job.
- Technical management is facilitated by BIM (Building Information Modeling), the 3D digital representation of buildings, which the IoT can provide real-time information for, thus allowing managers to be informed about a building's needs and optimize the associated maintenance operations.

Optimizing workspaces.

- RFID sensors, beacons, and motion detectors, can provide information on the behavior of users, and the way in which they use their spaces, in order to model optimal ways to organize working environments.

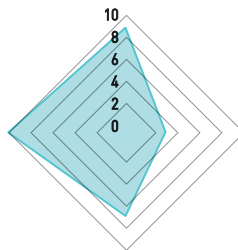
POTENTIAL: Considerable gains for industry stakeholders who are making huge efforts to develop solutions, in particular those involving BIM-IoT interactions

The growth in new IoT-based services

The IoT enables the implementation of numerous services related to the management of fluids, safety, comfort, and flows of people. These involve detecting failures, monitoring air quality, knowing whether work rooms are available, etc.

Use value and market acceptability

Controlling the energy consumption of buildings is a key lever of CSR policies. Furthermore, the IoT improves the well-being of employees and the management of subcontractors.



Competitive environment

A buoyant market driven by the activity around BIM.

Flexibility and regulatory scalability

A sustained regulatory activity (work groups on digital regulation and buildings) should help clarify issues such as data ownership.

TIME TO MARKET

2-7 years

BIM promotes the development of IoT-based services, but interoperability problems remain.

MAIN OBSTACLES

- The interoperability of connected equipments.
- The implementation costs for existing buildings.

See Methodology p.52.

Wavely: using noise to detect malfunctions

The Lille-based start-up, Wavely, is a company created in April 2017 that specializes in the development of smart and connected acoustic sensors that detect malfunctioning equipment. Historically, and even today, many technicians detect malfunctioning equipment "by

ear". Wavely claims to be able to detect gas leaks before significant concentrations of gas build up—thus preventing a dangerous situation.



WHAT CHALLENGES?

Low-wage households spend a significant proportion of their income on housing.

The poorest 10% of French people, spend 42% of their income on housing: four times more than the top 10%<sup>1</sup>.

The collaborative economy is very well developed in France.

More than 1/3 of French people used a collaborative platform in 2016: the largest proportion in Europe<sup>2</sup>.

WHAT CONTRIBUTION FOR IOT?

Facilitating the sharing of space in residential buildings.

- The IoT can inform residents about the availability of equipment (for example, washing machines) and enables occupants' usage patterns to be analyzed, allowing arrangements for communal areas to be better thought through.
- This makes personalized monitoring of consumption in shared spaces possible, and facilitates people's entry to, and exit from, them, by means of digital access control.
- The IoT can play a part in the development of "coliving", a community way of life based on the pooling of shared spaces (such as co-working spaces, sports facilities, cinemas, etc.).

Facilitating the sharing of associated public spaces for non-residents.

- The IoT simplifies the management and access control of public spaces that are open to non-residents. The clearest example is that of parking garages: here the IoT allows the automatic identification of vacant places, and remote access control via connected garage doors.
- Managers and residents ultimately broaden their sources of income from this, enabling external users to benefit from lower-cost parking spaces that are close to their homes.

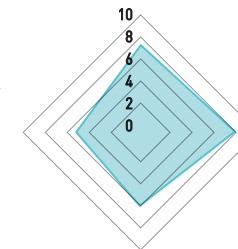
POTENTIAL: The IoT makes it possible to design space sharing solutions, and their adoption is being driven by changing ways of life and moves toward more community-based living

The growth in new IoT-based services

The IoT is a key factor in powering space-sharing applications that enable the monitoring of shared spaces, remote access control, and personalized consumption monitoring.

Use value and market acceptability

The sharing of equipment used for the activities of daily life requires a significant cultural shift.



Competitive environment

The market for these solutions, still nascent in France, is starting to develop, especially in the US.

Flexibility and regulatory scalability

The regulation of users falls to the relevant residence; and it therefore depends on the decisions of residents' associations.

TIME TO MARKET

>7 years

Space sharing requires a change in lifestyle to thrive.

MAIN OBSTACLES

- The protection of personal data.
- Concerns about the harmfulness of waves.
- The support of residential building designers.

See Methodology p.52.

The Pop, a connected button that provides instant access to a range of information

The Lyon-based company, Pop'n Link, offers connected buttons that users can pass their smartphones over to get instant access to a range of information, without having to download applications or provide any personal information. Their Pop'n stay system of connected but-

tons for housing applications allows residents to access information such as WiFi codes, the details of people to contact in cases of problems, places to visit, and codes of conduct to be followed.



1: Arseg, The French association of working environment directors - 2017. 2: Mission interministérielle de la qualité des constructions publiques [The French Interdepartmental Commission for the Quality of Public Buildings] - 2006



1: Insee, French National Institute of Statistics and Economic Studies, Housing study - 2013. 2: Eurobarometer, European Commission - 2016

WHAT CHALLENGES?

**Energy grids are decentralizing, resulting in the development of microgrids at local level.**

By 2022, the value of the global microgrid market is expected to reach €31.5bn<sup>1</sup>.



WHAT CONTRIBUTION FOR IOT?

**Providing regular feedback on indexes (measures of consumption).**

- IoT-based, communicating meters, form the link between buildings and the electricity grid. They relay the relevant information via indexes (consumption records), providing it to the distributors and generators who distribute surplus energy.
- They contribute to the development of microgrids: small energy networks involved in local production (using photovoltaic panels, mini-wind turbines, fuel cells, etc.).
- Benefits of decentralization include network resilience, reduced energy bills, savings on network investment, and the ability to supply areas where network coverage is poor, such as isolated rural zones.

**€31.5bn IS THE ESTIMATED VALUE OF THE GLOBAL MICROGRID MARKET<sup>1</sup>.**

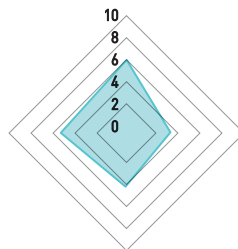
**POTENTIAL:** The evolution of technologies should allow the broader adoption of IoT applications, for which smart meters represent the first brick on the market

**The growth in new IoT-based services**

The IoT, working via smart meters plays a part in the development of microgrids, without being the core element of the system.

**Use value and market acceptability**

Local authorities will be able to obtain value out of local networks. Moreover, it is an essential step in bringing diversity to the energy mix.



**Competitive environment**

The smart meter market is very mature. That for automated microgrid management systems is more open.

**Flexibility and regulatory scalability**

At the end of 2017, the CRE [French commission regulating energy concerns] outlined actions regarding collective self-consumption. The regulatory framework should be set in stone in 2018.



**2-7 years**

Smart meters will be accepted over time. However, the change in grid structure will require time and significant investments.



**Costs of implementing, integrating and interconnecting networks.**

See Methodology p.52.

**The Brooklyn Microgrid: solar energy exchanges between neighbors**

The Brooklyn MicroGrid, a US physical distribution-network project, is divided into two parts:

- Generators/consumers equipped with photovoltaic panels.
- The buildings that consume power, which are divided into three groups depending on their degree of criticality.

Communicating meters track the consumption of the various players at local level, which allows exchanges to take place between producers and consumers. These exchanges rely on Blockchain Ethereum technology, which offers an unfalsifiable and decentralized registry of transactions.



1: Market and Market - 2017



WHAT CHALLENGES?

**A new way of caring for patients.** Outpatient surgery is defined as surgery patients being hospitalized for less than 12 hours without overnight accommodation. Care is based on postoperative monitoring in the recovery room, allowing, if they are not deemed to be at risk, patients to be discharged on the day of admission.

**The issue has an important economic element.** This method of patient care represents an important economic issue for hospitals, but also one for the quality of the care received by patients. The government has set a goal of 70% of surgery being done on an outpatient basis by 2022, compared with 54% today<sup>1</sup>.



WHAT CONTRIBUTION FOR IOT?

**Monitoring the patient's state of health when they return home, and generating alerts if abnormal situations arise.**

If used for outpatient surgery, these connected health devices would enable hospitals and doctors to monitor patients before they enter the operating theater, as well as helping ensure good recovery at home following an operation (through automatic monitoring and the use of questionnaires, for example).

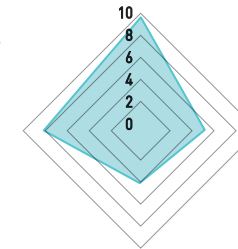
**POTENTIAL:** The relevant IoT technologies exist, and the development of a regulatory framework for outpatient operations should open the way to concrete applications in the medium term

**The growth in new IoT-based services**

The IoT makes it possible to maintain the patient-hospital link from home by use of remote monitoring solutions for post-operative patients.

**Use value and market acceptability**

Patients are in favor of solutions that enable them to return home more quickly (78% prefer to be at home for post-operative care) and that are underpinned by the use remote monitoring solutions.



**Flexibility and regulatory scalability**

The regulatory framework for outpatient surgery is still being developed, particularly with respect to alert processing.



**2-7 years**

Public policies should foster the implementation of post-operative connected solutions at home.



**The difficulty of putting the regulatory framework in place.**

See Methodology p.52.

**A platform to improve the quality of care at Paris's Bichat Hospital, in partnership with Docapost**



The AP-HP (a Paris hospital group), MSD France's laboratory, and the Fondation du Souffle (the "Breath Foundation") have created—at Paris's Bichat hospital—the first ever platform for the evaluation and analysis of connected health devices: the Digital Medical Hub. It aims to improve the quality of care through connected devices and their associated mobile health applications; their use and relevance are assessed and validated scientifically. The first experiment, launched in January 2018, is taking place with 25 lung transplant patients; they are equipped

with a medical case that includes three connected devices: a Tucky patch thermometer from e-TakesCare – winner of the 2016 French IoT award; a SmartOne spirometer supplied by MIR (Medical Research International), and an oximeter – in the form of a connected watch – supplied by Oxitone. The collected data is hosted and accessible via an application on Docapost's (a subsidiary of La Poste) Digital Health Space. Eventually, this experiment could be extended to the follow-up of patients who have undergone operations as outpatients.

1: Ministère des Solidarités et de la Santé [The French Ministry for Solidarity and Health] - 2018



WHAT CHALLENGES?

**An increase in the number of people affected by chronic illness.** By 2020, France expects to see an increase of 548,000 in the number of people affected by a chronic illness (such as diabetes, cancer, or a mental illness) requiring long-term treatment<sup>1</sup>.  
**The high cost of the healthcare system.** The prevalence of chronic illnesses is increasing steadily due to longer life expectancy and the systematization of diagnoses. The increasing number of illnesses being experienced as a result of age exposes older people to the need to take a range of medication and the increased risk of functional dependence, something that represents a very high cost for the French healthcare system.

WHAT CONTRIBUTION FOR IOT?

**Monitoring patients' medical indicators.**  
 The remote tracking of patients' medical indicators, via the IoT, reduces the numbers of visits to doctors and improves the quality of follow-up—thus avoiding additional hospitalizations. The increasing number of sensor types, and the emergence of new suppliers, enable more and more medical indicators to be monitored at ever-lower cost.

**59% OF THE FRENCH PEOPLE WISH TO OWN CONNECTED HEALTHCARE DEVICES TO IMPROVE DAY-TO-DAY MONITORING OF THEIR CHRONIC ILLNESS<sup>2</sup>.**

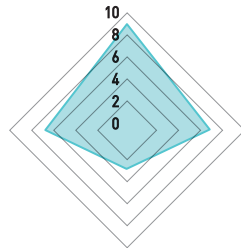
**POTENTIAL:** The establishment of a framework of trust around the use of health data is essential in ensuring the widespread use of these monitoring solutions

The growth in new IoT-based services

Today, the IoT allows, for example, the monitoring of patients with diabetes. Ultimately, the IoT will enable the remote monitoring of patients' medical indicators, reducing the number of visits to doctors and improving the quality of patient follow-up, thus avoiding unnecessary hospitalizations.

Use value and market acceptability

Miniaturization makes it possible to offer less and less intrusive solutions. In addition, constant follow-up data offers new opportunities for medical research.



Flexibility and regulatory scalability

The regulatory framework is very restrictive with regard to the use of connected health devices; they are not recognized in the same way as approved, connected medical devices.

Competitive environment

Many large technology groups are investing in the health sector, including the GAFSA companies.

TIME TO MARKET

**2-7 years**  
 For example, today IoT allows to follow patients with diabetes. In the medium term, it will allow to reduce the number of visits to the doctor and to improve the quality of follow-up to avoid unnecessary hospitalizations.

MAIN OBSTACLES

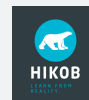
**The use of health data is a major concern for users.**

See Methodology p.52.

INRIA chooses HIKOB to support its research into Parkinson's disease

The CAMIN team at INRIA (a French public research body dedicated to digital science and technology) has chosen the HIKOB (a French remote sensor manufacturer) wireless data acquisition system to help conduct research on Parkinson's disease, which affects 195,000 people in France, and produces 25,000 new cases every year.

Problems in walking are a common effect of Parkinson's disease and are associated with a risk of falling. To prevent these problems occurring, the miniaturized wireless system assesses indicators of a patient's ability to walk—without being intrusive.



1: Health Insurance (CNAMTS – a French national, social security agency) - 2017  
 2: The French and e-health, an OpinionWay/La Poste study - 2017



WHAT CHALLENGES?

**The development of telemedicine.** The development of telemedicine (through the development of legislation for teleconsultation and tele-expertise) is a priority for the 2018 Social Security Financing Bill, and for health policy in the coming years. These policies aim to fight against the splintering of equal access to healthcare in France. To achieve this, plans to transform the organization of healthcare must promote the development of telemedicine, connected health devices, and predictive medicine.

WHAT CONTRIBUTION FOR IOT?

**Providing a link between the patient and health professionals, and sharing health data.**  
 - Telemedicine includes remote consultation, remote expertise – based on medical information, remote monitoring and interpretation of medical readings, remote assistance to the doctor from another health professional, and an initial diagnosis over the phone.  
 - Telemedicine solutions could benefit greatly from the technologies offered by connected health objects, which can provide an effective means of carrying out some of the examinations performed during a face-to-face consultation (such as temperature and blood pressure checks, electrocardiograms, etc.).

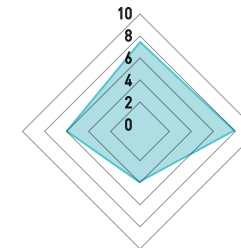
**POTENTIAL:** The IoT makes it possible to improve the reliability of remote consultations, and the introduction of standards will help win the confidence of health professionals

The growth in new IoT-based services

The IoT can connect patients to remote specialists (via telemedicine booths or portable devices) and offers a complement to traditional surgery-based doctors' services.

Use value and market acceptability

Telemedicine solutions can't completely replace face-to-face contact with doctors, which takes place within a framework of trust between patients and health professionals.



Flexibility and regulatory scalability

Telemedicine is now an official medical activity recognized by the state. Nevertheless, standards still need to be established if connected devices are to be fully integrated within telemedicine.

TIME TO MARKET

**2-7 years**  
 The harmonization of solutions between regions and the adoption by health professionals will be effective in the medium term.

MAIN OBSTACLES

**Winning the confidence of patients and health professionals.**

See Methodology p.52.

Visiomed's portable telemedicine station

Visiomed's VisioCheck solution is the world's first mobile and connected universal telemedicine station. Weighing less than 300g, it includes all the medical devices needed for the remote monitoring and/or consultation-based examination of patients in all settings. The system includes several medical devices that are essential for measuring vital physiological signs: a blood

pressure monitor, contactless thermometer, electrocardiogram, pulse oximeter, and blood glucose meter. This makes taking measurements of vital medical indicators, which are usually performed during a standard medical consultation (at the surgery or at home), easy, reliable, and quick.



WHAT CHALLENGES?

**More and more dependent, elderly people.** Dependency projection scenarios predict that the number of dependent, elderly people in France will reach 2.3m by 2060: twice as many as today<sup>1</sup>.

**An increase in the demand for health services.** This increase in the number of dependent people is leading to an increased demand for home-care services.



WHAT CONTRIBUTION FOR IOT?

**Creating new, more responsive, more flexible, and less intrusive, solutions for older people.**

- The development of accident detection and prevention devices is a priority for the home-health sector.
- In addition to solutions, new technologies are appearing, such as fall detection and geolocation wearables. These are being used in home-health solutions, which are now less intrusive and therefore better accepted by older people.

**€2.7bn IS THE ESTIMATED SALES REVENUE OF THE CONNECTED HEALTHCARE DEVICES IN FRANCE IN 2020 (COMPARED TO €15.2bn FOR THE GLOBAL CONNECTED DEVICES MARKET)<sup>2</sup>.**

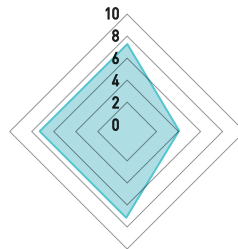
**POTENTIAL:** The development of solutions that are more adapted to the elderly will enable the widespread dissemination of these services, particularly for future generations

The growth in new IoT-based services

Numerous innovative, non-intrusive services are being integrated into housing and clothing.

Use value and market acceptability

Non-intrusive solutions for prevention which grant rapid care if needed, while letting the person maintain control, will be adopted massively.



Competitive environment

There is strong competition among technology players for access to the market for connected devices for the elderly.

Flexibility and regulatory scalability

The need for society to adapt to aging has been enshrined in law since 2015, and improvements in daily life for the older people is one of its major thrusts.



TIME TO MARKET

>7 years

Older people will become more open to accepting these solutions since future generations will have spent part of their lives using new technologies.



MAIN OBSTACLES

Complicated to implement.

See Methodology p.52.

E-vone connected shoes to detect falls among elderly people



The start-up E-vone, a subsidiary of the Eram group has developed a connected shoe for dependent, older people. In the event of a

fall, followed by a period of immobility, the shoe triggers an alarm, enabling relatives and the emergency services to be alerted.

1: DREES (the French statistical service for social and health-related policy), Projection of the dependent elderly population - 2013  
2: Statista, The market for connected objects in 2020 - 2016



WHAT CHALLENGES?

**The French healthcare system has traditionally focused on treatment.** In 2016, the consumption of healthcare and medical products in France was valued at €198.5bn, or 8.9% of GDP—one of the highest levels in Europe<sup>1</sup>.

**Moving toward preventive care.**

One of the priorities of the 2018-2022 French National Health Strategy is to reduce the imbalance between treatment and prevention in the health system.



WHAT CONTRIBUTION FOR IOT?

**Creating baselines that enable better knowledge of health populations, and the creation of a health history for each patient.**

- According to experts, connected medicine and e-health will follow four main themes (the 4Ps of medicine): they will be Predictive, Personalized, Preventive, and Participative.
- The data then become a medical tool, like any other, which can be used in a context of prevention, care, and assessment.
- Health connected devices must produce certified data in order to be able to pass from well-being data to medical data. Only the latter will enable health professionals to make decisions and act.

**62% OF FRENCH PEOPLE ARE READY TO USE CONNECTED DEVICES TO PREVENT HEALTH-RELATED RISKS<sup>2</sup>.**

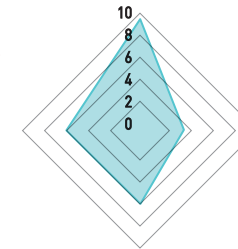
**POTENTIAL:** There are numerous connected services which could play a part in rebalancing the system, if public-sector stakeholders and health professionals choose to integrate them into care plans

The growth in new IoT-based services

The number of services is very significant in the overall scheme of things; which goes much wider than the mere treatment of illnesses using traditional approaches to healthcare—especially in terms of well-being.

Use value and market acceptability

If society is to manage health properly over time, the transition to prevention requires collective changes in habits.



Competitive environment

The IoT's potential is very strong here, and the players involved are developing a wide range of solutions—in particular a plethora of mobile applications.

Flexibility and regulatory scalability

Standards for interoperability between solutions are under development, but, as yet, there is no official recognition or labeling.



TIME TO MARKET

>7 years

A profound change in health habits that will be effective in the long term.



MAIN OBSTACLES

The strengthening of prevention requires and increased simultaneous awareness among health professionals, and the general public, to raise the profile of the potential benefits.

See Methodology p.52.

La Poste eSanté: healthcare for all in a digital age



The application, La Poste e-Santé, is aimed at anyone who wants to conserve their health capital, benefit from e-coaching modules, monitor changes in their health indicators (particularly for chronic illness), have easy access to their vaccination records, and be able to synchronize all of their health-related connected devices. This digital health record allows people to manage their

health-related data, and also to collect data from connected healthcare devices—whatever the manufacturer—whether purchased by them or provided by the hospital.

It provides a digital link between home, patient, hospital, and surgery, and also a lever to find a new balance between treatment and prevention.

1: DREES (the French statistical service for social and health-related policy), Health expenditure - 2016  
2: Renaissance Numérique, From a curative health system towards a preventive system thanks to digital tools - 2014



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GROUPE



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Every year, La Poste delivers 22.726 billion items worldwide (letters, printed advertising media and parcels), 6 days a week. In 2017, the Group generated €24.110 billion in revenues (24.4% from outside France) and had a headcount of more than 253,000. In its strategic plan – "La Poste 2020: conquering the future" strategic plan, La Poste has set itself the objective of stepping up its transformation with the active expansion into new regions. With its goal of becoming the leading company in local personal services, for everyone, everywhere, every day, La Poste is committed to making life simpler for all.

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