

Time to connect Belgium with 5G

An exhaustive industrial study reveals
roadblocks and opportunities

AGORIA

Capgemini  invent



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Executive summary

5G is perceived worldwide as a key enabler of digital transformation across industries. Internationally, large companies are preparing for it, or where already available, implementing use cases on 5G to seize all opportunities from this versatile new connectivity technology.

Faced with the fact that 5G rollout will have a considerable delay, we have conducted a survey of 489 Belgian organizations. The companies vary in size from SMEs to large companies and we investigated how they are positioned against 5G and the impact it will have.

Our study revealed :

- Awareness of 5G across all industries is high in Belgium, but knowledge on specific 5G features is lacking. This leads to low levels of 5G-engagement and of enterprises taking effective actions to prepare for 5G.
- Companies have high expectations of 5G. They expect substantial improvements on efficiency of floor operations and opportunities to develop new products and services with and around 5G.
- Companies are prepared to pay a premium fee for the new features that 5G brings once the benefits are proven. In this context, local private mobile networks are perceived as key for the industrial segment.
- Uncertainty on timing, costs, ROI, concerns about health, sustainability and privacy are the main roadblocks that need to overcome.
- The current delay in 5G roll-out could result in disinvestment and competitive disadvantage for Belgium.

To keep Belgium as a digital front runner and to gain competitiveness on an international level we recommend :

1. The development and strict execution of a national and regional coordinated 5G vision.
2. Telcos need to become digital transformation partners for companies.
3. A 5G-engagement increase at companies by boosting 5G knowledge.
4. Optimize conditions to activate 5G-ecosystems and prove value via use case pilots



I. Study about 5G in the Belgian Industry

1. Introduction

5G is expected to bring various benefits, such as higher connectivity speed, lower latency, higher connectivity density and higher reliability, but its overall impact is expected to go much further.

The new radio network is expected to be an enabler of digital innovation and pave the way for many connectivity challenges that companies are facing today. Think about Internet of Things (IoT), Artificial Intelligence (AI) and Machine Learning (ML), which face limitations with the current network solutions and where 5G will provide a gateway to reach the full potential of those innovations. It is therefore crucial that companies start to rethink their digital transformation strategy today by assessing how 5G can function as an enabler to transform their business and to maintain competitive relevance for tomorrow.

5G as a European priority

The European Union predicts that 5G will be one of the critical building blocks of our digital economy and society¹ and put it therefore on top of their agenda.

Countries such as Germany, Luxembourg, France, UK and the Netherlands have already developed a clear strategic vision and started to implement a national plan in line with the European Commission's recommendations. Several 5G pilots have already been initiated and are currently being tested across Europe.

Belgium, on the contrary, is lagging behind, as there is no date scheduled yet for the frequency auction. According to the worldwide 5G study from the Capgemini Research Institute, 75% of industrial companies expect 5G to be a key enabler of their digital transformation within the next five years.

Report objective

The aim of this report is dual. Firstly, we want to guide companies in identifying where the 5G benefits lie and how it can impact their business. Secondly, we want to present a comprehensive overview of what is happening in Belgium and specific action points to get out of the 5G impasse.

In our study we take a deep dive into the following :







1. Awareness and knowledge of Belgian companies of 5G.
2. The level of engagement of companies in the identification, the piloting and the industrialization of use cases across different industries.
3. Assessment of obstacles to deliver the 5G promise in Belgium.
4. Recommendations to keep Belgium as a digital front runner and to gain competitiveness on an international level.

1. Source: <https://ec.europa.eu/digital-single-market/en/towards-5g>










“The business model of the VRT will change substantially but not because of 5G. 5G will be an enabler to change the current business model.” - VRT

5G and Wifi 6.0 open a new world of opportunities

5G brings numerous improvements compared to 4G, beyond just speed, that will position it strongly to host a wide range of potential new use cases as it evolves on all elements that matter.

 Latency	10 ms
 Data Traffic	7,2 Exabytes / Month
 Peak Data Rates	1 GB / S
 Available Spectrum	3 Ghz
 Connection Density	100 Thousand Connections / Km2
 Moving Speed	<300 km/h








 Energy Savings	
 QoS	
 Private Network / Network Slicing	
 Latency	<1 ms
 Data Traffic	50 Exabytes / Month
 Peak Data Rates	20 GB / S
 Available Spectrum	30 Ghz
 Connection Density	1 Million Connections / Km2
 Moving Speed	>300 km/h

Together with 5G, also a new Wi-Fi technology, Wi-Fi 6.0, is entering the connectivity market. Like 5G, Wi-Fi 6.0 promises to bring a lot of improvements on the current Wi-Fi connectivity by dealing with problems such as security, capacity overloads and being difficult to integrate with cellular networks. Both new standards will co-exist in the future and depending on the needs of the customer will one technology be chosen. At this moment Wi-Fi is having advantages in comparison with the cellular connectivity, but as 5G will evolve over the next years, 5G has the potential to take the lead

in most of the parameters. As it looks now, the main differentiator, on which Wi-Fi 6.0 cannot deliver, is latency and QoS. 5G will be the preferred connectivity solution for the mission critical applications that need a very short response time and a guaranteed quality, also on floor operations where until now Wi-Fi is the dominant technology².



 Peak Data Rates	20 GB/s	- 4,8 GB/s
 User Experience Rate	100 MB/s	300 MB/s
 Mobility	500 km/h	N/A
 Latency	1 ms	< 10 ms
 Connection Density	1 mio/km ²	Undefined depending on BW/device

2. Global Data and Ericsson : "5G and Wi-Fi 6: Choosing the right technology for the job" - May 2019

2. 5G initiates a connectivity revolution for enterprises

5G introduces a versatile, adaptive and programmable connectivity engine, while offering a wide variety of connectivity features. With these 5G features, new use cases and business models can be enabled. These features are supported by two key components :

1. A new architecture, which is more open to third parties (partners, developers, service providers) via APIs, and which offers :
 - More distributed intelligence capabilities at the edge of the network
 - A mutualized core network across radio channels (e.g. 5G, LTE, NB-IoT, WIFI, etc.)
 - A highly flexible and adaptative software-driven network
2. A new radio, which materialises into highly improved features across three dimensions :
 - Enhanced Mobile Broadband : With its ultra-fast broadband speeds and its enhanced capacity, use cases which require high, fast data traffic can be leveraged.
 - Ultra-High Reliability and Low Latency : With latency being merely single-digit milliseconds, a possibility opens up for use cases requiring immediate response times.
 - Massive Connection Density : High connection density allows for more connected devices in the same area, making IoT related use cases far more scalable.

Although each individual feature holds great value in itself, the true potential of 5G resides in combining these features – even unlocking entirely new business models.

“5G can revolutionize broadcasting by shifting traditional on-site production to remote production thanks to high bandwidth that can deal with the heavy video data and lower latency for higher reactivity, in particular to cover secondary events that are not hosted in locations already covered by fiber. I.e. VTT championship, hosted in the countryside, smaller stadium or sports hall” - EVS Broadcast Equipment

5G is expected to become **the connectivity standard that combines the digital-, cloud- and fiber environment**. It drives the development at scale of technologies, such as real-time image processing, AR/VR, edge analytics and advanced automation, which has a decisive impact on society and all industry verticals. An international study³ conducted in 13 countries concluded that major companies identify 5G, along with cloud computing and artificial intelligence, as the top 3 technological enablers of their digital transformation.

5G is key enabler for digital transformation



Use cases for applications based on 5G have been identified in industrial verticals such as healthcare, finance, energy & utilities, manufacturing, public safety, logistics, media & entertainment and automotive, bringing more efficient and secure operations, better customer experience, new services and related revenue streams.

Notwithstanding the delayed deployment of 5G, Belgium is not different from any other country. During discussions with different companies in the framework of this report, we identified several early adopters of 5G. These are active in :

- development of 5G technology
- development of products and services based on 5G
- leveraging 5G in their connectivity strategy

3. Across industries the awareness is high but knowledge lacks

The general awareness on 5G in Belgium is high. Overall, 75% of Belgian companies replied that they are aware of 5G as a new mobile technology and that it will bring several new features.

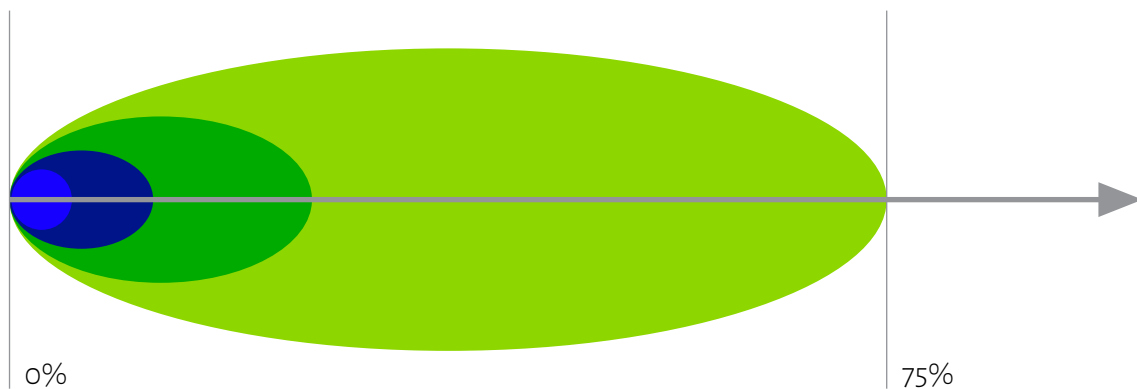
The level of awareness however fluctuates considerably depending on size, age and location of the companies. All large companies have heard about 5G. However, SMEs with a workforce between 50 and 100 employees and aging between 1 and 3 years, have a level of awareness on 5G, below 60%.

Awareness is only the first small step, knowledge and in-depth understanding of the features will unlock the currently hidden potential of 5G. Most of the respondents perceive 5G as an evolution of 4G, bringing only

improvements in terms of connectivity speed, they are not yet aware of the full potential which 5G can bring, including related opportunities which could become a game changer in their business segment.

Only 13% of all respondents were able to identify and explain all key features of 5G. A higher download speed was the (obvious) well-known feature of 5G. Other features, such as higher upload speed, connection density, lower latency, quality assurance and the possibility for private networks, were not always recognized.

In this context, we see a clear distinction between being aware or discussing high-level potential benefits of 5G and the willingness to effectively start to investigate in detail or prepare a 5G implementation.



Action > Engagement > Knowledge > Awareness

Awareness :

Being aware that the 5G, as new mobile technology, exists and will become available over the next years

Knowledge :

Knowing the main new features 5G will bring and the understand the impact of those

Engagement :

Pro-actively discussing and preparing 5G-implemenation in the organization

Action :

Testing or implementing

4. All industry verticals expect to benefit from 5G functionalities

Our interviews reveal that almost all companies' connectivity solutions are not meeting their expectations. Currently, companies mix fixed and wireless solutions to try to obtain the best possible result, compromising on the optimal benefits solutions could offer. In that context, the existing connectivity solutions are rated as 'acceptable' to serve the most critical needs.

The most identified connectivity problems are :

- **Outdoor coverage:** With a territorial coverage fluctuating between 95,75% and 99,99%⁴, Belgium has one of the best mobile coverage rates in the world. However, 100% is not achieved, impacting service companies with employees all over the country, as they need connectivity anywhere anytime to support their activities.
- **Indoor coverage:** Multiple interviewees complained about their indoor coverage, as such indicating the clear need for a seamless connectivity solution covering both in- and outdoor activities.
- **Reliability:** Combining reliability and mobility is a huge challenge. Mission critical operations via wireless network is currently not realistic due to the absence of QoS, high latency, gaps in coverage, intermittent interferences and low data transmission capabilities. In addition, there were also complaints about the reliability of mobile devices supporting the different technologies.
- **Wi-Fi limitations:** Most respondents have already implemented Wi-Fi as the main wireless solution on the work floor even with its limitation such as lack of robustness, interferences, not versatile enough for floor refurbishments and costly to roll-out. Mission critical applications can, at this moment, not be supported through a Wi-Fi-network.
- **Wired network limitations:** The different technologies over the wired network are very well placed for the mission critical applications and ensure a high degree of reliability. In most of the production facilities, machine controls are handled by the fixed network although wiring the shop floor is time-consuming, expensive and heavily reduces the flexibility.

Enterprises expect 5G to lift boundaries on connectivity.

55% of the respondents experiencing connectivity problems believe that 5G can improve their connectivity strategy as the combination of the different 5G features will enable mobile connectivity for critical applications, improve cost efficiency and increase flexibility and reliability.

Companies see multiple benefits for their business.

54% of the respondents indicated that they expect improved operational efficiency on the shop floor. More than a third of the companies highlighted the need to invest in 5G to improve their customer experience, have more secured operations or create new revenue streams.

Apart from optimized efficiency of floor operations and improved customer experience, all other identified benefits scored on average 15% lower than the international benchmark. Based on our analysis we see that detailed knowledge of 5G has a positive correlation with the overall appreciation of 5G and with the identification of potential opportunities.

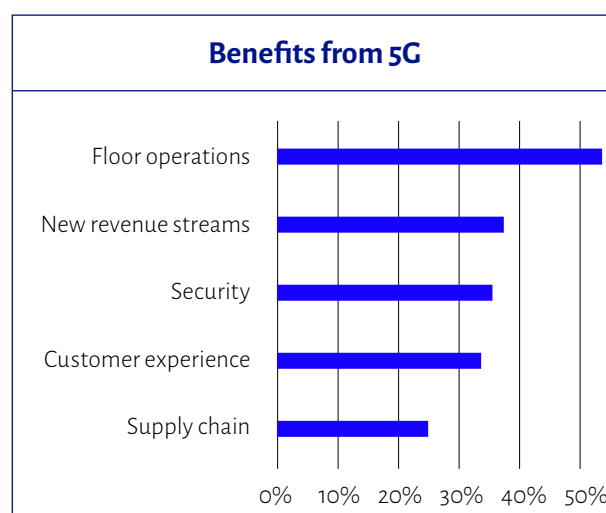


Figure 1 : Benefits from 5G (n=122)

More than 50% of the companies expect 5G to increase efficiency of floor operations.

Improving floor operations is ranked high on the list of 5G-expectations in every segment. For both SMEs and large companies, service- and product-oriented companies, national and international companies, more than 50% expect 5G to increase efficiency on the shop floor. The identified opportunities vary from very specific, complex applications to more general applications as well as from cases optimizing equipment functioning to use cases focusing on cost-savings.

SMEs and production companies with strong 5G-knowledge see opportunities to create new revenue streams.

35% of the surveyed companies expect to generate or improve their revenue streams thanks to 5G. Interviewees understand that 5G can enable them to develop new products, new business models or even help them to reduce time-to-market with entirely new go-to-market strategies.

Mainly smaller companies expect 5G to establish new revenue stream opportunities. Additionally, product-oriented companies see on average more revenue potential in 5G than service-oriented companies.

To fully understand the potential of 5G, an in-depth knowledge of all capabilities is necessary. Not surprisingly, companies that have very good to excellent knowledge of 5G are the ones with the highest expectations regarding revenue generation.

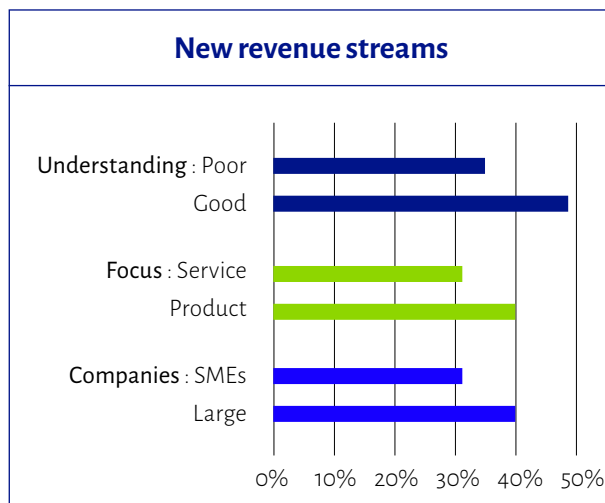


Figure 2 : Organizations that see opportunities to create new revenue streams with 5G (n=122)

Better customer experience will reinforce service-oriented companies.

Where most other benefits are materializing in a contained environment and have low visibility to the general public, customer experience can bridge the gap between business and consumer. From that perspective, service-oriented companies have the potential to deliver valuable use cases.

“Current Belgian 4G networks are among the best in Europe, but even so connection everywhere remains a challenge” - CNH Industrial

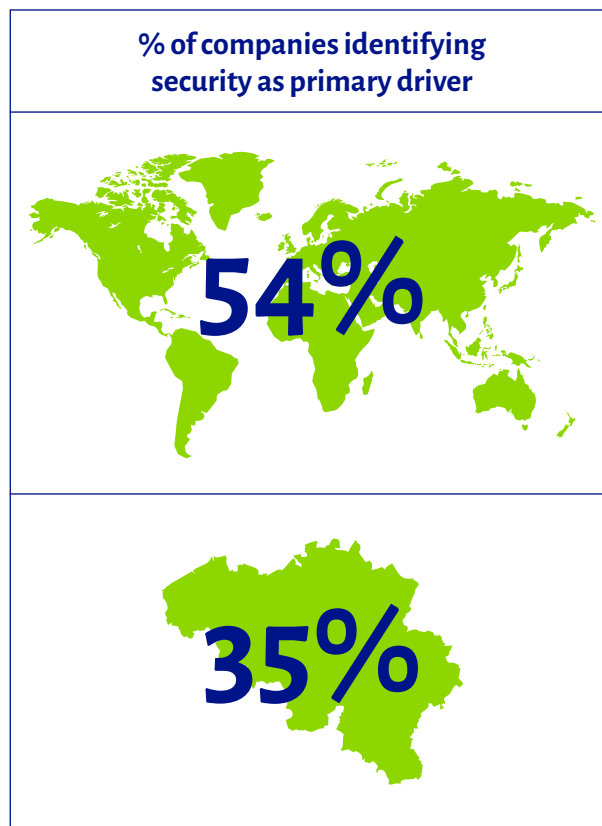
“The 4G coverage is currently not everywhere good enough in the Port” – Port of Antwerp

“It’s important that we have reliable connectivity in the ships that arrive in the harbor to establish smoother operations. Currently this is not achieved with 4G, hopefully it will be with 5G.” - ICO

“The basic application is a better alternative for Wi-Fi, so operations will definitely be impacted. For us, the impact will primarily be local, on the site itself where our core business is.” - ArcelorMittal Belgium

The benefit of secured operations needs to be better explained towards companies.

35% of the Belgian companies, 20% less than on the international level, see security as an important benefit. However, it is only ranked third of all perceived benefits. Several companies have indicated that security of 5G is a concern for them as the reliability of equipment providers has been questioned rather frequently by the media. In addition, as companies see the trend to move all data to the cloud, companies indicate that they are struggling with the idea of losing control over their data storage and having their data transported over the public network. Nevertheless, 5G features can contribute to more secure operations.



5G brings more security

5G is a more secure technology than previous generations due to an end-to-end unified authentication framework and IoT protocol. In addition, changes in the 5G network architecture will induce fundamental security enhancement.

- The service-based architecture (SBA) brings a more granular approach to security across core functions
- The 5G base station can be separated in a central – and a distributed unit. Hereby sensitive and less sensitive network functions can be managed at the most appropriate network level.
- Network slicing enables operators to isolate groups of network functions and enables to mitigate the possibility of network-wide breaches.
- Leading network operators and equipment vendors have developed the network equipment security

assurance scheme (NESAS), including security assurance specifications and auditing practices to enhance knowledge-sharing and certify vendors that meet stringent security requirements.

However, enhanced security for enterprises does not go without new security standards and responsibilities for network providers. The technological changes introduced by 5G create new cyber-security challenges and increase the exposure and liabilities for mobile operators as well as their dependencies on suppliers. As highlighted in a recent EU coordinated risk assessment of 5G networks security, this new security paradigm create the necessity to reassess the current policy and security framework applicable to the sector and its ecosystem. New measures are required by both public authorities and by operators, manufacturers and industry players to ensure 5G network security and resilience⁵.

5. Source : https://europa.eu/rapid/press-release_IP-19-6049_en.htm

During interviews identified use cases



PREDICTIVE MAINTENANCE

With predictive maintenance, companies can both prevent issues as well as pro-actively engage customers regarding required maintenance;



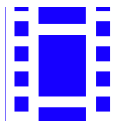
CONNECTED MACHINES

Machines with extremely fast or omnidirectional moving parts can be easily connected, while this is not feasible with a wire connection.



CAMERA SURVEILLANCE

Camera surveillance can be used to increase overall security (both in- and outdoor) while providing options to link certain actions to it.



ULTRA-HD CONTENT STREAMING

Streaming ultra high-definition content (e.g. in 4K) or even using VR to demonstrate products or provide additional product information.



PRODUCTION LINE AUTOMATION

Automating production lines while replacing wired networks increases flexibility on the floor and reduces costs of expensive wired networks implementations.



PRODUCTION MONITORING

Production environments can be monitored to guarantee both employees' safety as well as work space and equipment conditions.



INSTANT TRANSLATION

Having real time translations provides the opportunity to optimize or even create new interactions with or between customers and stakeholders.



AUTOMATED GUIDED EQUIPMENT

Remote controlled or AI enabled motion or vehicles, robots, drones,... With low latency and high reliability equipment can become "self-guiding".



PRIVATE NETWORKS & NETWORKS SLICING

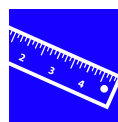
To enhance overall operational security, increase flexibility and safeguard a custom Qo5 private networks can be used to isolate entire groups or specific functions.

Network slicing (i.e. creating a private network) will probably be the most common type of private network.



VIDEO CONFERENCE

With 5G the current video conferencing capabilities can be enhanced, improving both efficiency and overall customer experience.



QUALITY MEASUREMENTS

Measurements to secure and optimize production quality to which specific (often mission critical) actions can be linked due to low latency and high reliability.

5. Companies are prepared to pay a premium for critical 5G-features

Enterprises will pay for features that bring value

In general, respondents are quite hesitant regarding the price tag related to 5G. Companies currently lack a clear view of (1) the recurring price model that will be defined by mobile operators, as well as (2) the set-up and implementation cost to install on-premise network equipment, (3) commercial model for guaranteed Quality of Service (QoS) and network slicing. Also, the availability of 5G-compatible devices and the integration cost with legacy network and IT remain unclear. Any investment or step towards 5G implementation requires thorough analysis in the light of business impact and possible Return on Investment (ROI).

In this context, interviewees indicated that they would be willing to pay more for specific 5G-features if added value is proven.

80% of the respondents are interested to pay more for each 5G feature. Among those, between 27% and 38%, depending on the feature, is ready to pay a premium fee of more than 10%.

Respondents unanimously indicate however that this is not the case for the data volumes as these are perceived as too expensive today. For some companies, the expectation of higher data volumes in the future has to go together with a price decrease.

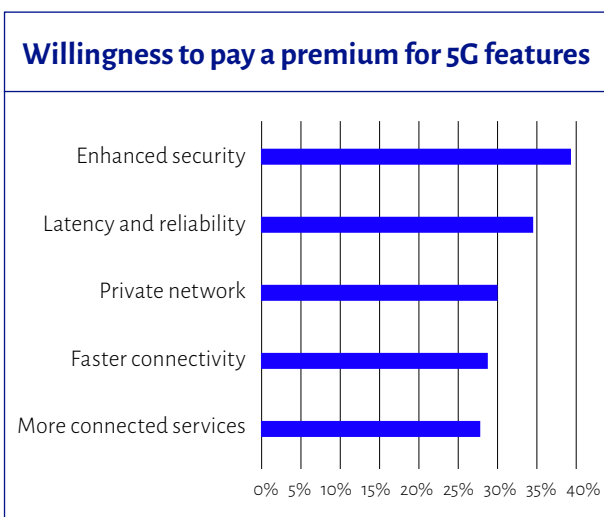


Figure 3 : Willingness to pay a premium for 5G features

Enhanced security is high on the list

All companies are willing to pay a premium fee for enhanced security. Although also ranked high at SMEs, the interest in security is the highest in large companies not only in % of respondents but they also indicated a higher degree of premium they are ready to invest in it. Lower latency is the second most important feature that large companies are clearly expecting a lot from. SMEs on the other hand see more potential in the higher speed that comes with 5G.

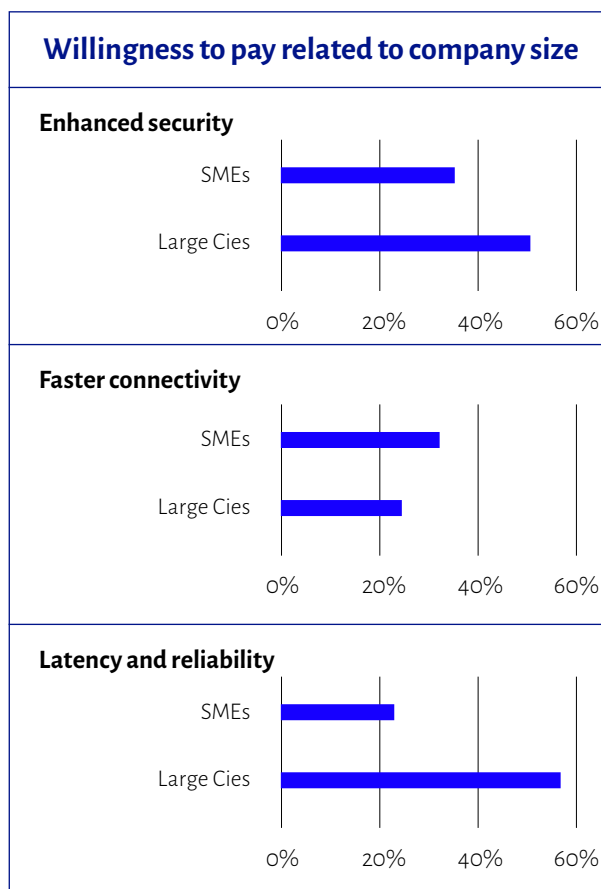


Figure 4 : Willingness to pay related to company size

“The biggest barrier is that the cost is recurring – you need to pay on a yearly basis. Today for our Wi-Fi we made one single set-up cost and there is no recurring cost”. - Tenneco Automotive Europe

6. Mobile private networks are perceived as key for the industrial segment

In line with the results of our global study, 30% of companies, across all company sizes, indicate that they are interested in a local private network and are willing to pay a premium to experience tailor-made solutions. The main reasons to choose a private network are :

- Shaping the 5G-service to their **own needs**, maximizing the 5G benefits which are needed for their business purposes.
- **Independence** from telco operators, while obtaining a tailor-made solution which is needed within a certain timeframe.
- Data **security** and the ability to keep data on their private company network and so avoid that data passes via a public network.
- **Quality** insurance by ensuring continuous coverage on premises. As companies with large plants experience coverage issues and/or variations in quality, they consider the private network as an interesting solution.

Most of the respondents that are interested in a private network do not show the ambition to host their own network as they do not consider this as part of their core business activities. They are, however, looking for the benefits of a private network. These companies are ready to outsource this activity to third parties, especially when this would be offered 'as-a-service' – migrating the CAPEX costs into OPEX costs.

SMEs also expressed the same level of interest in the benefits of a private network. This could be an indication that SMEs are not always happy with the services they have today. A lot of them have the same needs and requirements as large enterprises but are not served in the same way by the telco operators. In a lot of cases they receive a copy-paste offer from the retail market.

Do telcos sufficiently address the needs of their business customers ?


The Mobile Network Operators (MNOs) have mixed feelings regarding this desire for private networks. For their business customers, telco operators will primarily focus on network slicing to offer a private network. The question remains, however, what needs to be done by the telco operators to serve the different industries and sizes of companies with customized solutions. This customization is the key for success in the business segment, as we detected most of the respondents choose for a private network to move away from their mobile provider towards more independency whilst obtaining the customized service level they are looking for.














“If you take a public provider for 5G, we wouldn't be at ease knowing all our data would be gathered on a public network. A private network could be a solution for this, but the total cost needs to be investigated.”- Tenneco Automotive Europe

“A reliable network is essential to deliver qualitative products. When Tomorrowland takes place, we can't allow that the production processes will be impacted due to the network overload.” – Atlas Copco Airpower

“The operators need to take a wider role than today in order to stay relevant. Not just be the sole network provider but the one stop shopping place for all telecom services. The industries currently don't see this today and they are disappointed by the service model as they don't feel truly supported by them.” – Port of Antwerp

Mobile private networks



	1 Public	2 Public Network with Private APN	3 Public Network with Network Slicing	4 Public Network through Telco RAN sharing	5 Hybrid	6 Private
Mobility outside of campus	Nationwide 				Nationwide roaming 	 ❌
Antennas ownership	Telco ownership 				Private (Except roaming) 	Private 
Spectrum ownership	Telco ownership 				Dedicated or unlicensed spectrum (Bought, leased from telco) excl. roaming 	Dedicated or unlicensed spectrum (Bought, leased from telco, etc.) 
Core network ownership	Telco ownership 			Telco ownership 		
(e)SIM & customer data ownership	Telco SIM & customer data ownership 			SIM & customer data owned by industrial 		
Applications	Public	Private	Specifically available public apps or private	Private		
Security & Application data privacy	—	+	+	++	+++	++++
QoS	Best effort*	Best effort*	Guaranteed QoS (Depending on Telco coverage*)	Best effort*	Custom QoS	Custom QoS

*Coverage can be improved (through specific DAS deployments)



Private Networks on the rise

Our study shows that companies are interested in mobile private networks. Although still quite scarce, some companies have already started designing their private network solutions (e.g. Volkswagen in Germany⁵) and equipment providers are heavily mobilising around mobile private networks. However, in order to make an educated decision if one would benefit from a mobile private network, one must first understand what it entails. So, what exactly is a mobile private network?

Types of Private Networks

There are different types of “private network” – ranging from fully owned, stand-alone private to simply having a private APN on a public network.

As depicted above, there are five main types of “private network” with each their own benefits and costs linked to them. The more private a network is, the more secure and customisable it becomes. It provides a more flexible setup, with a custom QoS conform your needs. However, the downside to such a setup is a higher investment cost to tailor the network to your needs as well as to maintain

it. Non-dedicated private networks, on the other hand, are managed by telco operators – reducing the initial investment cost, but at the same time often increasing operational cost due to its “service” nature.

Network slicing (as depicted in #3 above) will probably become the most common type of private network with 5G, as several telco operators already indicated they will be pushing this in the B2B market. With network slicing a “network within a network” is created, meaning that a local network can be segregated (or “sliced”) within the public network, while still guaranteeing an agreed upon QoS, higher security and a dedicated service.

What Mobile Private Network to choose ?

This is, of course, highly dependant on the use case(s) and context and requires a detailed cost-benefit analysis. The key criteria to consider are :

- Business criticality (i.e. security and QoS)
- Need for customisation, applications and data
- Required coverage
- CAPEX versus OPEX

5. Source : Enterprise IoT Insights - Volkswagen to build private 5G networks from 2020; invites tenders from kit vendors (April 12, 2019).

7. Delivering the expected benefits will not happen overnight

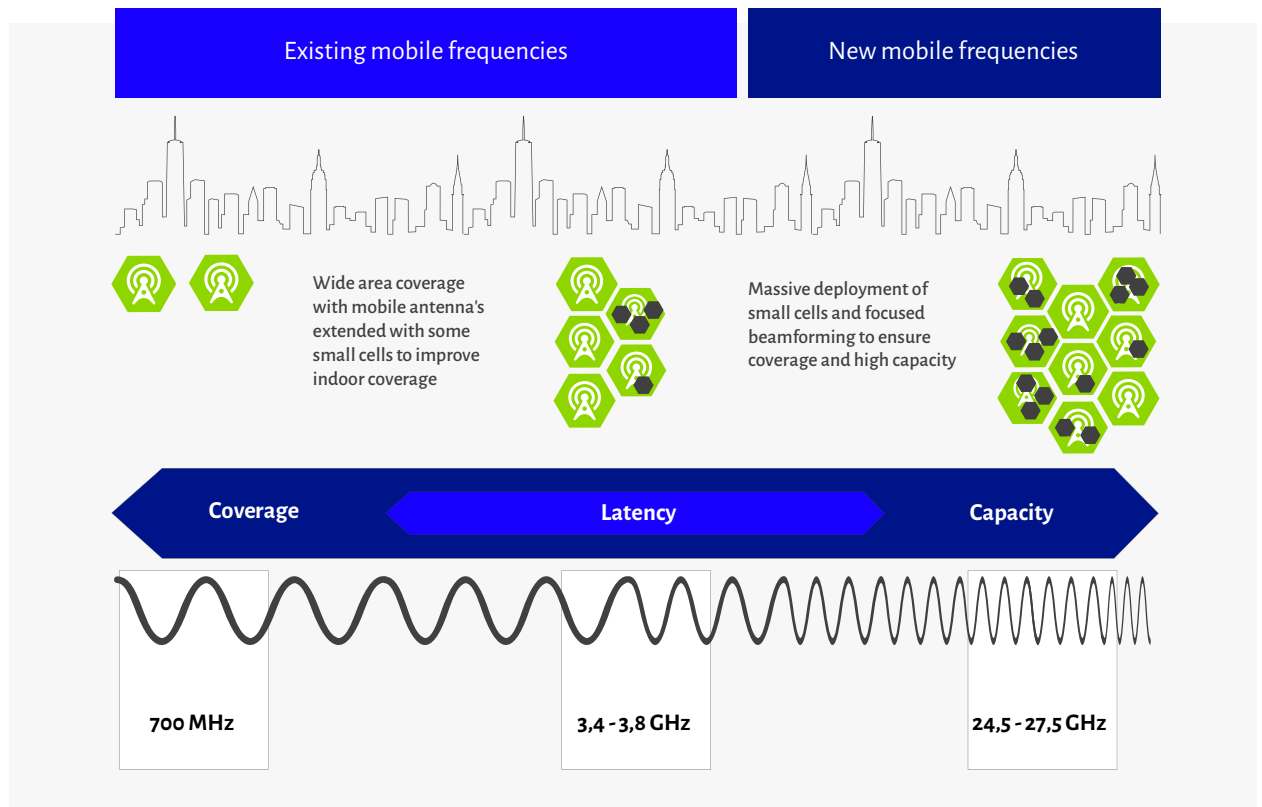
Belgian operators are emphasizing that the 5G roll-out will not be a revolution from one day to the other, but a progressive evolution by gradually upgrading networks, coverage and the different features.

The low-and mid-band spectrums (700mhz and 3,5Ghz) will bring an important change in terms of speed and connection density. Just like operators worldwide, Belgian operators will first roll-out 5G on these bands.

The millimeter wave spectrum (27-28Ghz), on the other hand, will drastically improve speed, latency and reliability. The use of this spectrum will only follow later on in the 5G roll-out.

In addition to the roll-out of their radio network, operators also must implement a stand-alone 5G core network to fully exploit all 5G benefits, such as high QoS and network slicing. Telco operators worldwide indicate that implementation of such a core network will take more than five years.

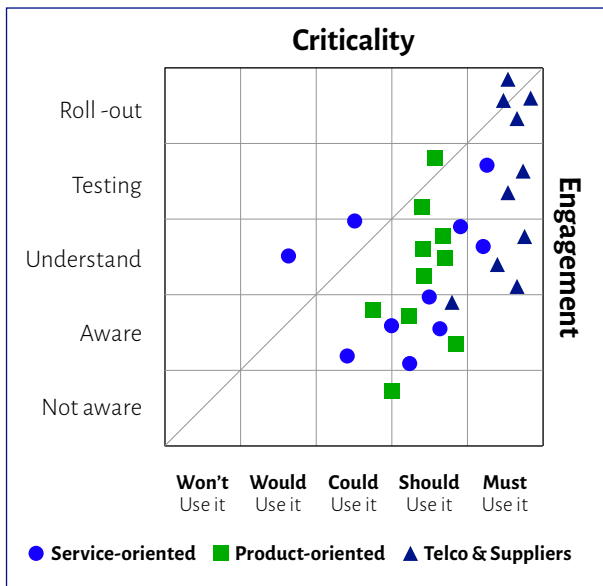
As a result, a lot of companies will have to wait longer than expected to gain full access to the potential benefits of 5G.



8. 5G engagement is driven by multiple factors

By mapping the interviewed companies on 2 axes, we have developed a 5G-engagement matrix :

- Level of industry criticality : indicating the future necessity and impact on the business based on the industrial vertical they belong to, market they are active in and position of the competition.
- Level of engagement: indicating the mindset and actions the enterprise is undertaking on 5G.



The more critical 5G is for an enterprise, the earlier it should start preparing or testing 5G and its applications to evolve on the learning curve. The 5G-engagement matrix is illustrating a Belgian landscape where, with some exceptions, enterprises are not sufficiently engaged in comparison with the critical impact 5G will have on their industry and individual business. Currently, most of the large enterprises are not giving 5G the attention it should have as they do not see the sense of urgency to start working on 5G.

Belgian based international companies are well engaged with 5G

Only a minority of them are not looking at 5G yet. Either they seize already commercial opportunities in other countries, or they leverage lessons learnt from other countries for future deployment in Belgium.

The majority (65%) of local only companies including SMEs does not yet understand the practical impact that 5G can have on their way of doing business.

The level of company engagement differs by region

The level of engagement (companies with a 5G roadmap and/ or ongoing pilots) remains overall low in Belgium. Of all 5G engaged organizations most are located in Flanders.

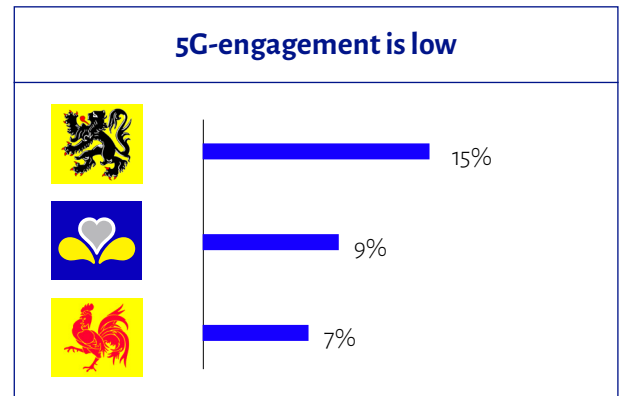


Figure 5 : 5G engagement per region (n=468)

Large companies are scoring relatively better than SMEs

We see a clear relation between the size of the company and the level of engagement regarding 5G. The larger the company the more they are already working on 5G related topics. Only 12% of the SMEs assume that 5G would have an impact on their digital roadmap.

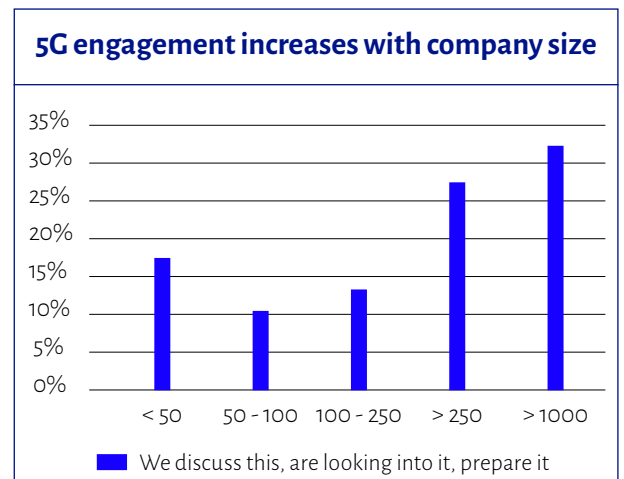


Figure 6 : 5G engagement related to company size (n=468)

Large companies show the highest engagement. They are the only group that have to some extent already use cases identified and examine how to test these.

In addition, companies with less than 50 employees show a high level of engagement. These small companies are often

“digital native”. With their small scale comes greater agility, enabling them to act faster on the newest technologies and target specific niche segments which focus on technology. Once companies start growing, their focus shifts towards optimizing their daily operations, leaving less room for innovative technologies.

The more digital the more 5G engaged

In general, we noticed that respondents with a high level of digital maturity demonstrated a higher appetite of 5G-engagement and expressed higher criticality. The lack of 5G-engagement risks further widening of the current digital gap which is already present today at companies without a digital focus.

A company's stance towards 5G is, apart from digital maturity, influenced by a mix of different factors such as the level of connectivity challenges a company is facing, the competitiveness of the market, eagerness to adopt new technologies, the management's risk-averseness and the number of identified use cases.

In this context we need to highlight that several enterprises still have a long way to go as we identified several use cases, put forward by the interviewees, that with the actual available technology are at this moment perfectly possible.

No difference between product- and service-oriented companies

We see the same level of appetite for 5G within organizations that are more product oriented and those that are more service oriented.

But their expectations on timing and availability are different. Product-oriented companies risk being disappointed in the timing of 5G roll-out.

- Service-oriented companies show, despite being interested, more reluctance to start quickly. Focusing on an improved customer experience, these companies show concerns around public acceptance of 5G (technology, health, ...) and future network coverage, as they realize that a country-wide coverage of 5G will take several years. Additionally, they have a more local focus which implicates that the timing of 5G roll-out is less present for them as international competition is less present.
- Production companies, mainly focusing on 5G coverage of their premises, indicated that they want to test and – if positive – start implementing 5G as soon as possible to achieve operational efficiency improvements and its financial benefits.

However, it is unlikely that the 5G features they are looking for – low latency and high reliability – will be available during the first few years of roll-out. In most cases these companies experience a high criticality for 5G as they are confronted with competition located abroad (where 5G and its features will become available faster), a delay creates a competitive disadvantage which is quite disconcerting.

“A lot of companies currently can't point the finger where they can use 5G. Once there is substantial 5G awareness then they will start seeing the possibilities but also the challenges.” - Fluvius

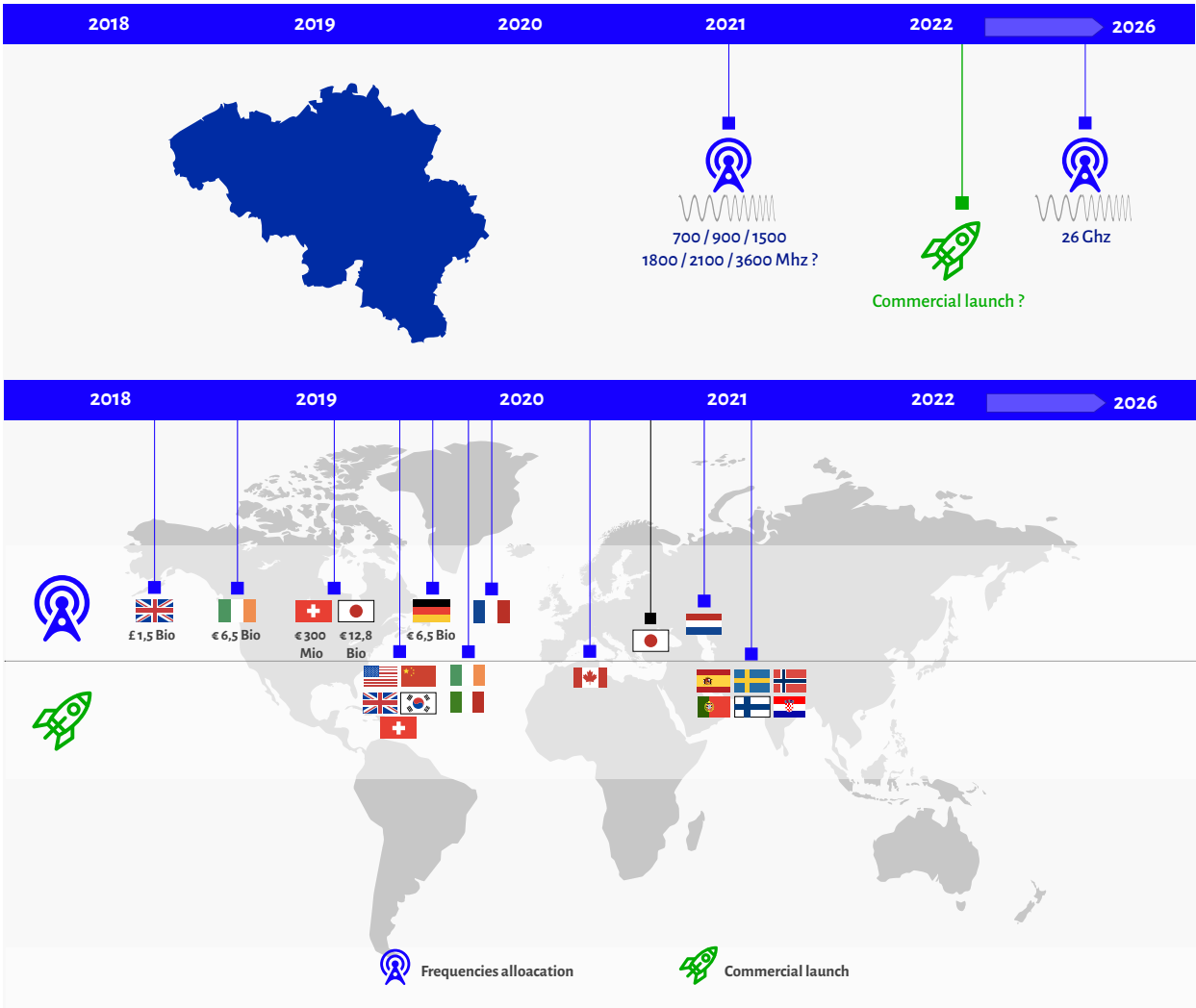
9. Yet 5G will not be available in Belgium any time soon

The European Union has highlighted 5G as a priority. To ensure early deployment of 5G infrastructure in Europe, the Commission adopted in 2016 a 5G Action Plan for Europe with the objective to start launching 5G services in all EU Member States by the end of 2020 at the latest (with one city 5G ready per country), followed by a rapid build-up to ensure uninterrupted 5G coverage in urban areas and along main transport paths by 2025.

The European Union is also aware that publicity and demonstration of 5G-capabilities by public authorities will be necessary to drive the adaptation and developments of new activities around 5G. Therefore, just like Japan has put forward the Olympic games in 2020, Europe selected the UEFA EURO 2020 football championships to demonstrate 5G.

So far, 5G auctions have been held in 10 European countries and 5G has been commercially launched in – amongst others – South-Korea, Switzerland, UK and the USA. In many other countries 5G will be launched during 2020.

In Belgium we still need to get a clear view on when the 5G auction will take place. We expect that an auction can be held by the end of 2020 at the earliest. A potential 5G commercial launch in Belgium is shifted in this way towards 2022. This implicates that Belgium, in the center of Europe in all aspects, will not be able to respect the EU objective to have at least in one city 5G available before the end of 2020. The Belgian government can count itself 'lucky' that Brussels was not chosen as one of the 12 European cities for the European football championship, as Belgium probably would have been the only country not being able to join the 5G promotion activities around this event.



Multiple roadblocks to overcome towards a 5G roll-out in Belgium

The Belgian 5G eco-system is confronted with uncertainty and unaddressed concerns on different topics. All surveyed parties are at this moment finger pointing at Belgian politics as the root cause for these delays and concerns.

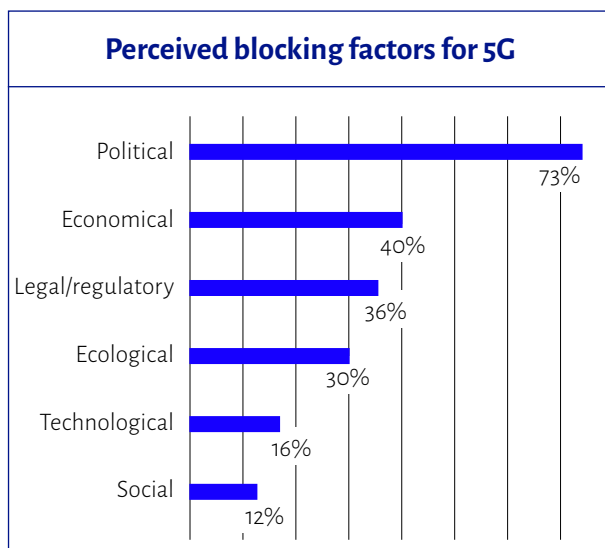


Figure 7 : Perceived blocking factors for 5G (N=87)

- **Political** : Most interviewees remember lively political bickering about whether a 4th operator should enter the market and how the auction revenues should be divided between the federal state and the communities. This has led to a delay of the auction and can be considered the root cause of most (if not all) uncertainty regarding the timing and feasibility of 5G roll-out in Belgium.
- **Economic** : Before companies decide to implement 5G, they need a clear view on their business plan and ROI. Therefore, they must be able to gain sufficient insights on the implicated costs and revenues related to 5G – which they do not yet have today. Even telco operators still deal with a lot of uncertainty as they don't have a clear view on what the cost of their licenses will be and what pre-requisites will be imposed on them to obtain 5G-frequencies.
- **Legal/regulatory** : Some of the most prominent legal topics are whether a 4th mobile operator will enter the market and if specific bandwidth will be foreseen for private networks and business users. Additionally, legal discussions such as data protection and the trustworthiness of Chinese equipment are also a concern for several interviewees.
- **Ecological** : There are growing concerns with regards

to sustainability and health impacts of technology. In case of 5G, this is crystallizing around the radiation standard. In Brussels, for example, the radiation norm is put at such a level that an eventual 5G roll-out is at risk or even impossible. In Flanders and Wallonia, the maximum radiation threshold is also set well below the WHO-standard, causing a 5G roll-out to be more problematic than in Belgium's neighboring countries. To enable a 5G roll-out, all regions need to find the balance between reviewing the radiation norm and technically and economically realistic network densification.

- **Technological** : Currently, there is still only a limited range of 5G compatible devices and machinery in Belgium but international roll-out is accelerating availability. In addition, several interviewees are questioning whether 5G technology will be able to live up to what is being promised today.
- **Social** : Only 12% of the companies stated that they believe that social will act as a roadblock. Although concerns on how people interact with technology, the majority believes that once the technology is available, consumer adoption will follow automatically.

“Companies will need to have more certainties regarding 5G roll-out. The political climate that creates uncertainties doesn't allow companies to start planning with regards to 5G.” - De Watergroep

“We also need to pay attention to radiation of 5G. In the past we also had a lot of enquiries concerning the usage of Wi-Fi, Bluetooth and the impact of it on the employees.” - Volvo Cars

Too much uncertainties on timing for 5G in Belgium

Consequently, all Belgian telco operators, potential new players and companies are uncertain about when the roll-out and commercialization of 5G will start. The mobile telco operators have no clear view on the timing of a spectrum auction nor on the conditions or price of the required licenses. However, potential 5G niche players and new entrants targeting the B2B-segment must also deal with regulatory uncertainty and ambiguity as they don't have any guarantee if bandwidth will be available for their services.

The combination of all these elements mean that, in contrast to our neighboring countries, the number of use cases and POCs is still very low in Belgium BIPT has foreseen spectrum for trials but initiatives to apply and use it are lacking.

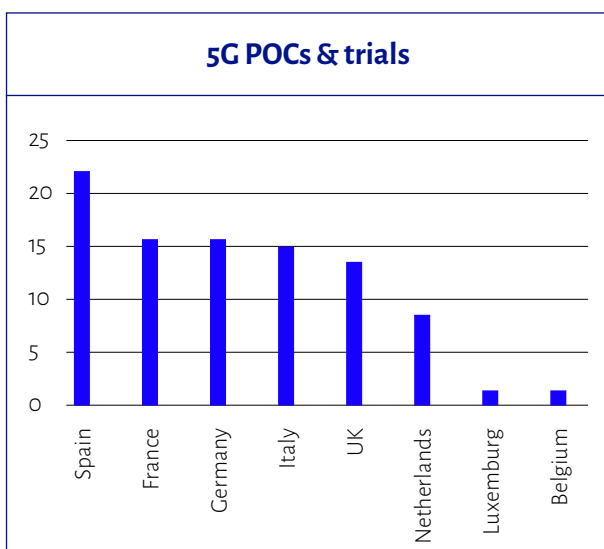


Figure 8 : 5G PoCs and trials⁶.

10. Telecom as strategic asset is at risk

A highly performant telecommunication infrastructure is an important indicator of a country's ability to attract investments and to ensure competitiveness for the industry. With an ongoing and increasing global digitalization this importance will only rise. Considering the impact that 5G will have on society and on the digital roadmap of companies, having access to a high performant 5G-network as soon as possible will be a decisive element for the evaluation of the performance of a country's telecommunication infrastructure.

All neighboring countries are implementing their own 5G plan

The European Union has decided to emphasize the importance of 5G and to put forward a clear timetable together with a selection of locations and events that have to speed up the roll-out and use of 5G. Between 2016 and now, our neighboring countries (Luxemburg, Germany, UK, France, The Netherlands⁷) have developed and are implementing a national plan in line with the European Commission's recommendation.

All of these plans are built around an active role that the government and its institutions need to take up. These countries have clearly identified the criticality that 5G has on their country's welfare and are acting accordingly.

As example, in "5G strategy for Germany" the German government defined 5 strategic pillars to make from Germany a lead market in 5G and its applications⁸:

1. Step up network roll-out
2. Make frequencies available on demand
3. Promote cooperation between telecommunications and user industries
4. Targeted and coordinated research
5. Initiate 5G in towns and cities early on

'International reputation for this sort of investments is not good for Belgium. Just to give an idea, Samsung decided to set up AI research center in Paris and London because they are the front runners in Europe.' - Samsung Electronics Belgium

No coordinated vision for 5G in Belgium

Belgium, as an export-oriented economy and being a logistic center for Europe, is not having the sense of urgency that neighboring countries demonstrate. A first step towards 5G, that all governments, federal and regional, urgently need to look into is the prerequisite to have a sufficient fiber-coverage all over the country as this is the basic backhaul infrastructure, required to unlock the full potential of 5G.

Since the elections in may 2019 and with the formation of the different regional governments, we detect for the first time a vision on 5G from the governments, being it that these visions are very high level and not complementary.

- The **Flemish government** is recognizing the benefits that 5G can bring and is putting forward a fast 5G roll-out as a priority. The government is willing to take up an active role by participating in 5G-initiatives and by pursuing the implementation of an open shared infrastructure model to ensure full 5G-coverage of the region.
- The **Brussels government** is stating that they want to roll-out 5G with respect for the precautionary principle and after an assessment on multiple aspects such as environment, health, economic viability, data protection and privacy.
- The **Walloon government** is welcoming the benefits of 5G but only after taking the necessary precautions and evaluation of the same elements as identified by the Brussels government. This analysis will be done by a group of experts.

These different points of view and approaches on 5G roll-out, need to be aligned and consolidated at national level to come to an efficient 5G-roll-out, while at the same moment, addressing the concerns around safety, security and health. To date, we do not see any political engagement nor initiative to come to a common structured vision or plan.

7. 5G strategy for Luxemburg, Actieplan digitale connectiviteit (NL), A 5G strategy for UK, 5G for Germany, 5G, une feuille de route ambitieuse pour la France (2018)

8. 5G strategy for Germany : A scheme to promote the development of Germany to become a lead market for 5G networks and its applications – German federal government

5G delay will result in disinvestment and competitive disadvantage

Our interviewees indicated that research and knowledge centers are already being installed in other countries where tests on 5G are ongoing. Belgian subsidiaries do not have the same telecom technologies at their disposal, meaning that in the long run new product lines and related investments are at risk as their foreign headquarters will prioritize more performant and experienced facilities.

Belgian production companies – being often export driven – and international oriented service companies expressed their concerns around 5G delays, as this will be an additional competitive disadvantage compared to neighboring countries. For a minority, those that effectively can shift activities, this could result in a delocalization in the long run.

Some companies are less impacted by this delay. Companies who are exclusively active in the Belgian market do not show the same sense of urgency as they have a local level playing field. Once competition would start using it, they certainly would have to follow quickly but currently they do not see the advantages of a 5G deployment. They believe that in 2 or 3 years they can implement a more mature technology with lower costs (e.g. for equipment and devices), fewer teething problems and lessons learnt on use cases from all over the world.

“Local establishments of international companies with a HQ abroad are interested in 5G, we are working on use cases and solutions for them” - Proximus

“In our line of business we are competing at the edge of newest technologies. Without having access to these technologies in Belgium we risk to get behind on international competition and to have difficulties to attract the know-how we need.” - SABCA



II. Recommendations

11. Urgent action needed by the Government(s)

5G is a valuable strategic asset for a country. The various Belgian governments, being the root cause of the 5G-delay and the uncertain climate that has consequently been established, urgently need to make 5G a priority on their agenda by having a structured debate and balanced action plan :

1. Economic value of the telco infrastructure
2. Enterprise digitalization and competitiveness
3. Health, security and other roadblocks

Apart from making the necessary frequencies available as soon as possible, the action plan must provide a clear roadmap on 5G roll-out and concrete actions to promote 5G towards industry and society. At the same time, the plan needs to foresee a structured approach to address the roadblocks and concerns from telco operators, industry and individuals (review of radiation norms, level of network densification, health, privacy, security, etc.).

As in other countries, the government has to play an active role in bringing the different actors of the 5G-ecosystem together to ensure focused research on the benefits and disadvantages and to stimulate 5G pilot projects.

12. Telcos need to become digital transformation partners

The Belgian telco operators have a crucial role to play in the acceptance and deployment of 5G. Being confronted with uncertainty themselves (timing of auction, fee of frequencies, possibility on collaboration models, radiation standards, etc.) they are currently focusing on their own interests by framing 5G as an investment decision. Although companies are not yet incentivized to prepare their businesses, this short-term strategy of telco operators will have a negative impact in the long run as the current communication will impact companies' position towards 5G.

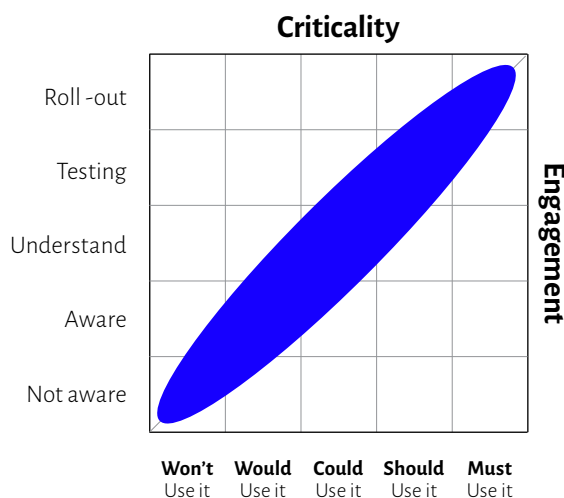
Telco operators are instrumental because they possess in-dept knowledge about telecom networks and 5G in particular. They could therefore be more proactive in informing and educating their business customers on the capabilities of 5G (including timelines of availability) and on its' impact on people, processes, IT and business products and services. This proactive role would improve companies' in-depth understanding of 5G and help incentivize business case development based on realistic connectivity strategies – while being coherent with their digital transformation roadmap.

With 5G, telco operators can lift telecommunication services out of the commodity goods category. However, whether the added value will be materialized by telco operators or by new players on the market will depend on the ability of telco operators to become digital transformation partners by (1) understanding the industry needs, (2) transforming the needs into solutions and (3) taking the lead in the implementation of solutions. As in other industries, digital transformation can significantly change the competitive landscape and completely new players may enter the market. 5G could be the new technology leading to such a disruption in the B2B Telecom industry.

13. Increase knowledge to enable enterprises to create value out of 5G

Our survey has identified that good knowledge of 5G is the main driver of 5G engagement. Governments, public and private organizations and the telco operators need to inform the industry and the different verticals as much as possible on the 5G-capabilities. Only with an in-depth knowledge will companies be able to position themselves correctly on the 5G-engagement matrix by assessing their 5G-criticality and positioning themselves on an appropriate level of 5G-engagement.

Having a correct view of their position on the 5G-engagement matrix enables enterprises to identify and prioritize use cases, to adapt their connectivity roadmap accordingly and to assess the impact on the digital transformation process.



14. Optimize conditions to activate 5G-ecosystems to prove value via use case pilots

Belgium does not currently have enough 5G trials. Highly visible use cases will not only increase awareness and knowledge on 5G-capabilities, they will also contribute towards the identification of valuable use cases for different industrial verticals.

To exploit 5G's full potential, all actors in the ecosystem (government, telco operators, vendors, application providers, integrators) need to collaborate more closely. All involved parties need to be made responsible to come to a coordinated approach around identifying and deploying 5G use case pilots. The implementation of "opportunity"-zones where a temporary, lower degree of rules and obligations to set-up trials is applicable, can bring the necessary support to the actors in the eco-system to start with industry trials. This lower level of obligations should be available (amongst others) on radiation levels, building permits, licenses, etc. This approach will significantly contribute to further develop insights in use cases for the industry and in policy definitions around 5G.

Methodology and participants

Profile surveyed companies

We conducted an extensive study from June to September 2019. In total we surveyed 489 organizations of which 35 were interviewed face to face, 400 were interviewed via telephone and 54 completed an online survey.

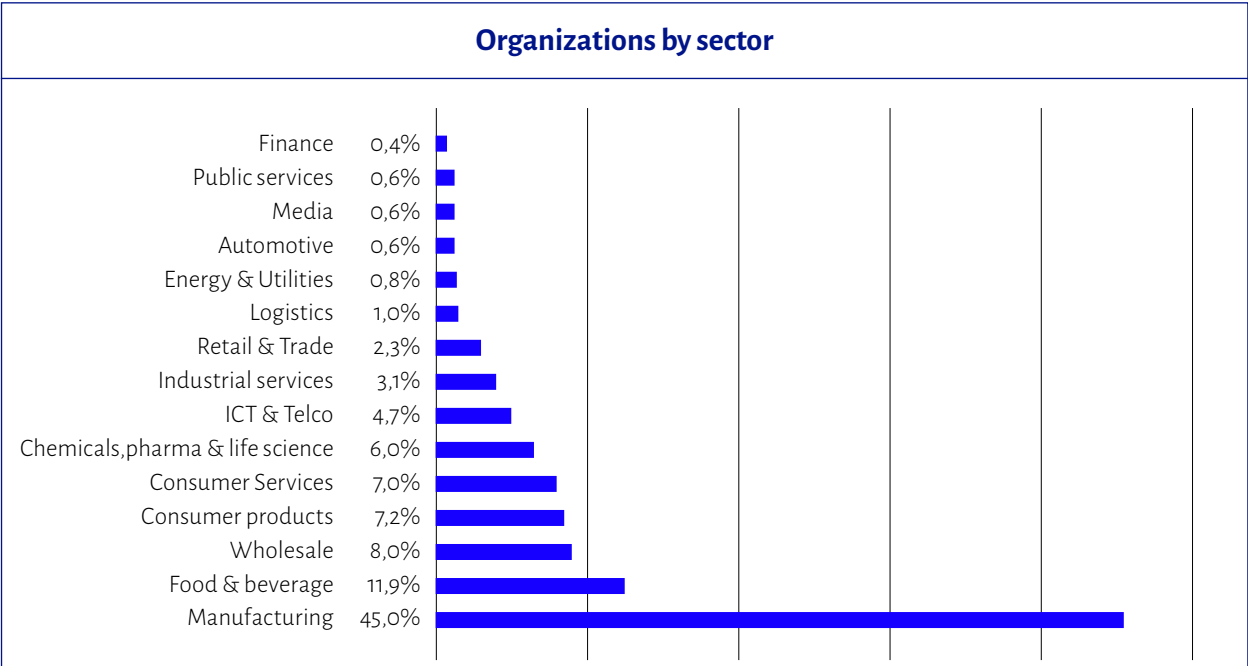


Figure 9 : Organizations by sector

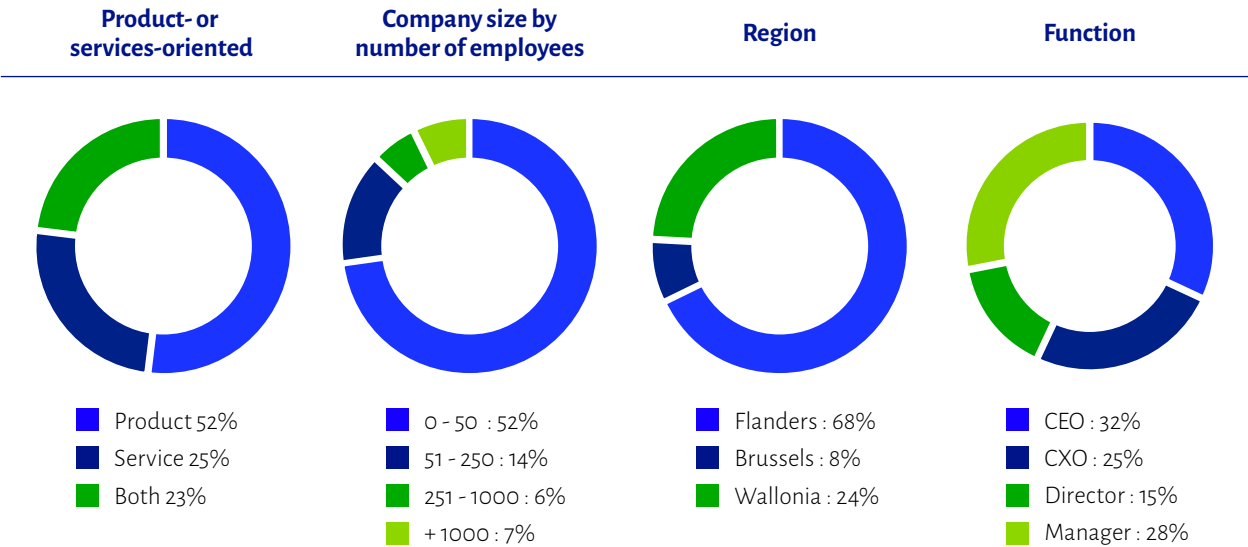


Figure 10 : Composition of the sample

List of interviewed companies

Capgemini Invent and Agoria would like to thank all companies that dedicated time for interviews and for completing the survey.

ArcelorMittal Belgium NV/SA
Atlas Copco Airpower NV/SA
Bekaert NV/SA
Bpost NV/SA
Citymesh NV/SA
CNH Industrial NV/SA
Colruyt Group
De Lijn
De Watergroep CVBA/SCRL
Dekeyzer-Ossaer NV/SA
Dematic NV/SA
DPG Media NV/SA
Ericsson NV/SA
EVS Broadcast Equipment SA/NV
Fluvius CVBA/SCRL
Haven v. Antwerpen, NV/SA
Hubo België NV/SA
Ion Beam Applications SA/NV (IBA)
International Car Operators NV/SA (ICO)
KBC NV/SA
MCS NV/SA
Nexans Benelux SA/NV
Nokia NV/SA
Orange Belgium NV/SA
Port autonome de Namur
Proximus SA/NV
Sabca NV/SA
Samsung Electronics BV/SRL
Telenet NV/SA
Tech Data BVBA/SPRL
Tenneco Automotive Europe BVBA/SPRL
Tessares SA/NV
Van Hool NV/SA
Volvo Cars NV/SA
VRT NV/SA

About the authors



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Marij Dedecker

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Hugo Landré

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Danny Goderis
Manager Digital

Danny joined Agoria two years ago. Before he was director of the former Flemish iMinds Research Centre and worked 15 years with Nokia.



Floriane de Kerchove
Business Group Leader Telecom

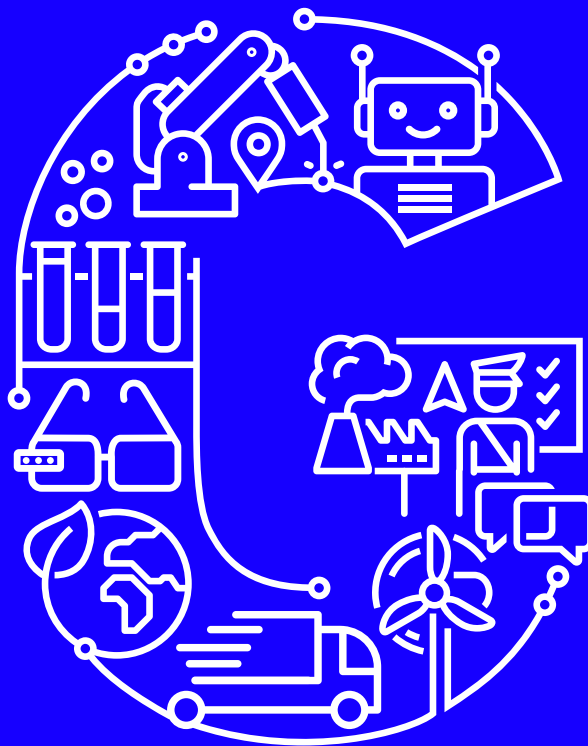
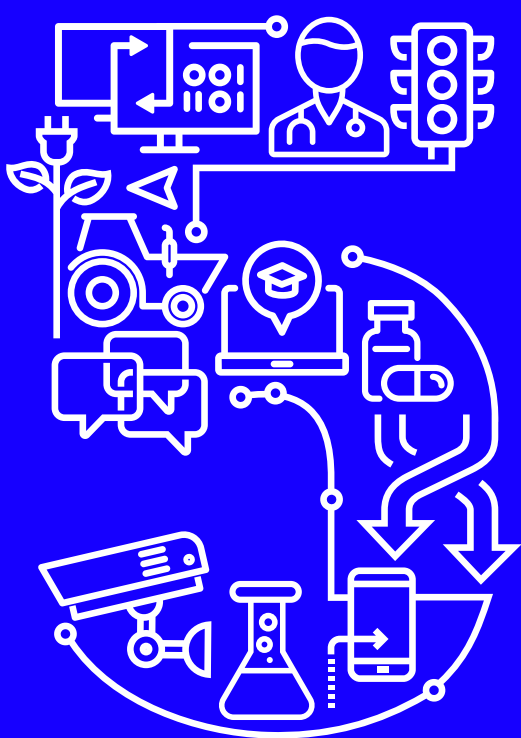
After some years in advocacy as Chief Brussels Region, Floriane has been working for more than 2 years in the Telecom sector for Agoria.



Alain Wayenberg
Business Group Leader Manufacturing

Specialised in Industrial Automation and Machine Tool business, Alain promotes and informs the members about new technology evolutions as digitalisation, industry 4.0 en Industrial IoT.

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