

5G-TOURS NEWSLETTER

The official 5G-TOURS project newsletter

5G-TOURS

5G-TOURS is 5G-PPP Project
European Commission Call H2020-ICT-2018-2020
Grant number 856950

A welcome from the 5G-TOURS business validation and exploitation team

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Dissemination leader

The 5G-TOURS interpretation of the European Vision of "5G empowering vertical industries" is explored in 5G-TOURS Deliverable 8.3.

5G-TOURS encompasses both supply side and demand side ecosystems, and thus provides an ideal environment within which to explore the dynamics. As we progress towards the final stages of the project our focus turns to the dynamics of the demand side which is fundamental to understanding the potential benefits of the innovations. Assessing potential for demand requires an understanding of the business models that underpin the opportunity; with the best fit emergent business models being different for each vertical sector and the place where the demand is to be served.

This third edition of our newsletters focuses on how we are progressing towards discovery of Business Model Archetypes of vertical industries and the 5G-TOURS commercial opportunity. We also report of significant trials activities that are engaging for the general public and potential future enterprise users of 5G Systems. Enjoy the reading!

Also, remember to visit our [website](#) and our [YouTube channel](#) for the latest videos!



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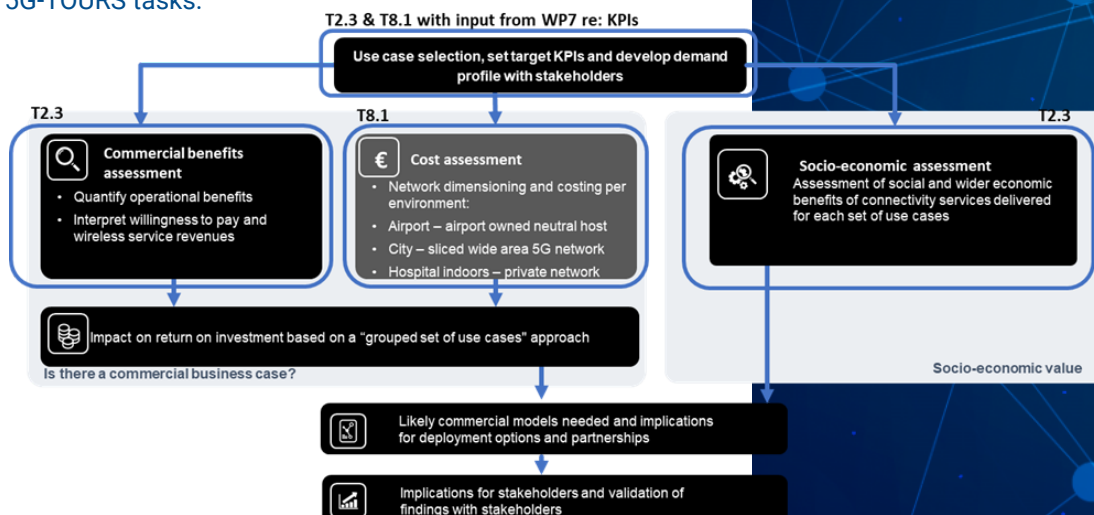
5G TOURS Techno-economic assessment approach

Finding effective Business models will help with directing the economic impact of the project, in particular the industrial sectors (market verticals) that adopt 5G as a platform for the delivery and use of products and services.

In the early stages of the project a search for potentially 5G oriented business models identified a number of templates that have been used and evolved to analyse typical innovations brought by 5G. However, none had thus far been applied to specific use cases such as those considered in 5G-TOURS. Having now considered both the state of the art in terms of the technical research of 5G-TOURS and Business Models that are relevant for 5G, year-2 was a period of stakeholder engagement in the verticals to ascertain the gap between their reality of business challenges today and the aspirations of 5G-TOURS in bringing value to them.

This activity has necessitated close co-operation with WP2 (Use case design) benefits analysts to derive and derive a validation method that is credible for verticals to help with understanding the potential of the innovations that are coming towards them through new network and device products and supporting services.

The 5G-TOURS cost benefits analysis framework has focussed analysis of the use cases, allowing for grouping of deployment scenarios and assessment scenarios to better understand those that have the potential for the greatest value creation in each market. WP2 collaborations within the framework focus the value generation potential of the use cases. The figure below illustrates where T8.1 fits in the overall techno-economic assessment being conducted by Real Wireless across the various 5G-TOURS tasks.



A key objective is to develop and validate business models for each of the markets addressed by 5G-TOURS (i.e., touristic, media and entertainment, e-Health, safety, transportation) using contributions from the other work-packages

With 5G technologies, mobile operators will offer new services allowing verticals to use new applications for their needs

Promising business cases are developed for each vertical use case to quantify their specific value. This information will be used to inform the identification and selection of appropriate business models for the deployment of 5G infrastructure in each of the operating environments (airport, city, hospital). These business models describe how organisations in each vertical can create, capture and deliver value, which is derived from 5G, in economic, social, cultural and other contexts. This can then be used by the project partners and other stakeholders to clarify their role in the vertical use case value chain; focussing their thoughts on how their innovations can drive strategies for the commercial exploitation of project results.

During this period, 5G-TOURS business analysis has enabled significant contributions in the 5G-PPP collaborative project domain supporting the formation (and holding of the vice-chair position) of the Business Validation, Models and Ecosystem (BVME) sub-group of the 5G-PPP Vision group. This group published its first paper in mid'2020 establishing consensus on the diversity of approaches taken by 5G-PPP projects and ensuring the compatibility of the 5G-TOURS approach with that BVME collective view. 5G-TOURS now has a common understanding of the approach taken across other 5G-PPP projects. We have concluded that the approach taken in 5G-TOURS aligns with the this process model and thus conclude that we are progressing using an approach that would be recognised as business validation in the 5G-PPP ecosystem.



Business validation approach for H2020 vertical use-cases
(Source)

5G-TOURS Business Analysis Framework

During this latest period 5G-TOURS partners have been developing a framework for navigating the opportunities presented by 5G, which draws on a number of business models, but which also incorporates elements of corporate strategy, individual sector objectives and value delivery within the vertical markets and the wider society. The framework is our 5G Enterprise Pathfinder Framework; proposed by Real Wireless and refined collaboratively within 5G-TOURS.

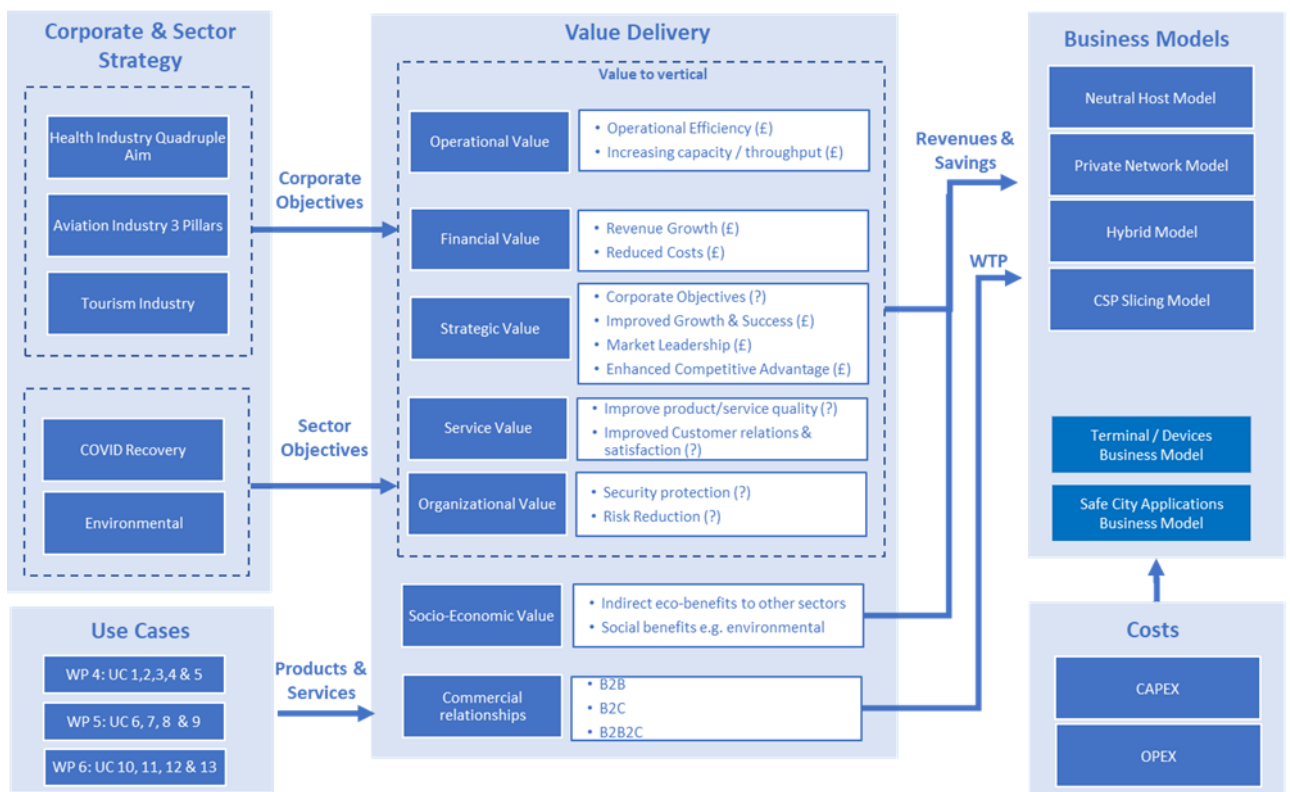
A noteworthy inspiration for the 5G-TOURS: 5G Enterprise Pathfinder Framework is the ICT-19 mission of “Enabling the Verticals”. The framework is built around the specific use cases associated with the 5G TOURS project, but the intention is that it will be applicable in any context to better inform 5G technology investment decisions within a range of environments and organisations. Use cases are considered to be incremental to a core service offering built around a collection of uses and applications for which it should be assumed there is already a degree of infrastructure investment. Therefore, the additional investment that is required to create and capture the value of a specific use case is what is being assessed.

This framework is illustrated in the Figure below and has been developed in partnership with the Innovation Managers. It guides the next stage of analysis as each of the three themed City contexts and platforms, the associated eco-systems and business models will be assessed in greater detail during the next phase of the project.

This latest phase of the project has seen the refinement and usage of the 5G Enterprise Pathfinder Framework. The framework seeks to reflect and support the broad range of value creation and articulate commercial components that need to be considered when progressing towards the infrastructure investment that enables to deployment of 5G.

The framework very deliberately takes the perspective of organisations operating within the market verticals and is therefore designed to be flexible enough to support a wide variety of use cases, settings and business models.

We are confident that the framework will be a useful tool in helping organisations navigate the myriad of 5G deployment options, however, as yet it remains untested.



5G TOURS 5G Enterprise Pathfinder Framework

With 5G technologies, mobile operators will offer new services allowing verticals to use innovative applications for their needs

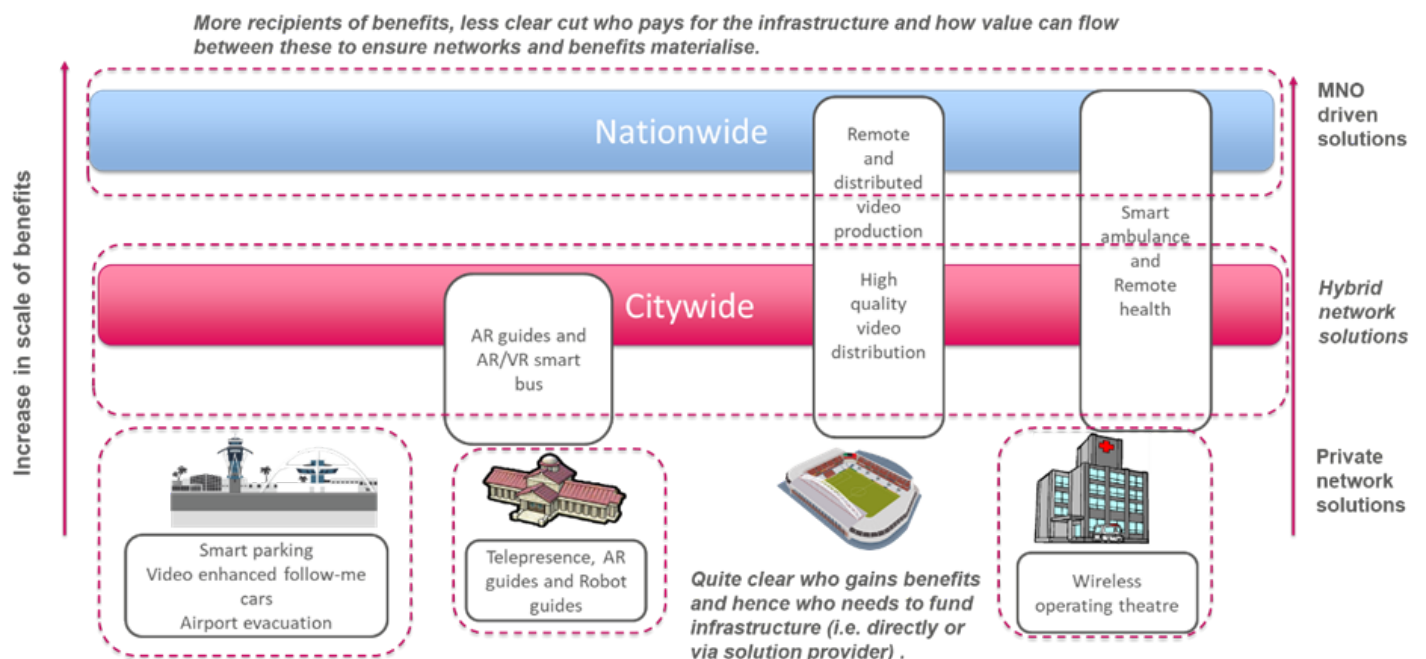
A Summary of the Assessment of the Benefits Potential

As a result, the techno-economic analysis by way of the interdependent study between WP2 and WP8 has derived quantification of benefits at a national, regional, vertical user and user benefit level. The use cases have been analysed individually to quantify their specific value to the vertical.

The results of the benefits analysis will be used to validate the selection of business models for the deployment of 5G infrastructure in each of the operating environments (airport, museum city, hospital). These business models describe how organisations in each vertical can create, capture and deliver value, which is derived from 5G, in economic, social, cultural and other contexts. This can then be used by the project partners and other stakeholders to clarify their role in the vertical UC value chain and how this can drive strategies for the commercial exploitation of project results.

The method of the analysis is described in [D.2.3](#) and the results will be reported in more detail in the relevant sections to come, but first we consider the context of the 5G-TOURS use cases and the places they are likely to be used in.

The Figure below illustrates the mapping for which the benefits have been derived under WP2 and shows the 5G-TOURS use cases aligned to the geographic coverage area and setting that these use cases are most likely to be consumed in.



Business opportunities for airports

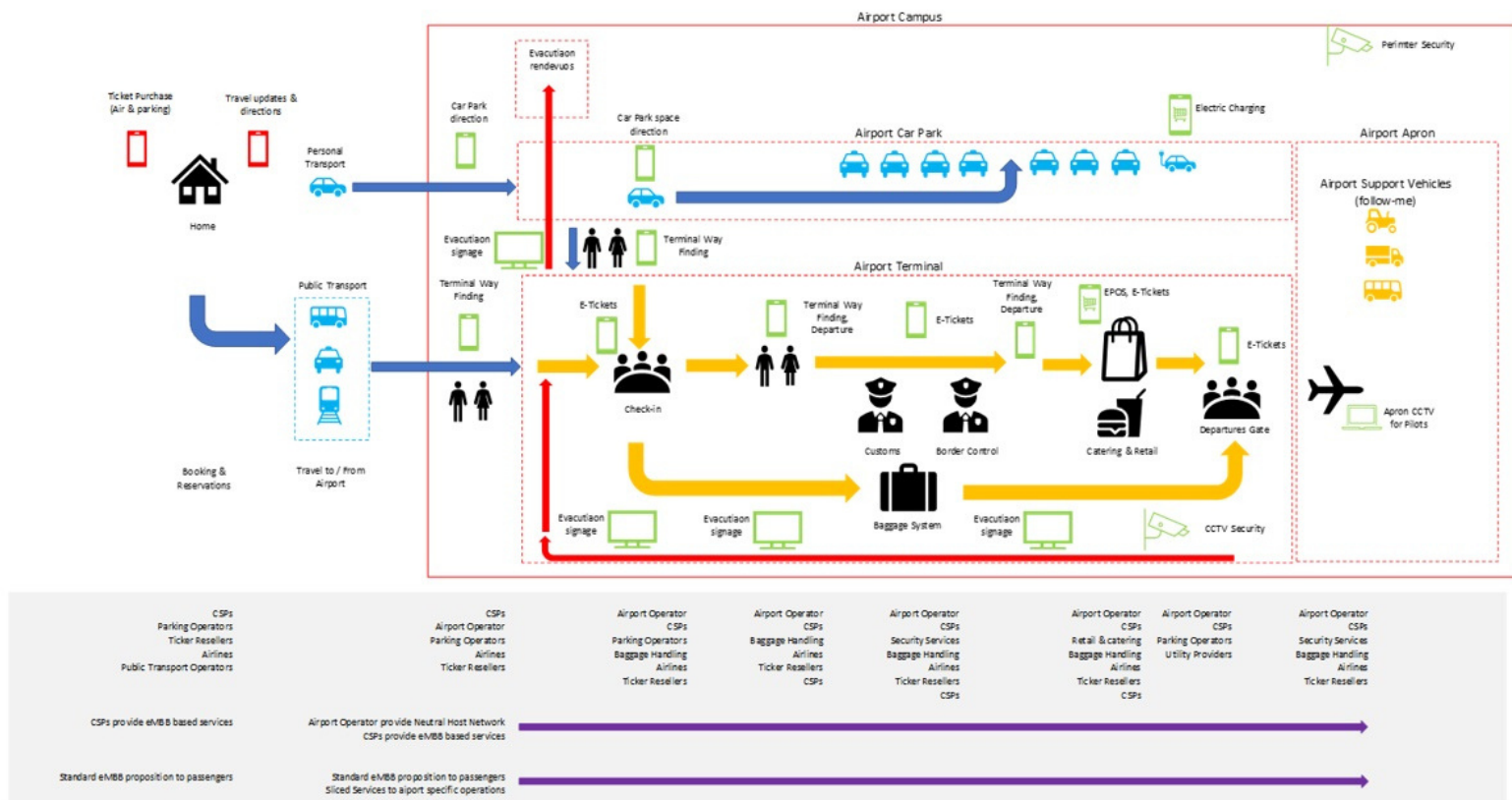
The air travel industry is the focus of use cases 10, 11 and 12 as introduced in [D.8.2](#) and the specific setting for the cost-benefit analysis is Athens airport, which has been used as the testbed for the trials, workshops, and validation activities.

The innovations in the transport-related work package (WP6) are related to improved passenger experiences and seamless movement through the airport setting enabled by 5G and analysed in WP8 as part of the overall passenger journey (Figure below). These user journeys are intended to support non-5G experts, with limited knowledge of networks, to visualize the operational setting of the innovations within their enterprise. Innovations which have been developed in the context of concrete use cases, articulated here based on the primary user beneficiary:

- **UC10 - Smart airport parking management**

Drivers will be informed in real-time about the parking facility status as well as finding a free parking spot and be routed to it based on the parking facility status, other concurrent requests aiming to minimize the unnecessary driving that leads to increased fuel costs, and emissions. Parking facility staff will be able to monitor the condition of the facility in real time as well as view the occupancy trends. This can lead to the optimal management of the parking facility as well as the ability to schedule maintenance proactively through the platform's real-time notifications.

The business opportunities in the “new normal” era can be found around the solutions, products and services that will cater for establishing trust for passengers to travel



Airport user journeys

Due to the prolonged effect of the pandemic, governments, airlines, airports, and international travel associations were searching for methods and measures under which air travel could be restarted

- **UC11 - Video-enhanced ground-based moving vehicles**

The end users (follow-me car driver and the control centre personnel) will increase their situation awareness, have better and more interactive collaboration among themselves and preemptively address irregular or harmful conditions that might happen.

- **UC12 - Emergency Evacuation**

The end-user (evacuee) will be guided towards the nearest exit via an intuitive interface rather than a set of instructions that maybe confusing for the user under stress. Also, the location accuracy that will be provided from the network will provide the users location precisely.

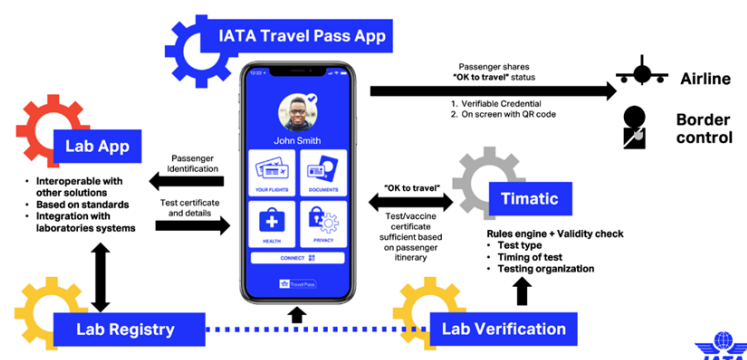
Having refined how the end user interacts with the system, the approach to deployment was evaluated. It was established that the Neutral Host Business Model is a recognised model for the Airport environment. This is primarily due to the requirement to host all national CSP's to serve all passengers and operational staff in the airport, irrespective of which CSP they subscribe to. Security and disruption considerations mean that it's better to have a shared infrastructure solution and a single responsible party, rather than multiple MNO solutions and multiple teams vying for access. In addition to public mobile services, a Neutral Host solution can also accommodate targeted Airport / Vertical specific services as demonstrated by the range of use cases. Where business requirements dictate, such vertical-specific services can be supported on a Private 5G Network but sharing elements of the same Neutral Host infrastructure as the CSPs.

During the 5G-TOURS project, several 5G related innovations, pertinent to the transportation/aviation sector were developed. Some of them addressing operational issues, other passenger experience, safety, and security ones.

To identify the most beneficial innovations for the transport/aviation sector, one has to take into consideration the latest development regarding air travel. Since March 2020, airline travel was impacted by the devastating effect from the COVID19 pandemic, where in many countries international travel seized completely; in some instances international travel was reduced up to 98%. Only some relief, medical and cargo flights with medical provisions were operating.

Due to the prolonged effect of the pandemic, governments, airlines, airports, and international travel associations were searching for methods and measures under which air travel could be restarted, while at the same time minimize the risk of the pandemic for passengers and staff, such as the IATA travel pass application illustrated in Figure below.

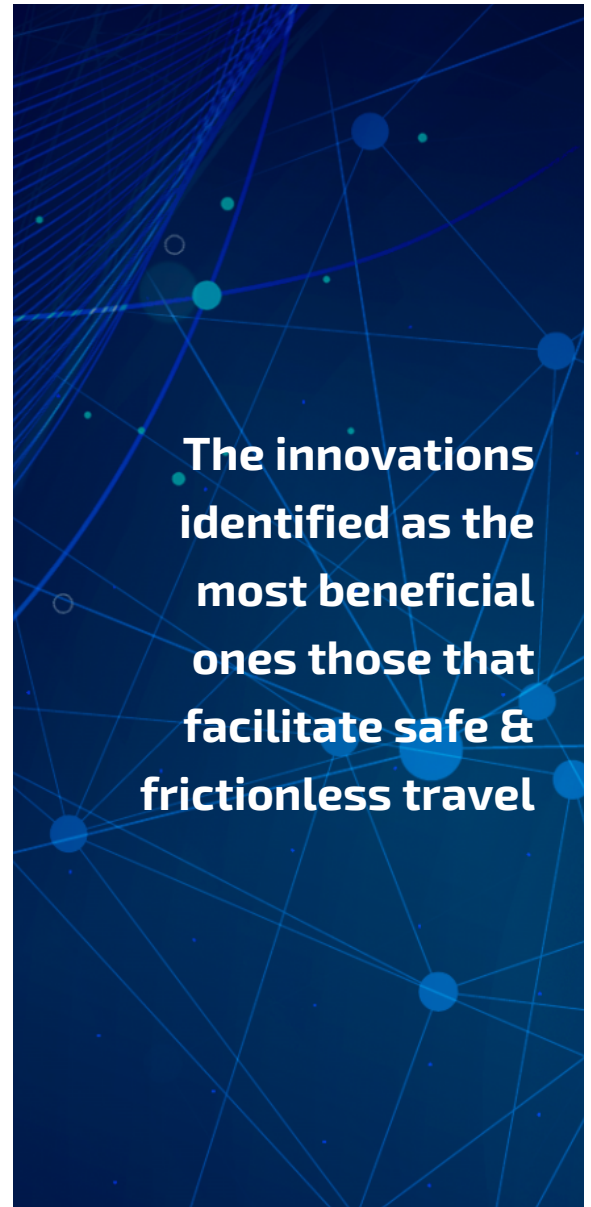
Overview



Under this prism, all 5G related innovations that could be utilized to fulfil the above-described objective became of primary importance to the industry. Furthermore, the 5G mobile networks advanced capabilities, such as network slicing and multiaccess edge computing, are potential assets that enable connectivity excellence, leveraging reduced latency, faster transmission, network management, a greater number of connected devices, accurate geolocation, and reliable information.

In this context, the innovations identified as the most beneficial ones are those that facilitate safe & frictionless travel. COVID-19 underscores the need to enhance airport passenger processing and make it as safe as possible. To achieve this, airports need to minimise direct contact with airport staff or other passengers and therefore it is necessary to fully digitise the entire process to minimize the impact of COVID-19 restrictions on congestion levels. Towards these objectives, 5G can play a pivotal role as it provides the necessary advanced capabilities to facilities advanced digital services in massive scale, e.g., tens of thousands of passengers travelling through an airport terminal such as:

- Thermal imaging and automatic fever detection empowered by a 5G network through a 4K cameras or AR enabled thermal glasses with facial recognition.
- Real time access to and secure transmission of passengers' travel & health records e.g. health passports, may detect critical cases (based on body temperature and travel history).
- Passenger tracking systems and flow management solutions can detect congested terminal areas and alerts for social distancing violations.
- Location based services based on 5G technologies that can accurately calculate the exact position, journey, and interactions of passengers in massive scale to be able to trace interactions of any passengers that is found be infected after their travel.
- Accurate guidance of AGVs for round-the-clock disinfection of strategic points taken into consideration passenger occupancy, journeys to facilitate dynamic and safe routing



through passengers.

In this context, other complementary digital initiatives enabled by 5G can be considered and implemented using 5G networks.



Graphical depiction of frictionless travel concept (Politicshome, 2021)

Tele-health solution area opportunities

In today's professional healthcare, one must identify ecosystems and collaborating partners that includes among other things the manufacturers of medical equipment, system solution integrators, hyper scale cloud providers, medical professionals, insurance companies and payers (health consumers).

By introduction of advanced tele-health solutions, network infrastructure providers and communication service providers (CSP) become part of the eco system, but now in a larger market. This can catalyse new business models and business opportunities.

The reason is that the variety of technology options that 5G can offer impose a different relationship between 5G CSPs, 5G network equipment vendors and healthcare solution providers than before. For example, manufacturing industries require 5G networks with different KPIs and deployment models than is needed for the touristic sector, automotive, agriculture, airports or healthcare. In manufacturing, most probably NPN networks with uRLLC characteristics will be deployed to control robots in real-time, while in agriculture mMTC technology will be mostly deployed for checking the condition of farmlands.

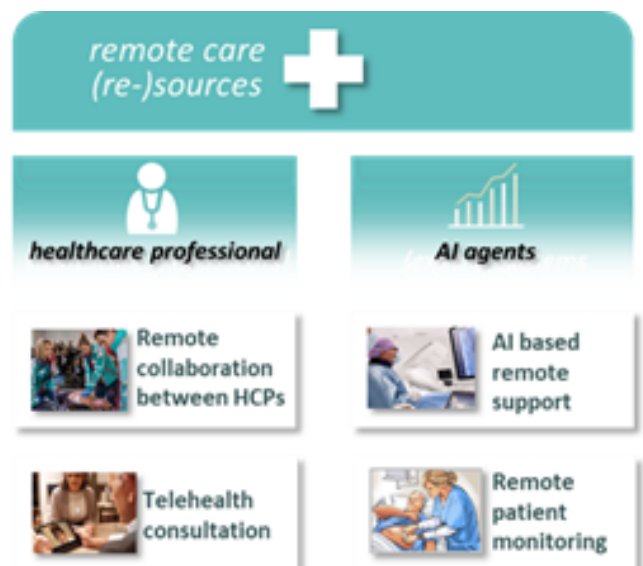
For each specific vertical industry network equipment providers and communication service providers become part of the eco system, but now in a large market; an enabler for new business models and business opportunities, including special service level agreement and billing models. The Figure below provides a simplified illustration for such an ecosystem for healthcare, which has different CSPs in each geography.

Different tele-health options and potential market opportunity areas are illustrated below.



By introduction of advanced tele-health solutions, also network infrastructure providers and communication service providers (CSP) become part of the eco system

Tele-Health Solutions Powered by 5G'
workshop organised by 5G-Heart and 5G-TOURS video

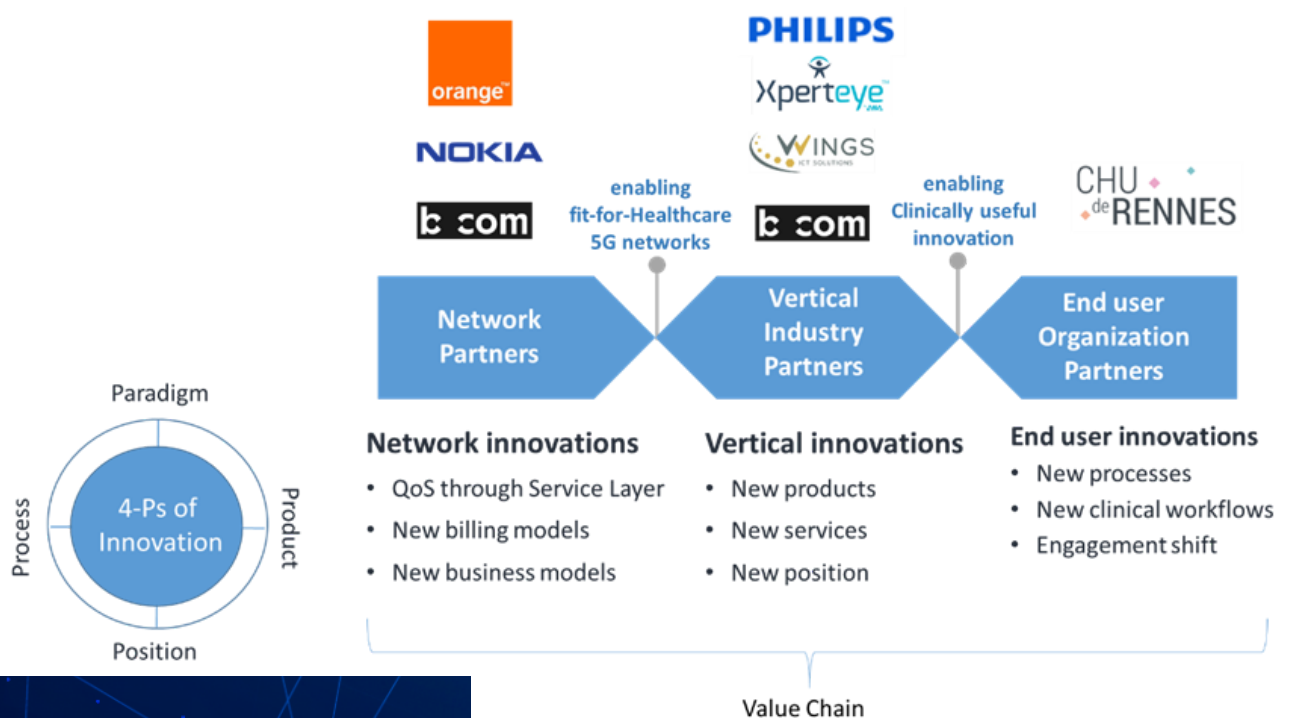


**The Safe City aims
to demonstrate
how multiple
vertical industries
can
simultaneously use
the same 5G
architecture and
services to deliver**

The innovations in the healthcare related work package (WP5) are related to continuous health monitoring & intervention support enabled by 5G and these are based on an overall scenario where a patient suddenly becomes chronically ill when being on a touristic trip. These innovations are developed in the context of concrete use cases:

- UC 6: Remote, wireless patient monitoring of the chronically ill.
- UC 9: Ambulance routing to get medical help ASAP to the incident
- UC 7: Tele guiding of ambulance staff by remote medical expert
- UC 8: Advanced surgical intervention enabled by 5G connected medical scanners in OR

To paint a more meaningful picture of the innovations from an ecosystem and value chain perspective, the 4P's framework (Product, Process, Position and Paradigm) is used to assess how technology meets both medical needs and provide business value for each partner along the value chain.



The value chain runs from network partners, such as communication service providers and network equipment manufacturers, up to end user organizations, such as the hospital addressed in work package 5 (WP5) of 5G-TOURS. In the middle are the vertical industry partners. In 5G-TOURS, these are medical equipment R&D companies (Philips), ICT solution providers (Wings), remote video service providers (AMA – XpertEye) and Research institutes such as BCOM (who also are working on network technology).



The Touristic City of 5G-TOURS is a place where visitors are provided with 5G-based applications to enhance their experience

Amazing 5G world in Turin

Innovation is the Engine of the Transformation of Tourism into Smart Tourism: the “Touristic city node” built by 5G-TOURS in the city of Turin creates a framework where products and services are created, targeting the 5 A’s of Tourism, i.e.:

- 1. Attraction:** It includes all those factors which attract a tourist. It could be a place, nature, lakes, beach, monuments etc.
- 2. Accessibility:** It is how to access or reach to that place of attraction. Ways to reach.
- 3. Accommodation:** Place to stay or accommodate while travelling for rest or overnight stays.
- 4. Amenities:** All the other services which we require while travelling for good and comfortable living such as food, drinking water, sanitary, etc.
- 5. Activities:** It includes activities which a place or attraction holds such as nature walks, history & architecture, boating, views, health, etc., empowered by the use of the most advanced technology.

The Touristic City of 5G-TOURS is a place where visitors are provided with 5G-based applications to enhance their experience:

- AR/VR for immersivity.
- Gamification to involve the youngest and promote connections and social inclusiveness.
- Robot-assisted services to improve employees work/life balance and productivity.
- Telepresence to allow for remote visits.
- Media distribution and production to further improve the visitors’ experience with additional content.

The 5G-TOURS innovations allow the development of services and products to cope with the COVID-19 emergency, offering services to tourists on site and to local residents that guarantee a safe experience. Social distancing could be provided by the use of robot-assisted visits that control the number of visitors at a touristic site or in front of an attraction. Use of personal devices instead of those rented by the museum for guided 5G-TOURS could be another means for reducing social distancing issues.

The 5G-TOURS innovations, however, also represent important tools to accompany the Touristic sector in its evolution, the post COVID-19 era: the immersivity experience offered by VR/AR can allow the creation of a new virtual tourism opportunity, to improve, complement or even replace the physical tourism experience. The 5G-TOURS UCs represent examples of products and services for these new types of tourism.

The 5G network solution at Palazzo Madama

In the month of October, the works related to the implementation of the 5G network solution at Palazzo Madama have been finally concluded. The result of the joint effort of TIM and Ericsson (with the collaboration of Fondazione Torino Musei), the 5G network solution has been designed to satisfy the most stringent requirements in terms of bandwidth and latency coming from the different use cases: 800 Mbps/cell for the downlink from UC1 "Augmented Tourism Experience" in which multiple users (e.g. up to 30 devices) will download multimedia contents of considerable dimensions such as 3D scans of artefacts; 80 Mbps/cell for the uplink from UC5 "Remote and distributed video production" in which 4 concurrent high definition video streams with a bit rate of 20 Mbps each will be transmitted on the uplink; latency of less than 10 ms from UC2 "Telepresence" and UC3 "Robot Assisted Museum Guide" for a proper behavior of the robots' navigation systems as well as from UC5 to deliver the video streams with a minimum and constant delay. More information about all the use cases in Turin can be found [here](#).

From the architectural point of view, the solution is based on the so-called Option 3 NSA (Non-standalone) defined by 3GPP in which the control plane relies on LTE technology (defined as "anchor") while the user plane takes full advantage of the potential provided by the NR (New Radio) access. Being connected to the TIM on-field CN (Core Network), the indoor 5G coverage of Palazzo Madama integrates perfectly with the outdoor commercial network, effectively constituting an ad-hoc high-performance extension of it. Preliminary tests showed outstanding performances, reaching up to 1.2 Gbps on the downlink, 116 Mbps on the uplink and very low latencies in the order of few milliseconds.



More photos are available on our website:



**The works
related to the
implementation
of the 5G
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The solution adopted complies with the 3GPP standard, despite some peculiarities such as the connection of the radio units with a remote baseband (i.e. 5G fronthauling), on the other hand, the fact of having to install it inside a historic structure protected by the Superintendency of Archeology, Fine Arts and Landscape, required a considerable innovative effort in terms of design to cope with the intrinsic complexities of the environment in which the solution would operate. From this perspective, for the insertion of the technological components within the museum context, especially in the courtly rooms of Palazzo Madama, a UNESCO heritage site, the design had to take into consideration and balance different needs: the requirements with respect to the positioning and choice of the appropriate transparent radio materials to house the antenna system, the technical constraints relating to the possibility of powering the equipment safely, the technical difficulties of cabling for the fiber optic connection of the radio units in a building with multiple historical stratifications and, last but not least, the aesthetic requirements necessary to integrate the equipment inside the rooms. All these factors made it necessary to identify an extremely flexible radio solution also in terms of used equipment, which could be installed without supports or wiring on the wall and ceiling; this particular requirement has resulted in the creation of an ad-hoc mechanical system for fixing the radio unit combined with the choice of designing new room furnishings, coordinated with those existing and in use, which practically re-functionalized the room seating and panels with the curatorial texts.

The work carried out, through tightly integrated collaboration between TIM, Ericsson and Fondazione Torino Musei, resulted in an innovative and “zero impact” indoor 5G radio solution within a museum (the first in Italy) and in recognition of which the Superintendency has granted a permission for a permanent installation until the end of the project. In general, the theme of “friendliness” with the environment of radio solutions (5G and future ones) in terms of visual-architectural impact is considered so important that the European Commission will most probably dedicate a proper space to it in the next calls for funded projects. In this sense, the 5G network solution implemented by 5G-TOURS can undoubtedly be considered the state of the art.

The first 5G-TOURS trial on the 5G network solution at Palazzo Madama took place the 9th of November as the “itinerant orchestra” concert. All the other UCs’ trials on augmented and virtual reality, telepresence and robotics will be performed starting from early 2022. In the meanwhile, the works for the 5G indoor coverage at GAM (Modern Art Gallery) museum have already been started...

The work carried out resulted in an innovative and “zero impact” indoor 5G radio solution within a museum (the first in Italy) and in recognition of which the Superintendency has granted a permission for a permanent installation until the end of the project

Video of the installation activity is available here:



The technological solution developed by 5G-TOURS in terms of remote television production system and 5G network coverage has not only allowed the resolution of fundamental technical problems, it has made available situations and possibilities up to now in fact never usable and capable by opening up a new and unexplored world to artistic thought

The first European trial of the itinerant orchestra

On the 9th of November, 'The Garden of Forking Paths', the latest work by the Turin composer and conductor Andrea Molino, took place in the Gran Salone dei Ricevimenti of Palazzo Madama in Turin in front of more than 100 invited people; a musical show for four itinerant voices and saxophones through the streets of the city center and an instrumental ensemble present in the hall that played together live thanks to the technological solution provided by 5G-TOURS. The event is the result of the collaboration between the City of Turin, Fondazione Torino Musei, Ericsson, LiveU, Rai and TIM, in the context of the UC5 "Remote and distributed video production".

Musicians and performers moving on different streets of the city were able to connect live, with a central direction, thus creating a series of engaging musical and theatrical interactions as if they were all in the same place in front of the orchestra conductor. The Ensemble Fiari, directed by Marilena Solavagione, interacted from the Gran Salone dei Ricevimenti of Palazzo Madama in real time and with a synchronization of musical precision (therefore with a margin of error of less than 3 hundredths of a second) with the four saxophonists of the 'SaXemble' of Zurich and four young actors who have just graduated from the Teatro Stabile Theater School. The itinerant performers, each followed by a live 5G video camera, moved freely in the spaces of Piazza Castello, gathered in front of the entrance of Palazzo Madama and, following different paths, entered in order to reach the Gran Salone where they finished the performance together with the other musicians, thus highlighting not only the precision of the remote coordination but also the artistic and technological compatibility between the two situations.



Also, in the context of the UC4 “High quality video service distribution” of 5G-TOURS, Rai worked on a 5G broadcast solution to deliver video contents to massive audiences through its High-Power High-Tower (HPHT) infrastructure. After almost one year of laboratory activities in which preliminary tests were performed for both transmitter and receiver stations, the 9th of November the on-field trial has been finally performed. During the concert “The Garden of Forking Paths”, Rai successfully tested the transmission of a high quality video stream towards mobile devices in 5G broadcast mode according the most recent implementation of the 3GPP eN-DC Rel-16 standard. In particular, thanks to the experimental transmission using 5G broadcast technology from the Rai Way transmitting site of Torino Eremo, the concert has been made available on mobile devices provided to the people visiting a demonstration area located in Piazza Castello, where an ad-hoc receiving chain was installed on board of a Rai special VAN. The demonstration showcased the potential of 5G for the TV reception in terms of video and audio quality enhancements as it will be on the next generation mobile phones and tablets implementing this technology.

Thanks to its high speed, low latency and the possibility to operate in both interactive and broadcast mode, in the next future the 5G technology will be able to transmit very high quality contents during huge audience events, also opening new perspectives for the distribution of immersive 360° video, augmented reality and interactivity on the customers side.



Video of 5G-TOURS itinerant orchestra is available here:



The technologies enabled by 5G in the cultural sector, as demonstrated by the 5G-TOURS project, are a possible driving force for promoting a new offer, for tourism and beyond, enriched, accessible and sustainable

Future 5G-TOURS events

Joint 5G-TOURS and 5GHEART industrial workshop on Healthcare Solutions Powered by 5G

5G-TOURS and 5G HEART are sister projects in the HORIZON 5G PPP program. 5G-TOURS vision is to improve the life in the city for the citizens and tourists. 5G-HEART focuses on pilots in healthcare, transport and aquaculture.

The workshop aims at presenting and discussing upcoming opportunities in the healthcare sector enabled the recent technology developments in 5G.

Place: Rennes, France

Date: March 2022



5G-TOURS industrial workshop on 5G-based solutions for mobility-efficient cities

5G-TOURS is organising industrial workshops, at trial sites in Athens. The aim of this workshop will be to gather technology stakeholders and vertical industries beyond those in the 5G-TOURS consortium and communicate to them the project concept and results in a direct and effective way. The expected outcome is to raise awareness of 5G-TOURS technology and deployments in the European stakeholders

Place: Athens, Greece

Date: February 2022

**Let's enjoy the benefits of
5G together!**



<http://5gtours.eu/>



<https://twitter.com/5gtours>



<https://www.linkedin.com/groups/8853316/>



<https://www.researchgate.net/project/5G-TOURS>



https://www.youtube.com/channel/UCYdXMN027pe_Nkc6Hr92-Mw



5G-TOURS is 5G-PPP Project
European Commission Call
H2020-ICT-2018-2020
Grant number 856950

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