5GMOBIX

5G for cooperative & connected automated **MOBI**lity on **X**-border corridors

D1.3

Innovation Management Plan

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Control sheet

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ABBREVIATIONS

Abbreviation	Definition
3GPP	3rd Generation Partnership Project
5G	5th Generation Wireless System
5G-NR	5G New Radio
AI	Artificial Intelligence
BMs	Business Models
CCAM	Cooperative, Connected and Automated Mobility
cm	Centimetre
CN	China (Trial)
CIP	Competitiveness and Innovation Framework Programme
DE	Urban Trial Sites Germany
EC	European Commission
eMBB	enhanced Mobile Broadband
ES-PT	Cross-Border Corridor Spain – Portugal
EU	European Union
F	Final
FI	Urban Trial Site Finland
FP7	Framework Programme 7
GNSS	Global Navigation Satellite System
GR-TR	Cross-Border Corridor Greece – Turkey
H2020	Horizon 2020
HD	High Definition
ICT	Information and Communication Technologies
IP	Intellectual Property

IPR	Intellectual Property Rights
IT	Information Technologies
L4/L5	(SAE Automation) Levels 4 and 5
MaaS	Mobility as a Service
MARL	Market Adoption Readiness Level
MEC	Multi-access/Mobile Edge Computing
mMTC	massive Machine Type Communications
ML	Machine Learning
NEC	Non-EU Country
NFV	Network function virtualization
NL	Urban Trial Site the Netherlands
OFDM	Orthogonal frequency-division multiplexing
PU	Public
R&D	Research and Development
R-W-W	Real-Win-Worth
SAE	Society of Automotive Engineers
SDN	Software-defined networking
SME	Small or Medium Enterprise
SFC	Service Function Chaining
TMT	Technical Management Team
TRL	Technology Readiness Level
UHD	Ultra-High Definition
uRLLC	Ultra-Reliable Low Latency Communications
WP	Work Package
x-border	Cross Border

EXECUTIVE SUMMARY

The present document is the deliverable D1.3 – Innovation Management Plan, which is prepared under the Task 1.3 – Innovation Management within Work Package 1 – Project Coordination.

Funded under the European Union's Horizon 2020 Framework Programme, the aim of 5G-MOBIX is to execute Cooperative, Connected and Automated Mobility (CCAM) trials along x-border and urban corridors using 5G core technological innovations to qualify the 5G infrastructure and evaluate its benefits in the CCAM context as well as to define deployment scenarios and to identify and respond to standardisation and spectrum gaps.

Task 1.3 Innovation Management will efficiently monitor market needs and technical evolutions throughout the project's lifetime. It will also make sure that the project work plan is adjusted as needed in order to implement the project's results in such a way that they best meet the needs of the market with the technologies available at the time.

Therefore, this deliverable includes the initial innovation management strategy and a detailed innovation management plan of action. Innovation management activities are managed by VICOM, Task 1.3 leader, in close collaboration with the Project Coordinator (ERTICO). The aim of this deliverable is to describe the innovation management approach to be followed during the 5G-MOBIX project's development.

The rest of the document is organised as follows:

- **Section 1 – Introduction** briefly presents 5G-MOBIX and describes the purpose of the document and its intended audience.
- **Section 2 – Innovation Process** defines innovation in the context of the 5G-MOBIX project in general, and of this deliverable in particular.
- **Section 3 – Innovation Management** describes the innovation management approach, according to different models of innovation. This section also presents the mayor innovation potential of the 5G-MOBIX project.
- **Section 4 – Innovation Strategy** describes the overall framework with regards to innovation in 5G-MOBIX, as well as the specific framework for assessment, and several innovation management tools that will be considered during the project.
- **Section 5 – IPR** Management briefly introduces the strategy that will be follow for results identification and management in 5G-MOBIX.
- **Section 6 – Conclusion** summarises the main outcomes of this deliverable.

1. INTRODUCTION

1.1. 5G-MOBIX concept and approach

5G-MOBIX will conduct trials to test and validate 5G technology for advanced CCAM along eight trial sites, which include cross-border and urban corridors. The Project Consortium includes 50 beneficiaries and an additional nine international partners from Korea and China. This large Consortium will share responsibilities of tasks divided into eight work packages (WPs) across 10 EU countries as well as in Turkey, China and Korea.

As a Horizon 2020 project, 5G-MOBIX is bound by a set of Ethics requirements that touch on various aspects of its work plan, specifically the use of human participants in trials, personal data processing, proper use of technology and the involvement of non-EU countries (NEC) in the project.

5G-MOBIX is determined to work towards its ultimate goal of the roll out of 5G networks to support CCAM in a societally acceptable and ethical manner consistent with the H2020 programme. To this end and in accordance with the Grant Agreement, the Project will submit four deliverables addressing all the issues that may raise ethical concerns during Project activities.

1.2. Purpose of the deliverable

The aim of this deliverable is to describe the innovation management approach to be followed during the 5G-MOBIX project's development. For this aim, the document provides supporting literature with regards to the concept of innovation and innovation management, in order to ensure the understanding of the report. In addition, some of the main innovation management tools will be described. Furthermore, it will serve as guidance for the consortium members. The 5G-MOBIX innovation management plan is dynamic and will be adapted during the project both according to the timeline and the achieved results.

1.3. Intended audience

This deliverable is disseminated both internally within the project consortium and externally to any interested parties outside the project. The dissemination level of D1.3. is public (PU) and not limited to members of the Consortium. This deliverable is intended to serve as an internal guideline for the appropriate innovation management of the 5G-MOBIX project. The main goal is for all project participants in the consortium to understand the procedures dealing with innovation management of the 5G-MOBIX action and the consortium. Additionally, it may serve as an informative report for those external partiers interested on different aspects concerning the project's innovation potential and its development.

2. INNOVATION PROCESS

With a view on addressing innovation management in collaborative environments such as the present project, the concept of innovation must be first be understood. However, experts have yet not found the perfect definition for this term and, as a consequence, many significations have been developed. In the context of H2020, the Innovation Management Plan of 5G-MOBIX will be based on the European Commission's (European Commission, 1995) definition for innovation, which is the "*successful production, assimilation and exploitation of novelty in the economic and social spheres*". From this perspective, innovation offers new solutions to problems and responds to the needs of both the individual and society.

5G-MOBIX has appointed an Innovation Manager, Esther Novo from VICOM, who will report to the Technical Management Team. The Innovation Manager will:

- Work with partners and stakeholders to keep track of end-user needs and of the state of the art of products and services available in the market (competition); and
- Work with partners to make sure that the planned work is adjusted as needed to adapt to the all the time moving target.

Furthermore, innovation points organisations towards ambitious long-term objectives, leads to the renewal of industrial structures, and fosters the emergence of new sectors of economic activity. Technological advances, changes in customer behaviour, intensified competition and the changing business environment are some of the key factors that are increasing the need for innovation (Goffin & Mitchell, 2010).

Innovation is also related to the organisations' ability to recognise opportunities in the market and to establish commercial relationships in order to make them economically viable. However, one of the biggest challenges organisations face is how to manage the innovation process. Innovative organisations are influenced by their macro-environment. The quality of the educational system, the regulatory, legislative and fiscal framework, the competitive environment and the firm's partners, the legislation on patents and intellectual property, and the public infrastructure for research and innovation support services are all examples of factors impeding or promoting innovation. The fabric of economic and social activities in a region constitutes the innovation systems, whose dynamics are a complex matter. Innovation systems can be defined as "the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge and are either located within or rooted inside the borders of a nation state" (Lundvall, 1992).

The lack of a common definition for innovation mentioned above is partly due to its multidisciplinary origin and, thus, influences the theory on innovation management. Various models of innovation break down the innovation process into various stages (Palmberg, 2006). The innovation processes have some common basic activities that support the generation of ideas for new product and process development and the management of the entire innovation process. These fundamental activities are as follows:

- Generation of ideas which potentially could become new products or processes after implementation,
- Acquisition of knowledge on the generated ideas, and
- Implementation and market monitoring to verify customer satisfaction and after sales.

Innovative firms have a number of characteristics that can be grouped into two major categories of skills: strategic skills (long-term view; ability to identify and anticipate market trends; ability to collect, process and assimilate technological and economic information) and organisational skills (mastery of risk; internal cooperation, and external cooperation with public research, consultancies, customers and suppliers; involvement of the whole firm in the process of change, and investment in human resources).

In fact, innovation needs to be part of the organization's culture. Areas such as Project Management or Research and Development are key elements for enabling innovation. However, all the company must share this culture and to achieve this at an organization level, Human Resources will play an important role, since it's the department responsible for promoting the training of the staff.

Advances in information technology are rapidly changing the market environment, and companies need to look outside to identify new skills and knowledge. In this context, the ability to innovate, by combining internal and external knowledge, is becoming one of the most critical components that leads to a sustainable competitive advantage (Stanko & Calantone, 2001).

According to the literature, the stages of development and pre-development activities belong to technology management (Specht, 2002). The field of R&D management is determined by adding upstream fundamental research, as well as product and process development. Finally, innovation management includes the final product and market introduction phase.

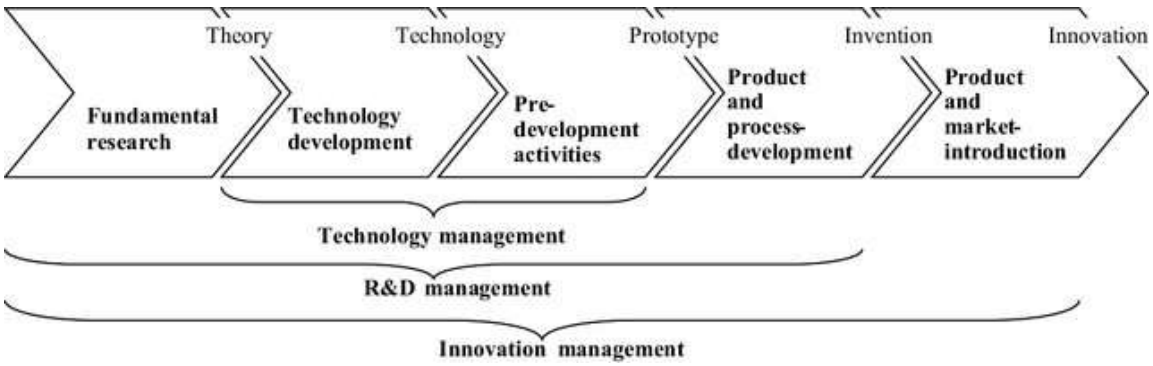

Figure 1: Classification of management phases (Specht, 2002)

3. INNOVATION MANAGEMENT

3.1. Innovation management approach

The models following the innovation management approach do not focus on the development of innovation itself, but rather on the evolution of companies' innovation management strategies under different social, economic and political circumstances. Among the infinite innovation management strategies, the approach chosen for the 5G-MOBIX project is commonly known as Open Innovation. This method supports the idea that innovation occurs as a result of interactions between different actors, rather than being the result of an isolated genius (Von Hippel, 1988).

In the current interconnected world, it is becoming impossible for organisations to remain isolated, making it necessary to integrate internal and external ideas and complementary technologies. In fact, this idea of interconnectivity is supported by the European Commission's H2020 programme and is the basis of the present project. Collaborative approaches to the research and innovation process have shown to deliver a positive effect on the results of innovation activities and business profitability.

Chesbrough (2003) defined the concept of Open Innovation as a strategy that leverages internal and external sources of ideas and takes them to market through multiple paths. According to the author, collaboration allows for high innovation rates and efficient product development, and the cooperation capacity of organisations through agreements lets ideas flow across organisational boundaries.

The term Open Innovation from the firm level is opposed to Closed Innovation (Chesbrough, Vanhaverbeke, & Wet, 2006), where the innovation process, from conception of the idea to marketing, happens internally in the organisation. One of the pillars of Closed Innovation is the profit generated by pioneering innovation in the market. In Open Innovation, not only the internal environment of the organisation is involved, but also the external environment.

Some of the advantages of developing Open Innovation strategies, i.e. rely on external research and development, compared to relying just on the organisation's internal R&D, are the possibility of exploring new markets and the increased flexibility. Furthermore, Open Innovation strategies facilitate access to new markets and new knowledge, allow to share both risks and resources in the process, support innovation, and foster the creation of new value, the confrontation of ideas and practices, and the creation of synergies. Therefore, collaboration networks represent a promising paradigm in a knowledge-driven society, also enabled by the current advances in Information and Communication Technologies (ICT).

However, there are also certain barriers to overcome when following an Open Innovation strategy, such as the dependence on the underlying value system, the difficulty in identifying the "added value" contributed by each partner, the complicated distribution of income and liabilities, and the change in valuable aspects from tangible to intangible. Some of the key factors that influence collaboration are the existing incentive schemes, the trust relationships established with other organisations, the management process, the

ethical code and culture of the organisation, as well as the negotiation of contracts and collaboration agreements.

In the development of an Open Innovation model, several processes can be followed:

- Outside-in process: organisations invest in cooperation with other agents and integrate external knowledge;
- Inside-out process: to outsource internal knowledge and technology. This allows organisations to reduce fixed costs of the R&D activities, positions them as a reference in the market, sets their products or services as standards, and provides benefits from licenses and patents; or
- Coupled process: the cooperation with other participants through strategic networks for an extended period. Greater benefits can be obtained, and success thus depends on choosing the right partners, and assimilating and integrating the external knowledge and skills (Gassmann & Enkel, 2004).

In order to develop these strategies, organisations need to build certain core capabilities (Smith, 2013). In the case of the outside-in process, organisations must rely on their absorption capacity to integrate sophisticated and costly technology. Moreover, they have to recognise the value of new external information, assimilate that information and apply it to the market, making use of efficient generation and integration processes. In the case of the inside-out process, organisations must rely on their multiplicative capacity to transfer internal knowledge to their parties. Organisations have to select the most appropriate partners and be able to code and share their knowledge. Finally, for coupled processes, organisations need to develop an effective connection capacity to build and maintain relationships with partners, particularly with complementary entities and competitors. This last approach is the one chosen by the 5G-MOBIX partners.

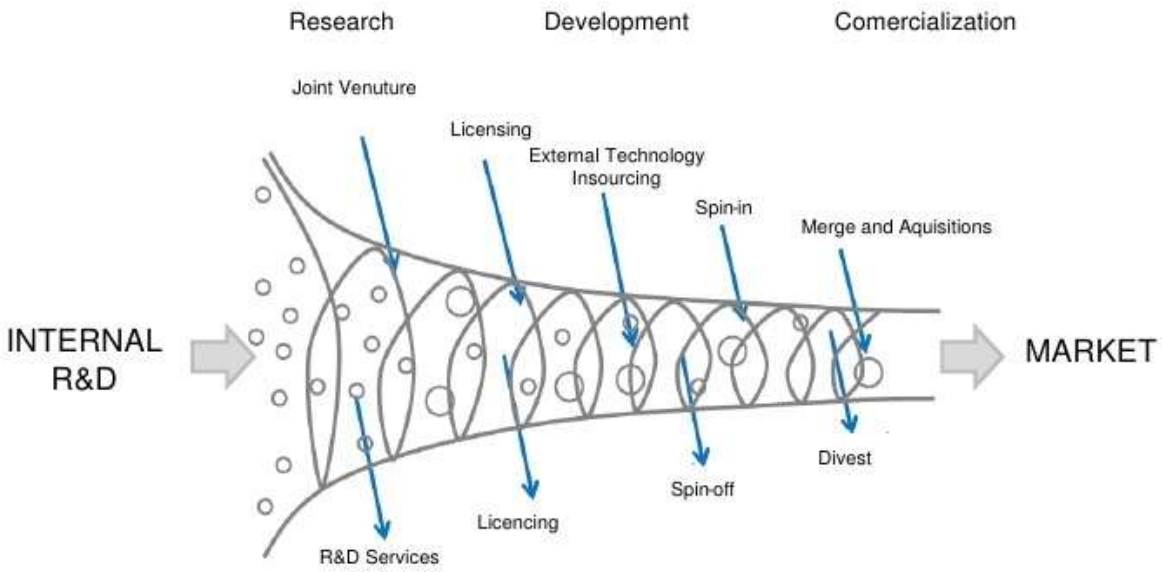

Figure 2: Open Innovation Funnel, modified from Chesbrough (2003)

3.2. Innovation potential of the project

5G-MOBIX specific performance and features for CCAM: 5G is the ideal candidate to provide the next level of connectivity necessary to fulfil the stringent requirements of automated driving applications. 5G-MOBIX will capitalise on this factor and innovate in several technologies and enablers to develop, test and validate in heterogeneous test sites the CCAM L4/L5 automated functionalities. Slicing and the dynamic slice provisioning of eMBB, uRLLC and mMTC slices, is one of the main enablers for V2X communications, as they accommodate the vastly diverse nature of vehicles from other mobile network users and can provide customized services based on the type of vehicle capabilities, type of CCAM use case, type of road, etc. 5G-MOBIX will innovate upon these base technologies to support CCAM use cases such as (1) truck platooning with 'see through' capabilities or UHD video streaming for infotainment purposes through an eMBB slice; (2) automated driving of L4/L5 (critical manoeuvre negotiation, emergency braking, etc.) through an uRLLC slice; or even (3) real-time map updates through mMTC slice, at the same time and for multiple vehicles.

5G slicing is usually combined with other advanced 5G features, such as SDN/NFV, service function chaining (SFC) and MEC, to offer an even greater degree of freedom and flexibility regarding the services provided in each individual vehicle and CCAM application, and to further reduce latency. The 'softwarisation' and flexibility offered by SDN/NFV and SFC enable the flexible and multi-purpose use of the same network infrastructure for different services and applications. The support of multiple vertical industries and stakeholders will thus be fostered, in a way that is cost effective and allows for the development of innovative business models, while they also allow for the integration of Machine Learning (ML) and Artificial Intelligence (AI) techniques to be applied to the automotive environment. This will at the same time contribute to the significant reduction of the network reaction time and contribute to the ultra-low latencies delivered by 5G connectivity. The deployment of a combination of these features in a MEC enabled environment will allow for innovation in how this core functionality can be brought closer to the edge of the network therefore enabling the challenging CCAM use cases.

The 5G-MOBIX CCAM use cases will utilise the 5G New Radio Access Network technology (5G-NR), which is one of the main innovations that 5G will deliver. The 5G-NR physical layer is still based on OFDM, but it allows for greater flexibility for deployment on various frequencies and for the support of applications with diverse requirements (flexible PHY), enabling extremely low latency slices and robust slices. CCAM applications require extremely low latency and with the technology present the potential for innovation in emergency braking or critical manoeuvre negotiation for example Standardisation, spectrum and cross-border issues: Innovation in telecommunications cannot happen without standards. Standardisation of 5G, spectrum allocation issues, and their effect on automotive applications are some of the main barriers to innovation in 5G applications. The 5G-MOBIX corridors and trial sites are coupled related to the developments within 3GPP standardisation the availability of 5G releases, since 5G products (chipsets, modules, etc.) will be available for integration into the 5G-MOBIX facilities the corridors and trial sites will allow for technological innovation representative of market demand, whilst also uncovering gaps and requirement in the standardisation and spectrum allocation process, particularly when borders and multiple jurisdictions come into play.

Seamless 5G Connectivity for cross-border scenarios: 5G-MOBIX will overcome the challenges of deploying 5G service that work seamlessly across geographical border by relying on the unique capabilities of reach, robustness, broadcast and security that the Satellite networks offers, and on the potential for further innovations that Satellite can add to 5G CCAM.

Digital Infrastructures: Automated vehicles require an accurate vehicle location. The acceptable error is less than 30 cm (in order to be of value and complement LIDAR systems). This accuracy can only be obtained by combining several sensors like GNSS and cameras, and matching the perceived environment with a HD map. HD maps are also used to overcome the range limitations posed by the on-board sensors.

Automated vehicles need to react predictively to an event, but the on-board sensor suite has only few hundred metres of range and direct line of sight visibility. Thus, HD maps are an active area of research and innovation in the Automotive Industry. They are necessary for a correct risk estimation and decision making. However, HD maps get outdated quickly – due to high level of detail and dynamic information – and need to be updated frequently. 5G could enable building reliable and fast methods for such updates, and enable innovation in the delivery of the technology. Digital Infrastructures will be tested in the GR-TR and the ES-PT corridor as well in the 5G-MOBIX DE, CN and FI trial Sites.

Mobility as a Service (MaaS): The triad driving innovation in the transportation sector is characterised by automation, a switch to electric vehicles, and the surge of ride-hailing services. While ride-hailing services still cost around the double of a privately-owned vehicle per mile, this value is expected to drop by 70% once the driver is taken out of the equation – thus making ride-hailing services cheaper than owning a car. Robotaxis, or fully automated taxi services, are likely to become a widespread reality faster than the privately owned fully automated vehicles. Combining public transportation with Robotaxis and the different ride-hailing services has the potential to greatly reduce the number of cars on the streets and emissions levels. Nevertheless, to effectively change urban mobility, the different types of services need to be coordinated. Assuring inter-operability between all transportation modes is paramount to foster "last mile" services and real-time communication and monitoring will be crucial to an effective management of the traffic flow. A 5G network has the potential for precise and timely communication between all agents, thus fostering prevention and effective traffic management measures and smoothing innovation in the sector. MaaS will be tested in the FR 5G-MOBIX Trial Site.

Information Society on the Road: Automated vehicles SAE level 4 and 5 have the potential to become the "third living space". This meaning that full potential use of information systems and the consumption of entertainment content will be feasible during commutes, as the user (formerly driver) is now freed from the driving task. Moreover, users will probably demand the possibility to access content that allows them to work or enjoy leisure activities (social networks, e-commerce, video streaming) while on the move. A 5G infrastructure has the capacity to provide such services, although the sparse nature of highway network infrastructures might represent a significant challenge to implementation. Thus, this is a CCAM use case that will be explored in the 5G-MOBIX project as it promises potential for innovation in applications and services that have yet to be imagined, particularly when the technologies are widespread and open to other vendors. Infotainment systems will be tested in the ES-PT corridor and in the 5G-MOBIX DE and KR Trial Sites.

4. INNOVATION STRATEGY

4.1. Overall framework

Some of the fundamental activities to be developed in this and any innovative process are as follows:

- Generation of ideas which potentially could become new products or processes;
- Acquisition of knowledge on the generated ideas; and
- Implementation and market monitoring to verify customer satisfaction and after sales.

Innovation management within European projects is a process that requires an understanding of both market and technical problems, with a goal of successfully implementing appropriate creative ideas. Corresponding business models and process innovations are hence an integral part of creating, adapting, and maintaining a product or service to market maturity. These new business models and process innovations are very often triggered through technological innovations, which act as enablers, but also generate requirements for the development of technology.

As part of the 5G-MOBIX management structure, the Innovation Manager reports to the TMT and also provides guidance to the Consortium with regard to best practices on innovation management, such as:

- Planning for innovation success, understanding and using innovation management techniques and processes during the lifetime of the project;
- Identifying and fostering innovation enablers/driving factors;
- Evaluating and improving the performance of the innovation management system;
- Identifying the "go to market" needs of high potential innovations;
- Systematically capture structured data on project innovations, related to innovation readiness, innovation management, and market potential (both TRL – Technology Readiness Level, and MARL – Market Adoption Readiness Level); and
- Identification and exploitation of positive spill-overs.

Innovation does not just require new technologies and products, but also new business models. In the European knowledge economy, production and services are based on knowledge-intensive activities. These activities contribute to an accelerated pace of technical and scientific advance. We will use existing business model tools and strategies to:

- Brainstorm and quick scan tooling for new Business Models focussed on formulating value propositions, branding and market segmentation in relation to organisational resources and capabilities and earning logics (examples: Canvas helps to structure the process of business model innovation and to early on deal with issues of business model implementation);
- Test Business Models in different scenarios;

- Define roadmaps on how to move to a new Business Model;
- Analyse impact for business processes, applications and IT infrastructure when Business Models are implemented;
- Align new Business Models with relevant partners in the environment of the SME (their eco-system), but also with existing IT-systems, platforms and architectures; and
- Facilitate codification, transfer and adaptation of successful BMs from other sectors and countries.

4.2. Framework for assessment

The aim of this section is to let the reader know about the processes or steps that the Innovation Manager will follow to make sure that the previously established innovation 5G-MOBIX objectives are adapted to trend on the market. In order to achieve this, trends in the field of R&D must be closely and regularly monitored, as well as market breakthroughs. Some of the tasks for the overall assessment are:

- 5G-MOBIX Innovation Management Plan will be first presented during month 6 of the project and will be regularly updated throughout its development.
- On month 36 the Innovation Management Report will be published, providing information on the progress made on the innovation by the 5G-MOBIX consortium in terms of the initial plan.
- Each partner will be responsible of updating the rest of the consortium in case they are aware of events affecting the Innovation Management of the Project.
- A slot of the General Assemblies and TMT meetings will be dedicated to the analysis of the Innovation Management Plan.
- Possible risks will be previously identified and classified according to the likelihood of occurrence.
- Given the context of a non-identified and unexpected threat emerges, the Innovation Manager will call for a meeting to the rest of the Consortium Members in order to jointly determine the next steps.

4.3. Innovation management tools

For an efficient innovation management during the project, a number of specific tools have been proposed in order to respond to the innovation management requirements. The Innovation Manager and TMT will be held responsible for these tools and procedures and will be implemented by all Consortium members.

4.3.1. S-curve framework

A tool that can aid in the identification of technological innovations is the S-curve (Foster, 1986) often used to describe the origin and evolution of technologically discontinuous or radical innovations. The S-curve framework can also be used at the firm level for planning new technology development and has become a centrepiece in technology strategy. As depicted in the figure below, during early stages of

technology the rate of progress in performance is relatively slow. Then the improvement increases, after been understood, controlled, and diffused. In a mature stage, technology will approach a limit.

Figure 3: Technology/Marketing S-curve, adapted from (Foster, 1986)

4.3.2. Stage Gate Model

The "Stage Gate" model (Cooper, 1990) is the industry standard for managing new product innovation excellence. It integrates numerous performance-driving practices into easy-to-understand steps for success. Its design engages users of all decision-levels and functions, enabling quality execution, timely decisions, alignment and speed. This process allows products to reach markets faster and organisations to generate better profits.

The Stage-Gate business process and risk model designed to transform an organisation's new ideas into new product, fostering a culture of product innovation excellence: product leadership, accountability, high-performance teams, customer and market focus, robust solutions, alignment, discipline, speed and quality. The model takes the complex innovation process and divides it into smaller stages (project activities) and gates (where business evaluations and decisions are made).

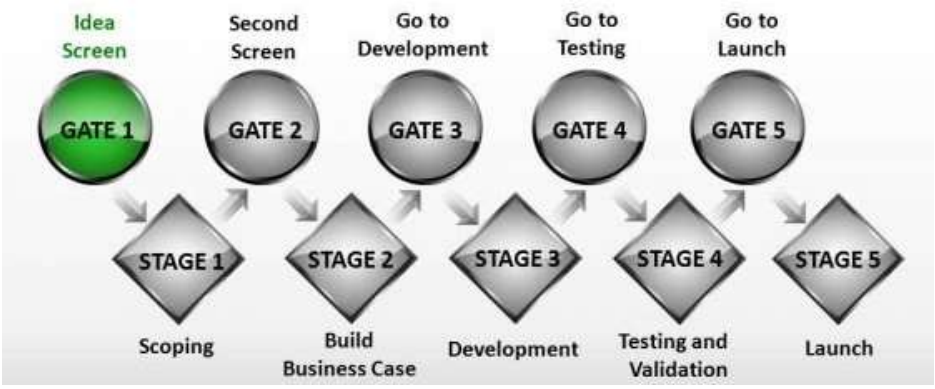

Figure 4: Stage-Gate Innovation Process

4.3.3. Funnel Model

The "Funnel" model (Wheelright & Clark, 1992), as well as the Stage Gate model, have become reference models for innovation management. Many models that have emerged since are variations of these two models.

As represented in the Figure below, the overall innovation process starts with a broad range of inputs and gradually refines and selects from them, creating a reduced number of formal projects that can be completed and introduced in the market. The phases of the funnel are: input of ideas, development goals, project planning, project management, execution, learning, improved post-project. The limits of the funnel represent the boundaries of the organisation, in the case of 5G-MOBIX, they represent the boundaries of the project's consortium.

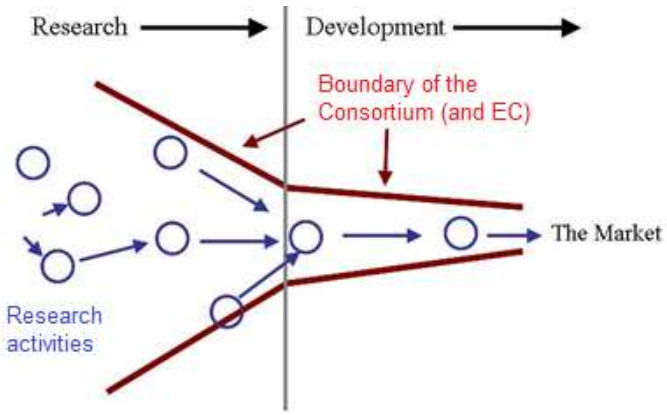

Figure 5: Innovation Funnel (Modified from Wheelright & Clark, 1992)

4.3.4. Risk Matrix

To balance 5G-MOBIX's innovation portfolio, the consortium needs a clear picture of how its activities fall on the spectrum of risk. The risk matrix employs a unique scoring system and calibration of risk to help estimate the probability of success or failure for each project based on how big a stretch it is: the less familiar the intended market (x axis) and the product or technology (y axis), the higher the risk.

A position on the matrix is determined by its score on a range of factors, such as how closely the behaviour of targeted customers will match that of the 5G-MOBIX's partners' current customers, how relevant their brands are to the intended market, and how applicable the technology capabilities are to the new product. The Innovation Manager together with the TMT will conduct the evaluation, with the support of the WP Leaders and the development teams. Team members will rate each activity independently and then explain their rationale. They will discuss reasons for any difference of opinion and seek consensus. The resulting scores serve as the project's coordinates on the risk matrix.

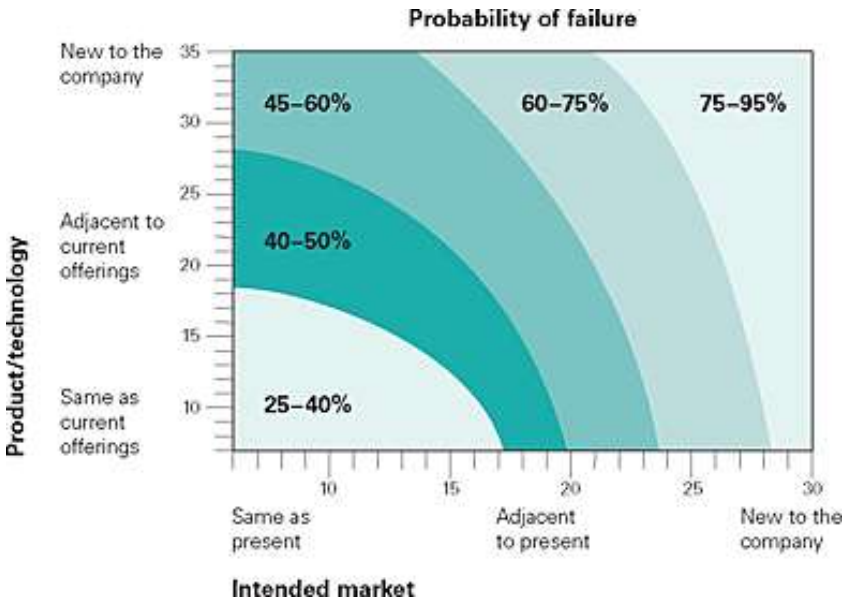

Figure 6: Risk Matrix for innovations

4.3.5. R-W-W Screen

The Real-Win-Worth-It screen, sometimes known as the Schrello screen, is a tool built on a series of questions about the innovation concept or product, its potential market, and the consortium's capabilities and competition. It is not an algorithm for making go/no-go decisions, but a disciplined process that can be employed at multiple stages of product development to expose faulty assumptions, gaps in knowledge, potential sources of risk, and to ensure that every avenue for improvement has been explored. The R-W-W screen can be used to identify and help fix problems that are miring a project, to contain risk, and to expose problems that might lead to termination of an activity.

The R-W-W screen can be used to evaluate individual activities, concepts, or ideas by answering questions in three broad topic areas: "Is it real?" explores the nature of the potential market and looks at the feasibility of building the product. "Can we win?" considers whether the innovation and the company can be competitive. "Is it worth doing?" examines the profit potential and whether developing the innovation makes strategic sense (Annex I).

4.3.6. Monnier's Innovation Matrix

According to the literature reviewed, very few authors have addressed the problem of managing collaborative innovation projects. The Monnier's Innovation Matrix (Monnier & Zolghadri, 2010) is a tool aimed at measuring the level of innovation of an offer or an organisation. The study suggests a method for measuring innovation in seven levels that can be applied to most industrial companies. The tool is composed of a two-dimensional matrix where the "X" axis represents the market level and the "Y" axis the new idea. This matrix will serve as a means to evaluate the technical level of the products or the relevance of a new service based on this new idea.

This tool could be considered as an efficient collaborative work platform, for the benefits of an innovation project management. Moreover, the Matrix could be used for evaluation of the innovation level for an offer, a supplier, for the evaluation of the innovation capability of the main outputs of a research study, as a strategic tool for decision making (e.g. patents), etc.

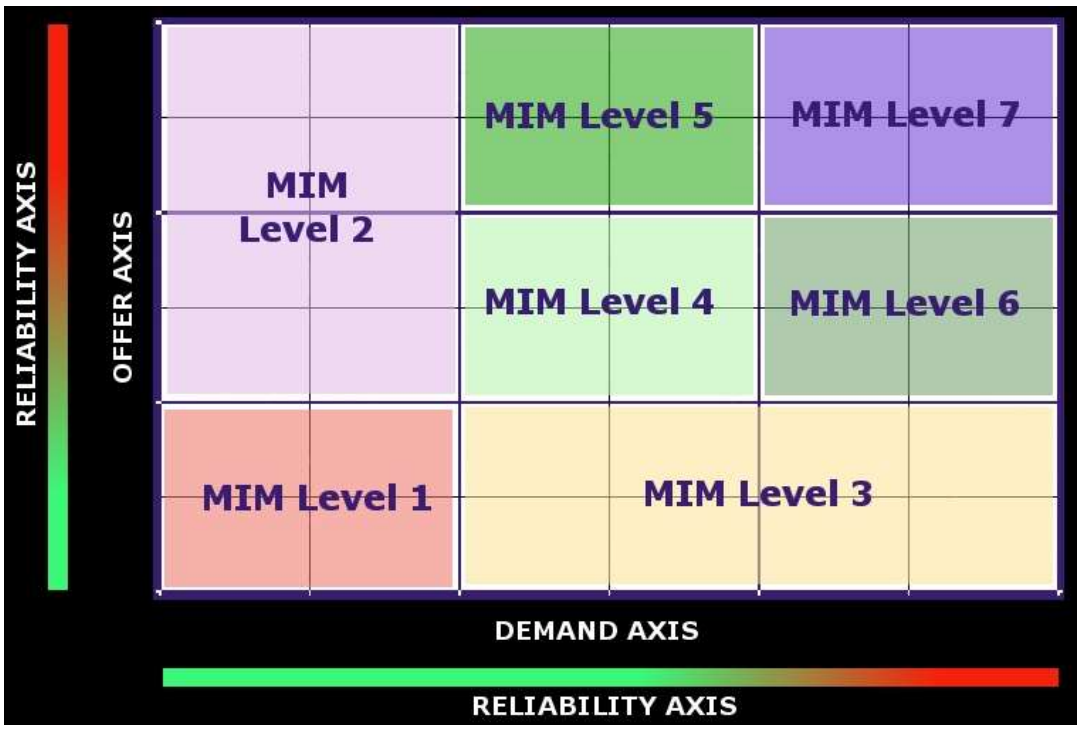

Figure 7: Monnier's Innovation Matrix

4.3.7. Innovation Radar

The Innovation Radar is an initiative of the European Commission focused on the identification of high potential innovations in FP7, CIP and Horizon 2020 projects. It supports innovators by suggesting a range of targeted actions to assist them in fulfilling their potential in the market. This initiative involves: assessing the maturity of innovations developed within the projects and identifying high potential innovators and innovations; providing guidance during the project duration in terms of the most appropriate steps to reach the market; and supporting innovators through entrepreneurship initiatives to cover specific needs concerning networking, access to finance, Intellectual Property Rights, etc.

According to De Prato, Nepelski, and Piroli (2015) the market potential and innovation readiness are among the strongest dimensions of the ICT innovations developed in the projects analysed in the report, while innovation management has the most room for improvement. In the context of 5G-MOBIX, the structured questionnaire that is used to review projects with respect to their innovative output by the innovation radar can be used to perform an internal qualitative evaluation of the potential innovations developed within the project (see Annex II).

5. IPR MANAGEMENT

5G-MOBIX actively monitors the creation of IPR during the lifetime of the project within WP1. As part of this process, Results which are both jointly and individually owned will be identified. Proposals for the division of share of such results and the base conditions for their exploitation were made by the project team, in particular those generating the results, the project coordinator, the innovation and exploitation managers.

These proposals will be made in line with the conditions first set out in the Consortium Agreement and in function of the IPR audits to be conducted. An online tool to support partners in the identification of the IP Foreground and the pre-existing knowledge to be protected will be provided, according to the project evolution. Nevertheless, each partner is responsible to apply the knowledge protection measures.

The different sections of the online tool for IPR auditing will include:

1. Control of access rights needed for the implementation of the project
2. Control of third owners' software used in the implementation of the project
3. Control of commercial hardware used in the implementation of the project
4. Control of third owner intellectual property rights used in the implementation of the project
5. Control of party background used in the implementation of the project
6. Control of party foreground generated in the project

Therefore, these IPR audits will identify the Foreground IP generated by the project, its dependencies on and External IP, Sideground or Background knowledge. The final report will summarise the foreground generated by each partner for the entire duration of the project. Moreover, the exploitable foreground of the project generated during this period will be identified, as it is key for the innovation management process, and the definition of an exploitation plan.

6. CONCLUSION

5G-MOBIX will have a significant impact in innovative, previously unfeasible, automated driving applications with high automation levels, both from a technical and a business perspective. To this end, an innovation management plan and strategy has been defined from the early beginning of the project.

This report provides the required literature and enables the reader to fully understand the chosen innovation management approach for the 5G-MOBIX project. This deliverable will also serve as guidance for consortium members and will be updated throughout the development of the project, in order to adjust to the innovation activity requirements.

The Innovation Management Plan is considered as an adaptive living document and it will be further updated according to different project phases.

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ANNEXES

Annex 1 – R-W-W Questionnaire

Annex 2 – Innovation Radar Questionnaire

Innovation Radar Questionnaire by EC DG CONNECT

Note: the first 16 questions below are to be answered for **each** innovation the project develops (up to a maximum of 3 innovations).

1) **Describe the innovation (in less than 300 characters, spaces included):**

2) **Is the innovation developed within the project…:**
   a) Under development
   b) Already developed but not yet being exploited
   c) being exploited

3) **Characterise the type of innovation (only to be answered if 2b or 2c is selected)**
   - Significantly improved product
   - New product
   - Significantly improved service (except consulting ones)
   - New service (except consulting ones)
   - Significantly improved process
   - New process
   - Significantly improved marketing method
   - New marketing method
   - Significantly improved organisational method
   - New organisational method
   - Consulting services
   - Other

4) **If other, please specify:**

5) **Characterise the macro type of innovation (only to be answered if "under development" is selected for Q2):**
   - Product
   - Marketing method
   - Organisational method
   - Process
   - Service (non-consulting)
   - Consulting service
   - Do not know yet

6) **Will the innovation be introduced to the market or deployed within a partner:**
   a) Introduced new to the market (commercial exploitation)
   b) Deployed within a partner (internal exploitation: Changes in organisation, new internal processes implemented, etc.)
   c) No exploitation planned

7) **If no exploitation planned, please explain why no exploitation is planned (answer only if 6(c) is selected)**

8) **Is there a clear owner of the innovation in the consortium or multiple owners?**
   - A clear owner
   - Multiple owners

9) Indicate who is the "owner" of the innovation: …

10) Indicate the step(s) already done (or are foreseen) in the project in order to bring the innovation to (or closer to) the market (answer only if 6(a) is selected)

	Done	Planned in project	Not Planned	Desirable
1. Technology transfer				
2. Engagement by Industrial research team of one of their company's business units in project activities				
3. Pilot				
4. Capital investment (VC, Angel, other)				
5. Investment from public authority (national, regional)				
6. Business plan				
7. Prototyping				
8. Market study				
9. Demonstration or Testing activities				
10. Feasibility study				
11. Launch a start-up or spin-off				
12. Other				

11) If other, please specify

12) Indicate which participant(s) (up to a maximum of 3) is/are the key organisation(s) in the project delivering this innovation. For each of these identify under the next question their needs to fulfil their market potential.

Org1:
Org2:
Org3:

13) Indicate their needs to fulfil their market potential

	Investor readiness training	Investor introductions	Biz plan development	Expanding to more markets	Legal advice (IPR or other)	Mentoring	Partnership with other company (technology or other)	Incubation	Startup accelerator
Org 1									
Org 2									
Org 3									

14) When do you expect that such innovation could be commercialised? (answer only if 6(a) is selected)

- Less than 1 year
- Between 1 and 2 years
- Between 3 and 5 years
- More than 5 years

15) Have any of the project partners…

(only to be answered if "Done" or "Planned in Project" is chosen for 10.5 "Investment from public authority")

a) already applied for support from private investors

b) already applied for investement from public authorities
c) Planning to start discussions with private or public investors

16) Which partners are in discussion with investors (or are planning such discussions)?

(the above questions are to be answered for **each** innovation developed by the project, up to a maximum of 3 innovations)

General Questions

(questions below are to be answered once in the project review, not for each innovation)

1) How does the consortium engage end-users?
- End user organisation in the consortium
- An end user organisation outside of the consortium is consulted
- No end user organisation in the consortium or consulted

2) Are there in the consortium internal IPR issues that could compromise the ability of a project partner to exploit new products/solutions/services, internally or in the market place?
- yes
- no

3) Please provide specifics of the IPR issues:

4) Which are the external bottlenecks that compromise the ability of project partners to exploit new products, solutions or services, internally or in the market place?
- IPR
- Standards
- Regulation
- Financing
- Workforce's skills
- Trade issues (between MS, globally)
- Others

5) Indicate how many patents have been applied for by the project: _____
6) Does the review panel consider the project performance in terms of innovation?
- Exceeding expectations
- Meeting expectations
- Performing below expectations

7) General observations of innovation expert on this project's innovation performance:

8) How would you rate the level of commitment of relevant partners to exploit the innovation?
- Very low
- Low
- Average
- High
- Very High
- None