D6.1

IMPACT AND DISSEMINATION PLAN FOR ACADEMIC RESEARCH, DEVELOPMENT OF INDUSTRY, STANDARDISATION AND REGULATION SYNERGIES

The 5G-SMART project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 857008.

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Grant agreement number:	857008
Project title:	5G for Smart Manufacturing
Project acronym:	5G-SMART
Project website:	www.5gsmart.eu
Programme:	H2020-ICT-2018-3
Deliverable type:	Report (R)
Deliverable number:	D22
Contributing workpackages:	WP6
Dissemination level:	Public (PU)
Due date:	31st of August 2019 (M03)
Actual submission date:	31st of August 2019 (M03)
Responsible organisation:	ULUND
Editor(s):	Sara Gunnarsson (ULUND) Harsh Tataria (ULUND) Fredrik Tufvesson (ULUND)
Version number:	1.0
Status:	Final
Short abstract:	This deliverable provides a broad overview of the communication, dissemination and exploitation activities planned by 5G-SMART.
Keywords:	Communication, demonstration, dissemination, exploitation, impact, Industry 4.0, regulation, standardisation

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Executive summary

This deliverable brings together 5G-SMART's plan for communication, dissemination, and exploitation of results from academic, industrial and social perspectives. The strategies and activities described in this deliverable will create maximum research and commercial impact within Industry 4.0, with the ultimate aim to integrate fifth-generation (5G) cellular network technology into the smart manufacturing sector.

With the objective of demonstrating the readiness of 5G in a manufacturing context via pre-commercial trials and measurements, strategies to achieve the desired impact are highlighted. This includes identification of relevant key performance indicators (KPIs) that can be used when assessing the project results, as well as potential impact barriers. A description of the available communication channels, which form a foundation for the planned dissemination activities, is presented. The communication activities aim at interacting with both technical and non-technical audiences with the overall aim of spreading awareness of 5G technology in Industry 4.0.

Dissemination activities include showcasing the use of 5G for smart manufacturing in a number of demonstrations and validation events, as well as contributions to international conferences, workshops, training and teaching activities. Exact venues, as well as relevant high impact journals and conferences for dissemination of 5G-SMART results have been identified and agreed upon. The chosen platforms are expected to generate the highest impact and add immense value, aiming to help Europe compete and lead the global stage with 5G integration into smart manufacturing. Further to the above, the result of an analysis of synergy effects, as well as of specific standardisation and regulation activities is also presented. A detailed exploitation strategy for the project as a whole, as well as exploitation plans for individual partners have been created and agreed upon.

The aforementioned plans will be exercised in an agile manner throughout the project, creating long lasting impact.

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1 Introduction

The objective of this document is to present 5G-SMART's strategies for effective communication, dissemination, and exploitation of the project. The tasks of communication, dissemination, and exploitation are of high importance to 5G-SMART, as it is recognised that they are crucial elements to increase the impact of the project. The overall goal of the dissemination and impact plan is to outline a path to increase the visibility of the project, promote the exchange of knowledge regarding the introduction of 5G in the manufacturing industry, and attract potential users of the project results by demonstrating the readiness of 5G in the manufacturing context. 5G-SMART will thus help to strengthen the research and innovation landscape in Europe.

The communication plan presented in this document aims at describing the planned efforts by 5G-SMART to reach out to society and show the impact and benefits of the project. Different activities and communication channels, that will be used to inform and promote the project and its results to multiple audiences, are explained.

The dissemination strategy outlined in this deliverable provides a clear plan on how knowledge and results obtained in 5G-SMART are planned to be transferred to potential users, including, for instance, the scientific community, industrial partners, and policymakers.

The exploitation plan of 5G-SMART presented in this document provides an initial strategy on how the project results could be effectively used, not only by project partners themselves but as well other user groups, organisations, etc., outside the project. Special emphasis is given to assuring a high impact of 5G-SMART on standardisation and regulatory bodies.

Apart from concrete plans on impact and dissemination, the deliverable details possible barriers and risks that could negatively influence the success of the project, while appropriate counter-measures are suggested alongside.

In order to assure a coordinated approach on dissemination and impact, 5G-SMART has both a separate work package that is dedicated to impact and dissemination as well as a dedicated exploitation and innovation manager, who oversees the impact of the project closely, provides active guidance, and coordinates the contribution of all project partners to the work on dissemination and impact.

While this deliverable provides the plan at the beginning of the project, the plan itself is not static but will be regularly reviewed and adjusted. Two follow-up deliverables on communication, dissemination and exploitation will be concerned with the evaluation of the project success in this regard, but as well with the description of adjustments of the strategy, and a more concrete exploitation plan.

1.1 Structure of the document

This document is structured as follows: Section 1 provides a general introduction to the deliverable. Section 2 discusses the expected impact of 5G-SMART as well as potential barriers and obstacles, including how to evaluate the activities in terms of impact. Then, Section 3 outlines the planned communication activities, and Section 4 presents the dissemination activities on the agenda. In Section 5, the standardisation and regulation synergies are further elaborated on. Section 6 presents the 5G-

SMART exploitation plan as well as the individual exploitation plans for each partner. Lastly, in Section 7, the deliverable is summarised, and conclusions are presented.

2 Impact of 5G-SMART

Figure 2-1 shows the path envisioned by 5G-SMART to create and maximise impact. The path originates from the project's objectives, and is backed by using relevant technical and business KPIs to analyse the results of the project. Specifically, the goals of 5G-SMART are to create impact by accelerating the 5G adoption in smart manufacturing, bring together the information and communication technology (ICT) world with operational technology (OT) industries, drive future 5G-enabled manufacturing solutions as well as to drive industry standards and scientific research. The expected impact can be achieved by identifying and filling gaps between the current state-of-the-art, the target KPIs, and the results obtained in the different activities specified to achieve the project objectives.

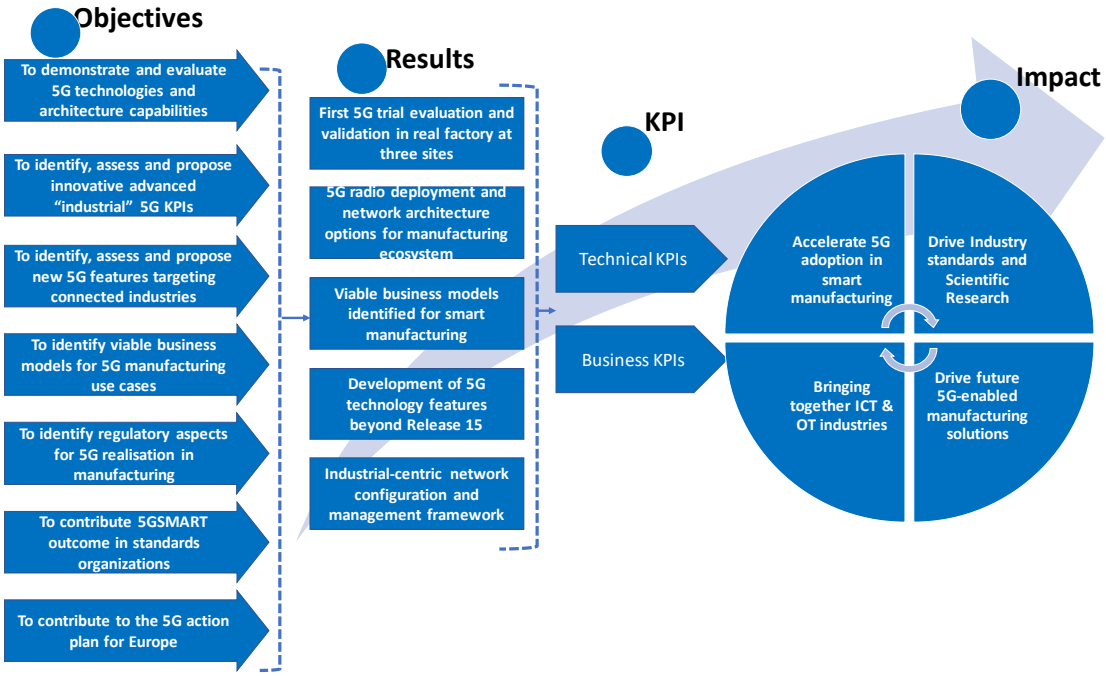

Figure 2-1: The 5G-SMART path to create impact

Being a phase-3 project, the project will create impact by conducting advanced trials to show the readiness of 5G for smart manufacturing. More specifically, 5G-SMART addresses the impact elements expected by ICT-19-2019: Advanced 5G validation trials across multiple vertical industries, in the Work Programme 2018-2020 for Information and Communication Technologies [EU19], where the following items are given:

- Validated core 5G technologies and architectures in the context of specific vertical use cases and deployment scenarios, from high to low density regions.
- Validated core technologies and architecture for differentiated performance requirements originating from enhanced mobile broadband (eMBB), massive machine-type communication

(mMTC), ultra-reliable low-latency communication (URLLC) use cases, notably for end-to-end slicing and virtualisation.

- Viable business models for innovative digital use cases tested and validated across a multiplicity of industrial sectors, including demonstration of required network resource control from the vertical industry business model perspective.
- Impactful contributions towards standardisation bodies, involving vertical actors, for what concerns the second phase of 5G standardisation. Participation of key European industrial partners with high standardisation impact is desired.
- Validation of relevant KPIs with services linked to specific vertical sectors.
- Europe 5G know-how showcasing.

5G-SMART is expected to create impact by covering all of the aforementioned items across its multiplicity of diverse work packages. To create synergies and harmony, the industrial partners will interact with other industry players to maximise the impact of the project on other vertical industries and standardisation bodies. From a research perspective, through academic dissemination, participants will present their proposed solutions, and evaluate their impact on the smart manufacturing ecosystem. 5G-SMART will also implement a comprehensive value creation strategy towards the scientific community, with the organisation of dissemination events, where concepts, which are fundamentally novel, can be promoted via demonstration of planned results and prototypes. It is of prime importance to let project results and findings percolate among academic as well as industrial research peers.

Impact on global standardisation organisations is naturally expected, as the majority of partners in 5G-SMART are active members in these organisations. Section 5 further describes the different standards organisations and their dissemination strategies.

Another part of the value chain is the impact on the factory and process automation ecosystem. Having operational technology players from the automation industry, such as ABB and Bosch, in the consortium, 5G-SMART will be able to unleash the value chain in the factory and process automation ecosystem, including industrial end-users, to raise awareness and provide concrete proof-points through trials about what 5G connectivity will bring to the industry.

2.1 Evaluation of impact activities

In order to evaluate the impact activities set by the 5G-SMART project, as illustrated in Figure 2-1 and previously described, relevant KPIs need to be identified. Below, the four impact activities, including their link to the ICT-19-2019 call, are addressed with their corresponding KPIs. The KPIs will be used for validation of the services linked to the specific vertical sector, in line with the fifth item in the ICT-19-2019 call.

Accelerate 5G adoption in smart manufacturing

This activity is addressing the first two items listed in the ICT-19-2019 call that relate to the validation of core 5G technology and architecture for specific vertical use cases, and the validation of the core technologies and architecture for differentiated performance requirements. 5G-SMART will perform field trials in real manufacturing environments at an Ericsson factory and a Bosch factory, as described in Section 5. These trials will be used to

measure the impact of this activity, by counting the number of successful trials and pilots of 5G technologies, such as network slicing and virtualization in industrial manufacturing.

Bring together ICT and OT industries

5G-SMART includes a strong consortium that consists of operational technology vendors, network operators as well as industrial customers such as Bosch, ABB and Marposs. The third ICT-19-2019 item, which relates to the business models for innovative digital use cases, will be addressed in this activity. 5G-SMART will deliver field trials involving all the actors in industrial manufacturing business models. Thus, the list of new prototypes or products described in the exploitation plans from each partner, and presented in Section 7, is the KPI to measure the impact of this activity.

Drive industry standards and scientific research

This activity will focus on the fourth item from the ICT-19-2019 call, which is to measure the impact towards standardisation bodies. The number of standardisation contributions made by the 5G-SMART partners in relevant standardisation forums, listed in Section 6, will be the main KPI to measure the achievements of this activity.

Drive future 5G-enabled manufacturing solutions

The number of dissemination activities, such as workshops, conferences and presentations, planned in Section 5 will be considered when quantitatively measuring the success of this impact activity. Addressing the last item of the ICT-29-2019 call, the list of new technologies developed within 5G-SMART, and validated through simulations or prototypes, will be used to evaluate the impact of 5G-SMART when showcasing the Europe know-how in industrial manufacturing.

2.2 Potential impact barriers and obstacles

On the path of creating impact, potential barriers and obstacles have been identified. These barriers include spectrum regulations, standards, and market fragmentation, and are further described in Table 2-1, including the actions 5G-SMART will take in order to lower these barriers.

Barriers	5G-SMART actions to lower barriers
Spectrum Regulations: the national spectrum regulators might take uncoordinated and contradictory decisions on how to respond to the need of spectrum for industries.	5G-SMART will approach the major regulations bodies in Europe e.g. BNetzA and PTS directly and indirectly (through alliances and individual organisations), in order to share insights about the business models (including operators' models) for manufacturing. In addition, regulators such as OFCOM are part of the 5G-SMART advisory board, hence the project will ensure direct interaction with decision makers about spectrum regulations to obtain most up-to-date information regarding the decision making.
Standards: Some of the stringent requirements (e.g. synchro-nisation, positioning) in manufacturing are not adopted or	5G-SMART will provide valuable insights via theoretical and practical studies on which of those requirements (timing, reliability, etc.) should be carried over from wire-based solutions to wireless solutions, and where adaptation of

not reported in 3rd generation partnership project (3GPP).	protocols is necessary. A holistic view on how to achieve a flexible and reliable system will avoid over-engineering sub-systems. To this end, 5G-SMART will identify: 1) technical implications of industry local area network (LAN) and time sensitive networking (TSN) integration with 5G network, and 2) requirements for 5G-supported time synchronisation and positioning. Those implications and requirements will be lifted to major alliances such as the 5G alliance for connected industries and automation (5G-ACIA), and in addition, the 3GPP players in the project will formulate common contributions to 3GPP on the matter.
Market fragmentation: varieties of competing business models/solutions/technologies emerge in the manufacturing industry	5G-SMART will work towards unified 5G technology solutions that are suggested under sustainable business models of the project. The project will begin by identifying the relevant business models, and evaluating the related network deployment options. It will deliver a qualitative analysis of business value creation from the perspective of the manufacturing industry players for the identified use cases. More importantly, 5G-SMART will identify the possible operator business models and value propositions, and give insight into the roles that mobile network operators (MNOs) can possibly take. The business model framework will be promoted towards the manufacturing end-users (e.g. the Process Automation Users' Association (WIB) and Scania), regulators and relevant associations (such as the German Electrical and Electronic Manufacturers' Association (ZVEI)). 5G-SMART will engage with relevant actors in the industries directly or indirectly through 5G-ACIA.

Table 2-1: Potential impact barriers and obstacles

3 Communication activities

The project communication activities aim at interacting with multiple audiences, not only targeting the project's own community, but also the media and general public. The goal is to spread information about the project as a whole, and build awareness on the benefits of such a project and the best possible ways to exploit the results under the Industry 4.0 and 5G umbrellas. The widespread communication about the project will not only help supporting the adoption of the project results and ideas, but as well help the general public to understand how the project tackles issues and challenges relevant to society. By choosing appropriate social media channels, a two-way communication is made possible. The innovation and exploitation manager coordinates the communication activities of 5G-SMART.

Communication activities have been planned to be closely aligned with the dissemination strategies described in Section 4.

In the remaining part of this section, the communication plan of 5G-SMART is outlined. The target audiences of the project are described and the different ways of communicating the project results are developed. These means of communication include both printed material and online material. The public website, and the presence of 5G-SMART in social media (Twitter, LinkedIn, YouTube), are further explained.

3.1 Target audiences

The target audiences of 5G-SMART can be split into four, possibly overlapping, groups. For each of the target audiences, adequate communication channels have been identified. These are listed in Table 3-1.

Target Audiences	Mechanisms	Channels
Academia, Industry R&D, Public R&D (OT)	Peer reviewed journals, white papers, fairs	Including but not limited to: IEEE Transactions on Industrial Electronics, IEEE Transactions on Instrumentation and Measurement, CIRP Journal of Manufacturing Science and Technology, CIRP annals of manufacturing technology
Academia, Industry R&D, Public R&D (ICT)	Peer reviewed scientific and technology conferences and journals	Including but not limited to: IEEE Communications Magazine, IEEE WCNC, IEEE/IFIP international conference on dependable systems and networks
ICT and verticals business stakeholders	Trade shows	Including but not limited to: Hannover Fair and Mobile World Congress, Control Fair in Stuttgart, EMO, IMTS and JIMTOF
General public	Press releases, social media	Project website, LinkedIn, Twitter, Facebook, YouTube

Table 3-1: Targeted audiences and communication channels

The overall efficiency and impact of the communication activities for the 5G-SMART project will be maximised through a coordinated approach. Emphasis will be laid on joint communication activities, including, in particular, joint contributions to best-in-class conferences, journals, keynote speeches, talks to expert groups, fora and standardisation meetings, etc. Furthermore, public showcasing of prototype platforms at key events will be used to reach out to a wider audience.

3.2 Printed material

The 5G-SMART project will at an early stage create a basic set of printed presentation materials targeted for various audience types in form of a dissemination and visualisation package that will be used as the core communication mean to promote the project to different organisations and fora. The project poster and leaflets will be designed during the first five months and will be used by all partners of the project consortium during the whole project duration. All offline materials contain references to the online sources of 5G-SMART.

Concerning the press, contacts will be established with the relevant trade press in order to extend the reach of the communications activities, and press releases will be prepared whenever suitable.

A periodic newsletter is planned on a yearly basis, including information about the latest achievements of the project and links to recent public deliverables and forthcoming events. This newsletter will be available both online as well as in a printed version.

3.3 Project website

The public website presents the 5G-SMART project as a whole, including news, events, project description, consortium and public deliverables of the project. Information about the project is provided on different levels of technical detail, thus addressing multiple audiences at the same time. The public website is the central hub for communication with different parties, and is available via the following URL:

https://5gsmart.eu/

In compliance with the European Commission (EC) open access policy, open access to all scientific publications created in the project will be ensured through the website, and when publishers are involved, the submitted papers will be made available in compliance with the rules of the publisher. Figure 3-1 shows, as an example, one part of the website's documents section, where presentations are shared.

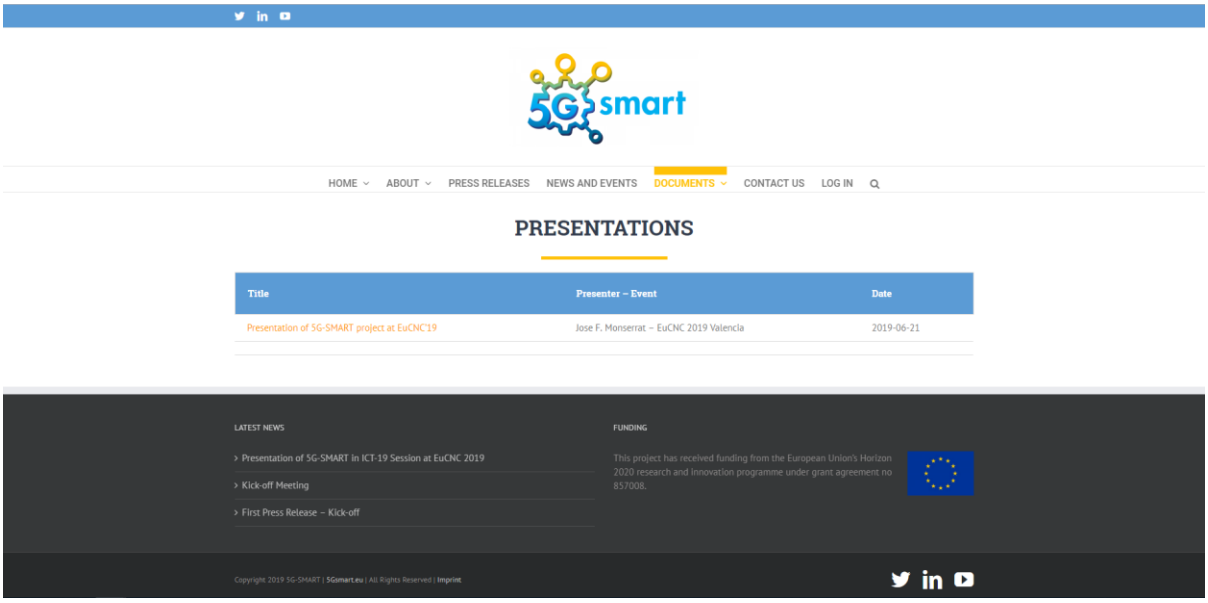

Figure 3-1: A screenshot of the 5G-SMART webpage

3.4 Social media

In order to ensure the largest possible exposure of the project to a wide audience, and to build a community, different social media and networking tools will be used in the project, including LinkedIn and Twitter. In addition, a YouTube channel has been created to capture presentations from e.g. industry forum demonstrations, workshops, and test-bed trials. These presentations will be made available whenever possible. The chosen media and networking tools allow two-way interaction with the project and are therefore particularly interesting for 5G-SMART. Moreover, social media is

considered of major relevance for the project as a means to reach younger scientists who are in an early stage of their career.

To improve the search engine ranking, all social media accounts will be interconnected with the project website. Moreover, interaction with other EU projects is planned.

The success of the social media presence of 5G-SMART will be continuously monitored and regularly evaluated using both quantitative measures obtained through numbers, e.g. by Twitter Analytics, and qualitative measures, e.g. by evaluating the types of comments received.

3.4.1 Twitter

The project is using Twitter as a key tool for communication. The Twitter account can be accessed via:

https://twitter.com/5g_smart

Here, short comments, announcements, news and other content relevant for a larger audience will be shared. Figure 3-2 shows the Twitter account of 5G-SMART.

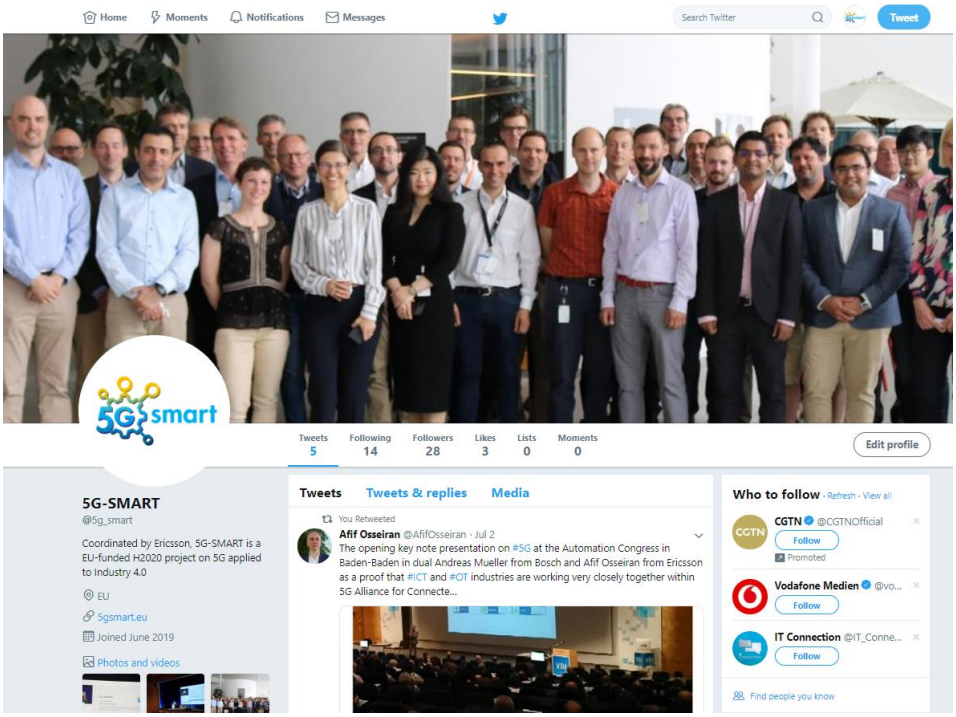

Figure 3-2: 5G-SMART Twitter profile

3.4.2 LinkedIn

A business account on LinkedIn has been created under the following URL:

https://www.linkedin.com/company/5gsmart/

Here, news, events, and relevant information is shared on a regular basis targeting a professional audience. Figure 3-3 shows the current view of the LinkedIn profile.

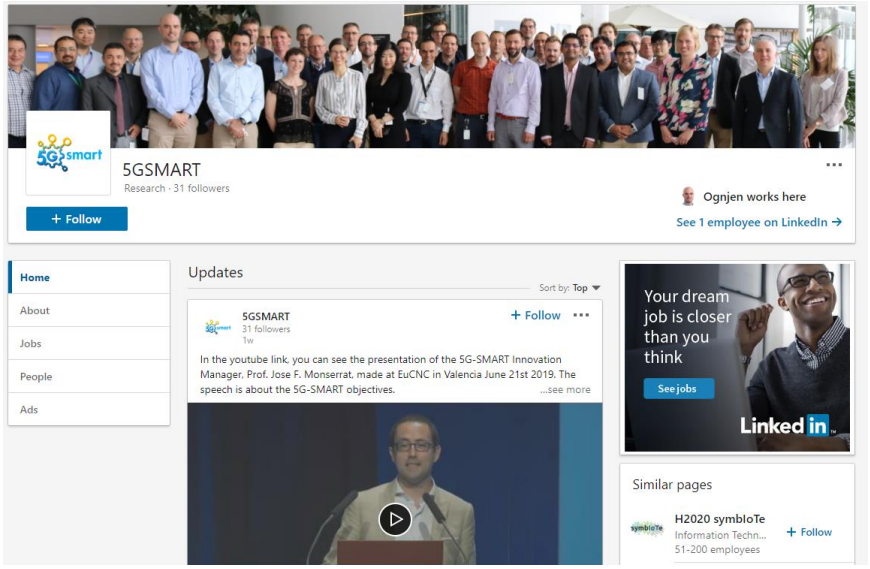

Figure 3-3: 5G-SMART LinkedIn profile

3.4.3 YouTube

A YouTube channel has been created to capture presentations from, e.g., industry forum demonstrations, workshops, and test-bed trials. The YouTube channel called 5GSMART is accessible at:

https://www.youtube.com/channel/UCdhRYuUuSfT97tIivMGLRIg

Figure 3-4 shows the project's YouTube profile.

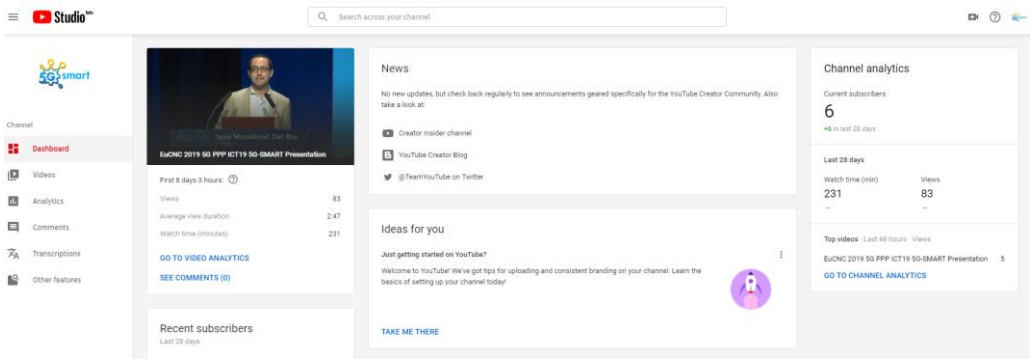

Figure 3-4: 5G-SMART YouTube profile

4 Dissemination activities

5G-SMART has a multi-fold dissemination strategy to provide relevant information to all stakeholders and facilitate market adoption of the project's results. The key actions of the strategy are to:

- Cooperate with other 5G-PPP research projects and disseminate the project results through the 5G-PPP and 5G-ACIA associations.
- Create synergy with the operational technologies players, putting together the telecommunications industry and the industrial communities. This is achieved by working with

relevant industrial alliances and related standards development organisations, and through demonstrations at relevant trade events that are specialized in Industry 4.0.
- Communicate with the research community through scientific publications and presentations at scientific conferences and workshops.
- Communicate with the regulators and standardisation bodies in order to raise awareness of the project results.

On the research and standardisation fronts, 5G-SMART aims to present novel, integrated smart manufacturing solutions, leading to high impact journal, conference and workshop publications, technical contributions on new features towards 3GPP and TSN-related standardisation bodies, as well as contributions to industry forums such as 5G-ACIA. Different means and media will be used for the communication, dissemination and exploitation of the project's results. In order to have a clear goal, these dissemination activities have been given target values, as shown in Table 4-1.

Dissemination activities	Target values
Journal papers, white papers and international conference papers	20
Contributions to standards and regulatory bodies	30
Keynotes and panels in major conferences	10
Participation in 5G for industry events and forums in Europe and worldwide	10
Workshops in major conferences	5
Training activities	5
5G demos and validations events	3

Table 4-1: Planned dissemination activities with target values

The dissemination plan will be constantly monitored, evaluated and potentially adjusted.

The remainder of this section describes in more detail the 5G demos and validation events that 5G-SMART targets, the types of scientific publication fora and workshops interesting for 5G-SMART, and the presentations, training and teaching activities planned. The dissemination towards standardisation and regulation bodies is the subject of Section 5.

Another aspect of the dissemination activities includes interacting with other projects within H2020 and beyond. Of course, all 5G-SMART partners will subscribe to cooperation in the framework of 5G-PPP and specific links of communication will be established due to the interrelation among the topics with 5Gang, H2020 SERENA, H2020 PRIMO, H2020 FORCE and ICT-17 projects on automation.

4.1 5G demos and validations events

In order to convince the OT industry to adopt 5G into their manufacturing processes, an essential part of the planned dissemination activities will be the 5G demos and validation events. The events that are identified and planned so far are outlined below.

4.1.1 Trial open days

5G-SMART plans several trial open days. The format of the trial open days will include presentations of 5G-SMART results, live demonstrations of 5G trial uses cases and workshops.

The trial open days target different communities, among these are standardisation organisations like 5G-ACIA, automation associations, and small and medium-sized enterprises (SMEs) across Europe

within the manufacturing area. The trial open days are means to strengthen the 5G-SMART impact on standardisation work. Moreover, they create greater awareness of 5G integration into manufacturing uses cases, and thus contribute to a faster adoption of 5G in the European manufacturing sector.

The first 5G-SMART trial open day will be held in Aachen.

4.1.2 Orange Research Exhibition

Every year, Orange welcomes more than 4,000 visitors during its annual Research Exhibition that runs for three days at its innovation eco-campus in the Paris region. The exhibition, which hosts a large number of discussions between Orange employees and external visitors, is an opportunity for Orange researchers to share their work. The 2019 edition showcased 37 presentations and 200 demonstrators over the three days. These presentations and demonstrations focused on the research results within areas such as the web of objects, future home, and ambient connectivity, which are linked to enriched personal services and augmented businesses.

Factories of the future, and particularly smart manufacturing, is one of those focus areas where Orange is putting significant emphasis through its research and development activities with the ambition of building new skills, engaging Orange in dynamic ecosystems, promoting high quality intellectual property, and developing or testing new technologies. In this context, Orange aims at showcasing a chosen set of 5G-SMART experimentations at its annual Research Exhibition to promote the project's innovations both internally (Orange employees) and externally (B2B clients, suppliers, government agents, regulators, etc.).

4.1.3 Demonstrations at trade shows

Industry events and trade shows provide very good means to promote the work of the project to a large number of professionals as well as to the general public. The project will target several major events in European cities, with their timing well aligned to project activities and having measurable results. Promotional material will be prepared for these events. Some specific trade shows, in which the relevance of 5G for next generation manufacturing will be disseminated, and the activities planned there, are described below.

4.1.4 Mobile World Congress 2020 and 2021

The Mobile World Congress (MWC) is the largest exhibition for the mobile industry, featuring players from end-to-end mobile ecosystem. Promotional material will be provided for both MWC 2020 and MWC 2021.

4.1.5 Hannover Fair 2020 and 2021

Hannover trade fair is the largest industry trade show in the world. Since a few years back, digitalization aspects have gained importance for this trade show. In 2018, Fraunhofer IPT for the first time showed 5G in operation for a manufacturing application, followed by 2019 with a dedicated 5G arena, which was positioned in a new hall. In 2020 and 2021, demonstrations of 5G-enabled sensors developed within 5G-SMART will be shown at the booth of Fraunhofer IPT, enhanced by other digital offerings with additions to the 5G ecosystem. Ericsson will partly support demonstrations directly in the Fraunhofer IPT booth, which will be located in the production area of the Hannover trade show.

4.1.6 SPS drive in Nuremberg

Smart Production Solutions (SPS) is a major international trade show in the field of industrial automation, which is being held every year in Nuremberg, Germany. In 2018, the SPS hosted more than 1600 exhibitors and attracted more than 65,000 visitors from around the world. The event covers the latest technological trends around industrial automation, including, for example, industrial real-time control, industrial PCs, programmable logic controllers (PLCs), industrial Ethernet, TSN, and real-time industrial OS and hypervisors, which are all relevant topics with respect to the scope of 5G-SMART. Accordingly, SPS can serve as an important platform, in particular for the OT partners in the project, for disseminating the achievements of 5G-SMART.

4.1.7 Control Fair in Stuttgart 2020

Control Fair is the largest trade show dedicated towards metrology and quality assurance in Germany. Fraunhofer IPT, as a member of the Fraunhofer Alliance Vision, takes part as an exhibitor since 1998, showing its current developments in metrology. For 2020, Fraunhofer IPT will demonstrate 5G sensor prototypes developed within 5G-SMART.

4.1.8 EuCNC

The European Conference on Networks and Communications (EuCNC) is one of the most prominent communications and networking conferences in Europe, and is supported by the European Commission. Special attention will be given to EuCNC by preparing not only 5G-SMART presentations but demos as well.

4.1.9 EMO, IMTS and JIMTOF

EMO (European trade show for manufacturing in Hannover), ITMS (International Manufacturing Technology Show) and JIMTOF (Japan International Machine Tool Fair) are the most important trade shows for machine tools and production equipment in Europe, USA and Asia, respectively. 5G as an enabler for manufacturing is well suited to be showcased in connection with machine tool companies, e.g. Georg Fischer (GF), Makino, and DMG Mori. 5G-SMART is planning to develop sensors, which will be shown in live machining operation in a machine tool, as a guest exhibition at the booth of a machine tool supplier. Fraunhofer IPT collaborates with GF Machining Solutions and Makino, which have a large affinity to networked adaptive production.

4.2 Scientific publications

The 5G-SMART partners will maximise the scientific visibility of the results obtained within 5G-SMART by publishing papers in major conferences organised by IEEE, as well as other relevant conferences, an also in high impact journals. Depending on the targeted society, different conferences and journals will be used for dissemination of the results. For 5G-SMART, the journals specific for vertical industries, like IEEE Transactions on Industrial Electronics, IEEE Transactions on Instrumentation and Measurement, CIRP Journal of Manufacturing Science and Technology, or CIRP annals of manufacturing technology are of particular relevance. The visibility of 5G-SMART will be guaranteed by providing open access to the submitted version of the papers on the project dissemination webpage, in compliance with the EC open access policy. In the following sections, journals, magazines and conferences, which are of particular importance for 5G-SMART, are listed together with the corresponding target society.

4.2.1 Journals and magazines

For academia, one of the main strategies for long-term dissemination of research results is the dissemination through relevant journals and magazines. When choosing an appropriate target for publication, high impact journals will be prioritised. Target societies and examples of relevant journals and magazines are outlined in Table 4-2 and Table 4-3, respectively.

Target society	Examples (including URL)
Antennas & propagation society	IEEE Transactions on Antennas and Propagation (JCR IF 4.435) https://www.ieeeaps.org/publications/ieee-transactions-on-antennas-and-propagations/ieee-tap-home
Communications society	IEEE Transactions on Wireless Communication (JCR IF 6.394) https://www.comsoc.org/publications/journals/ieee-twc
	IEEE Communications Surveys and Tutorials (JCR IF 17.18) https://www.comsoc.org/publications/journals/ieee-comst
Industrial electronics society	IEEE Transactions on Industrial Electronics (JCR IF 7.503) http://www.ieee-ies.org/pubs/transactions-on-industrial-electronics
Instrumentation and Measurement Society	IEEE Transactions on Instrumentation and Measurement (JCR IF 3.067) https://tim.ieee-ims.org/content/scope-ieee-transactions-on-instrumentation-and-measurement
Microwave theory and technologies society	IEEE Transactions on Microwave Theory and Techniques (JCR IF 3.750) https://www.mtt.org/transactions
Robotics & automation society	SAGE International Journal of Robotics Research (JCR IF 6.134) http://ijr.sagepub.com/
	IEEE Transactions on Robotics (JCR IF 6.483) http://www.ieee-ras.org/publications/t-ro
	(Springer) Autonomous Robots (JCR IF 3.634) https://www.springer.com/engineering/control/journal/10514
Systems, man, and cybernetics society	IEEE Transactions on Cybernetics (JCR IF 10.387) http://www.ieeesmc.org/publications/transactions-on-cybernetics
Vehicular technology society	IEEE Transactions on Vehicular Technology (JCR IF 5.339) http://winet.ece.ufl.edu/tvt/

Table 4-2: Target societies, including examples of specific journals

Target society	Examples (including URL)
Communication society	IEEE Communications Magazine (JCR IF 10.35) https://www.comsoc.org/publications/magazines/ieee-communications-magazine
Industrial electronics society	IEEE Industrial Electronics Magazine (JCR IF 13.24) http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=4154573
Robotics & automation society	IEEE Robotics & Automation Magazine (JCR IF 4.25) http://www.ieee-ras.org/publications/ram
	Science Robotics (JCR IF 4.21)

	https://robotics.sciencemag.org/
All societies	IEEE Spectrum (JCR IF 3.015) http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6

Table 4-3: Target societies, including examples of specific magazines

4.2.2 Conferences

Throughout the project, contributions to conferences will be prepared. Target societies and examples of relevant conferences for 5G-SMART are given in Table 4-4.

Target society	Examples (including URL)
Communications society	IEEE International Conference on Communications (ICC), https://icc2020.ieee-icc.org/
	IEEE Global Conference on Communications (GLOBECOM), https://www.comsoc.org/conferences-events/ieee-global-communications-conference-2020
	IEEE Personal Indoor and Mobile Radio Communications (PIMRC), http://pimrc2019.ieee-pimrc.org/
	IEEE Wireless Communications and Networking Conference (WCNC), https://wcnc2020.ieee-wcnc.org/
Robotics & automation society	ICRA 2020: IEEE International Conference on Robotics and Automation, http://icra2020.org/
	IROS 2019: IEEE/RSJ International Conference on Intelligent Robots and Systems, https://www.iros2019.org/
	Robotics: Science and Systems, http://www.roboticsconference.org/
	IEEE International Conference on Simulation, Modeling, and Programming for Autonomous Robots (SIMPAR), https://www.ieee-ras.org/conferences-workshops/fully-sponsored/simpar
Vehicular technology society	IEEE Vehicular Technology Conference (VTC), https://events.vtsociety.org/vtc2020-spring/#

Table 4-4: Target societies, including examples of specific conferences

4.2.3 White papers

As another mean of dissemination, 5G-SMART will publish white papers to describe the project as a whole and to highlight results.

4.3 Workshops and presentations

5G-SMART will implement a comprehensive dissemination strategy towards the scientific community with the organisation of workshops and participating and presenting at events, where innovative concepts can be promoted. Especially, the workshops serve an important purpose of creating impact, which consists of two parts. Firstly, it allows for sharing the project results and experiences with a wider audience and secondly, it is an opportunity to identify new research, development and deployment challenges in other sectors.

To facilitate that the work within the project will be publicised to interested parties, the 5G-SMART partners will aim at maximising the scientific visibility of the developed results by organising workshops in parallel with IEEE conferences and other relevant events. In order to have the maximum impact, major conferences related to industry and operational technologies will be targeted. More specifically, participation at EuCNC, 5G-PPP and 5G-ACIA events, as well as training and teaching activities, will also be in the agenda for the consortium.

4.3.1 5G-PPP events

The 5G Infrastructure Public Private Partnership (5G-PPP) is a joint initiative between the European Commission and European ICT industry. 5G-SMART will be part of the technical board, steering board and relevant working groups. Workshops and 5G-PPP events that 5G-SMART will take part in are to be identified in 2020.

4.3.2 5G-ACIA events

The 5G Alliance for Connected Industries and Automation (5G-ACIA) is a global forum, which brings ICT and OT players together, to ensure best possible applicability of 5G technology for connected industries, in particular the manufacturing and process industries. There are five plenary meetings planned each year in 5G-ACIA, for which workshops are scheduled either in the same week as the plenary, or throughout the year. Tables 4-5 and 4-6 show the summarised schedules as announced for Q4 2019 and 2020.

Dates	Location	Type	Comments
16 - 18 Sep	Shanghai	5G-ACIA Plenary Meeting + Workshop	
11 - 12 Nov	Paris	5G-ACIA Plenary Meeting + Workshop	

Table 4-5: The 5G-ACIA schedule for Q4 2019 (per announcement from the 5G-ACIA Chair)

Dates	Location	Type	Comments
20 / 21 Jan	London	5G-ACIA Plenary	Workshop yet to be added
24 – 26 Mar	Tokyo	5G-ACIA Plenary Meeting + Workshop	
23 – 25 June	Frankfurt	5G-ACIA Plenary + GA	
09 / 10 Sep	*TBD*	5G-ACIA Plenary	North America
04 / 05 Nov	*TBD*	5G-ACIA Plenary	Europe or Asia

Table 4-6: The 5G-ACIA schedule for 2020 (per announcement from the 5G-ACIA Chair)

The 5G-SMART consortium will contribute to the plenary sessions by presenting 5G-SMART's work in front of 5G-ACIA members, which include key stakeholders from the OT and ICT industries in Europe and abroad. 5G-SMART will establish a liaison relationship with 5G-ACIA to facilitate information sharing, events and conference speaking arrangements.

4.3.3 Presentations at events

5G-SMART consortium members will disseminate the work done by presenting 5G-SMART in various conferences and events. Table 4-7 summarises a list of high profile academic and industry events from Q4 2019 to 2021, which are of interest for 5G-SMART. The list will be updated once relevant events are announced for 2020 and 2021, as well as when speaking slots are confirmed.

Dates	Location	Event	Comments
26 Sep 2019	Cambridge	CW-TEC Conference	A speaking slot
30 Sep-2 Oct 2019	Dresden	IEEE 5G World Forum	A speaking slot, Krister Landernäs (ABB) will present
04 Oct 2019	London	IoD (Institution of Directors) event	A speaking slot, Sylvia Lu (UBK) will present
10-11 Oct 2019	Barcelona	2nd 5G World Summit	A speaking slot, Sylvia Lu (UBK) will present
22-24 Oct 2019	Los Angeles	MWC Americas	*To be confirmed*
8-12 Dec 2019	Waikoloa	IEEE Globecom	*To be confirmed*
24-27 Feb 2020	Barcelona	Mobile World Congress	*To be confirmed*
20-24 April 2020	Hannover	Hannover Fair 2020	*To be confirmed*
05-08 May 2020	Stuttgart	Control 2020	*To be confirmed*
20 Jun-2 Jul 2020	Shanghai	Mobile World Congress	*To be confirmed*
2021	Barcelona	Mobile World Congress	*To be confirmed*

Table 4-7: Targeted conferences and events for presentations of 5G-SMART

EuCNC is one of the most relevant and high impact conferences for 5G-SMART to participate in and present at. This is one of the most prominent communications and networking conferences in Europe, which brings together research, industries and businesses. 5G-SMART will present at this conference in 2020 and 2021, details are displayed in Table 4-8, to maximise the visibility of the project, as well as to promote the benefits of 5G for smart manufacturing.

Dates	Conference	Comments
17-21 June 2019	EuCNC, Valencia	Prof. Jose F. Monserrat presented 5G-SMART, please see the 5G-SMART YouTube channel for details
15-18 June 2020	EuCNC, Dubrovnik	Presentation proposal to be submitted
June 2021	*To be announced*	*To be announced*

Table 4-8: Upcoming EuCNC events

In addition, printed materials will be disseminated in major shows and conferences where 5G-SMART consortium members are represented. Table 4-9 lists relevant conferences and fairs taking place during 2019.

Dates	Event	Comments
16-21 Sep 2019	EMO Hannover 2019	Printed materials dissemination
17-21 Sep 2019	Industrial Automation Show, Shanghai	Printed materials dissemination
08-10 Oct 2019	5G Connected Mobile Machines (CMM) Expo	Printed materials dissemination
08-09 Oct 2019	TSN/A Conference, Bad Homburg	Printed materials dissemination
29-30 Oct 2019	Total Telecom Event, London, UK	Printed materials dissemination
07-08 Nov 2019	FUSECO Forum Berlin	Printed materials dissemination
26-29 Nov 2019	SPS IPC Drives, Nuremberg	Printed materials dissemination

Table 4-9: Target conferences and shows for dissemination of printed materials

5G-SMART will also benefit from its external Advisory Board members to bring 5G-SMART visibility to various conference and events where they are present.

Presentations will also be made for other relevant organisations where members of the consortium are participating. These organisations could, as an example, be network communities at a national level, aiming at boosting the development of 5G by gathering interested partners from both industry and academia. In the UK, 5G-SMART has already been presented by u-blox, for the UK 5G Innovation Network (www.uk5g.org) and Cambridge Wireless.

4.4 Training and teaching activities

In order to attain a thorough cross-sectorial knowledge and understanding of communications and operation management, several training activities are planned by 5G-SMART. Partners are highly complementary in the associated domains of expertise and, therefore, research staff involved in the project will have the chance to build a highly competitive professional profile. Both academic and industrial partners will contribute to these training activities. In case of academic events, the whole student community will be invited to join, as to make this effort profitable for the society. In addition, the courses are planned to be recorded and broadcasted live via the project's YouTube channel to maximise the audience and impact on the training act.

To date, three industry-oriented topics for training and teaching activities, as well as academic summer schools, have been identified by the consortium. The training and teaching activities are of relevance for both young researchers, as well as factory owners and SMEs who have an interest in introducing 5G to their business. However, the following list of training activities can be extended when the need for more training activities is identified.

5G technology

A workshop on the current status of 5G technology is of special relevance for the industrial partners not familiar with the ICT world.

Software-defined networking and 5G network slicing for industrial applications

This teaching activity will provide hands-on training on how to setup software-defined networks as well as on the concepts and technologies of network functions virtualisation, mobile edge computing and network slicing in the context of 5G networks. Participants will learn advanced concepts for creating SDN applications, while they will also be challenged to set up and configure a low latency network slice in a virtual network.

Requirements from production and operation management

This course will help ICT players to better understand the requirements coming from factory production, which in some cases are far away from the conventional key performance indicators used by telecoms.

Summer schools

At least one summer school is planned for, targeting PhD students and young researchers, and will allow in-depth discussions about different topics within 5G-SMART. Tutorials will be organised by 5G-SMART in conjunction with conferences organised by IEEE as well as other conferences. PhD students

will also find ideas during these events to steer their career in 5G and manufacturing industries. The project will organise info days in parallel with major scientific conferences and trade shows.

5 Standardisation and regulation synergies

To accelerate the impact of the project, it is important to identify the potential synergies with standardisation and regulatory bodies. The industry partners of the consortium make this possible, as they are key drivers and active members of the relevant standardisation bodies, in both the communication network and manufacturing industry. The knowledge, experience, global presence, networking capabilities and impact in research forums, consortiums and alliances from the industrial participants will be used to influence relevant standardisation and regulatory bodies by exposing them to the results of 5G-SMART.

With respect to standardisation bodies, 3GPP, European Telecommunications Standards Institute (ETSI) and IEEE-based TSN standardisation are the three main forums in which the activity of 5G-SMART, through its partners, will be of interest. Overall, the work related to standardisation and regulation synergies will include:

- Monitoring of the activities carried out within the framework of different standardisation bodies (both European and worldwide), particularly in areas of next generation factory and Industry 4.0, and making sure that the solutions put forward are aligned with standardisation efforts. The work will also include spreading the excellence of adopting the innovations from the project into standardisation bodies.
- Coordinating technical discussions with external research fora and working groups like 5G-PPP, and relevant research projects in 5G manufacturing for vertical industries, actively seeking links and interacting with other projects, not only in the European Frameworks, but also in North America and Asia/Pacific, and disseminating the project results through those associations.
- Creating synergies with the industrial world, including both the telecommunications industry and the vertical industries. This will be achieved by working with relevant industry alliances for 5G in the industrial domain like e.g. 5G-ACIA, ICTM or ICNAP, and related standards development organisations, and through demonstrations at relevant trade events.
- Managing the external technical and non-technical aspects related to e.g. spectrum, global workshops on requirements, potential standardisation of developed frameworks and regulation, by communicating with the regulators and standardisation bodies to raise awareness of the project results.

5.1 Specific standardisation and regulation activities

The consortium has identified a list of relevant standardisation and regulatory bodies where 5G-SMART findings and key results are expected to have significant impact. The 5G-SMART consortium will monitor the below outlined list of relevant standardisation bodies in order to align project technical work, 5G-SMART use cases and 5G features beyond the trials, with standardisation and to prepare relevant contributions to particular working groups.

5.1.1 3GPP

The 3rd Generation Partnership Project (3GPP) is a standards organisation which develops protocols for mobile telephony. Project partners that are active drivers and contributors for 3GPP standards will

closely monitor and bring learnings of 5G-SMART results into relevant 3GPP working groups such as RAN1, RAN 2, SA 1 and SA 2, both contributing to work items and study items. Technical features beyond 5G-SMART trials that are worked on in 5G-SMART (for, e.g., time synchronization, positioning and TSN-5G integration) are potential input to 3GPP working groups RAN 1, RAN 2 and SA 2. More specifically, relevant monitoring and contribution will be made for the SA 2 work on URLLC and industry LAN, the RAN 2 work on Industrial Internet of Things (IoT) and the RAN 1 work on URLLC. Use cases being developed within 5G-SMART will also be provided as input to 3GPP SA 1, 5G requirements and service requirements for cyber-physical control applications in vertical domains.

5.1.2 5G-ACIA

The 5G Alliance for Connected Industries and Automation (5G-ACIA) is a global forum, which brings ICT and OT players together, to ensure best possible applicability of 5G technology for connected industries, in particular the manufacturing and process industries. 5G-SMART project partners hold key positions in several working groups. These are: Chairman of the Board (Bosch), Chair of Working group on spectrum and operator models (Bosch), Vice-Chairman of the Board (Ericsson), and Chair of Working Group on Architecture and Technology (Ericsson). Project partners will collectively bring 5G-SMART results into 5G-ACIA for discussion, thus assuring that 5G-SMART results will serve as input for important pre-standardisation activities done within 5G-ACIA.

5.1.3 TSN

Time Sensitive Networking (TSN) is a Task Group (TG) evolved from former Audio Video Bridging (AVB) TG as a part of the IEEE 802.1 Working Group (WG). TSN aims to provide deterministic services (guaranteed packet transport with bounded latency, low packet delay variation and low packet loss) through IEEE 802 networks. Ericsson chairs the TSN working group in IEEE 802.1. 5G-SMART will closely follow the TSN standardisation progress and provide relevant input on 5G-TSN integration to TSN working groups, if appropriate. Moreover, results might be fed into a joint effort of IEC and IEEE on defining the TSN profile for industrial automation IEC/IEEE 60802.

5.1.4 ETSI

5G-SMART will contribute to the European Telecommunications Standards Institute (ETSI), in particular the working group ISG MEC, which focuses on integration of multi-access edge computing (MEC) capabilities discovery into 5G mobile backhaul. Moreover, project partners will bring results of 5G-SMART into the standards for Wireless Industrial Automation (WIA).

5.1.5 IIC

The Industrial Internet Consortium (IIC) brings together multinational corporations and academia to accelerate the adoption of Industrial Internet technologies. Having consortium members as active members in two steering groups, 5G-SMART learnings will be brought to IIC.

5.1.6 VDI/VDE GMA

One 5G-SMART project partner currently holds the position of the deputy chairman of advisory board for VDI/VDE Society Measurement and Automation Control (VDI/VDE GMA), technical division 8 – optical technologies. The partner will impact technical committees that deal with different kinds of optical sensing technology and image processing and, vice-versa, derive requirements coming from the different committees towards 5G.

5.1.7 OPC

Open Platform Communication (OPC) is an industry consortium responsible for creating and maintaining connectivity standards between industry automation devices and industry systems. Machine vision and robotics specification are a key focus in 5G-SMART. Project partners will closely monitor the OPC work and bring learnings from 5G-SMART trials to OPC Unified Architecture (OPC-UA) to contribute to the specifications.

5.1.8 ITU-R

Depending on the relevance, 5G-SMART project partners will bring Mobile Network Operator (MNO) spectrum models for smart manufacturing, co-existence studies for smart manufacturing use cases and 5G channel models into working groups WP5A, WP5D and SG3 of the International Telecommunication Union Radiocommunication Sector (ITU-R).

5.1.9 CEPT

Project partners will investigate contributions in the direction of the MNO spectrum models for smart manufacturing and co-existence studies for smart manufacturing use cases at the European level, in order to contribute to the European Conference of Postal and Telecommunication Administrations (CEPT). In particular, focus will be on project team PT1, which is responsible for mobile (IMT) issues and SE7, which is responsible for developing technical guidelines, sharing and compatibility arrangements for radio spectrum.

5.1.10 NGMN

The Next Generation Mobile Networks (NGMN) alliance is working on a project called Ultra Reliable Low Latency Communication (URLLC) requirements for vertical industries, where 5G-SMART project partners are also involved. Results of 5G-SMART, as per relevance, will be fed into the ongoing NGMN project.

6 Exploitation plan

The 5G-SMART exploitation strategy consists of both an exploitation plan for the project as a whole as well as individual exploitation plans per partner. Different types of exploitable results are identified. Their direct value, indirect value and impact for different stakeholders will be considered to boost the actions of interested partners in the exploitation of them.

6.1 Project exploitation plan

Depending on the partners' profile (university, research institute or industry player), activity (industrial tier one network provider or vendor), and size (large enterprise or SME), the consortium members will target some or all of the following objectives on exploitation:

- Enhance products, focused on operational technologies and industrial production, and development of future 5G products and services.
- Expand their Intellectual Property Rights (IPR) portfolio.
- Influence the standardisation bodies for adoption of the new features.
- Increase knowledge and know-how to be leveraged on for future industrial or research projects.
- Disseminate scientific findings in major scientific events.

Creating a link between the results of the project and the impact that the project will have, Figure 6-1 summarizes the inputs to the exploitation strategy, i.e., 5G-SMART results, and the outputs from the exploitation strategy, i.e., 5G-SMART impact. For the industrial partners, one part of the exploitation strategy focuses on using 5G-SMART results to enhance OT and ICT products and services, respectively, and to expand their IPR portfolios. By this, they will contribute to the impact goal of new 5G-enabled manufacturing products and services. By influencing standardisation bodies, the industrial partners will impact both future 5G standardisation as well as fostering the 5G adoption in the European manufacturing sector. Finally, all partners together in the project will use the 5G-SMART results to increase knowledge and know-how by disseminating scientific findings, leading to that the project as a whole will impact the EU economy by accelerating the Industry 4.0 digital transformation.

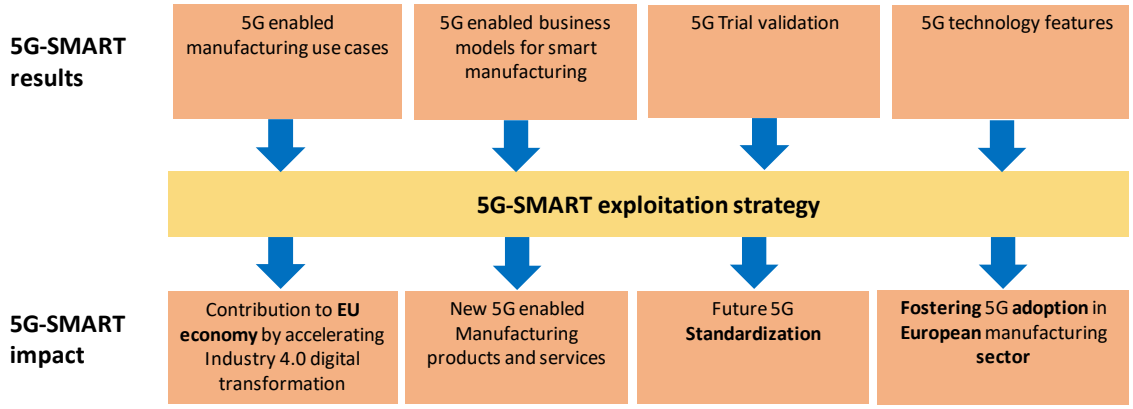

Figure 6-1: The 5G-SMART exploitation strategy input and output relationships. The inputs are demonstrated in terms of the 5G-SMART's expected results and the outputs constitute the expected impact generated by 5G-SMART.

More specifically, since one of the projects' main goals is to show the readiness of 5G in the manufacturing context, and the trials will use pre-commercial products, 5G-SMART will be a cornerstone for major partners like ABB, Bosch, Cumucore and Ericsson in enhancing the planned products in the area of 5G, as well as related applications in the smart manufacturing ecosystem.

ABB Robotics' services and solutions will integrate the main insights from 5G-SMART, thus extending ABB's products portfolio with the capabilities provided by 5G. Moreover, Bosch products and solutions for industrial automation and smart manufacturing will benefit from 5G-SMART by making them "5G-ready" at an early stage, thus providing a significant differentiation potential. Further, Cumucore will create a new product based on the integration of its Network Slice Manager with industrial applications contributed by the project partners. Finally, Ericsson will learn from the findings in the demonstration factory in Kista, which is part of the Ericsson global supply organisation, and feed the findings into their smart manufacturing product portfolio.

6.2 Individual partner exploitation plans

Ensuring exploitation of the expected results, each partner has a dedicated individual exploitation plan, as summarized below in its current state. The individual exploitation plans will be reviewed and updated during the project lifetime, such that they are in accordance with the project findings and

overall impact strategy. The final version of the exploitation plans, detailing all future exploitation activities at the consortium level will be described in a future deliverable. The final deliverable on dissemination and impact will include matured exploitation strategies, also showing the synergies between the partners and other stakeholders to make a substantial increment in the value added by the technologies developed and tested in this project.

6.2.1 ERI-SE, ERI-DE, ERI-HU

Ericsson is the market leader in 3G, 4G and 5G mobile technologies. Their product portfolio comprises mobile network and fixed network infrastructure, broadband and IoT solutions for operators, enterprises and developers. Ericsson conducts and actively drives research and development of new sustainable solutions, targeting market needs for telecommunication and other vertical industries such as media, automotive and transport. World-class innovation is achieved by Ericsson through cooperation with partners, customers, universities and research institutes. As an active player and technology leader in the 5G field (RAN, core and cloud), Ericsson intends to use the findings and results of 5G-SMART in order to influence the system specifications of 5G. The influence will be achieved by active contribution and representation in different regulatory and standardisation bodies, e.g. ITU, 3GPP (e.g. releases 16 and 17), etc. In particular, the findings in the following areas are expected to be of great significance: industrial use cases, propagation, operator model, radio network deployment, TSN integration with 5G, and system design including network architecture for different manufacturing scenarios. Ericsson will contribute to publishing 5G-SMART's major research findings at leading conferences, journals, and in the form of white papers. Further, Ericsson will use 5G-SMART's results and findings to ensure an adequate generation and ownership of intellectual property, to guarantee profitability of the manufacturers' business. Finally, the project results will serve as important input to Ericsson's regulatory and product strategy teams. Discussions with business units and product development units within Ericsson will help to shape the roadmaps of future products for manufacturing industries.

6.2.2 ABB

ABB is to offer products and solutions that will meet end-customers' requirements for Industry 4.0. In ABB's digital portfolio, communication is an essential building block for factory automation, and 5G technology is seen there as the wireless enabler for realizing low-latency and high-reliability connectivity. In this project, ABB will work together with other industry verticals, providers of networking and telecommunications solutions, and mobile network operators to implement and validate future 5G-based robotic solutions for smart manufacturing. This includes exploring deployment alternatives of both public and non-public 5G networks as well as cloud-based solutions on the factory floor. The collaboration with key 5G stakeholders will catalyse ABB's adoption of novel communication technologies and facilitate their exploitation in creating new services. In addition, ABB will feed 5G community with competences from vertical industries, thus contributing to synergy between communication and vertical service providers in fine tuning products to customer expectations. Main insights and results of the project will be integrated into ABB Robotics' services and solutions, thus extending ABB's products portfolio with the capabilities provided by 5G. More generic project findings and the gathered experiences will be further utilized to expand on the respective competences across multiple ABB businesses and for technology-driven innovations inside

the company. Also, together with the project partners ABB will identify both best-practices and improvements for future 5G standardisation.

6.2.3 BOSCH

Bosch has the ambition to be a leading user as well as a leading provider of components and solutions for the Factories of the Future (a.k.a. Industry 4.0). As 5G is going to play an important role in this respect in the coming years, 5G-SMART will help Bosch to identify as well as actively shape and test various relevant technology components and solutions early on. In particular, 5G-SMART will enable Bosch to validate if 5G can be deployed in sensitive industrial production facilities like a semiconductor factory, identify and address potential issues, and understand what it means to plan, deploy and operate a private 5G network in a factory. This will be an extremely useful input for optimizing Bosch's own production facilities in Europe and around the world (>270 plants) and particularly for ensuring the competitiveness of manufacturing facilities in regions with high labour costs, such as Europe. At the same time, many Bosch products and solutions for industrial automation and smart manufacturing may benefit from 5G-SMART by making them "5G-ready" at an early stage, thus providing a significant differentiation potential. The practical realization of the planned use cases from mobile robotics and TSN/industrial LAN over 5G represents an important step towards integrating 5G into manufacturing environments and developing 5G-ready products and solutions.

6.2.4 IPT

With the results and experiences of the project 5G-SMART, IPT will be able to enhance its existing know-how of the digitalization of the manufacturing industry. This will fundamentally increase the business opportunities for further industrial and research collaboration on 5G-enhanced manufacturing processes. IPT could support partners and manufacturing companies by consulting in suitable use cases, requirements, business models and deployment strategies regarding the use of 5G as enabler for digitalization and could play a key role in prototyping and delivering proof of concept solutions to customers. Furthermore, the new technical solutions for factory and in-process monitoring developed within 5G-SMART will help to influence other process technologies and support to gain new insights and process understandings, opening totally new research opportunities and approaches. Last but not least, in order to further increase the visibility of IPT and partners and improve the worldwide common understanding of 5G for industrial use, as an academic partner, IPT will disseminate findings and results through national and international publications and conferences. The project findings and the gathered experiences will further be utilized in workshops and lectures for industrial and scientific transfer.

6.2.5 CUMU

Cumucore currently has customers that require URLLC mobile network to be used in small-scale deployments of Industrial internet applications. Thus, Cumucore product portfolio already includes a Network Slice Manager (NSM) that would be used to prototype the project solution in more demanding scenarios specified by the project stakeholders. Besides, Cumucore will create a new product based on the integration of current Cumucore Network Slice Manager with industrial applications contributed by the project partners. The prototyping and testing of such product within project will benefit the go-to-market activities with current customers. Cumucore aims at playing a

key role in prototyping and delivering Proof of Concept solutions integrating current NSM with radio and core components from Ericsson as well as industrial applications from IPT, Bosch and ABB.

6.2.6 MARP, MMS

With the trials of 5G in industrial scenarios, as represented by the vertical use case under consideration, Marposs will share with the partners its knowledge of the production environment, especially with regards to the measurement and process monitoring in automotive, aerospace, and other industries alike. In close cooperation with the partners, Marposs aims at adapting the generally known requirements of URLLC Ultra Reliability Low Latency Communications to the specifics of workshop floor environments, in order to push impactful contributions towards 5G standardisation bodies in a direction that fosters the widest possible adoption. Marposs also aims at contributing to the definition of relevant KPIs applicable to the specific vertical scenario. Where appropriate, the concepts will be protected by suitable intellectual property rights. Marposs will use the results and the know-how obtained from the project and its activities, with the purpose of developing or improving its products and solutions.

6.2.7 ORANGE

Orange will use 5G-SMART to build on its existing technical experience and know-how in the domain of digital enterprises, with the ambition of being at the forefront and increasing its value creation in the manufacturing market. Orange will rely on 5G-SMART to get prepared for the upcoming opportunities on Smart Manufacturing (from technical and business perspectives), as well as preparing the Mobile Network Operator (MNO) business models and value creation. 5G-SMART will act as an efficient and rapid collaboration platform, allowing Orange to get precise information on the needs, use cases and requirements of the manufacturers as an input to the business and deployment strategy on the manufacturing B2B segment as well as to its internal R&D work. 5G-SMART will also help Orange assess future 5G Smart Manufacturing deployment scenarios and related infrastructure investments. Orange will benefit from collaborating with the major industry players within 5G-SMART, to build and share a common vision on Smart Manufacturing. The results of the project will be exploited through several internal and external means, in addition to contribution to standardisation bodies such as 3GPP as well as alliances such as 5G-ACIA, NGMN or GSMA, valorisation of the IPR generated, organisation and participation to external workshops and panels, production of publications in prestigious conferences and journals, and transfer of the project outcomes internally to operational teams and group affiliates, for decision on possible deployment choices. The cutting-edge digital/automated manufacturing technology that will be developed within 5G-SMART, particularly the forward-looking technology developments in WP5, to build pre-standardisation consensus among the major stakeholders and to benchmark/select technologies for future standards and infrastructure enablers. Last but not the least, Orange will showcase a chosen subset of the 5G-SMART trials in its annual big Research Exhibition event that attracts thousands of visitors both internal and external (3500 visitors in 2017 with more than 300 VIP visitors).

6.2.8 UBK, UBX

In this project, u-blox will closely support partners across the telecommunications, manufacturing and process industries, to understand and deliver effective solutions for connectivity, and for timing and positioning features on cellular connectivity platforms. This will be combined with experiences serving

other customers and markets to create cost-effective and high-performance systems for the manufacturing and process applications. The insights, results, and solutions of this activity can be incorporated in u-blox proprietary services, solutions, chipsets and products. Services, solutions, chipsets and products will be brought to the market in Europe and worldwide, through u-blox established and highly regarded development, manufacturing and marketing capabilities.

Together with the parties in the project u-blox will engage in the study and work items that arise to meet the needs of the Internet of Things that matter, to provide attractive solutions to customers and users in the manufacturing and process industries and elsewhere.

6.2.9 UPV

The development of the 5G-SMART project increases the business opportunities for further industrial and research collaboration of the UPV. Moreover, UPV could find out some technical solutions that could disrupt the current technological evolution towards 5G systems and its incorporation into manufacturing processes. 5G-SMART will impact activities of UPV by (i) improving the simulation platform capabilities for its future licensing, (ii) increasing the level of expertise in the field of network design for 5G systems, which could result in further opportunities for consultancy on the design, testing and deployment of 5G networks for factories, (iii) producing joint patents with other partners, (iv) bringing worldwide visibility by publishing in the main journals of the field, (v) enforcing know how and indeed creating novel courses on “5G and beyond” technologies, with special focus on operational technologies. As an academic partner, dissemination through publications in international peer reviewed conferences, workshops and journals is the main communication channel for UPV. It is worth highlighting that, as innovation managers of the project, we foresee a big impact of our institution on the creation of new ideas, which could result in the exploitation of a number of new patents.

6.2.10 T-SYS

The results and activities of this project will be integrated into T-Systems services and solutions. One of the most powerful dissemination channels is the dissemination of the project results during international workshops. It is an immediate way to present the project and its results to diverse stakeholders. To this aim, T-Systems will organize an international dissemination event in a form of a workshop, where the research results of WP1 A1.3 activity will be presented to the general EU and international audience.

6.2.11 ULUND

ULUND intends to use the results in our larger cooperation projects with both academic and industrial partners. Of special importance are the partners in the Wallenberg AI, Autonomous Systems and Software Program (WASP), as this program is not directly focused on communication but rather autonomy and automation. Hence, we plan to initiate follow-up projects with industry based on the 5G-SMART results. As a university, we will naturally also exploit the results in the form of new publications, presentations, and course material. Target groups include companies in various industrial sectors, not only traditional telecommunication companies as well as research institutes and academic partners. The results will also be disseminated through our involvement in COST projects at EU-level.

6.2.12 BME

BME will utilise its contact network and expertise in 5G related research areas to promote the 5G-SMART concept at both technical and innovation-oriented national and European meetups. BME will exploit 5G-SMART results and related knowledge in a number of ways. The already existing Cloud robotics research group at BME-TMIT will contribute to the leading edge of European 5G research, thereby creating a potential to grow in both size and impact. With regard to education, masters' and PhD students in BME will be able to gain hands-on experience on 5G enabled cloud robotics through their thesis work related to the project outcomes. BME also plans to strengthen its relationship to and cooperation with industrial stakeholders; 5G-SMART enables this by having top operators, vendors and SMEs on board. BME will benefit from joint academic publications with project partners both in radio networking technology and its industrial foundations and implications.

7 Summary and conclusions

Summarising this deliverable, 5G-SMART aims at being on the forefront of research dissemination and product demonstrations within the Industry 4.0 ecosystem. A clear plan that highlights the methodologies employed for communication, dissemination and exploitation of results is provided. Industrial as well as academic venues are identified to best disseminate the results. Furthermore, a detailed description of the available communication channels, which form the backbone for the planned dissemination activities is provided. An exploitation plan for both the project as a whole, as well as for individual partners is given. The result of our analysis of synergy effects, as well as specific standardisation and regulation activities, is also presented. Potential risks and obstacles on the path to create impact are identified, while the strategies to overcome them are formulated. Overall, the plans and strategies reported in the deliverable will ensure maximum-impact research outputs and will facilitate the successful transition of concept-driven ideas, to tangible deployments, which showcase the true potential of 5G technology in smart manufacturing environments.

List of abbreviations

3GPP - 3rd Generation Partnership Project

5G – fifth generation cellular network technology

5G-ACIA – 5G Alliance for Connected Industries and Automation

5G-PPP – 5G Infrastructure Public Private Partnership

eMBB – enhanced Mobile Broadband

ICT – Information and Communication Technology

IoT – Internet of Things

IPR – Intellectual Property Rights

ITU – International Telecommunications Union

KPI – Key Performance Indicator

LAN – Local Area Network

mMTC – massive Machine-Type Communication

MNO – Mobile Network Operator

NGMN – Next Generation Mobile Networks

OT – Operational Technology

SME – Small and Medium-sized Enterprise

TSN – Time-Sensitive Networking

URLLC - Ultra-Reliable Low-Latency Communication

References

[EU19] European Commission, Horizon 2020, Work Programme 2018-2020, “5.i. Information and Communication Technologies”, July 2019.