



SNS-OPS Survey Results on Technical, Vision and Market aspects of Phase 1 SNS Projects

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MARKET SECTION

Market Section



Key technologies and innovations for 6G

Main market trends in the advent of 6G

6G impact on vertical sectors

Validation of business opportunities

Main obstacles to the development of 6G

Novel markets for 6G development

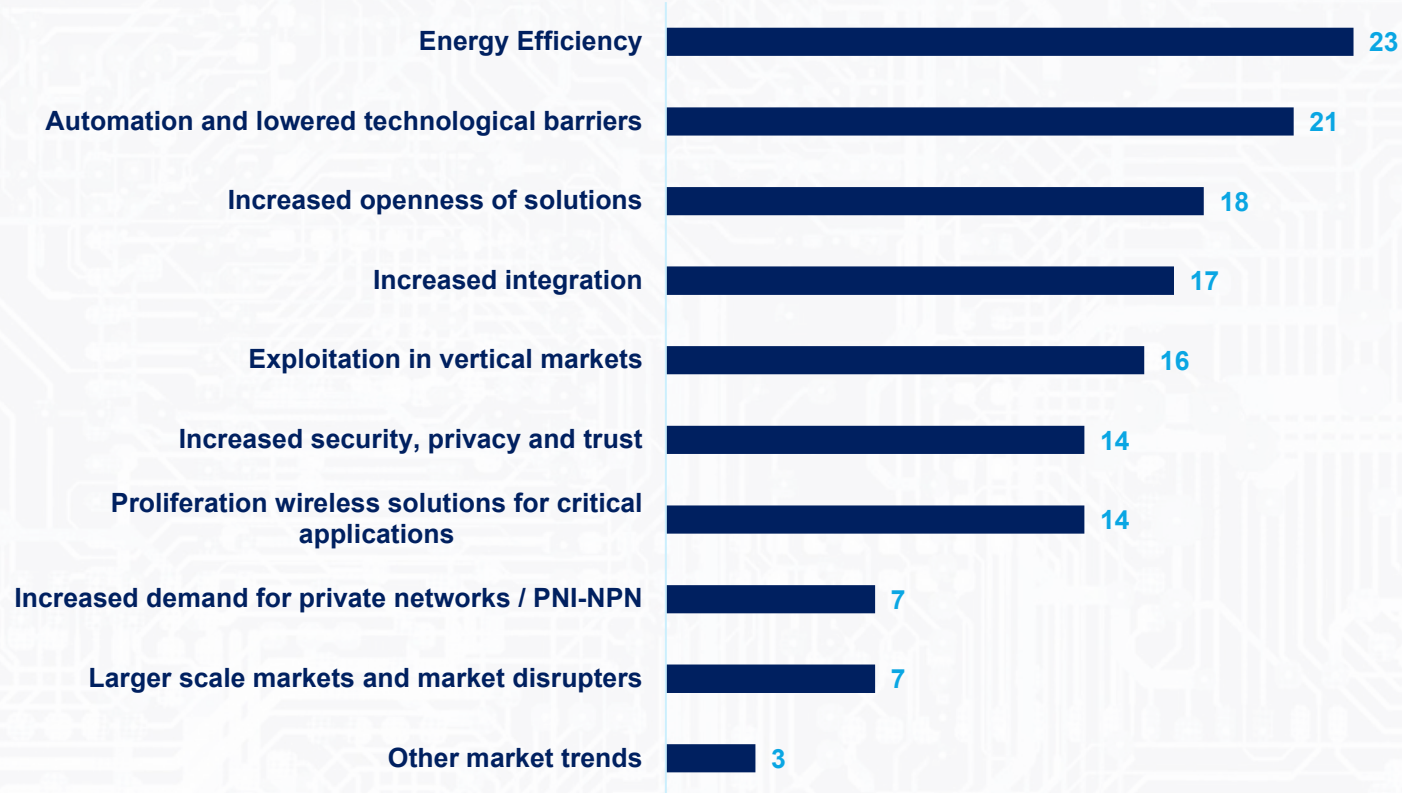
Key exploitable results (KERs) and TRLs

SME participation

6G Return of Investment

In light blue, new questions added in the questionnaire run amongst SNS 2023 projects.

Market, M1 - Which are the biggest market changes you expect in your domain/market area with the advent of 6G?



Key Insights



Energy-efficiency is expected to be the biggest market change (75%), followed by **automation and lowered technological barriers** (72%).



An increased **Integration** and **openness of solutions** are also anticipated to have a remarkable impact

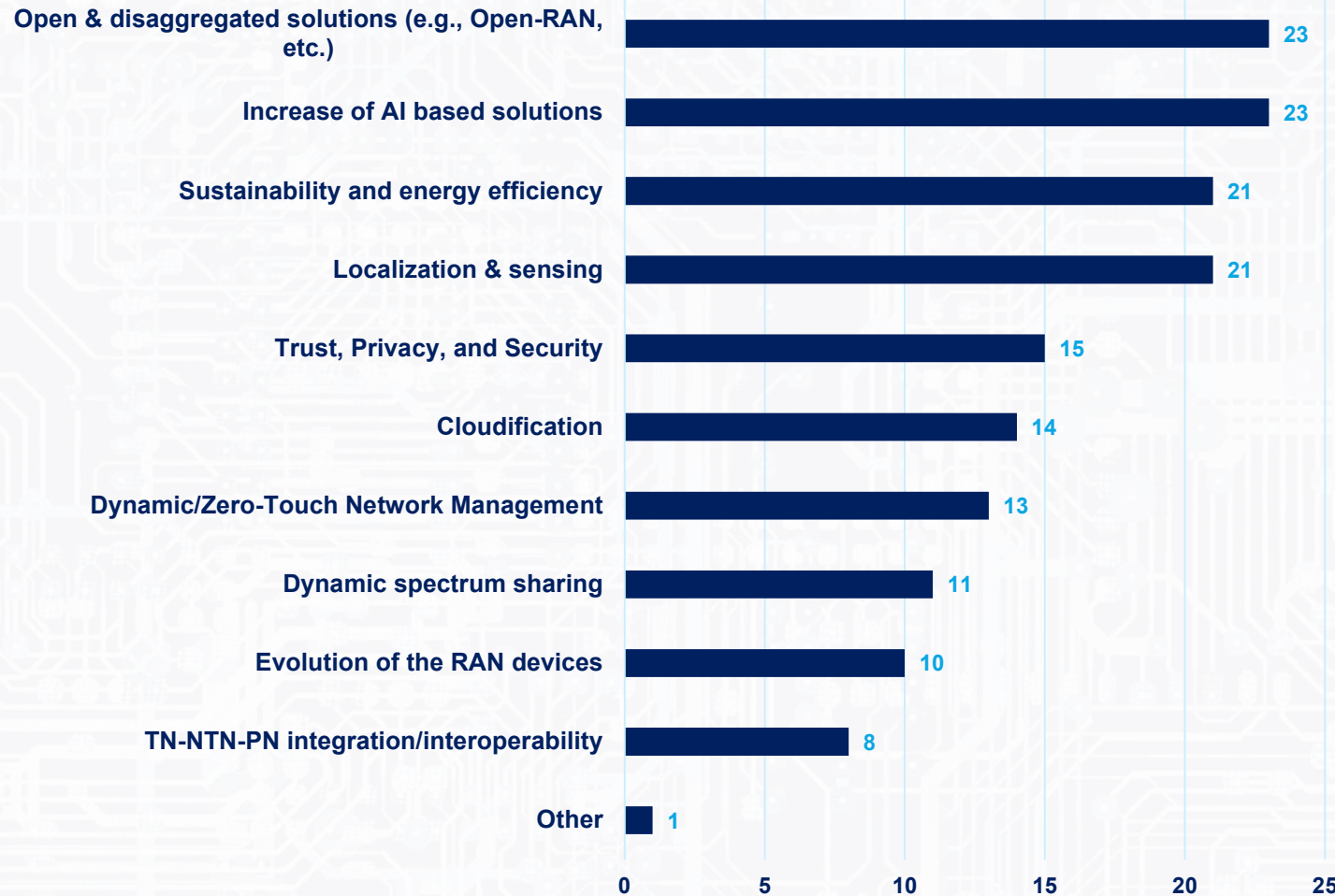


Larger scale markets and market disrupters, as well as **private networks/PNI-NPN** are considered to have the least overall impact. (25%)

No direct comparison can be established with call 2022 as the questions are formulated differently (free text vs pre-defined answers). Yet, the pre-defined answers listed are based on the results of the analysis carried out in the previous questionnaire.

Market, M2

Which of the following technologies/innovations do you expect to play an important role in the telecommunications market in the coming years?



Key Insights



Open & disaggregated solutions and **AI-based solutions** (82%) are anticipated to be main drivers in the telecommunications market.



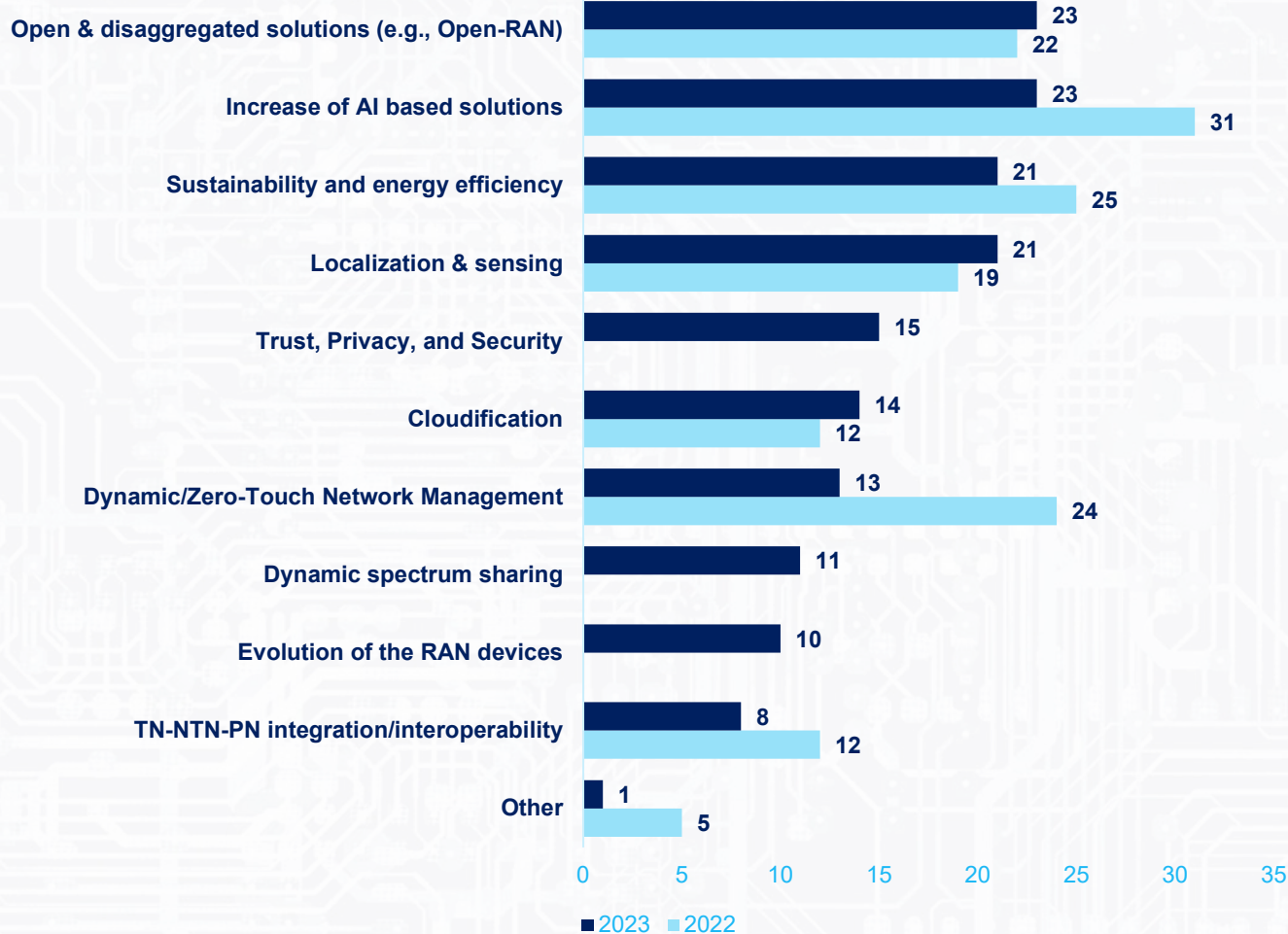
Localisation & Sensing alongside **Sustainability and Energy Efficiency** are also noteworthy (75%).



RAN devices and **TN-NTN-PN integration and interoperability** are estimated to have a lower impact, although still relevant according to various projects.

Market, M2

Which of the following technologies/innovations do you expect to play an important role in the telecommunications market in the coming years?



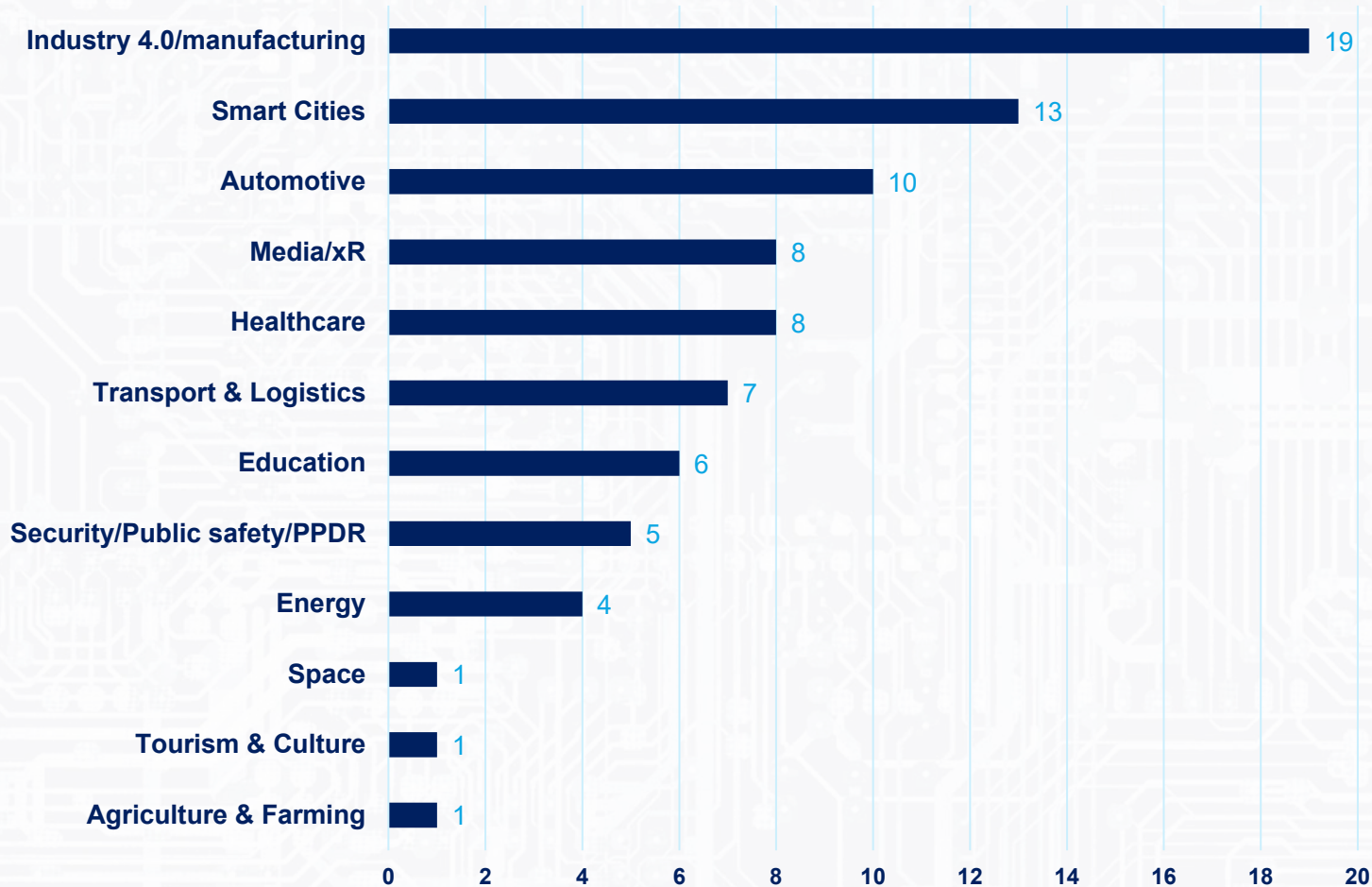
Key Insights

Comparison call 2022 and call 2023

- **Open and disaggregated solutions** are anticipated to play the largest role in shaping the telco market in the coming years according to 82% of the projects in the SNS 2023 call vs 58% of the SNS 2022 call projects.
- **AI-based solutions** and **sustainability and energy efficiency** continue to be amongst the top technologies.
- **Location and sensing** have gained relevance with 75% of the SNS 2023 call projects indicating innovations in this domain will have a great impact vs 55% of the projects in 2022. Similarly, **cloudification** has also been identified as a relevant trend by half of the SNS 2023 projects vs 36% of the SNS 2022 projects.
- **Dynamic / Zero-touch Network management** appear to have lost relevance, with 46% of the SNS 2023 projects choosing this technology vs 64% of the SNS 2022 projects.
- It is important to note that slightly more than 50% of the SNS 2023 projects have placed considerable importance in **Trust, Privacy and Security** (this was not an option in 2022).

Market, M3 – call 2

Which vertical sectors do you expect to be affected the most with the advent of 6G?



Key Insights



Industry 4.0/Manufacturing is expected to be the vertical sector most impacted by the advent of 6G by a large margin.



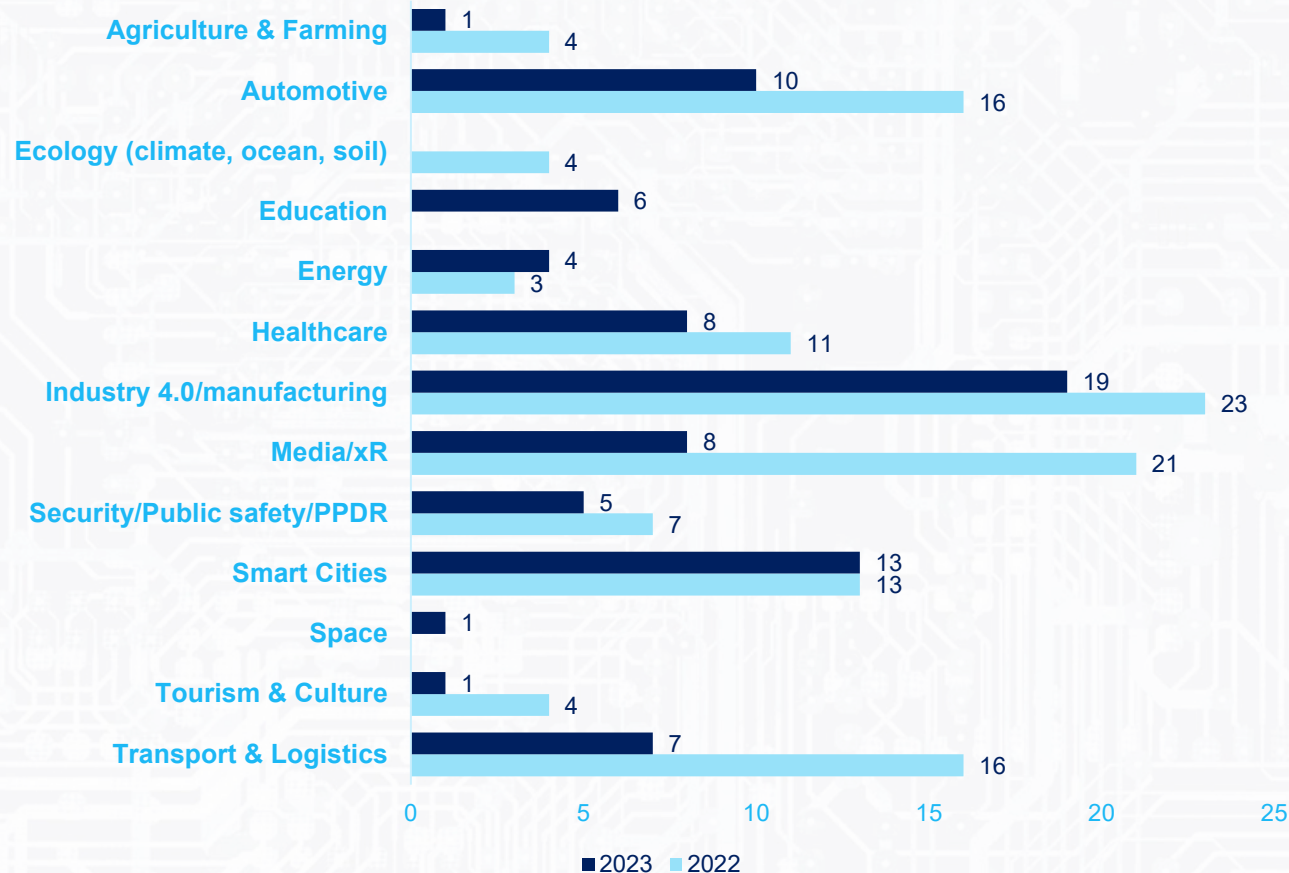
Smart Cities are ranked second in terms of estimated 6G impact (46%).



Space, Tourism & Culture and **Agriculture & Farming** are the sectors expected to experience a lesser impact.

Market, M3

Which vertical sectors do you expect to be affected the most with the advent of 6G?

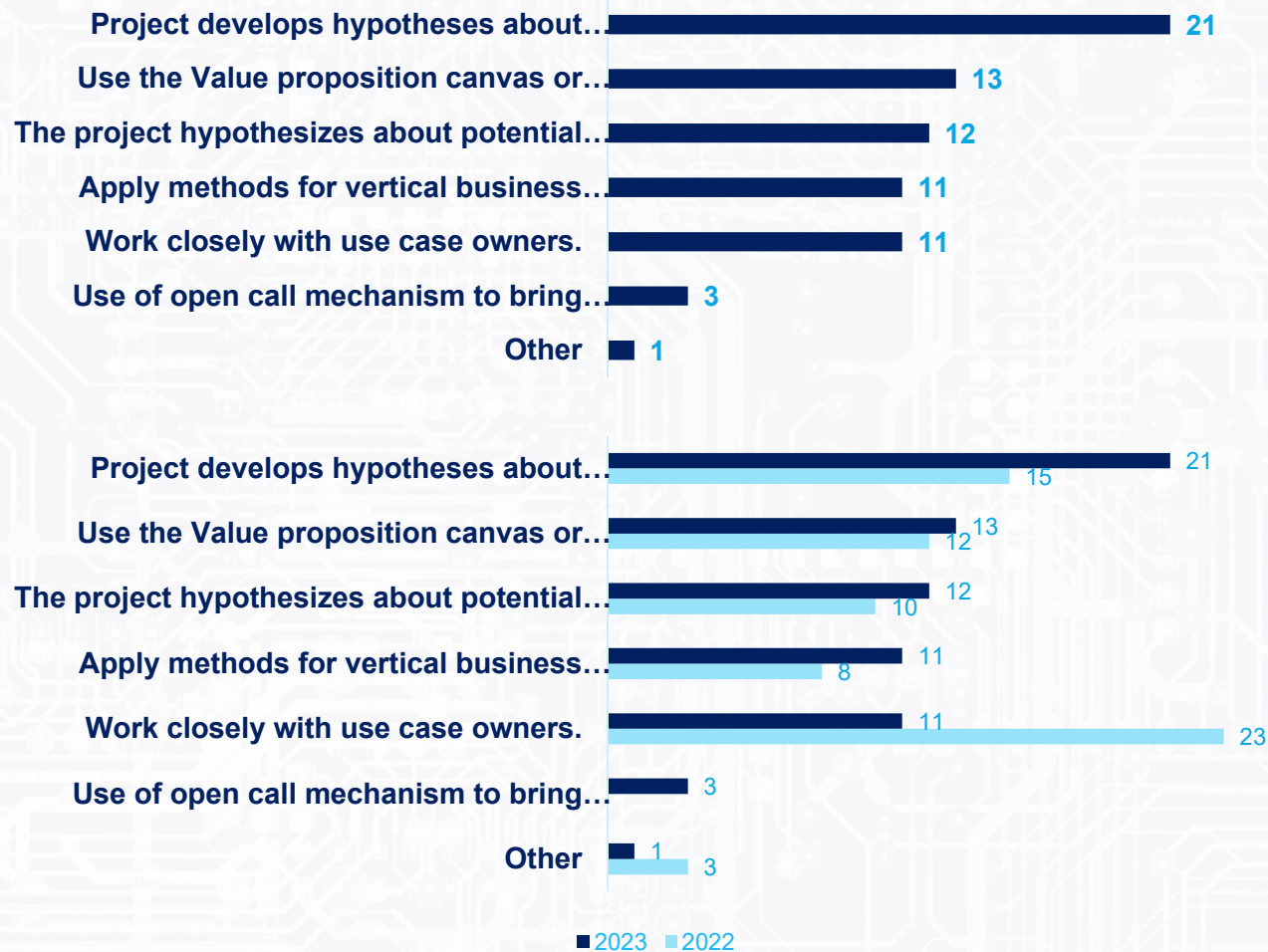


Space is newly included in the SNS 2023 questionnaire. Ecology replaces smart environment, Public Safety was added to Security/PPDR, Automotive was split from Transport and Logistics

Key Insights

Comparison call 2022 and call 2023

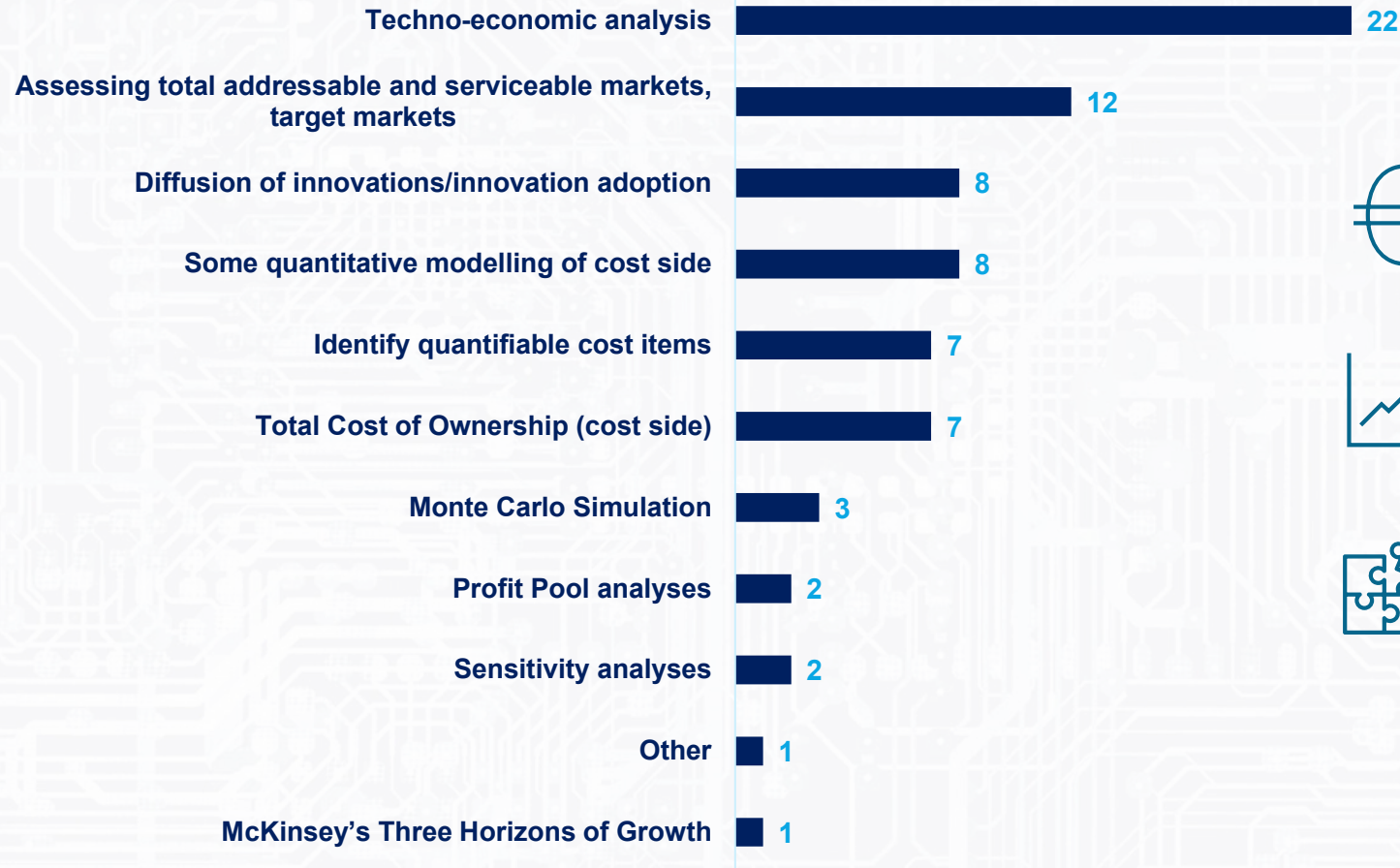
- **Media/xR**, which ranked second in 2022 (64%), is seen as disruptive by less than 30% of the SNS 2023 projects, marking an important difference in the trends.
- **Smart Cities** are anticipated to be highly impacted by 6G by 46% of the projects, vs 39% in 2022.
- **Automotive** continues to be on the top, whilst Transport and Logistics are in the middle of the ranking. In 2022, the three sectors were put together.
- The sectors expected to be the least impacted are largely the same: energy, tourism & culture, and agriculture & farming.
- **No SNS 2023 project selected Ecology.**
- **No SNS 2022 nor 2022 projects selected Construction.**

Market, M4**How do you validate business opportunities in vertical sectors?****Key Insights****Comparison call 2022 and call 2023**

- The results vary significantly between 2022 and 2023.
- **Working closely with the use case owners** was the preferred method by 70% of the 2022 projects, whereas only 39% 2023 projects opted for this approach.
- **Developing hypothesis about the need of verticals for a specific technology (75%)** is the most used method to validate business opportunities among SNS 2023 projects. Yet only 45% of the SNS 2022 projects chose it.
- The **use of the value proposition canvas has grown** from 36% among SNS 2022 projects to 46% among 2023 ones.
- The application of **methods suggested by 6G-IA** has also increased, with 39% of SNS 2023 projects using it, vs 24% in 2022.
- Most of the other methods listed in 2023, except for the use of open calls, are mentioned on an equal measure. Open calls are likely linked to the project itself including this mechanism.

Market, M5

How do you assess commercial viability (RoI) from investing in and deploying 6G?



Key Insights



Most projects assess RoI through a **techno-economic analysis**.



Assessing target markets ranks second, with 43% of the projects indicating its use.

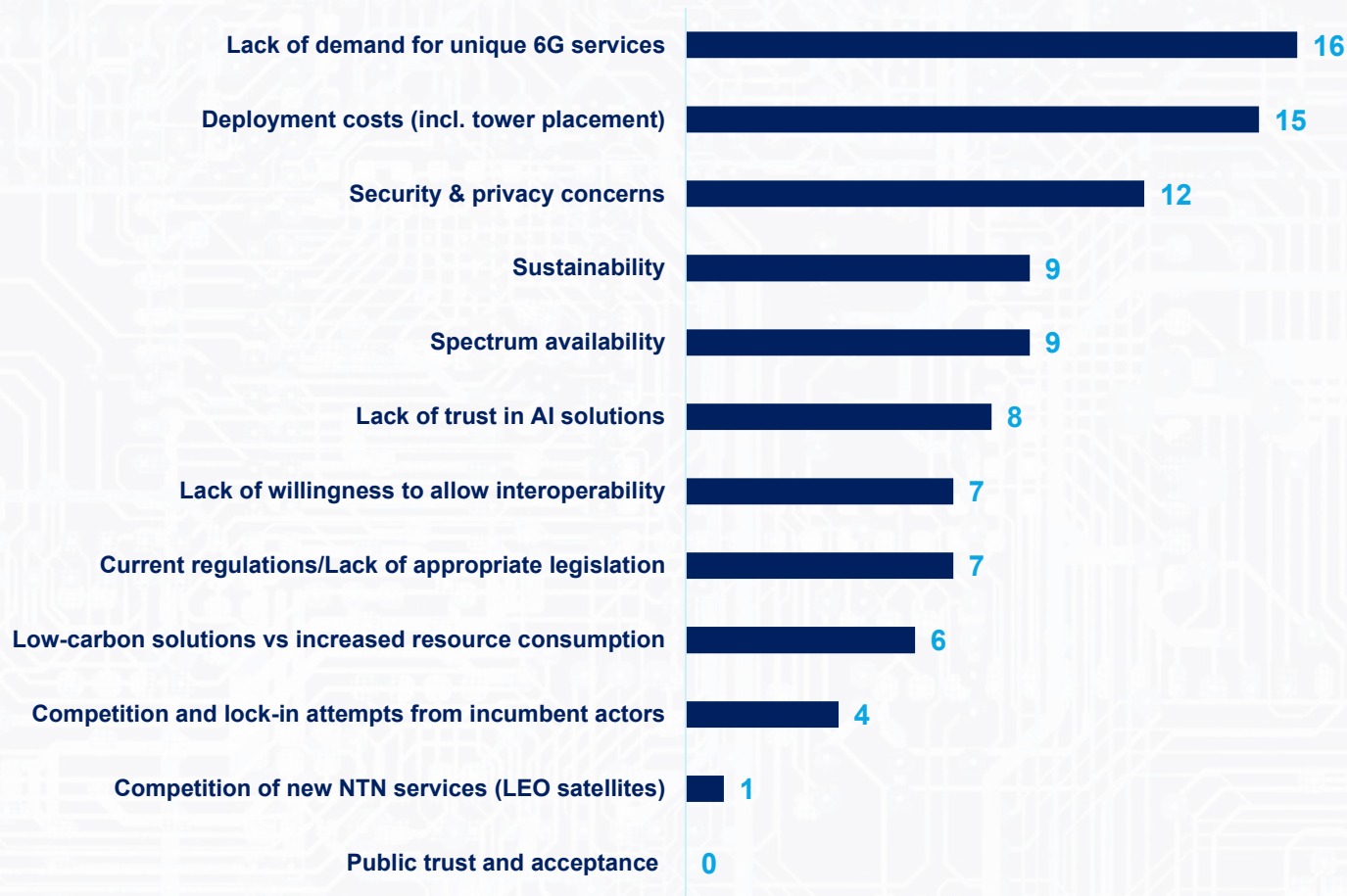


The adoption of **innovations**, the **quantitative modelling of cost side**, the **identification of cost items** and the **total cost of ownership** are also considered when assessing commercial viability by 25%-29% of SNS 2023 projects.

McKinsey's Three Horizon of Growth is the least used.

Market, M6

What do you consider to be the greatest obstacle for the deployment of 6G networks?



Key Insights



Lack of demand and deployment costs are considered the main obstacles to the implementation of 6G.



Security and privacy concerns have grown and rank third in terms of obstacles for the deployment of 6G. Likewise, challenges related to **spectrum availability** seem to be more pressuring.

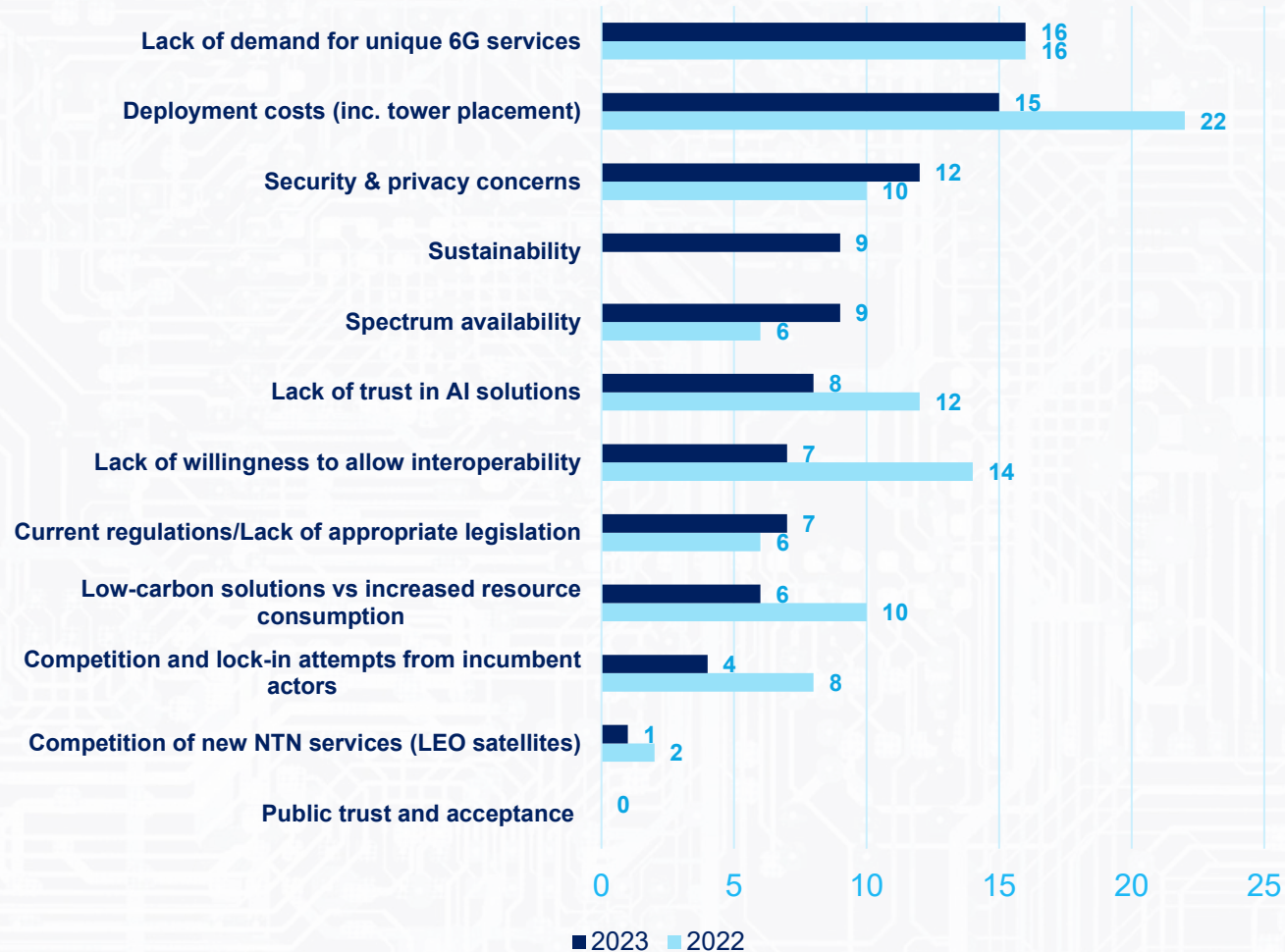


Obstacles regarding the **lack of trust in AI solutions** and the **lack of willingness to allow interoperability** have diminished.

No project indicated **public trust and acceptance** as a challenge.

Market, M6

What do you consider to be the greatest obstacle for the deployment of 6G networks? *Per stream*



Key Insights

Comparison call 2022 and call 2023

- SNS 2023 projects seem to show overall less concerns about the challenges listed e.g., lack of willingness to allow interoperability, low-carbon solutions, competition and lock-in attempts from incumbent actors, lack of trust in AI solutions, etc.
- The degree of concern linked to the **lack of demand and deployment costs** has decreased notably. In particular, costs concerns **have diminished from 67% in 2022 to 54% in 2023**.
- **Security and privacy** concerns have increased from 30% amongst SNS 2022 projects to 43% in 2023. Likewise, the **challenges related to the spectrum availability almost doubled**.

Sustainability and public trust and acceptance were not listed in 2022.

Market, M7 - 4G enabled the “App ecosystem”. 5G enables the ecosystem to include more reliable, numerous and bandwidth-rich applications and services addressing mainstream vertical markets. Do you believe enhancing 5G towards 6G can accomplish a similar mobilising of the ecosystem forward? If yes, what would be your estimation as to the novel market sector(s) that 6G may enable?



- There is a consensus around the potential of **6G for transforming the current ecosystem**.
- Some projects underline that 6G will help to fulfil the expectations that were not met by 5G whilst further pushing them to new heights and enabling completely new applications and services.
- The **SNS 2023 projects have echoed most of the novel markets indicated by the 2022 projects**, i.e., IoT, immersive ecosystem (AR, VR, XR, holographic technologies), edge computing, or smart cities.
- The **social impact of 6G**, which is expected to bring new and advanced solutions to tackle societal challenges promoting digital inclusivity, environmental sustainability, societal wellbeing and more, is underlined.
- A certain “evolution” can be observed from 2022 to 2023, with projects providing more detailed insights in the novel markets.
 - **5G/6G virtualisation**: the core network of the operator is being provided “as a service”. The newest trend is to outsource it to some cloud provider (i.e., an external data centre).
 - **Edge computing** is anticipated to be required for “extremely demanding yet highly promising new services e.g., automotive (V2X), industrial (IIoT) and end user (XR/VR). Most of the required edge infrastructure would not belong to the MNO providing the access network”
 - **AI & ML** introduce a new paradigm in the technological landscape, adding a new dimension to the 6G ecosystem capable of integrating and leveraging the data from different domains for (new) services. Uses include network optimisation, autonomous decision-making, and enhancement of various applications such as autonomous systems and immersive technologies.

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- **Artificial Intelligence**

- The combination of **generative AI and 6G** will create new business models, operational processes and market sectors.
- The creation of integrated services combining domains and technologies, **orchestrated by AI**, could be key in developing novel markets.

- **Seamless integration of communication and sensing capabilities.** In the advent of 6G, “networks will facilitate communication and serve as a pervasive sensing infrastructure”. **Perceptive network**

- **Enhanced Communication Services:**

- **Holographic Communications:** high-fidelity, real-time 3D communications for various applications.
- **Quantum Communication:** advanced security and communication capabilities leveraging quantum technologies.

- **Advance simulation and digital twinning** – 6G will support a large number of interconnected devices, sensors and actuators, enabling the creation of comprehensive and detailed digital twin models that allow monitoring and management of assets on a larger scale with higher granularity, applicable in manufacturing, urban planning, and infrastructure management, among other areas.

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- **Advanced Radio Access Technologies:** development of intelligent radio systems and antenna solutions for 6G spectrum
 - **Open Radio Access Network (Open RAN):** potential for innovation in network design and optimisation.
 - **Massive MIMO (Multiple Input Multiple Output):** expected to enhance communication and sensing capabilities.
- **Autonomous systems and drones** - 6G could facilitate the widespread deployment of autonomous systems and drones, powered by ultra-reliable communication and precise positioning capabilities, impacting autonomous transportation, delivery services, infrastructure inspection, disaster response, and environmental monitoring.
- **Internet of Things (IoT)**
 - **Smart Cities:** integration of IoT devices for efficient resource management, enhanced public services, enhanced sustainability, and better quality of life.
 - **Industrial IoT (IIoT):** real-time monitoring and management of industrial processes.

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- **Immersive technologies** - widespread adoption of technologies such as **augmented reality (AR)** and **virtual reality (VR)** could lead to the proliferation of immersive experiences. Applications span various sectors such as **gaming, entertainment, education, healthcare, and remote collaboration.**
- **Autonomous systems and drones** - 6G could facilitate the widespread deployment of autonomous systems and drones, powered by ultra-reliable communication and precise positioning capabilities, impacting autonomous transportation, delivery services, infrastructure inspection, disaster response, and environmental monitoring.
- **Personalised Healthcare and Remote Medicine:** 6G will power the real-time monitoring, diagnostics, and telemedicine. New market segments focusing on societal wellbeing and sustainability

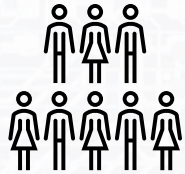
Market, M8 - What are the Key Exploitable Results (KER) expected to be delivered by your project? At which Technology Readiness Level (TRL) is each of them expected to be delivered?



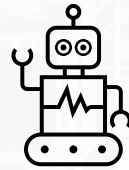
- **AI and ML Integration:** AI/ML reference frameworks for 6G networks, such as AI-native toolkits, AI-driven resource management, and AI-based orchestration and management services. AI trustworthiness.
- **Advanced Network Management: orchestration and automation** e.g., intelligent orchestration solutions for automated network management, **learning and management**, federated approaches to AI-based network functions and federated simulation engines for network digital twins
- **Security and Privacy:** E2E security orchestration systems, including zero-touch security orchestration, AI-enabled security frameworks.
- **Energy efficiency:** new architectures and solutions (automation, AI) to reduce energy consumption and enhance energy efficiency.
- **6G-Specific Technologies: physical and network architecture** - development of secure, scalable frameworks for data exposure and collection, programmable monitoring platforms, and AI-based network management frameworks; **communication and Sensing** - including AI-enabled collaborative positioning, waveforms for sensing-as-a-service, and advanced spectrum management techniques.
- *Most projects indicated TRLs between 3 and 4.*

Market, M9 - Does your project promote the participation of SMEs?

- There are 75 involved in the SNS 2023 call 28 projects (in 2022, there were 88 SMEs in 35 projects)



Active participation



Product & technology development



Market expansion



Collaboration and networking



Open calls



Training and outreach



New business opportunities

Market, M9 - Does your project promote the participation of SMEs?



- **Active participation:** most projects involve one or more SMEs directly as consortium members, leveraging their expertise in areas such as AI, network security, open RAN solutions, IoT, and advanced metering.
- **Product and Technology Development:** SMEs are often engaged in developing new technologies and enhancing existing products in areas like AI/ML, network automation, and ISAC systems. SMEs also playing a key role in creating solutions for secure network services, digital forensics, and cybersecurity. This helps SME broadening their product portfolios based on project results.
- **Market Expansion:** projects frequently aim to help SMEs expand into new markets by providing them with the technological insights and innovations necessary to meet emerging market demands. This includes targeting sectors like automotive, aerospace, telecommunications, and cloud services.
- **Collaboration and networking:** the projects promote collaboration among SMEs and with larger industrial stakeholders, academic institutions, and research communities. This collaborative approach helps build a strong network that supports mutual growth and knowledge sharing.
- **Open calls:** several projects devise open calls targeting SMEs, contributing to the convergence of different perspectives and expertise that leads to greater innovation and thus, fostering a more competitive and dynamic ecosystem.

Market, M9 - Does your project promote the participation of SMEs?



- **Support for Technological Integration:** SMEs are often tasked with integrating various technological components developed during the projects into cohesive solutions. This includes work on cloud platforms, orchestration systems, and comprehensive technical platforms supporting the 6G ecosystem.
- **Training and Outreach:** many projects include activities aimed at training and engaging professionals, as well as outreach to the general public. These efforts help SMEs promote their technologies, gain visibility, and foster market adoption.
- **Creation of New Business Opportunities:** projects aim to create new business opportunities for SMEs, either through the development of new products or by enabling them to tap into new market niches. This includes supporting the formation of new SMEs and startups within the 6G domain.

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