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HUB4NGI

D1.3 NGI IMPACT MEASURES AND BENCHMARKS

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Abstract	This deliverable presents the NGI Impact Measures and Benchmarks based on the KPIs collected through the SURVEY4NGI
Keywords	Impact, KPIs, Benchmarking, Assessment, Monitoring, Measures

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* R: Document, report (excluding the periodic and final reports)
DEM: Demonstrator, pilot, prototype, plan designs
DEC: Websites, patents filing, press & media actions, videos, etc.
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EXECUTIVE SUMMARY

Launched by the European Commission in autumn 2016, the Next Generation Internet (NGI) initiative aims to shape the future internet as an interoperable platform ecosystem that embodies the values that Europe holds dear: openness, inclusivity, transparency, privacy, cooperation, and protection of data.

The goal of this document is to present Key Performance Indicators measurement assessment and benchmarking of initiatives within the NGI program. This document provides an overview of how initiatives active in the NGI technology areas (i.e. technology providers, research projects, policy makers and projects distributing funds to 3rd parties) progress towards some specific NGI goals and building on the defined Key Performance Indicators, which includes Innovation, Sustainability, Collaboration, Interoperability, Market Needs, Social Impact and User Experience, collecting data that describes how the measurements have been carried out.

Scoring of the initiatives' sample on the selected KPIs has the twofold objective of showing their current level of effectiveness, highlighting their strengths and weaknesses, and charting out a benchmarking tool for other European initiatives.

Results suggest that initiatives are well performing considering the KPIs in scope. With collaboration and user experience being the indicators were initiatives are stronger. On the contrary, they show greater weakness on interoperability and innovation. These represent therefore the areas where initiatives should concentrate their actions as there is the largest space for improvements.

Finally, this deliverable besides assessing initiatives' maturity and effectiveness also provides the European Commission with some valuable insights to better understand its role in supporting such initiatives and identifies the areas where this support could improve, drawing a roadmap for future development and activities – related to what presented in deliverable D2.3 NGI GUIDE.

Recommendations for future NGI activities can be summarized in the following actionable points:

- **Foster initiatives' go-to-market effectiveness**, helping start-ups and SMEs move from a fully-funded projects status to solid commercial entities.
- **Support innovation development and scalability,** improving the provision of shared infrastructures, tools and data that can be leveraged by innovative companies, especially SMEs, in order to validate their technologies and turn their proof of concepts into market ready products.
- **Help different industries and projects speak to each other**, by fostering the creation of connections between different and potentially far domains and industries, creating the basis for synergies and complementarities between different sectors.
- **Keep pushing sustainable development**, continuing supporting the vision of a sustainable Europe with dedicated actions and specific innovation programmes.
- **Expand existing technology focus while scanning promising emerging themes.**

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1 INTRODUCTION

Today, the Internet is a fundamental part of almost any of our daily activities. It enables transactions at work and in our social lives. We are ever more dependent on the Internet as the machine that ties together and enables our daily lives, the economy and society as a whole. The trend is accelerating and is irreversible. In 10 years, the Internet will be even more vital for the functioning of society and the worldwide economy.

Thus, the overall mission of the Next Generation Internet (NGI) Initiative is to guide and foster that development to guarantee European added value creation in the Internet for 2030, while ensuring European values are maintained. In fact, there are many doubts as to what the Internet will look like, what technologies it will use and what economic models will be the champions. The proper balance between data privacy, transparency, citizen involvement, ubiquitous access and participation is important to ensure utility and equity. The themes raise questions that need a strong direction from public policy makers and the market itself. To help ensure that the Internet meets the objectives of all stakeholders, the European Commission has developed the NGI Program.

To ensure it responds to real stakeholders needs, the European Commission began engaging the public and stakeholders well before the launch of the NGI Initiative's public funding activities. The European Commission has been engaging both the public and industry, while experts have performed large-scale studies. In particular, the Next Generation Internet Initiative public consultation, that took place from November 2016 until January 2017[1], gave everyone a chance to share their views and ideas about the Internet of 2030. Several specific workshops were held to share expert insights and build consensus on the technological building blocks, establish priorities and foster credibility for the NGI. Finally, a study was launched to develop an NGI vision and analyse the current needs of people to deal with a future human-centric Internet ecosystem. The results of the public consultation were summed up in a public consultation report. It elicited opinions of stakeholders as to which technologies and topics they considered most important in the context of NGI and set the scope of investigation for the newly nascent HUB4NGI project. In particular, it highlighted which technologies would be most important in the development of the NGI. These various activities were the basis for the planning of Work Package 1 and 2 in the HUB4NGI project. It was deemed that if we were expected to monitor the objectives of the Program and provide a benchmarking system, the stakeholders opinions and requirements should be the basis of our investigation and the focus of monitoring and assessment activities we would perform. The consultation and planning phases had provided a roadmap of expectations and ranking of the importance of technological, social and economic themes that would be most important.

Deliverable D1.1 NGI Classification and Assessment Methodology provided a classification mechanism and a description of these technologies and themes, so that all stakeholders, analysts and the public would have a common understanding and could unequivocally refer to these concepts. Finally, it prepared a measurement and assessment model to provide a method to assess how initiatives active in the NGI technology areas progress in addressing the stakeholders and European Commission's objectives for the Program. It proposed a KPI-based impact assessment model commonly used in industry and government evaluation studies. It was based upon identifying technologies (those identified in the public consultation referred to above) and then eliciting and assessing observable metrics from initiatives.

[1] David Overton, Next Generation Internet Initiative – Consultation - Final Report March 2017
https://ec.europa.eu/futurium/en/content/final-report-next-generation-Internet-consultation

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NGI Focus Areas have been then furtherly investigated and expanded as part of Deliverable D1.2 Portfolio and National Programmes, which focused on charting out the status of the national initiatives, research topics, technologies, actors and resources available to the NGI community.

Thus, Deliverables D1.1 and D1.2 provided the framework to perform monitoring of the objectives while this Deliverable D1.3 performed a first instantiation monitoring of the Program, evaluating initiatives performance current level and providing a useful benchmarking tool for the broader European initiatives' community.

The primary mechanism for collecting the empirical evidence essential to perform the analysis and assessment, as mentioned, has been through a dedicated survey, titled SURVEY4NGI. The SURVEY4NGI involved 63 initiatives among technology providers, research projects and EC policy makers or initiatives funding 3rd parties.

This Deliverable's key primary objectives are to clearly define Key Performance Indicators used to measure initiatives, analyse SURVEY4NGI results and chart out initiatives' current performance status, in line with NGI Program objectives. The deliverable contains the following sections:

- Section 2 describes the intentions and objectives of Deliverable D1.3. It describes how this activity is related to the needs of the HUB4NGI project and how it fits into the framework of the European Commission and the utility for the community.
- Section 3 describes the SURVEY4NGI, and the data collection process that was carried out. It details how this information provides empirical evidence required to assess impact of the NGI Initiative. It describes the methodological approach used in the surveys as well as the process and logic used during the computer-aided telephone interviews and web-based surveys. The section details the Key Performance Indicators used to assess initiatives' performance. It describes the process and metrics used to define KPIs for Innovation, Sustainability, Collaboration, Interoperability, Market Needs, Social Impact and User Experience. It describes how the individual questions in the survey provide the single metrics that build the KPIs.
- Section 4 presents the results of the KPI assessment correlating the performance of initiatives with respect to NGI goals and benchmarks. It describes all the results of the 63 surveys performed in relation to each of the KPIs by briefly defining what the KPI is expected to measure and describing how the single questions achieve this measurement. It provides insights into the current performance level of initiatives in scope. This draws an overview of how well initiatives perform, while providing a useful benchmarking tool for the broad community of European initiatives.
- Section 5 provides a macroscopic analysis of the average scores from each indicator in comparison to the benchmarks or averages from the whole sample. It provides an analysis of how the single benchmarks are expressed across the sample and describes the calculations of these program-wide comparisons and indicators.
- Section 6 concludes with a discussion of the results and recommendations for policy makers based on the observation of the surveys and initiatives' collected feedback. Although these are not specific objectives of the document, they highly increase the value of the document for readers and its utility to the general stakeholders.

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2 GOALS AND OBJECTIVES

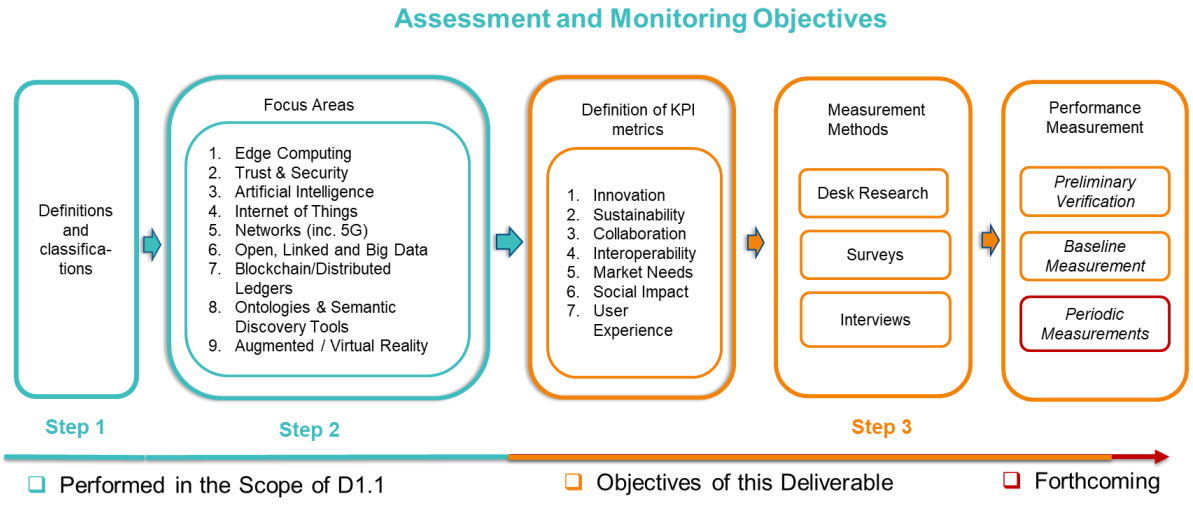
The objective of Work Package 1 is to assess the contribution of initiatives active in the NGI technology areas to the objectives set for the NGI. In this context, the Work Package plays a key role in the Coordination and Support Action to provide help and contribute to the overall success of the NGI Initiative in several ways. By providing assessment and monitoring HUB4NGI expects to:

- Define a **common** understanding and **taxonomy** to present the **scope of research and its priorities**;
- Identify the **community** and **engage key stakeholders**;
- Facilitate **cross-fertilisation of the initiatives across vertical sectors and technological domains**;
- Contribute to **the NGI roadmap definition** to help shape and define the future of the NGI;
- Contribute to **make the NGI vision more tangible and concrete**.

The objectives of the NGI and the technological categories of assessment have been derived from the original public consultation of the NGI Initiative[2]. Deliverable D1.1 together with this deliverable D1.3 have the ***primary objective of providing the methodology and empirical model to assess how well relevant initiatives have responded to NGI objectives.***

These objectives will be achieved following the original process based on three distinct phases.

FIGURE 1 STEPS IN THE ASSESSMENT AND MONITORING APPROACH



Source: D1.1 HUB4NGI 2018

The first objective (Step 1) was to define a classification scheme so that we could examine any initiative active in the NGI technology areas and understand what key enabling technologies it

[2] Complete information regarding the open consultation held to define the NGI initiative can be found at: https://ec.europa.eu/digital-single-market/en/news/consultation-next-generation-Internet.

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was using to achieve its objectives and in which industry it could be exploited and have its intended impact. This was carried out in Work Package 1 and described in Deliverable D1.1.

The second phase (Step 2) was to reduce the scope of NGI focus areas by focusing only on those technologies that are expected to play a significant role in the development of EC's NGI vision.

This selection has been based on the results of a public consultation process held between November 2016 and January 2017 involving more than 400 people eliciting opinions of stakeholders as to which technologies and topics they considered most important in the context of NGI and setting the scope of investigation for the newly nascent HUB4NGI project.

In particular. It highlighted which technologies would be most important in the development of the NGI. These various activities were the basis for the planning of Work Package 1 and 2 in the HUB4NGI project.

Focus areas are also aligned with the results of deliverable D1.2 of Work Package 1, that has defined relevant scientific, technological and innovation topics, NGI related research and development priorities across Europe.

Having completed the first two steps in the assessment and monitoring approach depicted in Figure 1 above, the goals of this document therefore relate to the final step in the process (Step 3). In particular, this document has the objective of clearly defining **Key Performance Indicators** (KPIs) and presenting the performance of those initiatives active in the NGI technology areas, based on observable **metrics,** to measure their contribution to NGI objectives. The metrics described in the following sections have the objectives of being:

I	Able to measure the performance of initiatives to achieve the goals of the NGI;
II	Based on data generated from the initiatives themselves through desk research and surveys;
III	Suitable to provide realistic, actionable and feasible recommendations to NGI stakeholders and to the European Commission;
IV.	Able to be used in the assessment of the key success factors of the program itself.

The document has the primary focus of analysing the results of SURVEY4NGI and providing insights into the current performance level of initiatives in scope. This draws an overview of how well initiatives perform, while providing a useful benchmarking tool for the broad community of European initiatives.

Although used in the assessment carried out in this deliverable, the KPI-based assessment process is expected to last beyond the HUB4NGI project. It is expected to be used in the future as a supporting tool in the advisory activities of Coordination and Support Actions in order to help assess all public and private Next Generation Internet activities and initiatives. The KPIs should support the European Commission itself, providing objective evidence to assess the impacts of the initiatives they have implemented.

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3 METHODOLOGY

Conceptual Framework

This section will describe the methodology followed for the performance assessment designed to respond to the goals and objectives described in section 2. The performance assessment has been carried out through a dedicated survey focused on assessing the contribution of those initiatives active in the NGI technology areas with respect to NGI objectives as well as EC effectiveness in supporting innovation in Europe, gaps and future trends. In order to provide a common framework of reference, a scheme of the following will be presented in this section:

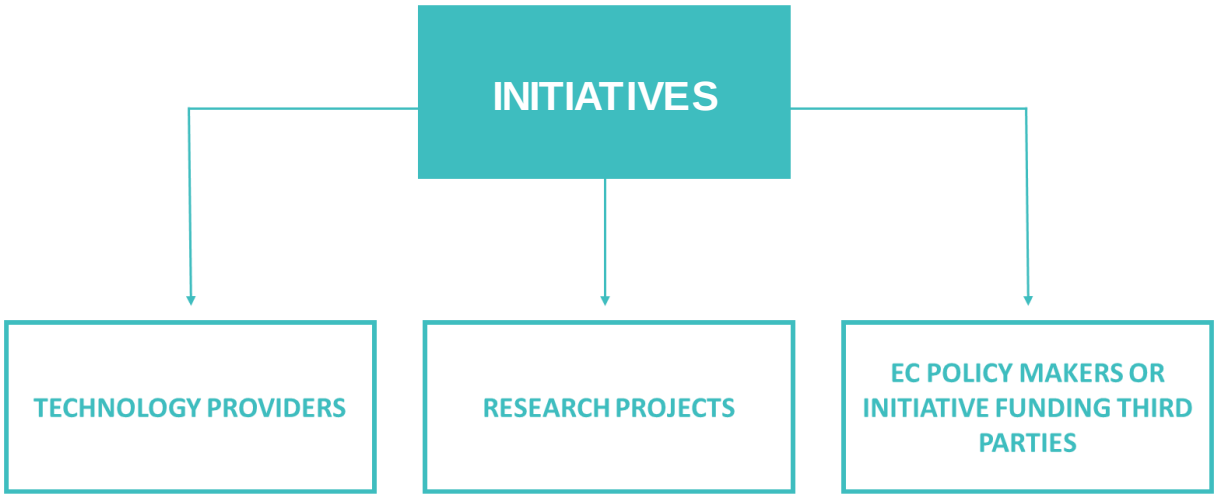
- Initiatives;
- KPI categories;
- Survey methodology;

3.1 DEFINING INITIATIVES

Initiatives have been defined as players with a relevant role within the NGI ecosystem. Particularly, the following categories of initiatives have been identified and defined:

- **Technology provider** refers to any company (sole ownership or control) developing or providing a technology solution to the market. This category includes companies belonging to the information and communication vertical market (NACE Rev.2). From a company size point of view, all sizes are included from small companies to large ones. Technological start-ups are also included in this category.
- The second category identifies **research projects** investigating a specific technology area as part of a project or consortium funded by 3rd parties. Research projects might or not be funded by the EC. They might or not have a technology solution available to the market.
- This category includes some particular EU stakeholders, which means European Commission **policy makers** and contact points as well as **initiatives and projects distributing funds for innovation to 3rd parties** on behalf of the European Commission. Part of this group are the cascade funding projects such as Fed4FIRE+.

FIGURE 2 INITIATIVES



Source: D1.3 HUB4NGI 2018

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3.2 IDENTIFYING KPI CATEGORIES

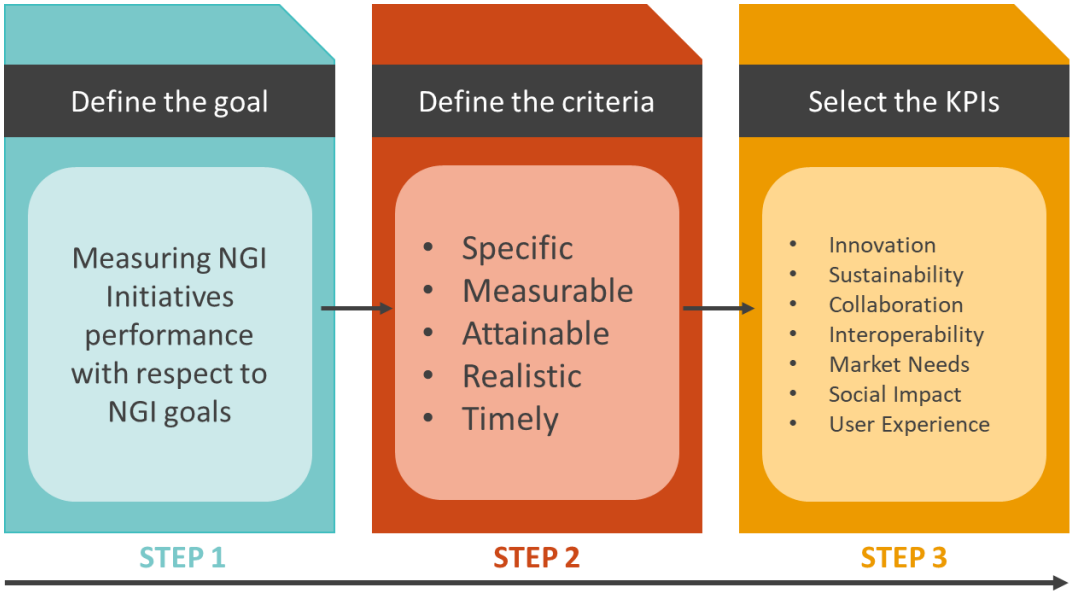
One of the key objectives of HUB4NGI is to assess the performance of those initiatives active in the NGI technology areas and monitor how they progress towards some specific NGI goals. This section describes the Key Performance Indicators (KPIs) used for the assessment of these initiatives as well as the methodology followed to prioritise and select them.

3.2.1 KPI Definition

A top-down approach has been followed in order to define and prioritise the KPIs for the performance assessment. As illustrated in the Figure 3 below, three steps have been followed:

- Step 1. Specify the overall goal that the performance assessment aims to achieve;
- Step 2. Define the criteria that KPIs must have;
- Step 3. Prioritise KPIs based on the criteria selected.

FIGURE 3 STEPS IN THE KPI SELECTION APPROACH



Source: D1.3 HUB4NGI 2018

For the first step, the goal defined for the performance assessment is to monitor initiatives' performance with respect to NGI goals, which can be summarised as follows "Creating an Internet that respects human and societal values, privacy, participation and diversity, and offers new functionalities to support people's real needs and address global sustainability challenges, while fostering a vibrant Open Internet movement that links research, policy, and society[3]."

[3] NGI Website (2018): https://www.ngi.eu/

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For the second step, the SMART[4] framework for goal setting was considered, defining the following criteria:

- Specific: KPIs must be as detailed as possible to allow progress towards their achievement;
- Measurable: indicators should be measurable and if possible benchmarked against a standard;
- Attainable: indicators should be reasonable and attainable, while keeping the bar sufficiently high to stimulate and motivate their achievement;
- Realistic and result-oriented: indicators should be achievable considering the available resources;
- Time-sensitive: time frame is necessary in order to measure success along a development roadmap.

In line with NGI objectives and with the SMART methodology and considering the input from the NGI unit and expert opinion of the consortium members, in the third step, the following Key Performance Indicators (KPIs) have been selected: Innovation, Sustainability, Collaboration, Interoperability, Market Needs, Social Impact, User Experience.

Innovation: this KPI quantifies the level of change in terms of either technology or value proposition that will contribute to reach the NGI goals. This includes identifying if a similar solution already exists in the marketplace, how a solution will impact the technology domain, if a solution has been described in trade or scientific publications, how near a solution is to be commercially exploitable, and if a solution is a stand-alone or part of a larger organisational technology development roadmap.

Innovation is often regarded as the main engine to growth and competitive advantage. The ability to innovate heavily affects the competitive environment as well as the progress of knowledge in a given technological domain. It has been defined by Freeman (1982) as the exploitation of new ideas, opposed to invention that is the first occurrence of an idea.

The scope of this KPI assessment will be limited to the product innovation, referring to a new product or service made available to the market. Data from Eurostat (2014) indicate that 49% of enterprises in EU28 are innovative, which means enterprises that had innovation activities during the reference period. Product innovative enterprises made up 49% of innovative enterprises.

Sustainability: The Sustainability Indicator measures initiatives' level of economic sustainability and how near they are to self-sustaining their business. As a relevant indicator of business readiness, those initiatives able to not fully depend on external funding are at a more advanced maturity stage and more likely to avoid failure in the near term.

Collaboration: this KPI assesses the level of collaborative approaches and involvement of external parties adopted upon creating a solution. An important component of innovation is being able to exploit the commercial potential of new ideas. Several studies have already demonstrated the importance of open innovation models and strategies, leveraging multiple

[4] Doran, G. T. (1981) "There's a S.M.A.R.T. way to write management's goals and objectives". *Management Review*. AMA FORUM. **70** (11): 35–36.

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external partners and sources, to boost and diffuse innovation. Open models play also a key role in allowing the so-called technology transfer, a process by which sharing of skills, knowledge and technologies and making them available to a large audience enables subsequent developments and spin-off of new innovations.

Interoperability: the purpose of this KPI is measuring how well do initiatives contribute to the existing framework of open single digital market. This includes assessing if an initiative is using an open source platform, tool, or protocol for the development of a solution and if an initiative is employing standards in the developments of the technology.

Open source instruments and technical standards are essential to allow interoperability across borders and consolidate knowledge and expertise in a technology domain to encourage new opportunities and investments. Interoperability can be defined as *"the ability of organisations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between these organisations, through the business processes they support, by means of the exchange of data between their ICT systems"* (European Interoperability Framework, 2017). It can be distinguished into:

- Technical interoperability – the ability of different information and communication systems to exchange data;
- Semantic interoperability – the ability of computer systems to exchange data with unambiguous, shared meaning;
- Organisational interoperability – integration of business processes and exchange of information between organisations.

Market Needs: this KPI quantifies to what extent a solution can address market demand and prove to be helpful to targeted customers. This includes identifying the main expected benefits that a solution will bring to a specific market in terms of reducing operational costs, improving sales performance, improving marketing effectiveness, enhancing customer (citizen for public sector, patient for healthcare) care, innovating the product or service companies sell/provide, strengthening multi-channel delivery strategy, simplifying regulatory tasks and complying with regulations, improving data protection, increasing use and distribution of open data and transparency, improving scalability of existing tools, and improving operational efficiency.

Social Impact: this indicator measures the ability of an initiative to address key issues related to European societies and improving citizens' quality of life in terms of autonomy, comfort, health, lifestyle, inclusion, access to services, security and so on. Achieving a sustainable market economy is among the targets the European Commission aims to reach as part of the Europe 2020 strategy. Furthermore, the increased complexity of current social challenges (population ageing, climate change, urbanization and mobility), have brought the concept of social innovations to the fore. Social innovations have been defined as new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations (*Open Book of Social Innovation, March 2010*). For this analysis social impact has been defined with respect to the following challenges:

- Citizens' fitness;
- Population health;
- Clean, efficient, sustainable energy;
- Public transportation challenges;

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- Finite resources' waste reduction;
- Communication speed and connection ubiquity;
- Inclusion;
- Collaboration;
- Protection from cyberterrorism, identity theft, fraud, cybercrime and cyberbullying;
- E-learning;
- Perceived security of communities, neighbourhoods, and housing;
- Access to relevant information.

User Experience: in an era where customer experience is driving many investments, it has become essential to put customer at the core of companies' strategies. This KPI aims at measuring the ability of initiatives to put users' experience at the top of their priorities. More broadly, the user experience KPI analyses initiatives' ability to assess user experience effectiveness, being able to track users' satisfaction and solutions' usability, while offering a high customization level. It also considers on one side the customer risk exposure coming from the usage of initiatives' solutions and on the other the benefits, in terms of new skills and enhanced collaboration, these solutions could lead to.

3.2.2 Scoring Methodology

KPIs of initiatives in scope were assessed using a dedicated survey, called SURVEY4NGI, available on the NGI consultation platform[5]. Dedicated questions were designed to assess respondents' performance based on the KPIs defined above. Each respondent was assigned a score from 1 (very low) to 5 (very high) corresponding to their performance. Aggregate KPIs for the total sample were then measured on a 5-point scale as an aggregated indicator by using an average score of the total sample.

The details of the measurement approach used for each KPI can be found in Section 4.

3.3 SURVEY4NGI

3.3.1 Survey field and methodology

Survey Field
The SURVEY4NGI's sample consisted of 63 interviews, including 37 technology providers, 19 research projects and 7 policy makers or initiatives funding 3rd parties.
The survey was conducted in English using a computer-aided system available online on the NGI consultation platform website (https://consultation.ngi.eu/).
The survey was carried out from September to November 2018.

Survey Method
Approximately 56% of the interviews (35 respondents) were conducted via telephone, which allowed interviewers to clarify some of the more complex questions to ensure accurate, meaningful responses. A computer-aided telephone interviewing (CATI) system, which

[5] https://consultation.ngi.eu/ngi-survey

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permitted simultaneous interviewing and data entry, was used. This system provided various automatic data checks and skip patterns, which occurred while the respondent remained on the line. The remaining 44% of respondents (28) were polled through a computer-assisted web interviewing (CAWI) system. CATI Interviews were conducted by NGI Partners, as shown in Table 9 in the Appendix.

TABLE 1 NUMBER OF SURVEY4NGI INTERVIEWS BY TYPE OF RESPONDENTS

Respondent	Interviews Total	CATI Interviews	CAWI Interviews
Technology Providers	**37**	23	14
Research Projects	**19**	11	8
EC Policy Makers or Initiatives funding 3rd parties	**7**	1	6
Total	**63**	**35**	**28**

November 2018

Source: D1.3 HUB4NGI 2018

3.3.2 Sample design and characteristics

3.3.2.1 Technology providers

Technology Providers' sample interviews profile

The technology providers' sample consisted of 37 interviews. Company sizes were based on the number of personnel employed and aggregated into the following segments: 1-9, 10-19, 20-49, 50-99, 100-249, 250-499, 500-999, 1,000-4,999, 5000+ employees. Target industries were defined according to the NACE Rev.2 Classification.

About 92% of the sample was made of SME companies (organisations with less than 250 employees) and particularly about 54% were very small companies with 1-9 employees.

From a country perspective there is high fragmentation across EU countries but, overall, 27% was based either in Italy or in the UK. As per the targeted verticals, 84% was targeting companies of the information and communication vertical. Detailed information on the number of technology providers per country and targeted vertical can be found in the Appendix (Table 6 and Table 7).

TABLE 2 TECHNOLOGY PROVIDERS BY SIZE

Company Size	Interviews
1-249 – SME	34
+250 – LARGE	3
Total	37

November 2018

Source: D1.3 HUB4NGI 2018

Other features that characterize technology provider respondents are the type of business model used and their interaction with external technology providers.

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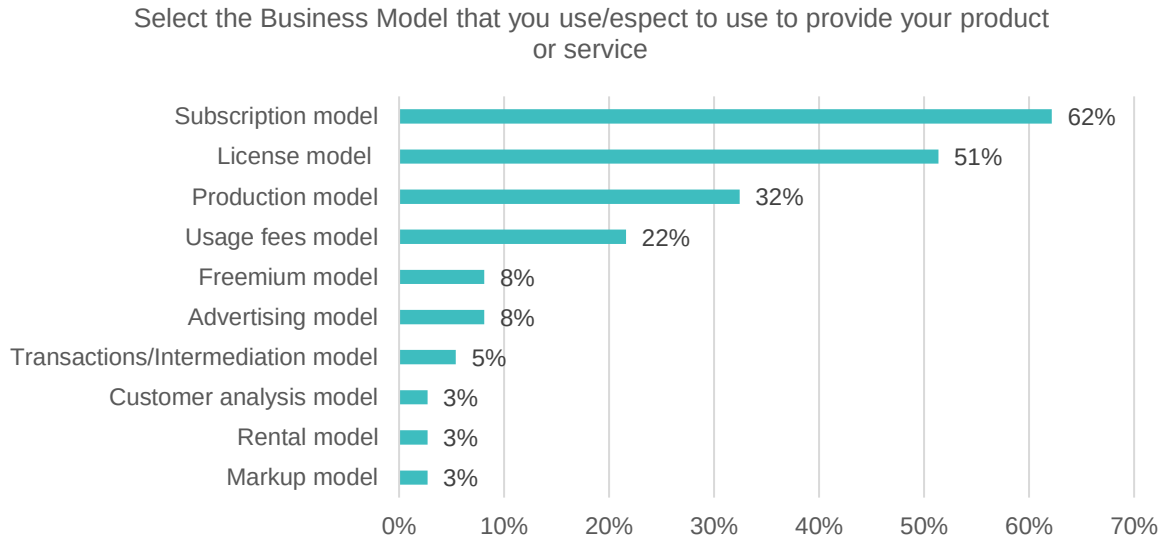
As far as the business model concerns, 62% and 51% of respondents adopt a subscription or license model, respectively, to provide the technology solution to the market. In the subscription model customers must pay at contracted periods of time, examples are the “as a service” model used for software sales but also for gyms, newspapers and entertainment (e.g. Netflix).
In the license model the owner keeps the proprietary right (copyright, patent) of the product while customers can buy licenses for using it paying an up-front cost. This kind of model is largely used by small companies that develop a sophisticated innovative solution (protected by intellectual property rights) but do not have the possibility to properly scale it. By licensing their innovations to larger companies, they can easily monetize their new products while the licensee can use and integrate the technology in a broader offering to create additional value for the end user.
The least used business models are the rental model, the mark-up model and the customer analysis model. All the three are more likely to be adopted by large organisations that have assets, resources and large amount of data.

FIGURE 4 TECHNOLOGY PROVIDERS' SAMPLE BUSINESS MODELS



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

Regarding technology providers' relationship with other technology providers, more than half of respondents, about 51%, replied to develop internally the technology solution. Among the remaining 49% purchasing externally an IT component, the highest percentage was for hardware components (22%).

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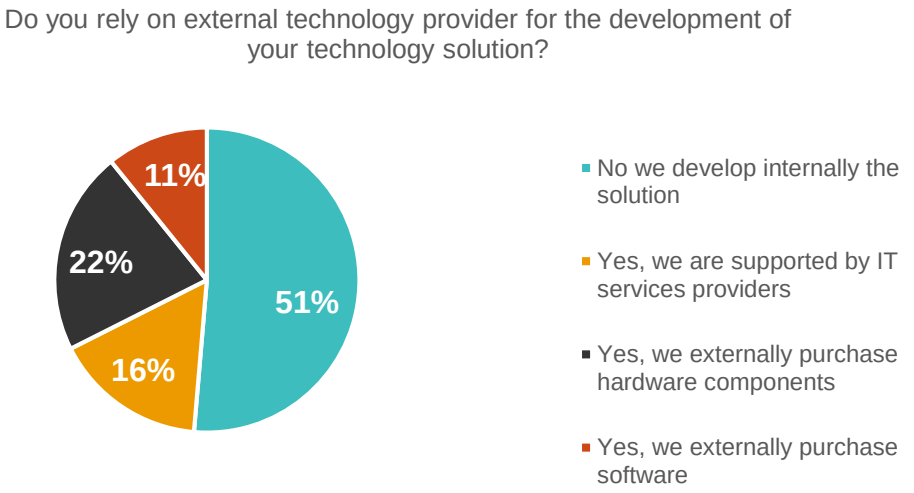
FIGURE 5 TECHNOLOGY PROVIDERS' SAMPLE IT INVESTMENTS



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

3.3.2.2 Research Projects

Research Projects' sample interviews profile

The research projects' sample consisted of 19 interviews. About 80% of the sample was receiving funding from the European Commission. The average number of partners per research project was 15 and 58% were targeting with their research information and communication companies (for more info on targeted industries see Appendix, Table 8).

TABLE 3 FUNDING BODIES FOR RESEARCH PROJECTS RESPONDENTS

Funding Body	Interviews
EC	15
Other EU bodies	3
Central Government	8
Local Government	8
Private entities	5

November 2018

Source: D1.3 HUB4NGI 2018

About 74% of the sample was involved in actively developing a technology solution to the market while the remaining 26% was conducting only theoretical research. This profile question has been used as a filter for many questions aiming at assessing the different KPIs of technological solutions within the NGI scope. For example, the question “Do you rely on external technology provider for the development of your technology solution?”, was asked only to research projects developing a technology solution. The results for this question (Figure 7) are very different from the ones obtained for tech providers. 71% of the sample buys from

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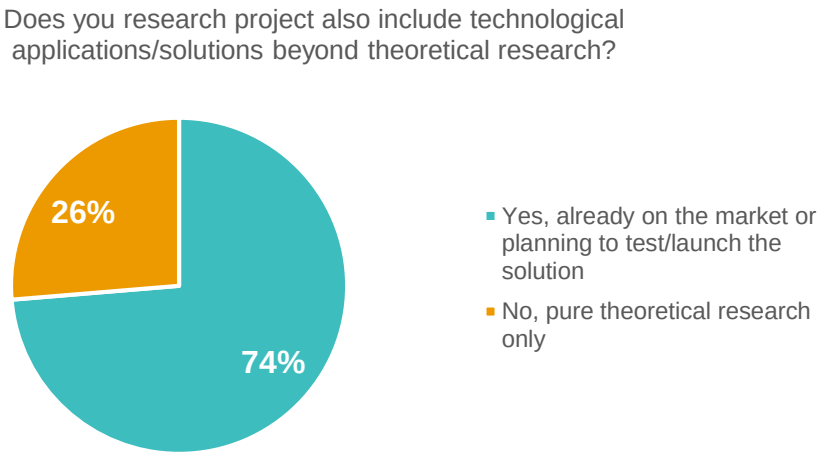
an external supplier an IT component, and the majority (36%) is purchasing hardware components.

FIGURE 6 RESEARCH PROJECTS' PROFILE

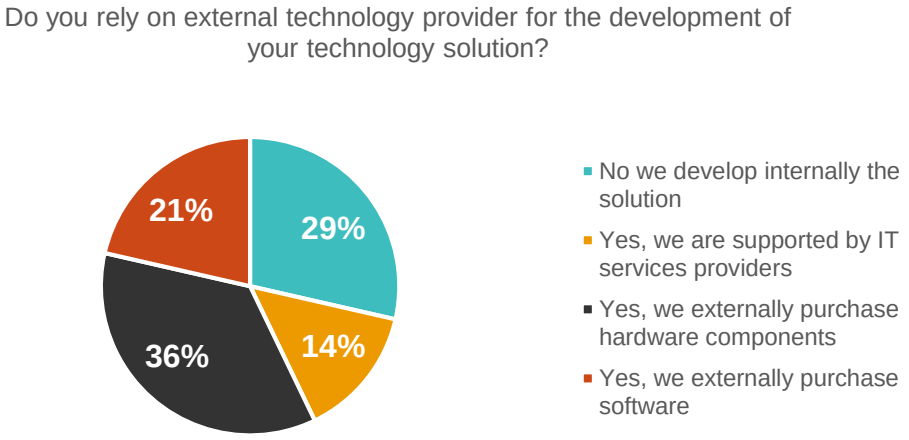


N=19, Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

FIGURE 7 RESEARCH PROJECTS AND IT INVESTMENTS



N=14, Active Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

EC Policy Makers or initiatives funding third parties

EC Policy Makers or initiatives funding third parties' sample interviews

The EC policy makers or initiatives funding third parties' sample included 7 interviews. Regarding the type of support provided, the vast majority was providing funding for research (71%), followed by provision of infrastructures or resources for testing (57%). Less support was on the contrary provided in terms of technology deployment, business or technical support or introduction to investors. This suggests that, as we will see later in this document, one of the areas where EC support for initiatives could improve is bridging them to the marketplace.

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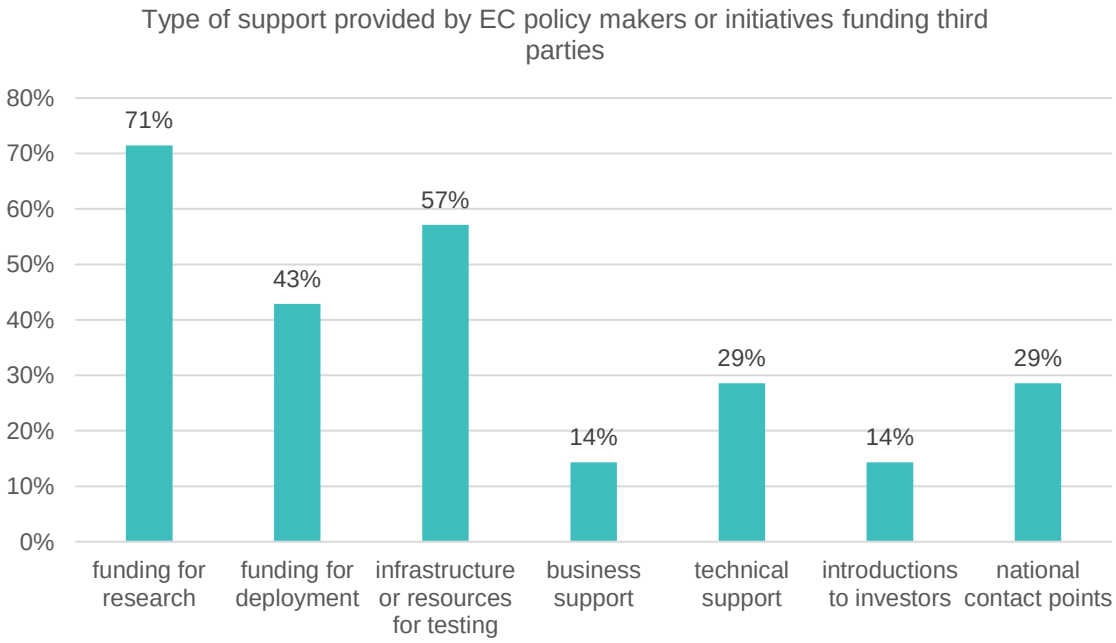
FIGURE 8 EC POLICY MAKERS OR THIRD-PARTY FUNDING TYPE OF SUPPORT



N=7, EC Policy Makers or Initiatives Funding third parties Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

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4 SURVEY4NGI AND KEY PERFORMANCE INDICATORS ASSESSMENT

In this section the results of the KPI assessment carried out to assess the performance of initiatives with respect to NGI goals will be presented.

KPIs were collected through the SURVEY4NGI carried out in September-November 2018, with a total sample of 63 respondents.

For each selected KPI (see section 3), the following will be provided:

- Road to Measurement – Analysing the questions used to quantify the specific indicator;
- Measurement Results – Providing an analysis of the respondents' scores on the specific indicator.

The analysis of the average score on each indicator for the whole sample will be presented in Section 5.

4.1 INNOVATION KPI

This KPI was measured using 5 questions, each one defining one measure contributing to the score of the aggregated KPI:

- Question I1: Does a similar solution already exist in the marketplace?
- Question I2: How does your solution impact the technology domain?
- Question I3: Has your solution been described in trade or scientific publications?
- Question I4: How near is your solution to being commercially exploitable?
- Question I5: Is the solution standalone or is it part of a larger organisational technology development roadmap?

The sample used to assess this indicator was made of technology providers and research projects actively involved in developing a technology solution. Particularly, the survey sample consists of 51 respondents (technology providers and active research projects) for questions I1, I2, I3 and I4 while it is of 37 respondents (technology providers only) for question I5.

4.1.1 Road to Measurement

Below are presented the results for the questions used to assess the Innovation KPI.

➔ **Question I1. Does a similar solution already exist in the marketplace?**

This question examines the originality of the solution developed and provided by a company, evaluating whether a similar solution has been already presented to the market by other players. Using Roger's (1983)[6] words, it can be framed as "the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of a system".

[6] Rogers E. M, 1962, Diffusion of innovations. New York: Free Press of Glencoe

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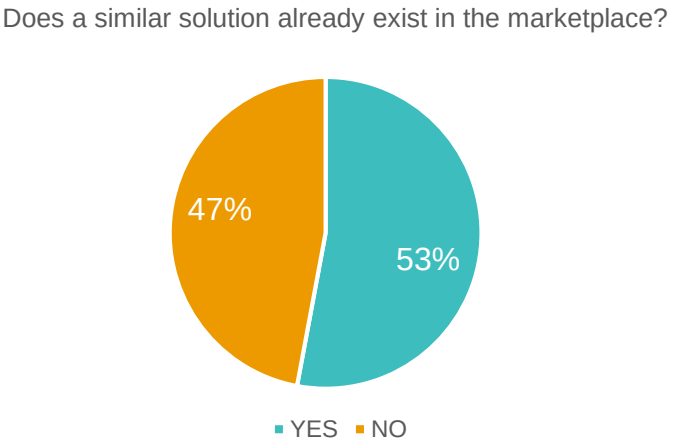
The results show a balanced distribution with 47% of respondents considering their solutions completely new to the market.

FIGURE 9 INNOVATION KPI - QUESTION I1



N=51, Technology Providers and Active Research Projects Respondents to the SURVEY4NGI

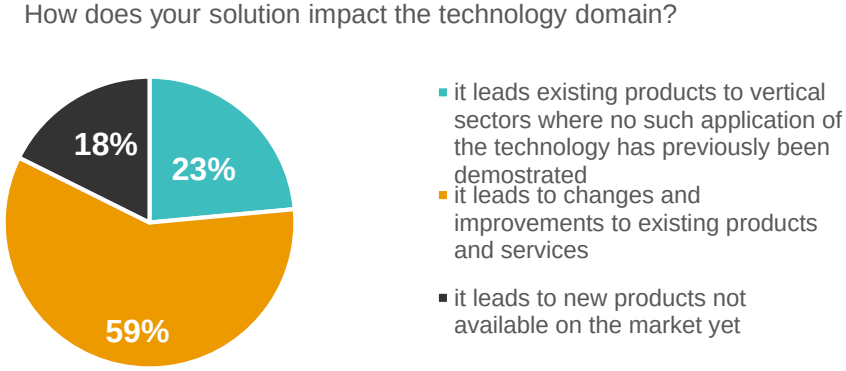
November 2018

Source: D1.3 HUB4NGI 2018

➔ Question I2. How does your solution impact your technology domain?

It is possible to distinguish between two types of innovation: incremental or radical innovation. Incremental innovations improve and renew already existing products and services progressing in an incremental way along the existing technology development path (an example are the different generations of video game consoles increasing the number of bits). Radical innovations are breakthrough new services or products that completely disrupt the existing market (an example is the Internet). Most innovations fall in the first category as they are the results of new combinations of existing knowledge. As expected, 82% of respondents are developing incremental innovation, which means either improving existing products or services (59%) or providing existing products or services in new industries where they were not existing before (23%). 18% of the sample is claiming to provide radical new innovations to the market, with disruptive and brand-new services and products.

FIGURE 10 INNOVATION KPI - QUESTION I2



N=51, Technology Providers and Active Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

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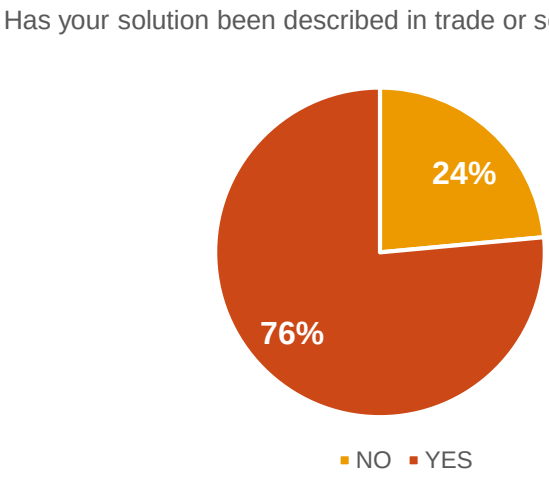
➔ Question I3. Has your solution been described in scientific publications?

This question aims at assessing whether the technology solution developed by respondents is contributing to increase knowledge in a technology area. Being described in scientific publications represents a measure of how much an innovation is contributing to the development of new expertise around a scientific or technology domain. Great majority of respondents replied that their solution was described in a scientific publication. As expected, the research project respondents have a higher score on this measure, with 94% of respondents having been involved in a kind of publication.

FIGURE 11 INNOVATION KPI - QUESTION I3



N=51, Technology Providers and Active Research Projects Respondents to the SURVEY4NGI

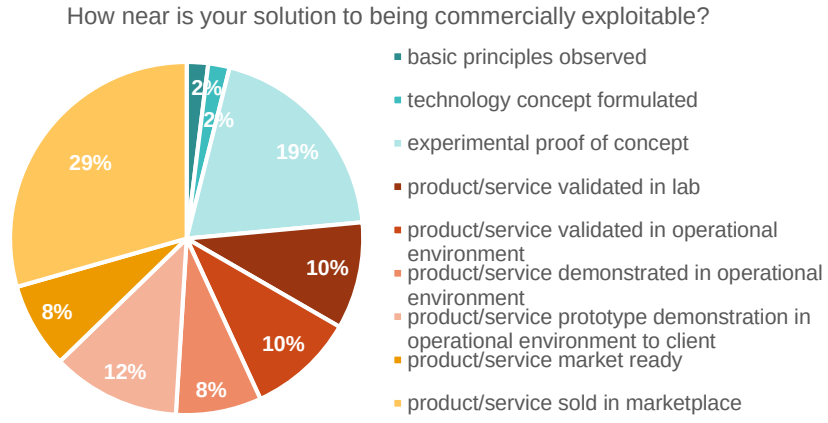
November 2018

Source: D1.3 HUB4NGI 2018

➔ Question I4. How near is your solution to being commercially exploitable?

This question's purpose is to assess the market readiness of the solution and the commercial viability of the innovation. The great majority of the sample (40%) is in a prototyping phase (whether in lab or in an operational environment), another 37% has a commercially viable solution, 23% is at the initial stages of development with 19% in the proof of concept stage.

FIGURE 12 INNOVATION KPI - QUESTION I4



N=51, Technology Providers and Active Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

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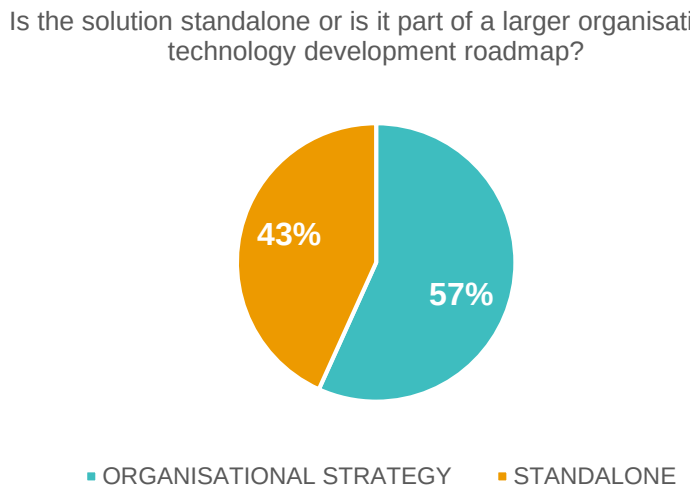
➔ **Question I5. Is the solution standalone or is it part of a larger organisational technology development roadmap?**

This question, asked only to technology providers, aims at understanding whether the technology solutions within the scope of the survey are developed as a standalone project, based on a contingent peculiar need of the company, or whether they are part of a broader organisational roadmap and aligned with corporate goals.

As expected, considering that the sample is in great part made of small companies, 57% of respondents replied that the technology solution developed is part of a corporate roadmap.

FIGURE 13 INNOVATION KPI - QUESTION I5



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

4.1.2 Measurement Results

In the chart below, it is possible to see the scores of the 51 initiatives on the Innovation KPI. Final scores were assigned to each respondent as follows:

1. **Scores were assigned to the options of each question.**
   For yes-no questions (I1, I3) the maximum score was assigned to the option positively related to innovation. For I5 the highest score was given to the respondents where innovative solutions are part of a broader corporate strategies and the lowest to those where the solution in the scope of the survey was a standalone project. For the questions with a list of possible options (I2, I4), a score was assigned to each possible option ranging from 1 to 5 based on the associated innovation level.

2. **Weights were assigned to each question** according to their relevance in defining overall innovativeness of the sample.

Additional details on scores and weights can be found in the Appendix 8.2.1.

The Innovation KPI, has been then calculated as an average of respondents' scores, where:

- Scores from 1 to 1.99 correspond to a **low level of innovation**;

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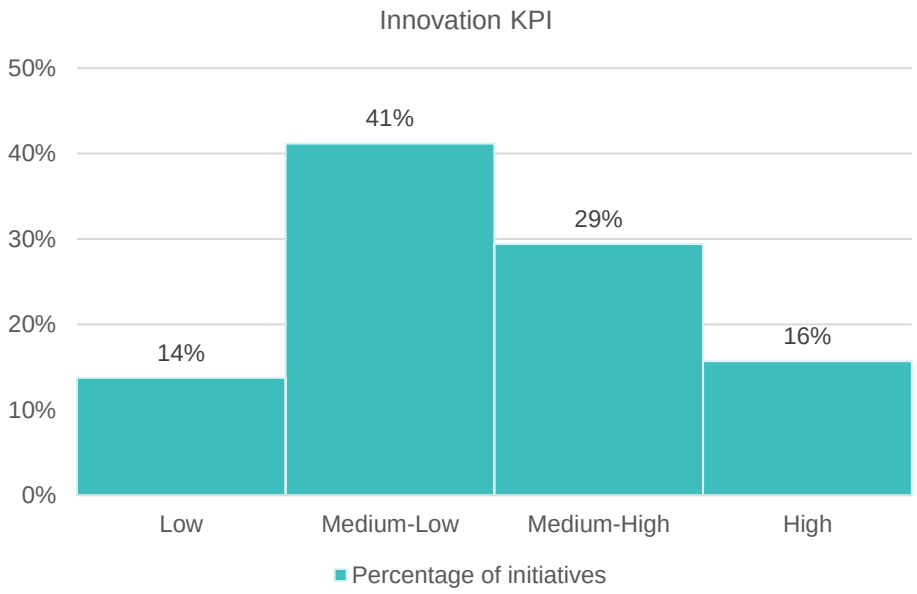
- Scores from 2 to 2.99 correspond to a **medium-low level of innovation**;
- Scores from 3 to 3.99 correspond to a **medium-high level of innovation**;
- Scores from 4 to 5 correspond to a **high level of innovation**.

Most initiatives (around 70%) report a score between 2 and 4, thus indicating a middle level of innovativeness among initiatives that took part to the SURVEY4NGI.

FIGURE 14 INNOVATION KPI SCORING



N=51, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

4.2 SUSTAINABILITY KPI

The Sustainability Indicator has been measured using one single question:

- Question S1: How much external funding do you think will be needed for developing the solution before reaching sustainability? (%)

This Indicator only applies to Technology Providers (n=37 respondents), being other type of respondents not directly impacted by this measurement.

4.2.1 Road to Measurement

Below are presented the results for the question used to assess the Sustainability KPI.

➔ **Question S1: How much external funding do you think will be needed for developing the solution before reaching sustainability? (%)**

According to the Survey results, the average percentage of initiatives' budget still depending on external funding is 78%. Among respondents, 22% of the sample declared to have already reached break-even which implies the solution being already fully commercialized, while 11%

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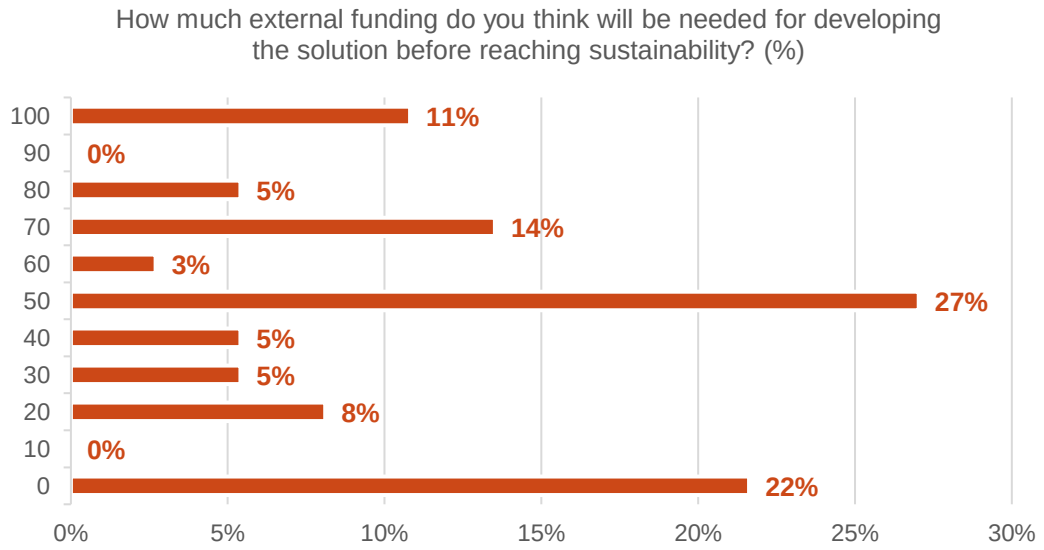
said they still need to fully rely on external funding, as most likely in the early development of the solution. Overall 40% of the sample suggest requiring less than 50% of their overall budget from external funding.

FIGURE 15 SUSTAINABILITY KPI - QUESTION S1



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

The fact that only one fifth of respondents is fully self-sustainable from a financial point of view is on one side, a clear indicator of the average business maturity level reached by initiatives. and on the other, it underlines the important role that cascade funding programs and public funding plays in supporting European initiatives' growth, at their initial stages.

4.2.2 Measurement Results

The chart below shows the distribution of Sustainability scoring per respondent.

For the scoring of this KPI, respondents' replies have been grouped into 5 bands, each associated with a score on a 5-level scale representing the level of economic sustainability. The bands and the related scores are reported in the Appendix. 8.2.2.

Based on the percentage value, each answer has been scored from 1 to 5, where:

- Scores from 1 to 1.99 correspond to previous question percentages in the 80%-100% range and indicate a **low level of self-sustainability** from external funding;
- Scores from 2 to 2.99 correspond to previous question percentages in the 50%-70% range and indicate a **medium-low level of self-sustainability** from external funding;
- Scores from 3 to 3.99 correspond to previous question percentages in the 30%-40% range and indicate a **medium-high level of self-sustainability** from external funding;

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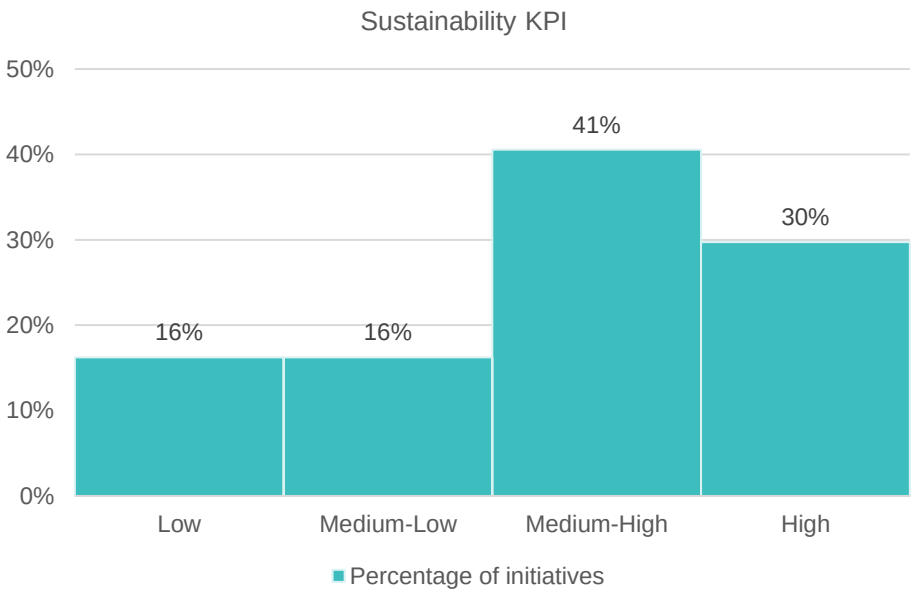
- Scores from 4 to 5 correspond to previous question percentages in the 0%-20% range and indicate a **high level of self-sustainability** from external funding.

FIGURE 16 SUSTAINABILITY KPI SCORING



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

4.3 COLLABORATION KPI

For assessing the Collaboration KPI one single question has been used in the survey:

- Question C1: Are you collaborating with external partners for the development of the solution?

Respondents could choose from a list of potential partners, including universities, private organizations, associations, public administration and governmental bodies.

The sample for this KPI is composed of both research projects and technology providers (n=56).

4.3.1 Road to Measurement

Below are presented the results for the question used to assess the Collaboration KPI.

➔ **Question C1. Are you collaborating with external partners for the development of your solution?**

Results show that most of the interviewed companies have a collaboration strategy in place, only 5 technology providers suggested to have no collaboration in place.

The graph also shows that, not surprisingly, universities and private organisations are leading the charge. Collaboration is extremely valuable for smaller companies, the 91% of our sample, which can have more gains from sharing and accessing university or other companies'

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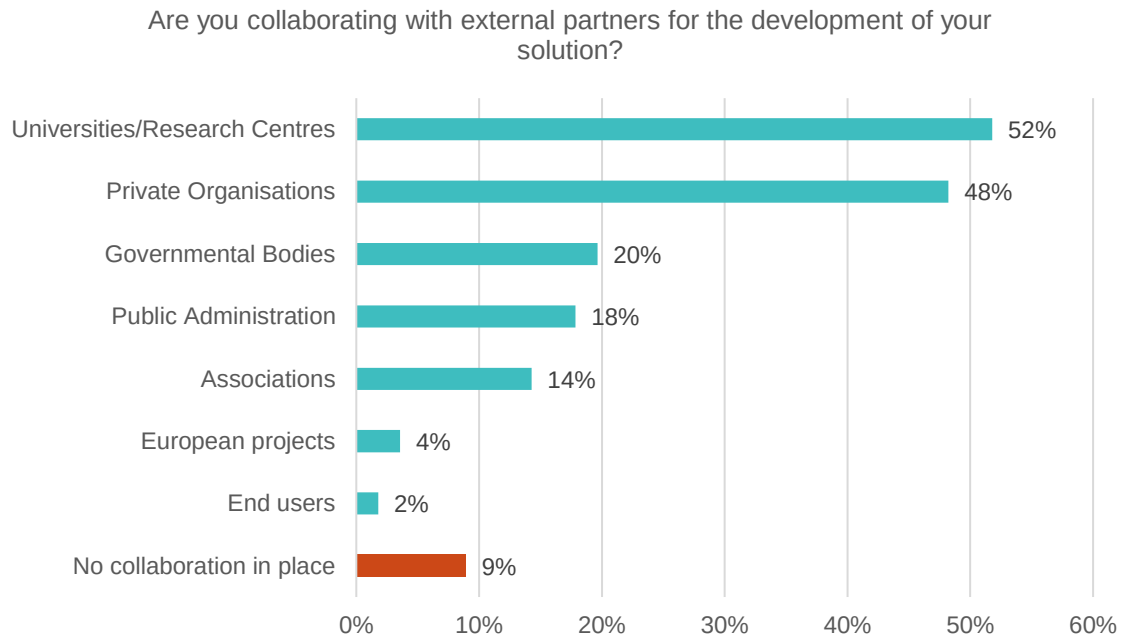
knowledge and resources. It is interesting to notice that some initiatives mentioned among their partners European projects and end users, not included in the original list. End users, particularly, are becoming increasingly relevant for innovation processes as co-creating innovative solutions with them has proved to bring additional values to both parties.

FIGURE 17 COLLABORATION KPI - QUESTION C1



N=56, Technology Providers and Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

4.3.2 Measurement Results

The measurement approach taken for this KPI was to assign the maximum score to those initiatives collaborating with at least one partner, while the lowest score was given to the initiatives with no collaboration in place. Additional details can be found in the Appendix 0.

The chart below shows the scoring distribution for the Collaboration KPI, where:

- Scores equal to 1 correspond to **low level of collaboration**;
- Scores equal to 5 indicate a **high level of collaboration**.

As seen in the previous graph, most of the initiatives in the sample confirmed to collaborate with at least one partner, therefore scores are skewed toward the upper part of the 5-point scale. As a consequence of that, the interviewed sample shows overall a tendency towards collaboration that is higher than European average. According to Eurostat (2014), only 34% of innovative enterprises[7]* in Europe (EU28) is engaged in any type of collaboration with another

[7] Innovative enterprise is defined as those with innovation activities during the period 2012-2014, including enterprises with on-going and abandoned activities. In other words, enterprises that had innovation activities during the period under review, regardless of whether the activity resulted in the implementation of an innovation, are innovation-active. The sample is limited to

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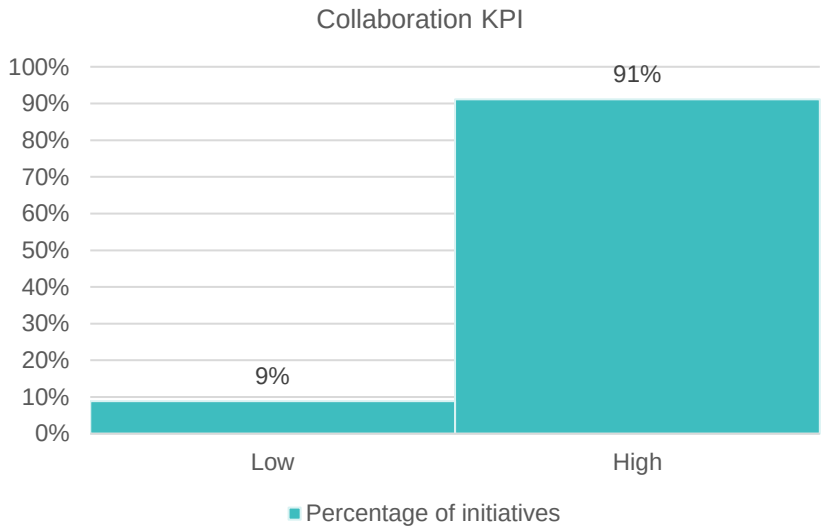
entity. Among them, 58% is cooperating with suppliers of equipment, materials, components or software and another 39% is collaborating with universities or other higher education institutions.

FIGURE 18 COLLABORATION KPI SCORING



N=56, Technology Providers and Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

4.4 INTEROPERABILITY KPI

The measurement of this KPI has been based on a set of two questions:

- Question IN1: For the development of the solution are you using open source platforms, tools, protocols?
- Question IN2: Do you employ standards in the development of the technology?

For each question, in case of positive answer, it has been required to respondents to specify which open source instruments and standards they were making use of.

This indicator was used to assess the performance of technology providers and research projects actively involved in providing a solution to the market. The sample thus includes 51 respondents.

4.4.1 Road to Measurement

Below are presented the results for the questions used to assess the Interoperability KPI.

product or process innovative enterprises, regardless of marketing or organisational innovative enterprises (Eurostat, Community Innovation Survey 2014)

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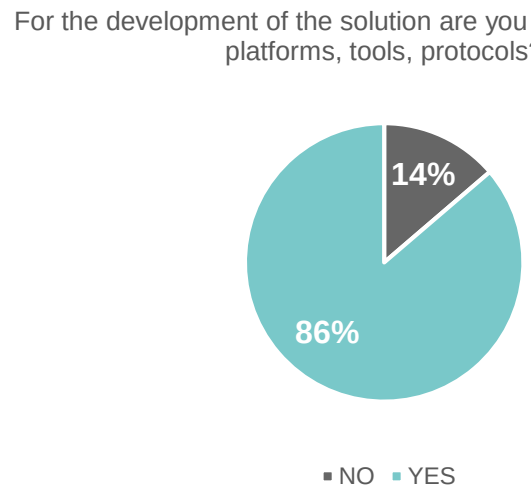
➔ Question IN1. For the development of the solution are you using open source platforms, tools, protocols?

The aim of this question is to determine how respondents are contributing to the improvement of an open source environment for technology development, encouraging open collaboration and peer production. The use of open source data, software, tools and protocols help reduce development costs since development occurs in a cumulative way building on others' work. It also helps avoid the lock-in effect typically associated with proprietary assets. 86% of respondents confirmed to use open source platforms, tools and protocols. Java, Python, Azure, Linux, Elastic Search and Jenkins were the most used open source products. These findings are even more optimistic than the results from the 2018 Open Source Program Management Survey[8], which suggests that 72% of companies uses open source for internal purposes.

FIGURE 19 INTEROPERABILITY KPI - QUESTION IN1



N=51, Technology Providers and Active Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

➔ Question IN2. Do you employ standards in the development of the technology?

Employment of standards is another measure to determine the maturity of a given technology domain. Standardization minimizes the risks connected with the development of a given technology, lower acquisition costs since the volumes purchased increase and the unitary prices decrease and improves technology quality while ensuring compatibility and interoperability. Although standardization is a phenomenon that takes place on a voluntary basis, the European Union has put a lot of effort into promoting European standardization. Besides heavily contributing to the establishment of the Internal Market, standardization has been increasingly used as a policy instrument by the European Commission to support different areas, including innovation, competitiveness, transport, environment, energy and so on.

In Europe there are three main European standardization organisations (ESOs):

[8] Source: Open Source Program Survey, 2018. Full sample, n=748.

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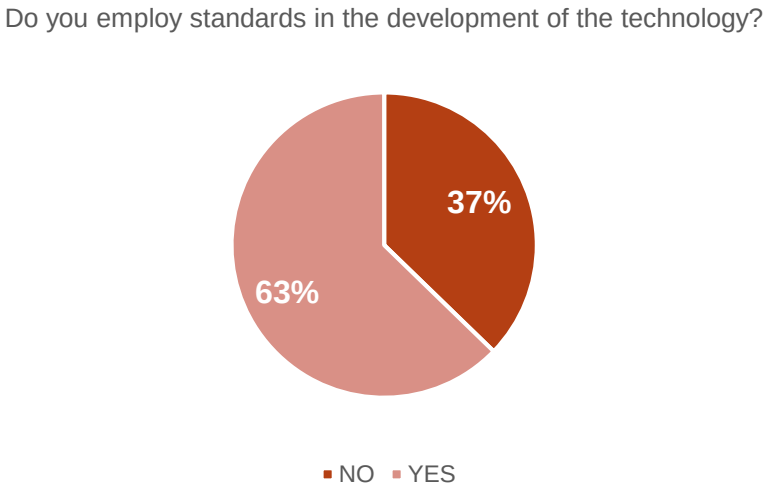
- European Committee for Standardization (CEN)
- European Committee for Electrotechnical Standardization (Cenelec)
- European Telecommunications Standards Institute (ETSI)

These three organisations act in conjunction with all the interested parties, including small and medium enterprises (SMEs), government, research centres, consumers, trade unions and so on.

In the survey, 63% of initiatives confirmed to employ standards. Among the top standards mentioned by respondents, we find 3GPP, ETSI, IETF, ISO.

FIGURE 20 INTEROPERABILITY KPI - QUESTION IN2



N=51, Technology Providers and Active Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

4.4.2 Measurement Results

For both questions, scores were assigned depending on the number of open instruments and standards adopted by respondents. In question IN1 the lowest score (1) was assigned to respondents not using open source instruments, in question IN2 the lowest score (1) was assigned to respondents not using any standard. Maximum score (5) was assigned for using more than 4 open source tools in IN1, and more than 4 standards in IN2. The final score for each respondent was calculated as an average of the two questions, considered as having the same weight. Details on scoring and weights can be found in the Appendix 0

Each respondent has been then assigned a single score, on a 5-point scale, where:

- Scores from 1 to 1.99 correspond to a **low level of interoperability**;
- Scores from 2 to 2.99 correspond to a **medium-low level of interoperability**;
- Scores from 3 to 3.99 correspond to a **medium-high level of interoperability**;
- Scores from 4 to 5 correspond to a **high level of interoperability**.

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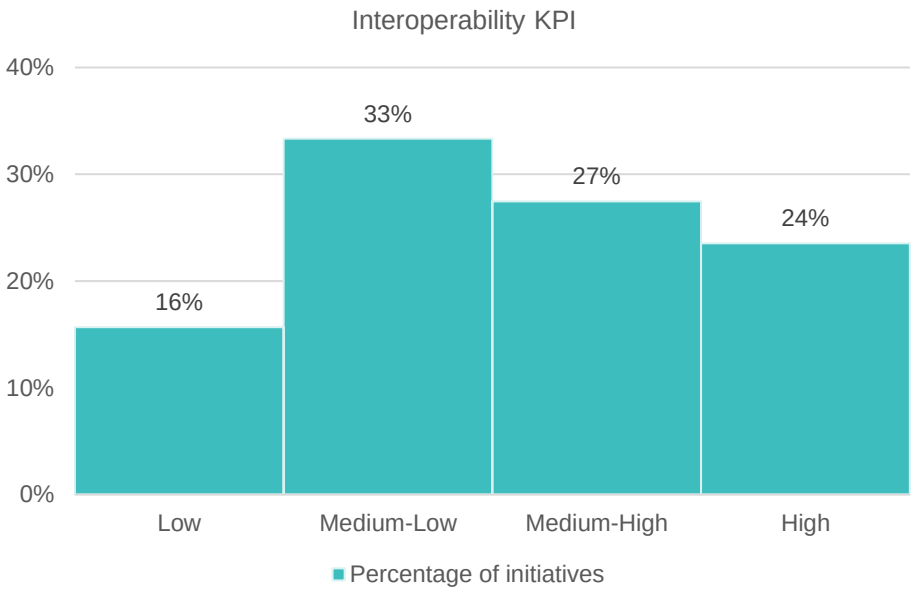
Most respondents (60%) report a medium score (between 2 and 3), suggesting that open source and standards are somehow used and accepted by the initiatives in scope, but there is space for larger adoption. As companies and technologies mature, we can expect that the number of standards and open source tools used will increase as well.

FIGURE 21 INTEROPERABILITY KPI SCORING



N=51, Technology Providers and Active Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

4.5 MARKET NEEDS KPI

For measuring this KPI a set of two questions has been used:

- Question M1: Which industries are you targeting?
- Question M2: Which are the main expected benefits your solution(s) will provide in your target market(s)?

This indicator has been used to assess the performance of both technology providers and research projects. The focus for the analysis will be on B2B only market needs, as the consumer market was not addressed by a relevant number of initiatives.

4.5.1 Road to Measurement

Below are presented the results for the questions used to assess the Market Needs KPI.

➔ **Question M1: Which industries are you targeting?**

In this question respondents were asked to select the industries they were targeting from a list of possible options elaborated according to NACE Rev.2 classification.

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As mentioned in Paragraph 3.3.2, about 84% of technology providers and 58% of research projects were targeting information and communication respondents. Detailed results about targeted verticals can be found in the Appendix (Table 6 and Table 7).

➔ **Question M2. Which are the main expected benefits your solution(s) will provide in your target market(s)?**

In the survey, initiatives were asked to select the top three benefits they were providing to their customers from a list of possible benefits:

- Reducing operational costs;
- Improving sales performance;
- Improving marketing effectiveness;
- Enhancing customer (citizen for public sector, patient for healthcare) care;
- Innovating the product or service companies sell/provide;
- Strengthening multi-channel delivery strategy;
- Simplifying regulatory tasks and complying with regulations;
- Improving data protection;
- Increasing use and distribution of open data and transparency;
- Improving scalability of existing tools;
- Improving operational efficiency.

According to the results of the survey the top three benefits surveyed initiatives aim to bring to their targeted markets are:

1. Reducing operational costs;
2. Improving operational efficiency;
3. Innovating the product or service client companies sell/provide.

Surprisingly, responses suggest that the focus of initiatives is related to the reduction of operational costs and efficiency improvement while product innovation comes only at the third place, highlighting that there is still large untapped potential for exploiting NGI technologies to truly disrupt and transform the business.

4.5.1 Measurement Results

In order to assess initiatives' capability to satisfy the needs of their targeted verticals, the answers to the question M2 were matched with targeted industries from question M1 and compared with a benchmark elaborated by IDC based on the results of IDC's European

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Vertical Markets Survey 2018-2019[9], which among other topics measured business priorities across about 2,800 respondents in Europe.

The benchmark provides a ranking of priorities by vertical market reflecting the importance given by each industry to each business need.

The two tables below show the ranking (from 1=lowest importance to 11=highest importance) of priorities according to the benchmark elaborated by IDC for all the 20 verticals targeted by initiatives and defined according to the NACE Rev 2 classification.

TABLE 4 IDC BENCHMARK VERTICAL PRIORITIES (A-K)

SURVEY4NGI Benefits	A	B	C	D	E	F	G	I	H	J	K
Improving sales performance	6	6	6	5	5	5	8	5	7	6	5
Improving scalability of existing tools	6	6	6	5	5	5	8	5	7	6	5
Enhancing customer care	8	8	11	8	8	11	11	11	9	11	11
Reducing operational costs	1	1	6	3	3	8	6	5	10	9	8
Improving operational efficiency	1	1	6	3	3	8	6	5	10	9	8
Innovating the product or service companies sell/provide	5	5	5	7	7	10	10	9	6	8	10
Simplifying regulatory tasks and complying with regulations	9	9	2	9	9	2	1	3	2	2	3
Increasing use and distribution of open data and transparency	9	9	2	9	9	2	1	3	2	2	3
Improving data protection	11	11	10	11	11	7	4	9	5	4	7
Improving marketing effectiveness	3	3	4	2	2	4	5	2	4	5	2
Strengthening multi-channel delivery strategy	4	4	1	1	1	1	3	1	1	1	1

TABLE 5 IDC BENCHMARK VERTICAL PRIORITIES (K-T)

SURVEY4NGI Benefits	L	M	N	O	P	Q	R	S	T
Improving sales performance	5	5	4	4	8	9	8	5	4
Improving scalability of existing tools	5	5	4	4	8	9	8	5	4
Enhancing customer care	11	11	8	8	11	6	11	11	8
Reducing operational costs	8	8	6	6	6	4	6	8	6
Improving operational efficiency	8	8	6	6	6	4	6	8	6
Innovating the product or service companies sell/provide	10	10	3	3	5	3	5	10	3
Simplifying regulatory tasks and complying with regulations	2	2	9	9	3	7	3	2	9
Increasing use and distribution of open data and transparency	2	2	9	9	3	7	3	2	9
Improving data protection	7	7	11	11	10	11	10	7	11
Improving marketing effectiveness	4	4	1	1	1	1	1	4	1
Strengthening multi-channel delivery strategy	1	1	2	2	2	2	2	1	2

[9] Source: IDC's European Vertical Markets Survey, 2018-2019. Total sample n=2759 European organizations with more than 10 employees

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N=2759 European companies

November 2018

Source: IDC's European Vertical Markets Survey, 2018-2019

Vertical Markets Legend:

A Agriculture, forestry and fishing

B Mining and quarrying

C Manufacturing

D Electricity, gas, steam and air conditioning supply

E Water supply, sewerage, waste management and remediation activities

F Construction

G Wholesale and retail trade; repair of motor vehicles and motorcycles

I Accommodation and food service activities

H Transportation and storage

J Information and communication

K Financial and insurance activities

L Real estate activities

M Professional, scientific and technical activities

N Administrative and support service activities

O Public administration and defence; compulsory social security

P Education

Q Human health and social work activities

R Arts, entertainment and recreation

S Other service activities

T Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use

Final scores, on a 5-point scale, were assigned to each respondent considering the relative importance given to each benefit for the targeted vertical(s) and comparing this relative importance with the one assessed by the IDC European Vertical Markets Survey. Therefore, the higher the correspondence with the benchmark, the higher the score given to each respondent. Particularly:

- Scores from 1 to 1.99 correspond to a **low level of coherence with market needs**;
- Scores from 2 to 2.99 correspond to a **medium-low level of coherence**;
- Scores from 3 to 3.99 correspond to a **medium-high level of coherence**;
- Scores from 4 to 5 correspond to a **high level of coherence**.

Interestingly, most respondents (76%) fall in the medium to high level of the scale. It is also worth noticing that there are some relevant differences across verticals. For example, higher alignment with real market needs can be found for initiatives targeting transport or information and communication verticals, while lower alignment can be seen for example, for the electricity vertical.

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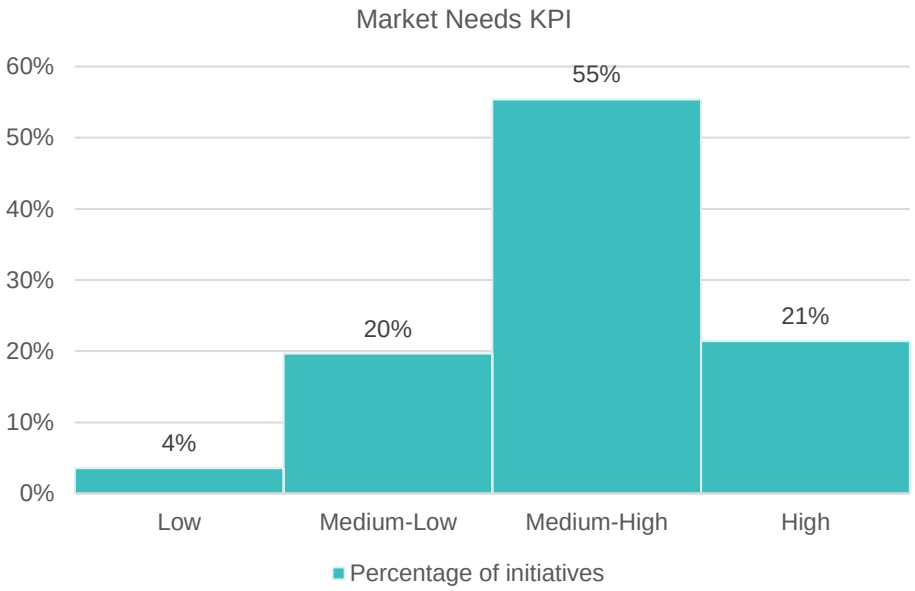
FIGURE 22 MARKET NEEDS KPI SCORING



N=56, Technology Providers and Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

4.6 SOCIAL IMPACT KPI

For the social impact indicator one single question was used, asked to the whole sample of technology providers, research projects, policy makers or initiatives funding 3rd parties (n=63):

- Question SI1: Which societal challenges does your solution contribute to?

4.6.1 Road to Measurement

Below are presented the results for the questions used to assess the Social Impact KPI.

➔ **Question SI1. Which societal challenges does your solution contribute to?**

For this question, a list of social challenges was then given to respondents asking them to select those ones their solution was contributing to. About 11% of respondents replied that they were not addressing a particular social challenge with their solutions or research. The social challenge addressed by the majority of interviewed initiatives (54%) is speed of communication and ubiquity of connection. This result is no surprising as improving communication is one of the key features of technologies within the scope of the NGI, such as 5G. Other social challenges addressed by survey respondents are access to relevant information (37% of respondents), collaboration (29% of respondents) and public transportation challenges (25%). The lowest scores are for physical security of communities, fitness and waste reduction, highlighting a particular social challenge propensity across initiatives.

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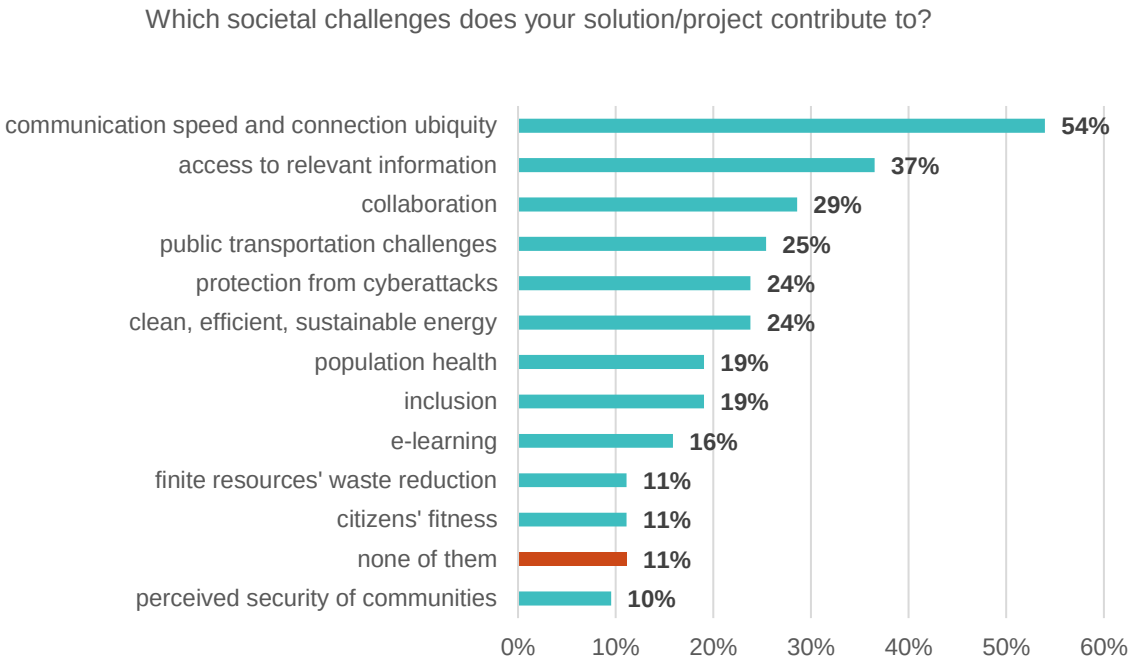
FIGURE 23 SOCIAL IMPACT KPI - QUESTION SI1



N=63, Technology Providers, Research Projects and EC Policy Makers or Initiative funding 3rd parties Respondents to the SURVEY4NGI November 2018

Source: D1.3 HUB4NGI 2018

Looking at the different types of respondent it is possible to see that speed of communication is leading the charge across all the three categories. However, while for tech providers it is followed by access to relevant information and collaboration, for research projects cybersecurity and e-learning are the second and third, respectively, while for funding initiatives public transportation and clean, efficient and sustainable energy are tied for second.

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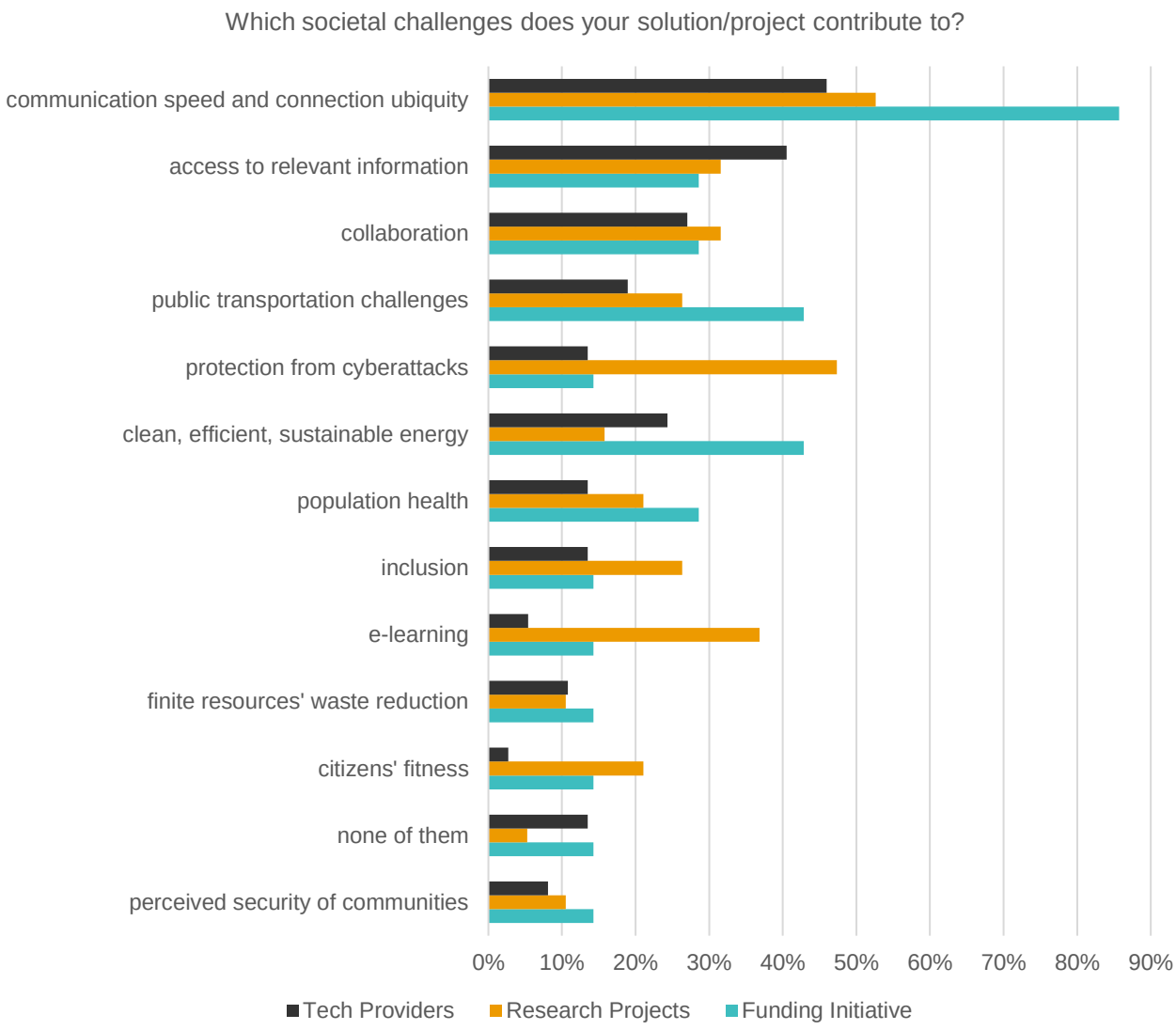
FIGURE 24 ADDRESSED SOCIETAL CHALLENGES BY TYPE OF RESPONDENTS



N=63, Technology Providers, Research Projects and Policy Makers or Initiative funding 3rd parties Respondents to the SURVEY4NGI November 2018

Source: D1.3 HUB4NGI 2018

4.6.2 Measurement Results

The approach to measure this KPI is based on the number of challenges addressed by each solution: the higher the number of social challenges the higher the social impact of the solution and the score for the respective respondent (on a 5 scale where 1 is very low and 5 very high). Therefore, the lowest score (1) was given to respondents do not addressing any of the listed challenges, while the maximum score (5) was assigned to respondents responding to at least 4 challenges. Additional details on scoring methodology can be found in the Appendix 8.2.5.

The Figure 25 below shows the distribution of Social Impact KPI for initiatives, where:

- Scores from 1 to 1.99 correspond to a **low level of social impact**;
- Scores from 2 to 2.99 correspond to a **medium-low level of impact**;

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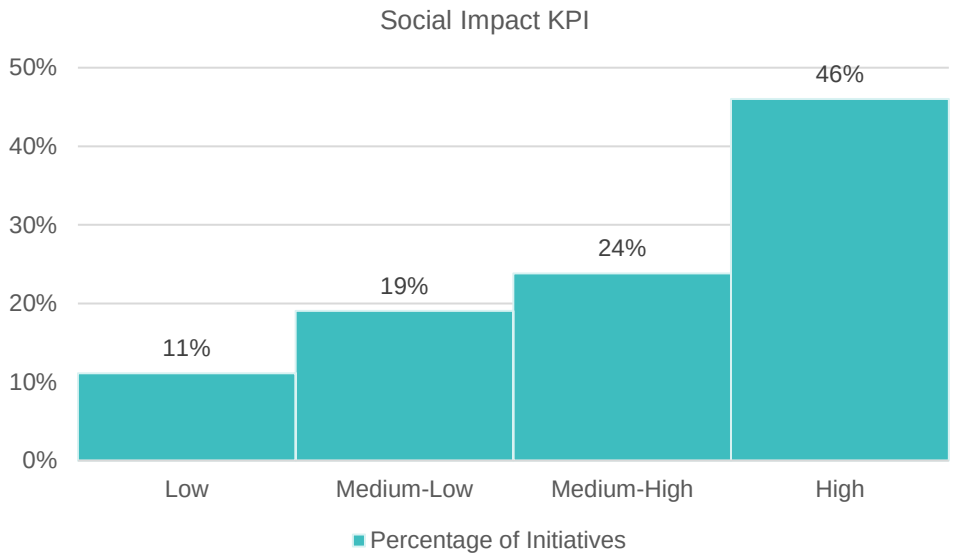
- Scores from 3 to 3.99 correspond to a **medium-high level of impact**;
- Scores from 4 to 5 correspond to a **high level of impact**.

The maximum number of challenges addressed was 10, while 11% of the sample does not address any of the social challenges mentioned. Respondents addressing more than 4 challenges represent 46% of the sample.

Through this indicator we deduce that the sample has a distribution skewed toward the higher side of the scale, with 70% of respondents in the medium-to-high score.

FIGURE 25 SOCIAL IMPACT KPI SCORING



N=63, Technology Providers, Research Projects and Policy Makers or Initiative funding 3rd parties Respondents to the SURVEY4NGI November 2018

Source: D1.3 HUB4NGI 2018

4.7 USER EXPERIENCE KPI

For assessing this KPI 6 yes/no questions were used:

- Question UX1: Is there a process to ascertain if users are satisfied in their experience with the solution?
- Question UX2: Is there a process to ascertain the ease of use?
- Question UX3: Can the user learn new skills or improve existing ones with the solution?
- Question UX4: Is it possible for the user to customize their experience?
- Question UX5: Does the solution support collaboration between users, for example to achieve a common goal?
- Question UX6: Does the user face any risks when experiencing the solution, over and above their normal use of the Internet?

This indicator only applies to Technology Providers (n=37 respondents), being other type of respondents not directly impacted by this measurement. For all questions, in case of positive answer, respondents were asked to provide additional details.

4.7.1 Road to Measurement

Below are presented the results for the questions used to assess the User Experience KPI.

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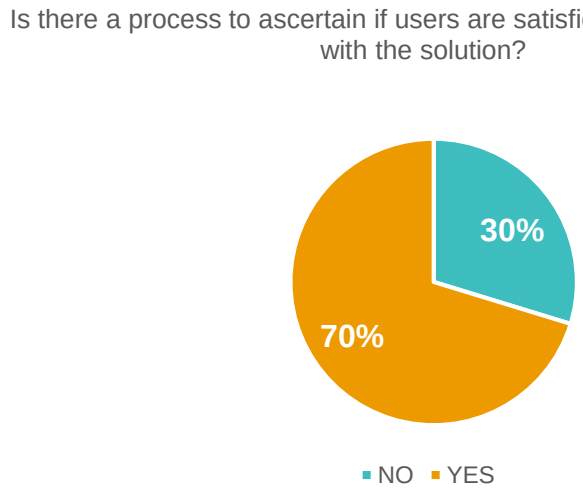
➔ Question UX1. Is there a process to ascertain if users are satisfied in their experience with the solution?

The first question is intended to assess whether initiatives measure how much users are satisfied with their solution. Customer satisfaction measures if the products or services offered by a company can meet or exceed customers' expectations, this happens if the quality perceived by the customer after the purchase is able to meet and exceed pre-purchasing expectations. This construct has been widely analysed in marketing literature for its relevance as Key Performance Indicator of market effectiveness and consequently higher returns. More specifically, customer satisfaction is an indicator of customers repurchase intentions and loyalty, since the higher the satisfaction, higher will be the likelihood that customers will purchase again the same product/service in the future and recommend it to others. Ideally, companies that are actively monitoring and using customer satisfaction can continuously improve their offering through customers' feedbacks. An example of this approach is the total quality management (TQM). Among surveyed initiatives, 70% reported to being somehow measuring customer satisfaction. The most widely used approach to measure it is through satisfaction/engagement surveys or system testing, other more innovative ones include co-design and customers' direct involvement in roadmap definition.

FIGURE 26 USER EXPERIENCE KPI - QUESTION UX1



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

➔ Question UX2. Is there a process to ascertain the ease of use?

The second question has been designed to assess an important determinant of user acceptance, that is the perceived ease of use. Several studies have demonstrated that perceived ease of use is positively correlated with both current and future use of the technology. Actively monitoring ease of use allows companies to track technology accessibility and usability which is particularly relevant for new technologies and services. As experience with the technology increases, it is expected that perceived ease of use will adjust accordingly. Results for this question are aligned with the previous one, with 70% of respondents suggesting having a process in place for monitoring users' ease of use. Users surveys and testing are also in this case the most common approach adopted to measure it. Other innovative approaches include workshops or analysis of data coming from the technology.

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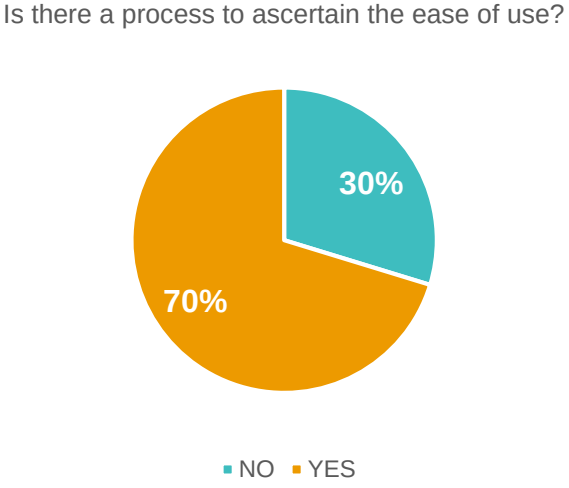
FIGURE 27 USER EXPERIENCE KPI - QUESTION UX2



N=37, Technology Providers Respondents to the SURVEY4NGI

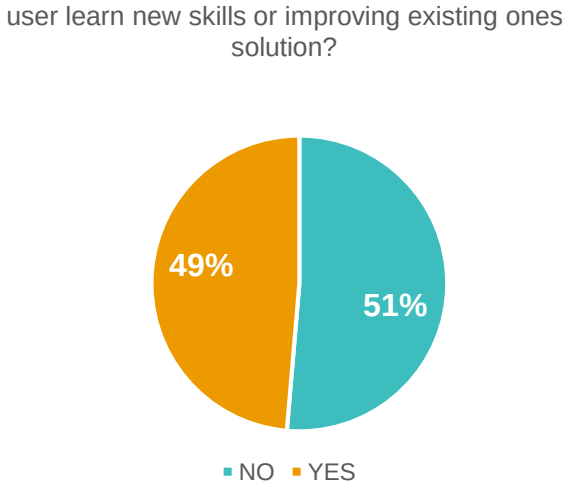
November 2018

Source: D1.3 HUB4NGI 2018

➔ Question UX3. Can the user learn new skills or improve existing ones with the solution?

This third question investigates the impact of initiatives on users' acquisition and development of new skills. Users' learning activities affect both users' satisfaction and diffusion of the technology. Results show a balanced distribution, with 51% of respondents not providing solutions contributing to users' development of new skills against the remaining 49%. The skills that users can learn are related to the specific solution and range from data analysis to physical capabilities.

FIGURE 28 USER EXPERIENCE KPI - QUESTION UX3



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

➔ Question UX4. Is it possible for the user to customize their experience?

Customization is a marketing strategy that is increasingly gaining attention in the e-business space together with the concept of personalization. The difference between the two is that:

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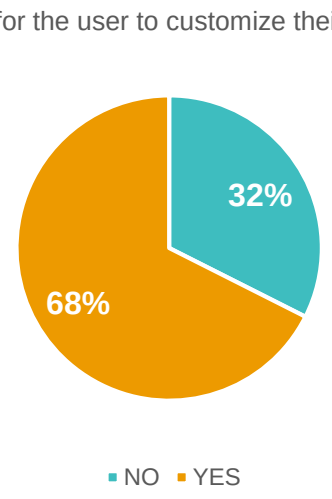
- Personalisation refers to a firm-driven activity to adapt the marketing mix offered to single users/categories of users, based on data collected on users' preferences, characteristics and behaviours (e.g. Amazon's recommendations).
- Customisation happens when the user can proactively decide one or more components of the marketing mix, she/he gets offered. (e.g. Nutella customisable labels, or NIKE customisable shoes).

One of the main advantages of adopting a customization strategy is that it positively correlates with higher customer satisfaction and grants product differentiation, which is crucial to thrive especially in a highly competitive environment.

Interestingly, 68% of surveyed initiatives give to their users the ability to customize their experience with the solution provided, ranging from customizing solution configuration and settings to the selection of the features of the service provided.

FIGURE 29 USER EXPERIENCE KPI - QUESTION UX4



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

➔ **Question UX5. Does the solution support collaboration between users, for example to achieve a common goal?**

The purpose of this question was to analyse if the solutions provided by initiatives support collaborative behaviours between users. Being part of a community, where the individual user can establish relationships with others sharing the same interests and values, positively impact user's satisfaction and the perception of the product/service offered by the company thus affecting users' retention. Furthermore, collaboration between users can help generate new ideas and further innovating the product or service offered by leveraging network's shared knowledge. Results suggest that most Initiatives (54%) do not support collaboration. The remaining 46% supports collaboration in different ways, from information sharing to collaborative data analysis for finding the solution to a problem, to gamification features where collaboration is associated with entertainment and rewards.

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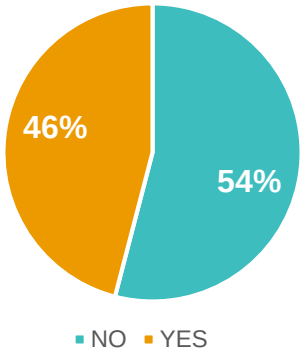
FIGURE 30 USER EXPERIENCE KPI - QUESTION UX5

Does the solution support collaboration between users, for example to achieve a common goal?



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

➔ **Question UX6. Does the user face any risks when experiencing the solution, over and above their normal use of the Internet?**

This question is focused on assessing whether the use of the technological solution developed by the initiatives exposes the user to new risks. The Internet and the rapid deployment of emerging technologies have materialised new risks for the customers. For example, the growing complexity and vulnerability of IT systems, combined with an increasing amount of data and information shared across different systems and networks, have made security issues more likely to occur. From misuse of sensitive information to identity theft or financial fraud, cybersecurity crimes have expanded exponentially. This is confirmed by the fact that according to IDC's European Vertical Markets Survey[10] 2018-2019, cybersecurity is the second most important priority, considered a top priority by 42% of the 2759 European organisations interviewed. According to the results of the NGI survey, shown in the chart below, only 8% of respondents consider their solution as bringing new risks to the user. About 70% of these risks were associated with potential security issues and management of sensitive data (e.g. personal health and fitness data). The remaining risks were associated with potential physical issues caused by extended use of technologies such as VR headset.

[10] Source: IDC's European Vertical Markets Survey, 2018-2019. Total sample n=2759 European organizations with more than 10 employees

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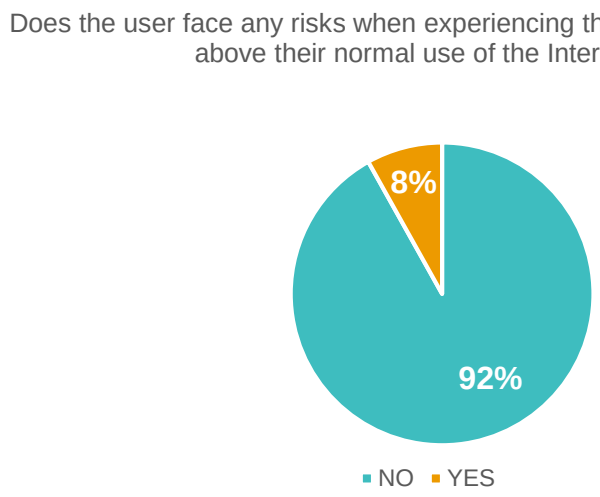
FIGURE 31 USER EXPERIENCE KPI - QUESTION UX6



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

4.7.2 Measurement Results

The aggregated indicator for User Experience has been calculated by assigning for each question the maximum score (5) to the answers associated with a positive user experience ("YES" for UX1, UX2, UX3, UX4, UX5 and "NO" for UX6) and the lowest (1) to the answers associated with a negative user experience. Weights assigned to each question determined the final score for each respondent, measured on a 5-point scale. Additional details on scores and weights can be found in the Appendix 8.2.6.

Scores intervals, shown in Figure 32, have been defined as follows:

- Scores from 1 to 1.99 correspond to a **low level of user experience**;
- Scores from 2 to 2.99 correspond to a **medium-low level of user experience**;
- Scores from 3 to 3.99 correspond to a **medium-high level of user experience**;
- Scores from 4 to 5 correspond to a **high level of user experience**.

Results for the NGI sample are again skewed toward a medium-high level of user experience (representing 78% of the sample). Only 8% of the sample falls in the lowest interval, confirming that user's experience centricity is an important feature for NGI technology providers.

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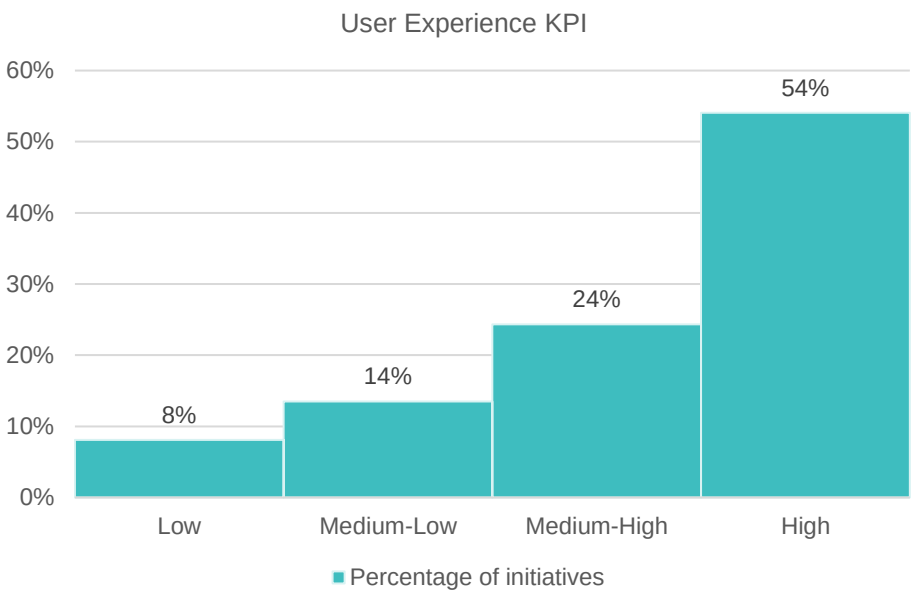
FIGURE 32 USER EXPERIENCE KPI SCORING



N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

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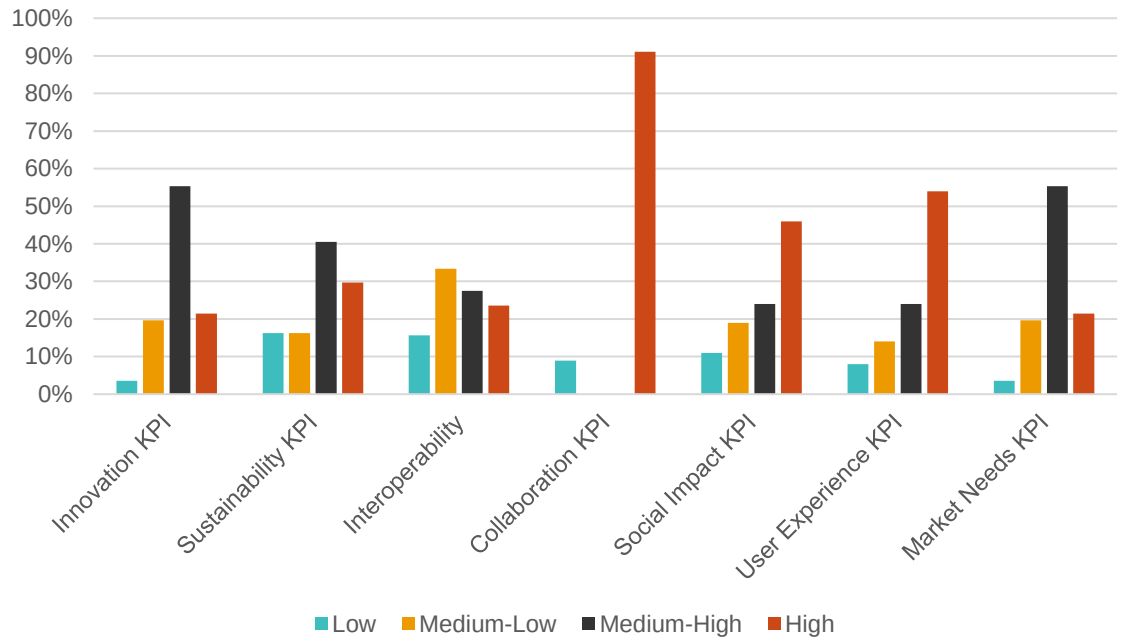
5 CONCLUSIONS

5.1 KPI SCORING

In the previous sections we have shown the results for the seven selected KPIs and their related metrics and we have measured how initiatives perform on a 5-point evaluation scale using the following scores intervals:

- Scores from 1 to 1.99 correspond to a **low performance level**;
- Scores from 2 to 2.99 correspond to a **medium-low performance level**;
- Scores from 3 to 3.99 correspond to a **medium-high performance level**;
- Scores from 4 to 5 correspond to a **high-performance level**.

FIGURE 33 KPI RESPONDENTS SCORING



N=63, Technology Providers, Research Projects and Policy Makers or Initiative funding 3rd parties Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

This section will present the analysis of the scoring of the whole sample on the selected KPIs obtained as an average of respondents' scores on each KPI. This, while providing an overall assessment of initiatives current effectiveness highlighting strengths and weaknesses, it also provides initiatives, or more broadly European organisations, with a benchmarking tool allowing them to assess their performance and effectiveness level with respect to the current European average.

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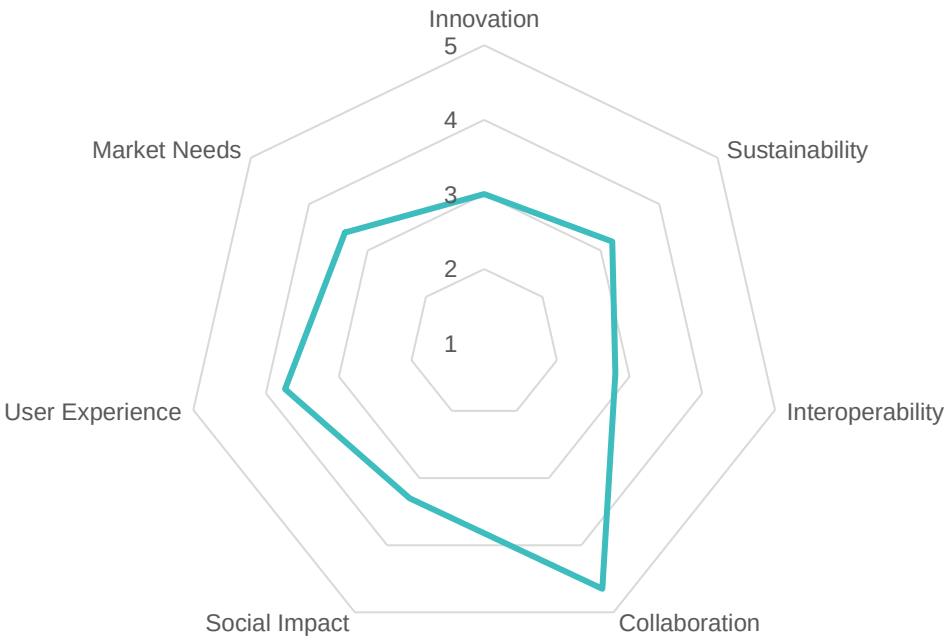
FIGURE 34 KPI SAMPLE SCORING



N=63, Technology Providers, Research Projects and Policy Makers or Initiative funding 3rd parties Respondents to the SURVEY4NGI November 2018

Source: D1.3 HUB4NGI 2018

The **Innovation KPI** is one of the indicators where the score is relatively low, equal to 3, thus slightly above the threshold for a **medium-high** performance level. As we have seen in the previous section, most respondents concentrate in the two central intervals corresponding to a medium performance level. Although all initiatives in the sample are developing solutions in emerging technology domains, which means that they are innovative when compared with the total population of European organisations, few of them are truly revolutionising the market achieving therefore the highest score on this indicator. Medium score on this indicator, therefore, does not imply that initiatives are not innovative in absolute terms, but rather than the degree of innovativeness is more incremental than radical.

The **Sustainability** KPI, with an average score of 3.2, falls in a **medium-high** performance level. About 41% of respondents declared to need less than 40% of external funding, with one fifth of the companies being already sustainable. Although the sample is mostly represented by SMEs they seem to be in a good position in terms of securing funds, probably since most of them are involved in EC funded projects.

With a 2.8 score **Interoperability** is the **lowest KPI**, slightly below the threshold for medium-high level of performance. This indicator presents a balanced distribution between initiatives, with 49% in the low or medium-low interval and 51% in the medium-high or high part of the scale.

The highest score goes to the **Collaboration** KPI, with a 4.7 score almost touching the **top of the scale**. 91% of initiatives collaborate with at least one partner, underlying how collaboration between different actors is becoming a pillar for fostering innovation. This is especially true when it comes to emerging technologies, such the ones in the NGI scope, because in this field cross pollination between academia and private organisations or between two private organisations is even more important for bridging the gap between the lab and the

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marketplace.

Looking at the **Social Impact** KPI, with an aggregate score of 3.3, the NGI sample is in a **medium-high** position. About 90% of initiatives develop solutions addressing at least one societal challenge. The most supported social challenges are speed of communication and access to relevant information.

The **User Experience** KPI has also a medium-high score, equal to 3.7, highlighting that attention to users' experience is highly relevant for initiatives even if with some differences. Assessing users' satisfaction and facilitating ease of use and customisation are key features for most of the solutions developed by initiatives. Risks for the users are also limited thus enhancing users experience for most of the respondents. Higher polarisation can be found for facilitation of users' learning and collaboration, for these questions sample is equally split between providers and non-providers of such features.

Lastly, the **Market Needs** KPI holds a similar position in the medium-high ring with a 3.4 score. Overall, initiatives are focused on delivering through their solutions benefits that are broadly aligned with the priorities of their targeted markets.

Overall, the analysis shows that initiatives are well positioned considering the KPIs in scope (average score>3 for most indicators). Particularly, collaboration and user experience are the areas where initiatives are stronger, while interoperability and innovation are the indicators where there is the largest space for improvements.

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6 GUIDANCE

6.1 EC EFFECTIVENESS AND GAPS

The SURVEY4NGI has not only allowed to take the pulse of initiatives' maturity and effectiveness level, it also provided a good opportunity to better understand the role that the European Commission plays in supporting initiatives and those areas and aspects where this support could improve, providing food for thought and recommendations for the future of NGI activities.

The European Commission has a crucial role in supporting initiatives growth along their maturity roadmap. This support goes beyond mere funding and monetary injections, as clearly emerges from the SURVEY4NGI results described below.

When asking those European Commission-supported initiatives about the top values perceived from the EC support, the possibility to meet a fertile ground and network to develop new ideas and products, while gaining new technology knowledge and industry-specific insights, emerge as the primary perceived values.

Finding new partners and stakeholders comes next, with the European Commission having a pivotal role in creating the opportunities for initiatives to find business partners and expand their ecosystem, while sharing best practices with organisations in their domain and getting inspiration from activities and success cases from adjacent industries.

FIGURE 35 EUROPEAN COMMISSION SUPPORT VALUE PERCEPTION

N=55, Initiatives involved in EC funded projects

November 2018

Source: D1.3 HUB4NGI 2018

On the other side, it is also clear that there are some areas where there is still room for improvement, this in particular when thinking about support in increasing initiatives' products

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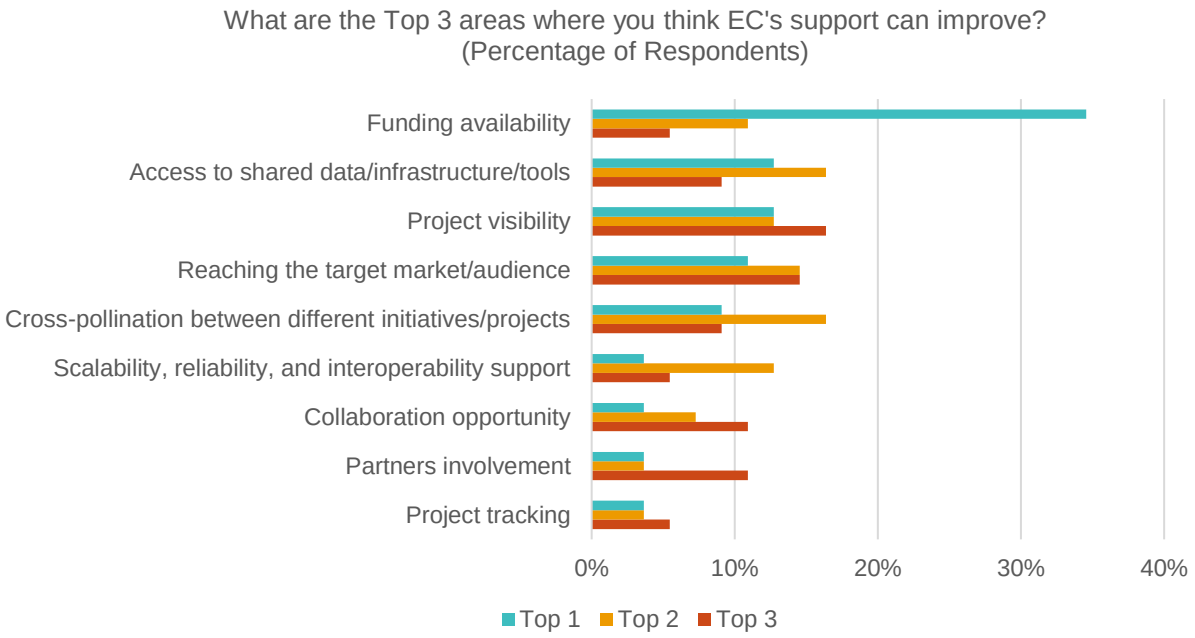
and achievements market visibility, while helping providers to boost up their go-to-market and sale effectiveness.

Similar insights also emerge when asking initiatives about those areas where they think the European Commission's support may improve. Beyond funding availability, that unsurprisingly takes the first place among those areas where a higher support would be highly appreciated by initiatives, the two key areas that would require a higher focus are shared data/infrastructure/tools and go-to-market enablement and project visibility.

Having the possibility for initiatives to have access to shared data repositories, advanced infrastructure and technology tools, is certainly a key priority for initiatives, enabling projects and technology providers to leverage technologies they would not easily have access to and scale up their business and capabilities in an agile mode. At the same time, especially for those initiatives at early maturity stage, it is particularly tough to get a presence and visibility on the market, this both in terms of having a direct contact with target end-users and emerging among those competitors already having a consolidated presence on the market. These two areas can certainly be considered as the main drivers for the European Commission's further support to NGI activities.

FIGURE 36 POTENTIAL IMPROVEMENT AREAS FOR EC'S SUPPORT



N=55, Initiatives involved in EC funded projects

November 2018

Source: D1.3 HUB4NGI 2018

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6.2 RECOMMENDATIONS

The SURVEY4NGI's results showed in this section as well as used for the KPIs analysis, in parallel with the interaction had with some European initiatives, lead to some key **recommendations** for future NGI activities:

- **Foster initiatives' go-to-market effectiveness**: One of the key needs for initiatives, especially for those technology and solution providers at their early business stage, is a further support in go-to-market activities and sales effectiveness, helping start-ups and SMEs move from a fully-funded projects status to solid commercial entities. This translates into multiple best practices, ranging from the organisation of technology industry-specific end-users-oriented events that could facilitate an interaction with targeted industries, to marketing support both in terms of market visibility enablement activities and customer needs understanding, and to support in cross-countries activities, opening initiatives' addressable market to broader scenarios.

- **Support innovation development and scalability:** Another important area where EC support can improve is the provision of shared infrastructures, tools and data that can be leveraged by innovative companies, especially SMEs, in order to validate their technologies and turn their proof of concepts into market ready products. Sharing infrastructures and tools can help these companies to cut down their fixed costs and develop their innovations rapidly. Fostering scalability, reliability and interoperability is the following step for ensuring technology development and this is another aspect where EC can reinforce its actions. As we have seen, the aggregate respondents' score on the Interoperability indicator falls in the low-medium intervals. Promoting a trustworthy environment where technology standards and open source models help build on each other progresses in a cumulative way is a win-win approach that the EC should encourage more in the future.

- **Help different industries and projects speak to each other**: The importance of a solid partners ecosystem is clear among initiatives, as also witnessed by the very high scoring that the Collaboration KPI shows. The efforts put in place by the European Commission to foster the creation of new partnerships and networks among technology providers, end-user communities and public institutions in recent years have been massive and their effectiveness is recognized when also speaking with initiatives. The further step towards a holistic partner ecosystem paradigm is now the creation of connections between different and potentially far domains and industries, fostering knowledge and information sharing, while creating the basis for synergies and complementarities between different sectors. This not only means having the different cascade funding projects sharing ideas and approaches, but also facilitating the interaction between companies targeting different industries and with separate product/service portfolio. A cross-fertilization between industries and technology domains, could enable innovative ideas and unexpected technology applications and use cases, while opening new business opportunities.

- **Keep pushing sustainable development**: There is considerable evidence that governments are under significant pressure from multiple factors, including increasing urbanization, an ageing population, waste of finite resources, growing inequalities etc. New technologies are increasingly playing an important role in addressing several of these societal challenges. The European Commission has already fully embraced and actively committed to the 2030 Agenda and the 17 sustainable development goals launched by the UN. However, the journey towards a sustainable Europe is only at the beginning, continuing supporting this vision with dedicated actions and specific innovation programmes is essential to progress along this way.

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- **Expand existing technology focus towards promising emerging themes**:
    - **Further sustaining these technologies**. Technologies such as IoT, Artificial Intelligence, 5G, Cybersecurity/Privacy and Open Data were highly recommended by the surveyed initiatives as those areas where EC activities should focus more in the future. This highlights how these technologies, already in the NGI scope, are extremely valuable for EU organisations. Recommendation for EC is to keep expanding research and innovation in these areas, with a focus on the less developed use cases such as self-driving vehicles.
    - **Do not forget established technologies**. Medium relevance resulted for more established technologies such as big data, visualization tools, cloud, intellectual property and digital copyright and e-learning. Most of these technologies represent key enablers for emerging technologies development. This suggests to EC that keeping an eye on the enabling infrastructure and tools is important.
    - **Keep scanning the horizon**. Other emerging topics and technologies were mentioned by initiatives as possible areas that EC should take care of in the future. Some of these emerging trends are edge computing, digital fight to fake news, personal data digital twins, neuromorphic computing, quantum computing, and bio-engineering. Furthermore, what emerged as crucial particularly for these emerging topics is keeping focusing on large experimentation and testing in a semi-real environment to ensure commercial success of new products and bridge the gap between market and research.

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8 APPENDIX

8.1 SURVEY4NGI ADDITIONAL DETAILS

The tables below show additional data related to the characteristics of the SURVEY4NGI sample and methodology.

TABLE 6 TECHNOLOGY PROVIDERS RESPONDENTS BY COUNTRY

Country	Interviews
Belgium	1
Denmark	1
Estonia	1
Finland	2
France	2
Germany	1
Greece	4
Ireland	1
Italy	5
Netherlands	1
Poland	4
Portugal	2
Serbia	1
Slovenia	2
Spain	4
United Kingdom	5

N=37, Technology Provider Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

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TABLE 7 TARGET INDUSTRIES FOR TECHNOLOGY PROVIDERS RESPONDENTS

Target Industry	Interviews
Accommodation and food service activities	2
Activities of extraterritorial organizations and bodies	2
Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	0
Administrative and support service activities	2
Agriculture, forestry and fishing	4
Arts, entertainment and recreation	5
Construction	1
Consumer	2
Education	3
Electricity, gas, steam and air conditioning supply	4
Financial and insurance activities	5
Human health and social work activities	5
Information and communication	31
Manufacturing	7
Mining and quarrying	1
Other service activities	4
Professional, scientific and technical activities	8
Public administration and defence; compulsory social security	3
Real estate activities	1
Transportation and storage	7
Water supply, sewerage, waste management and remediation activities	3
Wholesale and retail trade; repair of motor vehicles and motorcycles	1

N=37, Technology Providers Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

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TABLE 8 TARGET INDUSTRIES FOR RESEARCH PROJECTS RESPONDENTS

Target Industry	Interviews
Agriculture, forestry and fishing	3
Mining and quarrying	1
Manufacturing	1
Electricity, gas, steam and air conditioning supply	5
Water supply, sewerage, waste management and remediation activities	1
Construction	2
Wholesale and retail trade; repair of motor vehicles and motorcycles	1
Transportation and storage	5
Information and communication	11
Financial and insurance activities	4
Real estate activities	1
Professional, scientific and technical activities	4
Administrative and support service activities	1
Public administration and defence; compulsory social security	3
Education	6
Human health and social work activities	7
Arts, entertainment and recreation	2
Other service activities	1
Consumer	5

N=19, Research Projects Respondents to the SURVEY4NGI

November 2018

Source: D1.3 HUB4NGI 2018

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TABLE 9 CATI INTERVIEWS BY HUB4NGI PARTNER

	IDC	Open University	PSNC	IMEC
Technology Providers	9	4	4	6
Research Projects	7	3	-	1
EC Policy Makers or Initiatives funding 3rd parties	-	-	1	-
Total	**16**	**7**	**5**	**7**

November 2018

Source: D1.3 HUB4NGI 2018

8.2 KPI QUESTIONS SCORES AND WEIGHTS

Tables below show scores and weights assigned to the questions used to calculate the aggregate KPIs for the respondents.

8.2.1 Innovation KPI

TABLE 10 OPTIONS AND SCORES FOR QUESTIONS I1

Options	Score
YES	1
NO	5

Source: D1.3 HUB4NGI 2018

TABLE 11 OPTIONS AND SCORES FOR QUESTION I2

Options	Score
it leads to changes and improvements to existing products and services	1
it leads to new products not available on the market yet	5
it leads existing products to vertical sectors where no such application of the technology has previously been demonstrated	3

Source: D1.3 HUB4NGI 2018

TABLE 12 OPTIONS AND SCORES FOR QUESTION I3

Options	Score
YES	5
NO	1

Source: D1.3 HUB4NGI 2018

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TABLE 13 OPTIONS AND SCORES FOR QUESTION I4

Options	Score
basic principles observed	1
technology concept formulated	1.5
experimental proof of concept	2
product/service validated in lab	2.5
product/service validated in operational environment	3
product/service demonstrated in operational environment	3.5
product/service prototype demonstration in operational environment to client	4
product/service market ready	4.5
product/service sold in marketplace	5

Source: D1.3 HUB4NGI 2018

TABLE 14 OPTIONS AND SCORES FOR QUESTION I5

Options	Score
Organisational Strategy	5
Standalone	1

Source: D1.3 HUB4NGI 2018

TABLE 15 WEIGHTS FOR INNOVATION KPI QUESTIONS

Questions	Weight
I1	5
I2	5
I3	2
I4	4
I5	3

Source: D1.3 HUB4NGI 2018

8.2.2 Sustainability KPI

TABLE 16 OPTIONS AND SCORES FOR QUESTION S1

Options (%)	Score
0-20	5
20-40	4
40-60	3
60-80	2
80-100	1

Source: D1.3 HUB4NGI 2018

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8.2.3 Collaboration KPI

TABLE 17 OPTIONS AND SCORES FOR QUESTION C1

Options	Score
>=1 collaboration	5
No collaboration in place	1

Source: D1.3 HUB4NGI 2018

8.2.4 Interoperability KPI

TABLE 18 OPTIONS AND SCORES FOR QUESTION IN1

Number of open source instruments used	Score
0	1
1	2
2	3
3	4
>4	5

Source: D1.3 HUB4NGI 2018

TABLE 19 OPTIONS AND SCORES FOR QUESTION IN2

Number of standards used	Score
0	1
1	2
2	3
3	4
>4	5

Source: D1.3 HUB4NGI 2018

8.2.5 Social Impact KPI

TABLE 20 OPTIONS AND SCORES FOR QUESTION SI1

Number of social challenges addressed	Score
0	1
1	2
2	3
3	4
>4	5

Source: D1.3 HUB4NGI 2018

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8.2.6 User Experience KPI

TABLE 21 OPTIONS AND SCORES FOR QUESTIONS UX1, UX2, UX3, UX4, UX5

Options	Score
YES	5
NO	1

Source: D1.3 HUB4NGI 2018

TABLE 22 OPTIONS AND SCORES FOR QUESTIONS UX6

Options	Score
YES	1
NO	5

Source: D1.3 HUB4NGI 2018

TABLE 23 WEIGHTS FOR USER EXPERIENCE KPI QUESTIONS

Questions	Weight
I1	3
I2	5
I3	3
I4	5
I5	3
I6	5

Source: D1.3 HUB4NGI 2018

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