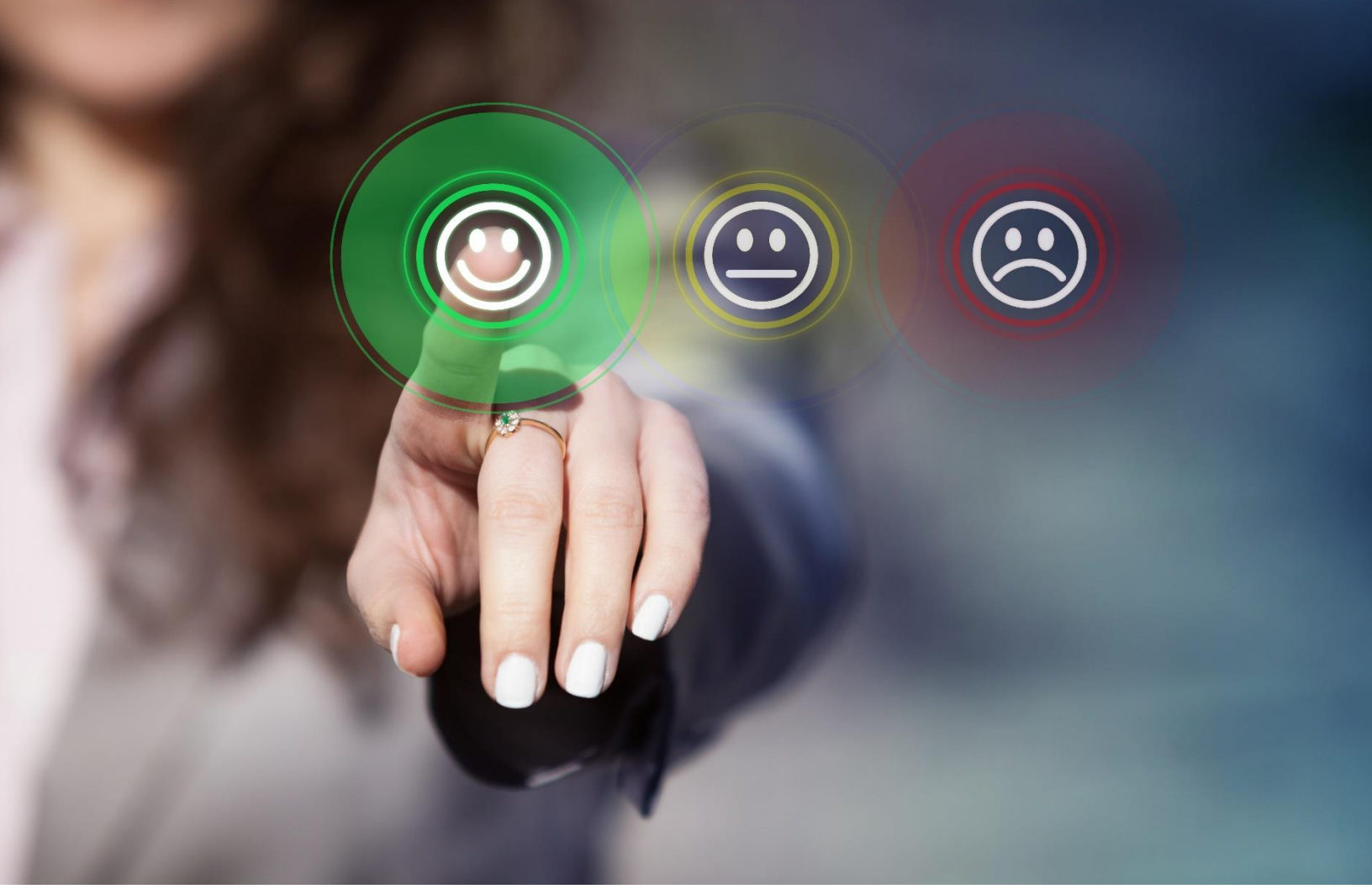

NEXT GENERATION INTERNET
CLASSIFICATION AND ASSESSMENT METHODOLOGY

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1 INTRODUCTION

- HUB4NGI: A Collaborative Platform to Unlock the Value of the Next Generation Internet

The **Next Generation Internet (NGI) initiative**, launched by the European Commission in autumn 2016, 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 NGI should ensure that the increased connectivity and the progressive adoption of advanced concepts and methodologies (spanning across several domains such as artificial intelligence, Internet of Things, interactive technologies, etc.) drive this technology revolution, while contributing to making the future internet more human-centric. HUB4NGI addresses the need for a **Coordination and Support Action** to strengthen and coordinate the work done by ongoing and upcoming projects focusing on NGI while **ensuring its sustainable impact in H2020 and beyond**. Its main goal is to transform the current NGI initiative into an **increasingly dynamic, collaborative and participatory Innovation Ecosystem** capable of effectively supporting and coordinating activities across the whole NGI landscape and provide a collaborative platform or "**HUB**", including content, tools and processes, to turn all Internet Researchers and Innovators into NGI promoters.

Among its objectives, HUB4NGI aims to provide a performance measurement framework to observe, quantify and describe progress of the NGI initiative by:

1. defining a set of methodologies that will be used to classify and categorize those initiatives;
2. providing a framework for assessing how well any of the initiatives that are identified respond to the objectives of the NGI initiative as expressed by the European Commission and the public consultation that will guide the program itself.

This white paper builds on the in-depth analysis presented in the Deliverable D1.1: NGI Classification and Assessment Methodology[1], which sets forth the main findings at this stage of the project, which have been divided into 3 main areas as shown in Figure 1.

GOALS AND OBJECTIVES	• the logical process whereby the NGI was founded and the goals that it sets for itself.
IDENTIFICATION AND CLASSIFICATION	• the logical framework to classify any initiative unequivocally according to the technology used, the category of products or services involved and the vertical market being addressed; • the technological focus areas in the scope of the program.
INITIATIVE ASSESSMENT AND KPI INDICATORS	• assessment methodology; • 7 types of KPIs.

FIGURE 1. THE PERFORMANCE MEASUREMENT FRAMEWORK OF NGI INITIATIVES

[1] https://hub4ngi.eu/wp-content/uploads/sites/11/2017/09/hub4ngi_d1.1_v1.0.pdf

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2 GOALS AND OBJECTIVES

2.1 GOALS OF THE NGI

According to the European Commission, the main goals of the NGI initiative are to:

1. Defragment and connect:
   - Create a pan-European ecosystem.
   - Ensure that such an ecosystem reaches beyond the ICT scene.
2. **Engage new stakeholders**, so as to ensure new ideas and "fresh blood" are injected into the overall ecosystem.
3. **Link long-term research with applied research and innovation**, with policy and societal expectations.
4. **Promote new functionality, services, applications and technologies** to support people's lives and global sustainability.
5. Reflect and **promote the European core values: openness, security, privacy and participation**, to create a level playing field for all business actors, open to innovation and preserving democracy.
6. A movement for a **human Internet** as a political objective that can be shared across Europe.

2.2 GOALS OF MONITORING AND ASSESSMENT

NGI initiatives will be classified according to HUB4NGI assessment and monitoring approach, which follows three steps, as shown in Figure 2.

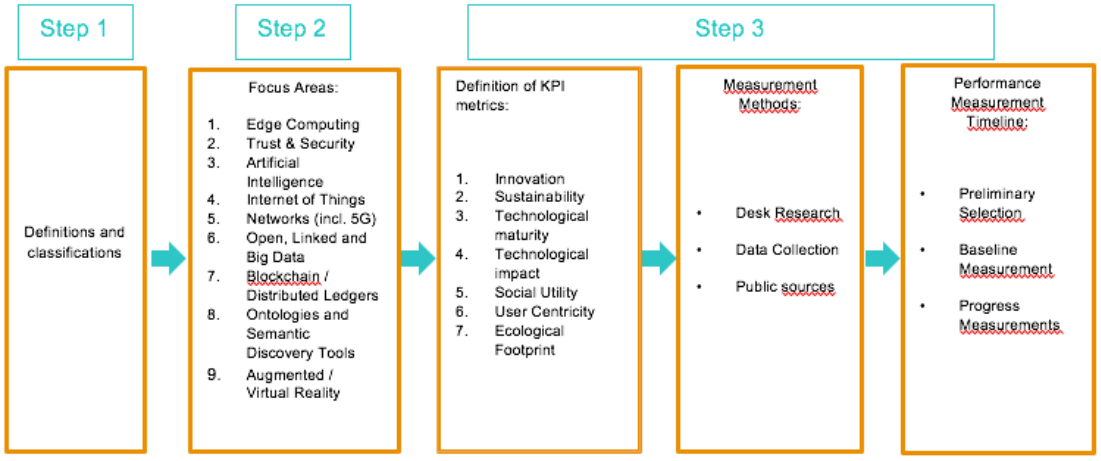

FIGURE 2. STEPS IN THE ASSESSMENT AND MONITORING APPROACH

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3 IDENTIFICATION AND CLASSIFICATION

3.1 NGI CLASSIFICATION

In a large program like the NGI it is essential to have a common understanding of the concepts and terminology that are being discussed and a common frame of reference to classify the initiatives.

As we see in Figure 3, the HUB4NGI classification is broken into three distinct areas: technology identification, potential ICT product and service categories, and identification of the vertical market where initiatives will operate.

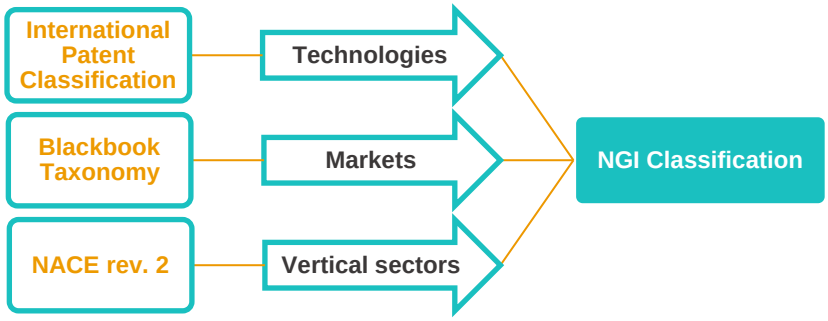

FIGURE 3. NGI CLASSIFICATION

3.2 3.2. TECHNOLOGICAL FOCUS AREAS

Following a public consultation for the NGI, held between 10th November 2016 and 9th January 2017, the HUB4NGI consortium has identified 9 technological areas that the community believes are most important and that have been ranked as follows:

EDGE COMPUTING

A cloud computer system in which computing is carried out by devices at the edge of the network, as well as by the centralized computing resources. Devices that have data to process can interact with the computing resource next to them, rather than having to use the same central computing resources.

POTENTIAL USE CASES: Factory/site automation (robots and drones interacting with local systems for detection and reporting of their own location), remote command and control, traffic control and automation (vehicle autonomy and predictive maintenance), monitoring and analysis (real-time analytics on data like in the context of financial trading applications), telecoms cost automation, real-time interactive multimedia (online multiplayer gaming and online VR).

WHAT WE SHOULD MEASURE: Edge computing servers, device software, co-location sites and services.

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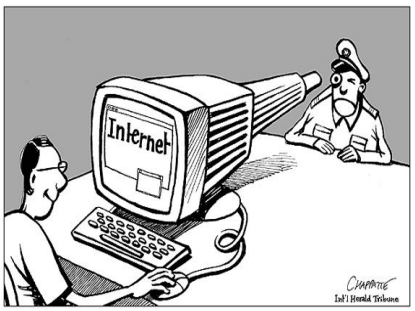
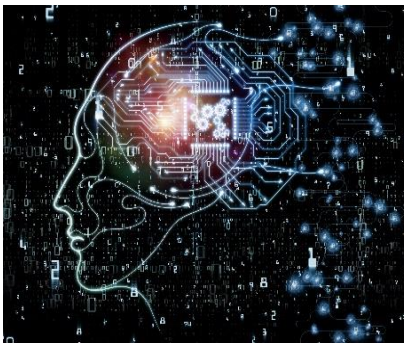


TRUST AND SECURITY

The specific case of security relevant to the NGI is cybersecurity which encompasses a series of technologies that provide safeguards to help bring about protection against criminal or unauthorized use of electronic data. This supports users' confidence in deciding whether to trust use a particular service, resource or protocol.

POTENTIAL USES: Addressing threats to countries' national security and citizens' privacy, from cybercrime and increasing ubiquity of IoT devices.

WHAT WE SHOULD MEASURE: "Index of Trust" for the Internet, citizens' satisfaction towards GDPR and privacy enhancing technologies, cyberterrorism and cybercrime attacks, education activities and reporting in the mass media on cybercrime, tracking trends of security certification and labelling.

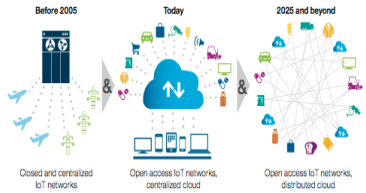


ARTIFICIAL INTELLIGENCE

Simulation of human intelligence such as the acquisition, understanding and application of knowledge for useful purposes, or recognition, decision making and goal seeking in automated machines.

POTENTIAL USES: Transport, business management, healthcare, IT management.

WHAT WE SHOULD MEASURE: Increases in efficiency, costs, verifiability, transparency and responsibility.



INTERNET OF THINGS

Aggregation of end-point devices that carry out data capture, transport and analysis; and that communicate with each other over a network without needing human interaction, using a combination of local and wide-area connectivity.

POTENTIAL USE CASES: Freight monitoring, asset management, smart grid, healthcare, smart city, smart home, connected vehicles.

WHAT WE SHOULD MEASURE: The number of time an IoT initiative employs and element in their IoT-specific items.

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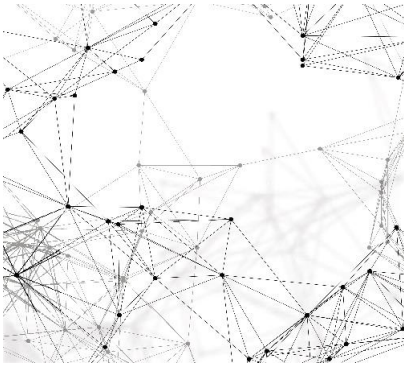
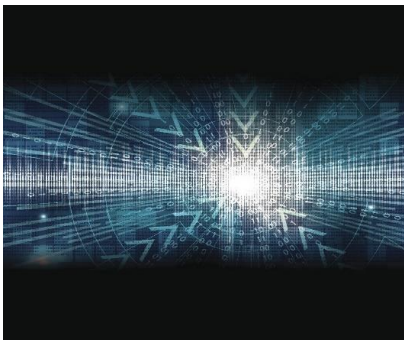


NETWORKS (INCLUDING 5G)

POTENTIAL USE CASES: P2P communication, data communications, industrial applications (robotics and automated industrial systems), IoT.

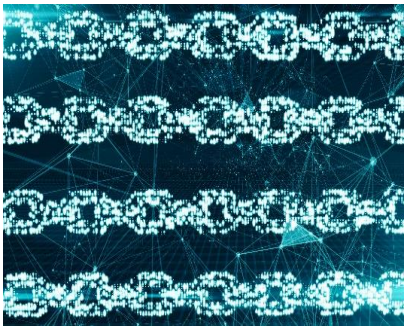
WHAT WE SHOULD MEASURE: Physical network infrastructure, IT systems and services associated with the construction and maintenance of telecom networks, for operating, managing and controlling telecoms networks, and associated with telecoms operators' customer-facing functions; services provided by telecom network operators to their customers, bandwidth available to commercial users in the last mile.



OPEN, LINKED AND BIG DATA

POTENTIAL USES: Business (productivity increases, increased competitiveness, improved allocation of production factors) government and society.

WHAT WE SHOULD MEASURE: Growth rate of unstructured / structured / semi-structured organizational data and data on the web, growth rate of linked and open data initiatives.



BLOCKCHAIN/ DISTRIBUTED LEDGERS

Distributed ledgers are replicated, shared and synchronized digital data geographically dispersed over multiple sites. A blockchain is a specific type of distributed ledger where an ever-growing list of records, called blocks, are linked together to form a chain.

POTENTIAL USES: Financial services, identity management, luxury goods, energy, IoT, land registry, education.

WHAT WE SHOULD MEASURE: The market value of main currencies, number and diversity of the sectors, number of startups, value of the overall market.

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ONTOLOGIES AND SEMANTIC DISCOVERY TOOLS

In the fields of AI, systems and software engineering, ontologies are used to organize information and limit complexity by providing a shared meaning for constructs. The Semantic Web is one of the principal areas that uses ontologies: content is expressed in machine-processable form using ontologies, so that software agents (Semantic Discovery Tools) can discover and maintain it, enhancing presentation, search precision and enabling logical reasoning.

POTENTIAL USES: White good manufacturing, personal knowledge management, data integration and migration, healthcare, transport and supply chain management.

WHAT WE SHOULD MEASURE: Among the long list of use cases identified, we found: number of ontologies developed per month/year, number of semantic web services and semantic discovery tools developed per month/year, number of new smart devices added to the Semantic Web and the IoT per month/year, etc.

AUGMENTED (AR) / VIRTUAL REALITY (VR)

VR and AR describe those technologies that superimpose a computer-generated image on a device's vision of the real world, thus providing a merged image. They provide users with an enhanced or enriched experience by generating artificial surroundings and adding context-aware data to a real-world environment.

POTENTIAL USES: Gaming and entertainment, social networks, healthcare, tourism, production workflows, video coding and delivery, VR displaying.

WHAT WE SHOULD MEASURE: Total headset device shipments per year, cost reduction, revenue, number of applications using VR/AR technology available on the market and/or used by users, number of new functionalities/implementations/projects within VR/AR technology.

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4 INITIATIVE ASSESSMENT AND KPI INDICATORS

In order to assess NGI initiatives, HUB4NGI sets forth 7 types of KPI areas, which emphasize how well the initiatives address the goals of the NGI. The following table provides an overview of the KPI categories used, how they will be measured and the type of output that will be provided. The complete detailed methodology, including the description of the metrics and the measurement approach is provided in Section 4 of the Deliverable D1.1.

KPI category and short description	Measurement areas	Results
Innovation The level of originality introduced by the initiative as an idea or concept.	• Innovation Pace • Originality • Sectorial Innovation • Public Innovation Policy • Level Strategic Innovation • Organizational Support for Innovation	5-Point Scale
Economic Sustainability The availability of sufficient funds, for a sufficient length of time, for the initiative to remain in existence and develop fully to fruition.	• Total Funding Needs • Sources of Funding • Adequacy of Planned Funding	Low to high continuum
Technological Maturity The status of the technology at the heart of the initiative being assessed.	• Temporal Maturity • Stability • Stage of Adoption • Development Pace • Reliability • Future Development and Support	Adapted TRL Score
Market Needs The initiative's response to market needs arising from economic factors, changes in competitive environment of businesses or actions of governments and regulators.	• Satisfaction of Consumer Market Needs • Satisfaction of Enterprise Market Needs	Raw Score Comparison to industry Benchmark
Social Utility The initiative's benefits to the collective society, rather than to individual citizens or users.	• Health, demographic change and wellbeing • Beneficial Impact on Environment • Beneficial Impact on Energy • Beneficial Impact on transport • Environmental Efficiency • Inclusiveness	Initiative Footprint 5-point Scale
User Centricity How well a technology, product or service responds to the needs and aspirations of users.	• Individual and Personal improvement • User interaction • User learning • User satisfaction • User costs • Use of Personal Data	Initiative Footprint 5-point Scale

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5 CONCLUSIONS

The conclusions herewith presented build on the conclusions set forth by the Deliverable D1.1, whose primary objective has been to create a classification scheme and a performance measurement framework to observe, quantify and describe progress of the NGI as it moves forward over the next several years. To do this we have described the objectives of the NGI program and depicted the focus areas that have come out of the public consultation and discussions with the European Commission as these are the areas we will be observing. This document has highlighted the technological focus areas and the classification mechanism we are using so that the technologies and vertical implementation domains of the initiatives can be compared. The deliverable has provided a performance assessment mechanism to assess the initiatives that will be funded by the European commission as well as initiatives that are harvested from the wider community.

The next step will be to actively search for initiatives and employ the methodology. We will first prepare a test survey and an interview guideline to test the types of data collection and classification mechanisms described in the document. The results will either confirm the classification scheme or will lead to slight adaptations. At this point an on-line survey will be prepared in the HUB4NGI portal.

NGI research initiatives are not yet started and it is premature to start collecting data, but it is correct to start at this early phase in the NGI program so that we will have time to perfect the data collection and classification scheme. Starting now, when the first initiatives are launched they will be able to be categorized, catalogues and assessed. In this way, the results generated in the program can be assessed in a transparent manner and the knowledge generated can be shared with the widest possible community.

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