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Focus Area on Digitization Further Deployment of Digital Technologies in Industrial Sectors

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2.1 Introduction

In 2016, the European Commission launched a strategic investment in the Internet of things (IoT) as part of the Digitising European Industry (DEI) policy [1]. The overall DEI objective is to put in place the necessary mechanisms to ensure that every industry in Europe, in whichever sector, wherever situated, and no matter of which size can fully benefit from digital innovations.

The investment in IoT materialised into the set-up of the IoT Large-Scale Pilots Programme in support of societal challenges like health, agri-food, mobility and smart city. In this programme five IoT Large-Scale Pilots (LSPs) projects [2] were funded and started in 2017 in the areas of smart cities, smart living environments for ageing well, wearables for smart ecosystems, autonomous vehicles in a connected environment and smart farming and food security, with a total amount of EU funding of 100 million EUR.

Based on the achievements of the first wave of pilots, in 2019, 10 large-scale pilots projects have been launched with a total amount of EU funding of 150 million EUR. These new pilot deployment projects are addressing both the technology aspects and the regulatory and societal issues around Digital technologies, demonstrating that digital technologies and digital innovation have the potential of solving societal challenges as well as stimulating the creation of open European and global standards. This chapter provides an overview of these new pilots in three sectors: agriculture, energy and healthcare.

2.2 Deployment in Agriculture Sector

The topic on “Agricultural digital integration platforms” targeted agricultural digital platforms for knowledge creation and innovation in agricultural sector with 3 pillars: (a) building digital platforms solving interoperability issues; (b) sharing data and generating knowledge; (c) developing decision support systems that could provide advices to farmers. From this topic, two projects, ATLAS and DEMETER were funded.

The goal of ATLAS – Agricultural Interoperability and Analysis System is to achieve a new level of interoperability of agricultural machines, sensors and data services. ATLAS enables farmers to have full control over their data: farmers decide which data is shared with whom in which place. ATLAS will build an open, distributed and extensible data platform based on a microservice architecture which offers a high level of scalability from a single farm to a global community.

The technology developed in ATLAS will be tested and evaluated within pilot studies on a multitude of real agricultural operations across Europe along four relevant use cases: precision agriculture tasks, sensor-driven irrigation management, data-based soil management and behavioural analysis

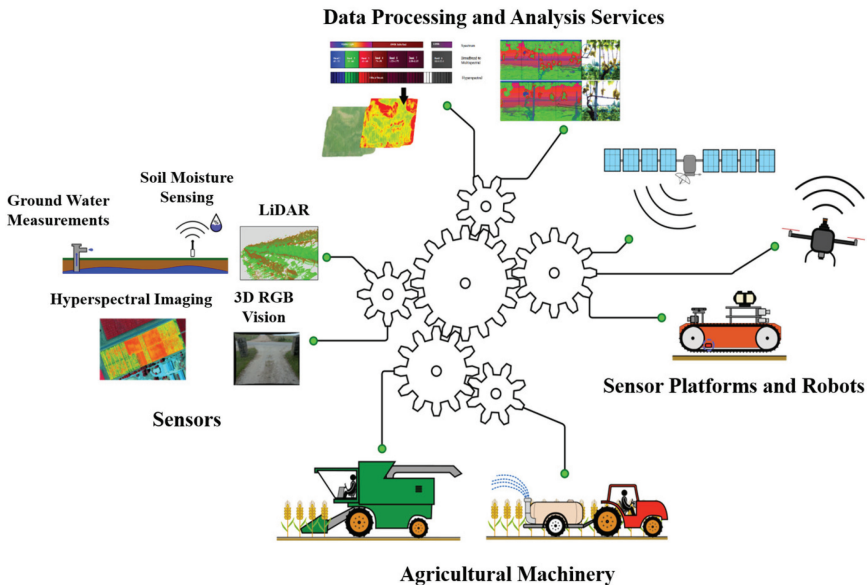


Figure 2.1 Interoperability of sensors, machines and data services through the ATLAS platform.

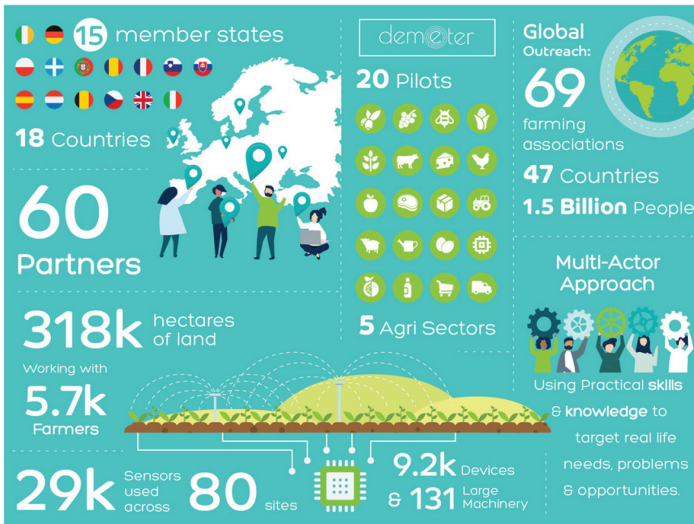


Figure 2.2 Scale of the DEMETER project.

of livestock. ATLAS will involve all actors along the food chain, simplifying and improving the processes from farm to fork. Through the support of innovative start-ups, SMEs and farmers, ATLAS will enable new business models for and with the farmers and establish sustainable business ecosystems based on innovative data-driven services. Started in October 2019, ATLAS will run for 3 years, involving 30 partners from 8 European countries, including research institutions and universities, the agricultural manufacturing industry, SMEs as well as commercial agricultural operations and agricultural cooperatives.

The second new LSP in this sector is DEMETER. This project will show how field and plant sensors, weather stations, monitoring and control devices and much more will help support sustainable and safe farming and food production systems. Through its multi-actor approach, the project also aims to improve farmer wellbeing and generally support farmers in precision decision making. DEMETER will demonstrate the real-life potential of advanced interoperability in the IoT technologies across the value chain in multiple agri-food operational environments, involving different production sectors, production systems and farm sizes. DEMETER will also display how an integrated approach to business, behaviour and technology can support farmers and the sector. It will provide further opportunities, including new business models on the farm and in the wider agri-food economy, while also helping to safeguard Europe's precious natural resources.

DEMETER will ease the uptake of future (not yet developed) services, data sources, technologies by farmers, thereby allowing the farmers and relevant other stakeholders to increase the range of choices for the most appropriate combination of tools from different suppliers in order to support their expected innovation, all the while limiting vendor lock-in. An open call for interested farmers, technology solution providers and other interested parties will be launched in 2020 and will have a €1 million budget.

2.3 Deployment in Energy Sector

Changes in climate, digital technologies and geopolitics are already having a profound effect on the lives of Europeans. In striving for digitising and transforming European industries under the new focus area, we must focus on making energy markets work better for consumers, business and society, and must support industry to adapt to globalisation and better achieve climate goals.

The internet of things is an enabler for a digital energy world that reinvents power, generation, transmission, distribution, and consumer services. IoT makes use of synergies that are generated by the convergence of Consumer, Business and Industrial Internet.

Tomorrow's energy grids consist of heterogeneous interconnected systems, of an increasing number of small-scale and of dispersed energy generation and consumption devices, generating huge amounts of data. Digital platforms may overcome fragmentation between different sectors, and lead to intelligent services and a new level playing field. The distribution network as such runs into Local Flex dilemma – more renewable energy requires more flexibility at system level and at the local edge; more flexibility is needed through an agile charging infrastructure for electric vehicles, both will result into more complexity for system design. Distribution System Operators (DSOs) are transformed more into system operators rather than just distributors of energy.

Launch of 4 new pilot projects under the Focus Area domain in the energy vertical under the topics: “Interoperable and smart homes and grids” and “Big data solutions for energy”. With the pilot **InterConnect**, we aim at open platform concepts that demonstrate a transversal approach connecting different sectors and different systems to achieve energy efficiency and manage flexibility through volatile energy sources and increasing demands from electric vehicles. Digital technologies like IoT and big data analytics will be central to the new pilot projects in order to break down silos between different

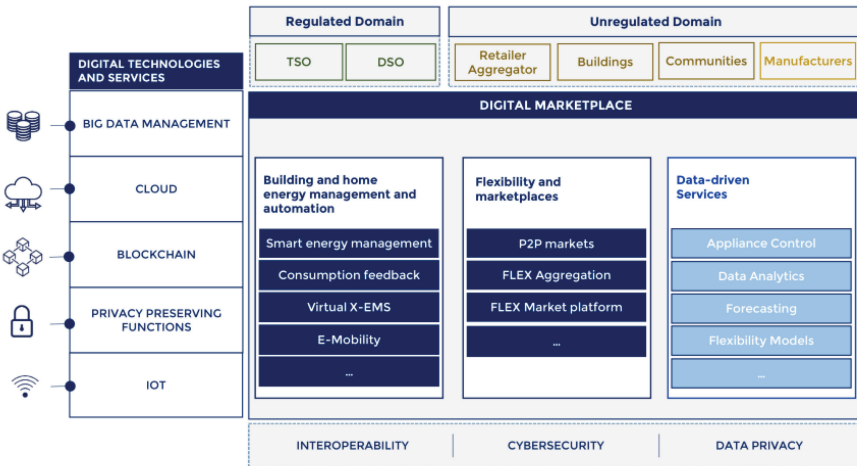


Figure 2.3 InterConnect concepts.

sectors like living, mobility, smart city and utilities to achieve cross-sector optimization in terms of resource-efficiency and sustainability: It is time for Change: “The new Energy Platforms of the Future won’t be built on silos of the past.”

With 3 more pilots called **BD4OPEM**, **SYNERGY**, **PLATOON**, data analytics is central to support the development of a wide range of energy services, at least to increase the efficiency and reliability of the operation of the electricity network, to optimize the management of assets connected to the grid, and to de-risk investments in energy efficiency (e.g. by reliably predicting and monitoring energy savings).

The aim of the large-scale pilot **InterConnect** is to exploit IoT reference architectures models that allow for combining services for home or building comfort and energy management. InterConnect’s vision is to produce a digital marketplace, using an interoperability toolbox and SAREF compliant *IoT reference architecture* as main backbone, through which energy services, compliant devices, platform enablers (i.e., blockchain, smart contracts) and applications can be downloaded onto IoT and smart grid digital platforms (see Figure 2.3). Main focus will be on the design of a *Distributed System Operators standardized interface* to interact with market platforms and ensure connectivity with DSO legacy systems.

InterConnect will rely on *Co-creation involving citizens* which is the basis for the design of applications that turn energy management technologies into

easy-to-use services and non-energy services, while ensuring comfortable, efficient, sustainable and healthier living environments. The envisaged architecture will allow for *third party contributions by means of open calls* which will give access to small and innovative ICT players (SMEs and start-ups).

2.4 Deployment in Health and Care Sector

The topic on “Smart and healthy living at home” targeted a platform for smart living at home to integrate a mix of advanced ICT ranging from biophotonics to robotics, from artificial intelligence to big data and from IoT to smart wearables in an intelligent manner to promote early risk detection of health risks and healthy and independent living. From this topic, the following projects were funded as visualised in Figure 2.3.

PHARAON

PHARAON’s overall objective is to make a reality smart and active living for Europe’s ageing population by creating a set of integrated and highly customizable interoperable open platforms with advanced services, devices, and tools including IoT, artificial intelligence, robotics, cloud computing, smart wearables, big data, and intelligent analytics. Platform interoperability

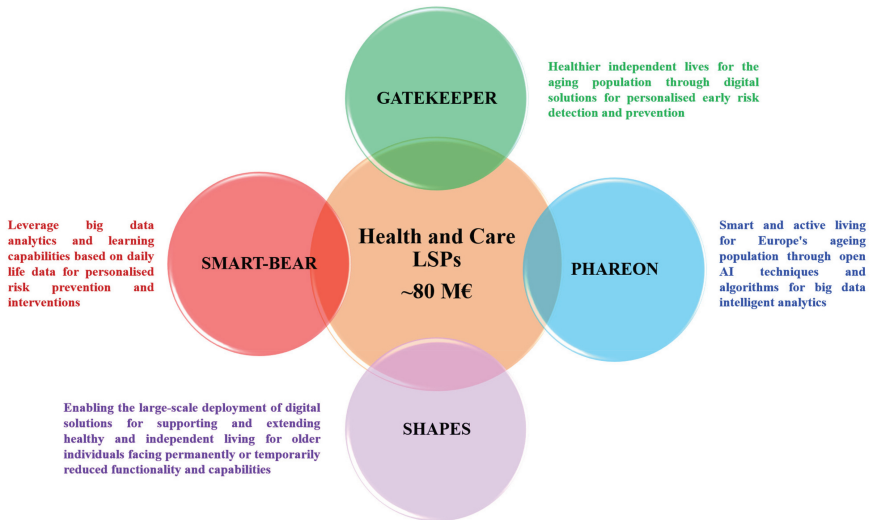


Figure 2.4 Health and Care LSPs.

will be implemented within PHARAON ecosystems and platforms, as well as other standardised platforms within health and other domains (energy, transport and smart cities). Pharaon will consider relevant standards and will contribute to them with the help of the two standardisation bodies of the consortium. Data privacy, cybersecurity, interoperability and openness will be key design principles to pursue through the requirements generated by PHARAON experts.

PHARAON will be built upon mature existing state-of-the-art open platforms and technologies/tools provided by the partners, which will be customised and will implement cloud technologies, AI techniques and traditional algorithms for big data intelligent analytics. A user-centric approach will be followed. PHARAON will evolve based on the user feedback and the results from a MAFEIP framework that will be implemented for impact assessment. Both inputs will be used to find innovative solutions through two “open calls”: (1) single solutions, and (2) solutions to be demonstrated in small-scale pilots. Pharaon’s integrated platforms will be validated in two stages: pre-validation and LSPs, in six different pilot sites: Murcia and Andalusia (Spain), Portugal, The Netherlands, Slovenia and Italy. A team of partners in each pilot will ensure its right development.

A set of development tools will be created and made publicly available to simplify the customisation and integration. These tools and the results of dissemination will spread the generated knowledge to promote the development of new solutions similar to PHARAON.

GATEKEEPER

The main objective of the GATEKEEPER Project is to create a ecosystem, that connects healthcare providers, businesses, entrepreneurs, elderly citizens and the communities they live in, in order to originate an open, trust-based arena for matching ideas, technologies, user needs and processes, aimed at ensuring healthier independent lives for the ageing populations.

By 2022, GATEKEEPER will be embodied in an open source, European, standard-based, interoperable and secure framework available to all developers, for creating combined digital solutions for personalised early detection and interventions that (i) harness the next generation of healthcare and wellness innovations; (ii) cover the whole care continuum for elderly citizens, including primary, secondary and tertiary prevention, chronic diseases and co-morbidities; (iii) straightforwardly fit “by design” with European regulations, on data protection, consumer protection and patient protection (iv) are

subjected to trustable certification processes; (iv) support value generation through the deployment of advanced business models based on the VBHC paradigm.

GATEKEEPER will demonstrate its value by scaling up, during a 42-months work plan, towards the deployment of solutions that will involve ca 40.000 elderly citizens, supply and demand side (authorities, institutions, companies, associations, academies) in 8 regional communities, from 7 EU Member States.

SMART BEAR

It is a fact that the European population growth is slowing down, while the population ageing accelerates. Rapid increases in the elderly population are predicted for the coming decades due to the ageing of post-war baby births. Within Europe's ageing population, Hearing Loss, Cardiovascular Diseases, Cognitive Impairments, Mental Health Issues and Balance Disorders, as well as Frailty, are prevalent conditions, with tremendous social and financial impact. Preventing, slowing the development of or dealing effectively with effects of the above impairments can have a significant impact on the quality of life and lead to significant savings in the cost of healthcare services. Digital tools hold the promise for many health benefits that can enhance the independent living and well-being of the elderly.

Motivated by the above, the aim of the SMART BEAR platform is to integrate heterogeneous sensors, assistive medical and mobile devices to enable the continuous data collection from the everyday life of the elderly, which will be analysed to obtain the evidence needed in order to offer personalised interventions promoting their healthy and independent living. The platform will also be connected to hospital and other health care service systems to obtain data of the end users (e.g., medical history) that will need to be considered in making decisions for interventions.

SMART BEAR will leverage big data analytics and learning capabilities, allowing for large scale analysis of the above-mentioned collected data, to generate the evidence required for making decisions about personalised interventions. Privacy-preserving and secure by design data handling capabilities, covering data at rest, in processing, and in transit, will cover comprehensively all the components and connections utilized by the SMART BEAR platform. The SMART BEAR solution will be validated through five large-scale pilots involving 5.000 elderly living at home in Greece, Italy, France, Spain, and Romania.

SHAPES

SHAPES aims to create the first European open Ecosystem enabling the large-scale deployment of a broad range of digital solutions for supporting and extending healthy and independent living for older individuals who are facing permanently or temporarily reduced functionality and capabilities. SHAPES builds an interoperable Platform integrating smart digital solutions to collect and analyse older individuals' health, environmental and lifestyle information, identify their needs and provide personalised solutions that uphold the individuals' data protection and trust. Standardisation, interoperability and scalability of SHAPES Platform sustain increased efficiency gains in health and care delivery across Europe, bringing improved quality of life to older individuals, their families, caregivers and care service providers. SHAPES Large-scale Piloting campaign engages over 2000 elderly persons in 15 pilot sites across 10 EU Member States, including 6 EIP on AHA Reference Sites, and involves hundreds of key stakeholders to bring forth solutions to improve the health, wellbeing, independence and autonomy of older individuals, while enhancing the long-term sustainability of health and care systems in Europe. SHAPES's multidisciplinary approach to large-scale piloting is reflected across 7 themes that, together, provide a clear understanding of the reality of European health and care systems and enable the validation of cost-efficient, interoperable and reliable innovations capable of effectively supporting healthy and independent living of older individuals within and outside the home.

Building an ecosystem attractive to European industry and policy-makers, SHAPES develops value-based business models to open and scaleup the market for AHA-focused digital solutions and provides key recommendations for the far-reaching deployment of innovative digital health and care solutions and services supporting and extending healthy and independent living of older population in Europe.

2.5 Conclusion

The rise of global platforms and 'Digital champions' drives the need to change the rules of the game. In large-scale piloting, pilots are set up that make use of the digital platforms, develop prototype applications on top of the platforms, and validate the platforms in both reduced, controlled environments and in real-life use cases. Supporting pilots and platforms we build on Europe's strong industrial companies and this track record of collaboration to

foster cooperation across industry's vertical and horizontal boundaries, across manufacturing, farming, energy, homes & buildings and health.

With intangible investment eclipsing the tangible kind, the rise of platforms and the ability to scale and to do so quickly seem to matter more for a significant part of the innovation ecosystem. In supporting ecosystem building, the take-up of open APIs and standards as integral part of digital platforms, is fostered by expanding the ecosystem of players involved and through opportunities for entrepreneurs by promoting new market openings allowing also smaller and newer players to capture value. With cascading grants, the selected pilot projects are open for medium-size companies as well as small entrepreneurial firms and start-ups in a straight and non-complicated manner.

Significant contributions should be made to suitable standardisation bodies or pre-normative activities, as outlined in the Communication on Priorities of ICT Standardisation for the Digital Single Market. With this major investments under the Focus Area in Horizon 2020 [3], pilots represent a unique and rich source of use cases – by which we expect increased prospects for future digital industrial platforms, validation of technological choices, sustainability and reproducibility, through architecture models, standards, and interoperability, as well as of verification of non-functional characteristics such as security and privacy.

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