RUMORE
Interreg Europe

PILOT ACTION. ***Testing the development of a Digital Innovation Hub in the Agrifood sector*****.**

Deliverable 2: Strategic Roadmap

REGIONAL DEVELOPMENT FUND OF CENTRAL MACEDONIA ON BEHALF OF THE REGION OF CENTRAL MACEDONIA

European Union
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Deliverable 2: *Strategic Roadmap*

Project: *Pilot action of the project "RUMORE-Rural-Urban Partnerships Motivating Regional Economies"*

Contents

Executive Summary

The current deliverable “Strategic Roadmap” is implemented in the context of the implementation of the pilot action of the project "RUMORE-Rural-Urban Partnerships Motivating Regional Economies" which co-financed by the European Interregional Cooperation Program INTERREG EUROPE 2014-2020». The aim of this deliverable is the development of a "strategic roadmap" which could support RCMs decision to scale up the already influenced by the project policy instrument.

The region of Central Macedonia is the largest and 2nd most populous region in Greece. Its capital, Thessaloniki, is the 2nd largest city in Greece, with more than 100.000 college students. The region has a population of 1,9 m inhabitants, representing 17% of the country's population (ELSTAT, 2020) and produces 13,7% of the GDP (2nd after Attica) (Eurostat, 2021).

The vision of the Region as expressed by its governor in line with all ecosystems, is to become the leading business and innovative region in Southeastern Europe. Enhance research, innovation ecosystems and links between industry, research, governance, and society. The long-term objective is the creation of new products and services and the improvement of existing ones to boost their global competitiveness position.

Smart specialization for the region *means discovering its unique characteristics, and comparative* competitive advantages, and pooling local actors and resources around the vision, *driven by excellence and extroversion.”*

The 4 priority areas of the RIS3 strategy 2014-2020 are (The region works to develop its new 2021-2027 strategy):

1. Agri-food
2. Tourism
3. Textile and
4. Material (building)

The following technological areas are supporting the above sectors:

1. Information and Communication Technologies
2. Energy
3. Environment, and
4. Logistics

Region’s main future challenges are:

- Plan and implement a development agenda that promotes cohesion, heals the financial and covid-19 crises' wounds, and at the same time accelerates all its capabilities to create a robust innovation ecosystem
- Implement activities around a transformative long-term economic model
- Increase funding alternatives and
- Align activities to create a brain gain momentum as a strategic goal and a prerequisite for the future economic growth.

The Region and all its stakeholders have been collaborating on a common strategic long-term plan. The main points of this are:

1. Investments in digitization & sustainability
2. Attract Foreign Direct Investments
3. Long-term activities on Biodiversity, Green Deal and Farm to Fork objectives to add value to the existing economic sectors.

As digitization is one major objective the Region could along with local R&D providers and Business stakeholders, to fully back a digitization in AgriFood strategy with various tools: DIH, digital & exporting vouchers, financial instruments, networking, etc.

As part of its RIS3 priorities, the proposed DIH will focus on the largest thematic area that is: The **Cross-Sector Agri-Food ecosystems**: cultivation, nutrition, bio-based materials, chemicals, packaging, logistics, Wellbeing, genomics, bioinformatics, tourism, cyclical economy, consumer experiences, retail technologies, creative industries, public sector: buyer & legislator. The number of legal entities, falling in the previous sectors in the region, were 136.104, (ELSTAT 2017), representing almost 60% of total legal entities of the region, including though all of them even the one-person service provider. The sales in € terms of these entities were 10.6b€ (ELSTAT 2017), representing almost 40% of the regional sales and they employed 324.237 people, around 57% of the total employment of the region. Exports is an important aspect in the core of the DIH's planning both as an asset and as an area of huge transformation and capitalization potential. The region is only 2nd to Attica in terms of value, accounting for the 20% of national exports, in 2017, (not including petroleum products), with yearly increases despite the crisis. For the same year food represented 36% of the total regional exports.

This DIH will serve all the above sectors both in the region and in other close by regions in the future. These **targets** have needs that spread form basic ones like processes digitization to advanced AI algorithms, the new DIH could offer a mix of services to cover all. The technological specialization of the members/partners of the proposed DIH would cover different fields but should focus more on AI/ML and HPC, Blockchain, Cybersecurity, digitization of procedures, advanced digital skills, support

to boost investments and finally we expect to have an immediate impact form the innovation procurement services.

The **services** could include Strategic support to RDI, Contract research, technical support on scale up, Testing and validation, Provision of infrastructure, Business development, impact assessment, Support facilities, Funding lifecycle management support, Legal and ethical support, Ecosystem engagement and management, coordination for projects, training, and skills as well as awareness raising.

The **networking** strategy should also be in the heart of the development. We will try to play a major role in the upcoming period, fostering the widespread adoption of disruptive technologies -particularly AI, HPC, and Cybersecurity, both for SMEs and public organizations. Cooperation is expected to increase the capacities, technologies, and skills of the proposed DIH and reinforce its activities, by creating synergies with other DIHs across the EU. Collaboration offers to DIHs the possibility to upgrade their respective technological capacities, service offerings and in-house skills. The **collaboration** aims should **focus** on:

- Deliver a service in partnership with other DIHs
- Build synergies in terms of skills and assets.
- Develop a new service.
- Invest in new opportunities.

The most important expected **outcomes** would be:

- Raise competitiveness and position in global value chains
- Increase all SME's business strength
- increase ICT investments - boosting productivity
- Society empowerment
- Reduce – Stop brain drain
- The whole ecosystem will become more resilient and future proof
- More green and local based sustainable products and services will be created
- Innovation procurement services would greatly affect the whole ecosystem since public entities would offer new ways of buying innovation products and services

The hub should focus on **dissemination** and **training** to both **educate** customers and **inform** them about the benefits of adapting Digital tools and applications.

A. Introduction

The Deliverable 2 "Strategic Roadmap" is implemented in the context of the implementation of the pilot action of the project "RUMORE-Rural-Urban Partnerships Motivating Regional Economies" which co-financed by the European Interregional Cooperation Program INTERREG EUROPE 2014-2020». The focus of the pilot action of "RUMORE" project is to test the plan for the development of a Digital Innovation Hub (DIH) in the agri-food sector and implementing field research and a specific digital application in the rice value chain.

The current deliverable aims at developing a strategic roadmap, taking into consideration the results and outputs gathered during the previous stages of the pilot action. This roadmap includes:

- Main strategic directions in order to set-up a DIH in the agri-food sector.
- The opportunities and risks.
- Trends scanning
- The next steps and the requirements to support and fund this new policy tool.

B. Trend and Uncertainties Analysis

B.1. Trends Scanning: Opportunities and Risks

Urbanization and the size of Urban Middle Class are expanding on global level. As the global population rises, the urban share of the population will also continue to rise at high speed (8.5%) and growth will even accelerate compared to the last 20 years (7.8%). By 2030, 4.9 billion people, or 59% of the world's population, will live in cities, starting from 3.5 billion today (50% of the world's population). In addition, by 2030, the global middle class is expected to reach 5.0 billion, from current's 1.8 billion. Furthermore, the global middle class (annual income of $14,600 to $29,200 for a family of four) is expected to grow by 66%, to a total of about 3 billion more consumers with increased purchasing power and expectations (like for the quality of food and the protection of the environment), while China's cities alone will be home to nearly 1 billion people (United Nations, 2015).

Climate Change is real and almost irreversible. Nature's capacity to absorb human activity is diminishing, and global warming is increasingly causing extreme weather events around the world, leading to death, displacement, and serious economic damage. By 2030, food and water supply will be about managing scarcity — a problem that will keep worsening. The rising global temperatures, rising sea levels and changing precipitation patterns are increasingly affecting crop growth, livestock

performance and the availability of water. Some areas may become unsuitable for farming, while others in higher latitudes may become suitable, while urban farming is expected to provide an alternative food source in highly affected areas (The Government Office for Science, 2011).

Demand for Food: The demand for food is rising mainly due to the increase of the population, urbanization, and the expansion of the global middle class (especially in emerging economies). Specifically, FAO (2017) calculates that if current trends in population growth continue, the world population is expected to reach 9 billion before 2050, and agricultural production must increase by 70% to feed the world, or in other words each farmer should have to feed 310 people – almost twice as many people than they did just a decade ago (Russo, 2018).

Resource Depletion. Several critical resources on which food production relies will come under more pressure in the future, especially as land and water availability is going to be heavily affected by climate change:

- Land: Expanding population and urbanization is expected to reduce the global land available for agriculture. The global agricultural land for food production is decreasing due to intensive forms of agriculture that cause environmental damage, urbanization, the use of land for the production of energy crops (biofuels), and the expansion nature conservation areas (Specht et al., 2014).
- Energy: BP forecasts a 37% increase in world energy demand from 2013 to 2035, of which 96% will come from emerging economies, causing higher and more volatile energy prices, as well as higher prices for nitrogen fertilizers (ESPAS, 2015).
- Water: By 2030 global water demand could be 40% more than the current supply, and half the world could be living in areas with severe water stress. Agriculture already currently consumes 70% of total global "blue water: withdrawals from rivers and aquifers available to humankind. Demand for water for agriculture could rise by over 30% by 2030 (The Government Office for Science, 2011).

New Technologies: With the proper technology, farming can go anywhere. Moreover, and besides the farming technologies, disruptive changes are coming to food industry itself, directly affecting farming practices (Kuzminov et al., 2018). These innovations include synthetic foods (Harman, 2014), gene editing (Gates, 2018), and other disruptive changes (United Nations, 2015).

B.2. Uncertainties Scanning: Opportunities and Risks

Societal changes - New ethos: Ethics will increasingly drive consumer choice. Millennials and Generation Z are replacing Generation X, as market drivers affecting all business segments, and policy making. Examples include the acceptability of modern technologies (e.g. synthetic modification, genetic modification), the value placed on animal welfare and enhanced social responsibility. In this framework, consumers will increasingly make purchase decisions based on their resonance with the ethical positioning of a firm. These will get amplified by industry—particularly the insurance industry, which needs to price in risks related to climate change or regulatory malfeasance. Finally, it might be the case to see more food-related movements, to be considered as an investment risk (Azhar, 2017).

Nevertheless, prediction of the societal changes and of the related dietary trends entails a high uncertainty level as it is affected by various social, cultural, ethical, religious, and economic drivers. Consumer choice is now being driven by concerns for personal health, ethical growers, taste, and home cooking as popularized by a host of reality cooking television shows.

Dietary choices of the future consumers are crucial for the future of urban farming, because affect the whole farm to fork chain. Consumer choice is now being driven by concerns for personal health, ethical growers, taste, and home cooking as popularized by a host of reality cooking television shows. There is relative certainty as regards the global meat consumption per capita which is expected to increase from 32Kg (2011) to 52Kg by 2050, while fish demand is expected also to increase as an alternative source of protein, together with other high protein foods (The Government Office for Science, 2011).

Also, we already see the healthier food trend influencing the product lines of the world's most valuable food brand, Nestle, who is now adding healthier food to their product lines (Russo, 2018), but the future developments entail a high degree of uncertainty.

Major uncertainties around future per capita consumption include: a) the degree to which consumption will rise in Africa, b) the degree to which diets will converge on those typical of high-income countries today, c) whether regional differences in diet (particularly in India) persist into the future, d) the extent to which increased GDP is correlated with reduced population growth and increased per capita demand.

Phosphorus Depletion: Phosphorus-based fertilizers are an essential nutrient for crops, but phosphorus, itself, is not a renewable resource, while reserves are limited and not equally spread over the planet. The only large mines are located in Morocco, Russia, China and the US (Faradji & Boer, 2016). The scientific estimations for the

depletion of the world's phosphate rock reserves vary between 35 to 400 years (Cordell et al., 2009)– though the more optimistic assessments (Cho, 2013) rely on the discovery of new deposits. While phosphorus demand is projected to increase, the expected global peak in phosphorus production is predicted to occur around 2030. The exact timing of peak phosphorus production might be disputed; however, it is widely acknowledged within the fertilizer industry that the quality of remaining phosphate rock is decreasing, and production costs are increasing (Faradji & Boer, 2016).

Food Digitalization is closely related with the open-source technologies, but in this case, it particularly describes specific changes in trade, the direct interaction with clients, improved traceability, and consumer trust. In the current digital era consumers are less tolerant, tending to complain faster and are harder to satisfy. The constantly connected consumers are more informed, while consumer-to-consumer dialogue has grown through social media allowing to build and destroy brands (driven by opinions of 'friends', 'followers'). Over the last years, manufacturing companies must face several challenges, mainly related to the volatility of the demand and to the continuously changing requirements, both from the customers and suppliers. In the meantime, new technological roadmaps and suggested interventions in manufacturing systems have been implemented (Demartini et al., 2018).

However, the digitalization era that has already started is also related with the concept of open innovation and co-creation with consumers. The consumer, through web-based apps, can act creatively, limiting the combination of the characteristics of the food product only to those that can be effectively realized, ensuring that a user's design will be producible (Bigliardi & Galati, 2013). An example of an ICT-consumer based model adoption in the food industry is the Bush Boake Allen (Awazu et al., 2009), which allowed food companies (such as Nestlè) to develop their own specialty flavours using an Internet-based tool. Every consumer can create his customized flavour choosing between a set of flavours (using a database) and send his product idea to a machine that manufactures a sample in few times. After tasting the flavour, the consumer can modify the flavour design and request a new sample (Awazu et al., 2009).

C. RUMORE PILOT KNOWLEDGE OUTPUT

In the context of the pilot action of RUMORE project, the following steps were envisaged to be implemented:

1. Field research: stakeholders' identification and data/requirements collection, both for the future DIH and the digital application implementation.

2. Digital application specifications, design, planning and development (preparation for the 1st application of the envisage DIH)
3. Development of the Digital Integration Platform and Subsystems. Data integration (Development of the 1st digital application of the envisaged DIH)
4. Initial blockchain application verification, assessment, and evaluation
5. DIH Strategic roadmap: Results of the field research and the blockchain traceability application implementation

Every stage offered important input and feed back to final develop the DIH strategic roadmap.

a. Stakeholders' requirements/needs as identified by primary research (questionnaires)

In addition to discussions and meetings that took place with the stakeholders of the rice value chain in the context of the pilot action of the blockchain, it was decided to voluntarily create a questionnaire, with the aim of collecting data for the Strategic Road Map. In this way, the opinion of the stakeholders working in the whole rice value chain could be captured more accurately and in an organized way. This questionnaire was distributed to a) the largest rice cooperative in Greece representing more than 500 rice producers, b) a cluster of organic rice producers and c) three rice mills, two of which are among the largest in Greece. The results of the questionnaire were processed and analyzed in the context of this deliverable. The main conclusions drawn are the following:

- Their main need lies in the placing their products in the markets
- The main challenges they face are increase in production costs, reduced profits due to competition, difficulty in entering new markets
- Most of the respondents do not cooperate with a research institute even though they want to, mainly because of the high cost, lack of guidance, lack of time.
- 75% of the respondents have invested in digital tools
- They are not satisfied with their traceability system
- They believe that a blockchain tool would be useful for their companies.
- There is a need to create a mainly geographical identity of products and to highlight the nutritional value of their products

The team of experts working on the pilot project analyzed the questionnaires of the rice professionals involved, which are clearly a representative part of the rice agricultural supply sector in Greece. Thus, the same conclusions were reached as those drawn from the discussions with the stakeholders of the rice value chain. Apart from that a new effort must be made in the future to justify these findings.

b. Interregional Interactions

Within the implementation of the pilot action of RUMORE project, two interregional interactions concerning rice agri-sector were held online. The aim of these meetings was the interregional exchange of experience. Representatives from Regions of Lombardy and Central Macedonia as well as their stakeholders from rice value chain participated in these events, exchanged their experience and investigated possible future collaborations.

During these interactions, the participants concluded that they should identify common needs and challenges to be addressed by both regions in rice value chain. In addition, it was concluded that tools like blockchain and DNA analysis in rice product value chain are very important to achieve specific goals and generally, the incorporation of innovative digital tools in every section of the value chain i.e. harvesting, production and processing management, and marketing as well. The reliability of collected data was also an issue discussed in depth in these meetings. Moreover, both regions agreed that they should continue their collaboration under a new project in order to establish common protocols of digitalization and labelling according to European standards for more sustainable and competitive European rice production. The ultimate goal of this collaboration will be to produce high quality European rice product in order to compete the products originating in non-EU countries.

c. Workshop entitled “Digital Transformation of Rice Value Chain”

In the frame of the development of the current deliverable, a workshop entitled “Digital Transformation of Rice Value Chain” was organised by Regional Development Fund of Central Macedonia (RDFCM). The participants of this Workshop include representatives of RCM, pilot action parnters (ELGO-DEMETER, CERTH), representatives of A’ and B’ Agricultural Associations of Chalastra and Agios Athanasios, processing companies and individual farmers.

The discussion between the participants revealed that stakeholders of the rice value chain understand the challenges of the future and that they need to get more modernized and more "green" in order to be competitive. Additionally, all participants agreed that there is a need for businesses’ education on issues related to sales, purchasing, business models, digitalization etc. Finally, the need for the development of digital tools for product traceability, at the stage of processing and cultivation of products, emerged once again.

Moreover, during the Workshop in-depth interviews were conducted to the 11 of the 18 participants. The activity of most of the respondents was in the primary and secondary sector. According to the results received, the main challenge they face is the increase in costs of production and secondarily the strong competition. Their main needs lie on sales i.e. enter into new markets. The respondents believed that the most important European strategies for their sector are “Innovation/ Participation in Global Value Chains” and

"Green Growth/Climate Change ". Additionally, the upcoming years, it will be needed by their opinion to use new technologies in cultivation processes and traceability. Lastly, the respondents expressed that the current global consumption patterns are focused on low-cost products.

One of the main outputs of this Workshops, was the decision of the signing of a MOU between the Agricultural Cooperatives A and B of Chalastra, Agricultural Cooperative of Agios Athanasios, ELGO-DEMETER, Region of Central Macedonia and Regional Development Fund of Central Macedonia for continuing their collaboration after the end of the current pilot action and apply the blockchain tool at least for one more year.

D. DIH Background and Focus

The following strategic roadmap for setting up a Digital Innovation Hub in the agri-food sector was developed taking into consideration:

- the trend and uncertainties analysis conducted in the frame of the current deliverable and is described above,
- the main outputs and feedback received from the previous stages implemented in the frame of the pilot action.
- European Commission's strategy in regard to the European Digital Innovation Hubs, that are at the core of European digital policy

The proposed DIH will provide its total services following the following roadmap:

- **First 2 years**: Initiation of new loose network or legal entity. At the first stage of its operation, with the regard to the MOU signing, the DIH will focus on traceability and blockchain services, as these services were identified through the implementation of the pilot action of RUMORE project, as priority activities in the agri-food sector in the Region of Central Macedonia.
- **Years 2 – 5**: At the later stage, the DIH will provide more services to the agri-food ecosystem in the region of Central Macedonia, as they are described in the following chapters.
- **Years > 5**: The need for interregional collaborations in agri-food sector was identified through the interregional interactions that took place in the frame of RUMORE project as the identified common needs and challenges. In this regard, the proposed DIH will provide its services in a broader level.

D.1. Target group and Geographical coverage

The DIH should have both a **European** geographical scope and a **cross-sector** emphasis, since RCM's strategic focus is **systemic**, meaning that they approach the market as a system, as a set of clusters and platforms, around **food & nutrition**. Innovation and growth occur on the areas where different value chains interact as inputs or outputs, in several domains and in all different processes and procedures.
Main specializations should be all sectors and subsectors that are directly or indirectly collaborate and/or stand on the edge of Food Ecosystem and more specifically food, nutrition, and relative industries, both requesting for digital services and representing the fertile ground for value chain transformation.
The fields that these sectors belong to are agriculture, manufacturing, services, and environment, tourism, ICT, energy, health, education, social services, defense and military, infrastructure, urban planning, R&D, resilience, sustainability, biodiversity, exports, and global value chains.

To name a few, these sectors could be:

- Food, nutrition and relative products and services industries
- Companies providing any type of **inputs** or/and **outputs** materials to processing companies, supplements, expertise, data, machinery, automation, plants, seeds, land use and systems, water, all other resources, and intangible elements.
- **Chemical** and **bio**-based companies, i.e. fertilizers, **packaging**,
- **Transportation** and **logistics** industries
- **Specialized** foods, **Health**, **Wellbeing**, lifestyle & Sports, Health – Tourism, Agri-**biotechnology**, Bio-medical, bioinformatics, etc.,
- Tourism, and food **services** industries, in focusing on **local** food and short value chains
- **Beauty** & health products based on **local**/regional **ingredients**- raw materials
- **Cyclical** economy industries like food loss and waste,
- Companies operating in **consumption**, consumer **experiences** and **marketing**, like channels of distribution, **retail** technologies, **creative** industries, bricks & mortar or ecommerce retail, **behavioral** analytics, etc. and
- **Public** sector entities, both as one of the largest **buyers** (Hospitals, Schools, Care and social support centers, military camps, etc.), as well as an important stakeholder, affecting the whole economy, through legislation, qualifications, testing, certifications, safety regulations, supporting, funding, etc.

Following a **bottom-up approach**, the target groups are identified from local, regional, national, cross-border, and finally EU origin. The DIH should focus on offering its services to SMEs including Start-ups, Midcaps, and governmental/public organizations.

The total **addressable** market in the region of Central Macedonia, covers different type of targets:

1. single **farmer**, **cooperatives** and farmers' associations,
2. industrial **SMEs**, and industrial **clusters**,
3. single **retailer**, buyers' **associations** & cooperatives and e-commerce **platforms**
4. **Expertise** providers like technical, legislation or exports professionals
5. All service **providers** in food and related services like Hotels, Restaurants, logistics, delivery companies etc,
6. **Companies** working in the fields of cyclical economy, or involved in nutrition ingredients/materials and services, providing bio and non-bio fertilizers, plants seeds, etc
7. Specialized **services** like water treatment, marketing services and technologies, customer behavioral agencies, promotion, advertising, and creative industries and
8. A huge number of local, regional, and state **entities** in the fields of health, education, military, and other social services that either buy food and related products and services or interact in legislation, safety, exports, certifications, and other important activities.

The number of legal entities that are falling in the previous sectors in the region of Central Macedonia were 136.104, based on ELSTAT 2017 report, representing almost **60% of total legal entities of the region**. The sales in € terms of these entities were 10.6b€ for the same year, representing almost 40% of the regional sales and they employed 324.237 people, around 57% of the total employment of the region.

One important aspect that is in the core of the planning both as an asset but also as an area of huge transformation and capitalization is **exports**. The region is only 2nd to Attica in terms of value, accounting for the 20% of national exports, in 2017, (not including petroleum products), with yearly increases throughout financial crises. For the same year (2017) food represented 36% of the total regional exports. (If we add all other sectors of our DIH focus this number is much higher).

The proposed DIH should offer an extensive **mix** of services to target groups. It will initially provide all its services through its members who are mainly innovators with facilities and staff, that can be called Competence Centers. It must offer and continuously test all services for the phases of establishment, development and operation, considering its customers' needs and **certifying** all the facilities and services on ISO standards. Even though all members/partners of the proposed DIH have extensive experience the DIH must use **quality** standards in offering its services in a specific **same way,** and its members as well. Having a common method of offering services, each competence center staff should be **co-trained** to develop a sense and

a culture of value offering to end customer. Having prepared the whole system to offer **added value** and **certified** services, the **marketing** people (preferably tech and engineers) should be trained to start implementing the **communication** strategy to **inform** the target groups about the **open – doors strategy** and **easy to use technologies and innovations**. Every possible mean (digital and non) should be used to approach the targets and build **trust**, using mainly real life, pilots that work.

The DIH will mainly and for the initial stage, focus on the Region of Central Macedonia, since the targeted audience is quite large in both private and public sectors. Due to the capabilities of the DIH stakeholders, we are foreseen a great possibility of offering DIH services to nearby regions both in the country and outside.

The **expansion** to those regions will be succeeded by **forming close collaborations** with local R&D centers and ICT companies. These collaborations will be based on delivering the tested innovation activities and marketing them. Forming close strategic partnerships with both technology partners offering their labs and expertise and at the same time train and approach end customers through trusted ICT companies that already work with, can be a twofold winning strategy.

D.2. State of play

Studies contacted by the region of Central Macedonia in the context of **RIS3**, and by others such as National Documentation Center, show that despite the region has done a superb job in increasing various innovation indicators like R&D expenses /GDP, other areas like private R&D expenses and digital transformation activities, face challenges. Even though 1/3 of SMEs are planning to use digital transformation as part of their strategy, the expenses and investments on ICT are low and mainly focusing on technologies for business optimization. Based on a recent study by EIF (**European Investment Fund**) approximately 1/3 of SMEs in south Europe have adopted technologies to support the **digitization of operations**, such as CRM or ERP technologies. These are well-established technologies that can help companies remain **competitive** through improvements in operational efficiencies. In this sense, SMEs have focused on optimizing existing models and processes, rather than on carrying out transformative digital projects.

In a recent study by the E-Business Research Center of the Athens University of Economics and Business & Cosmote for the whole country we can found some very interesting results:

- In 2020, SMEs increased their **demand** and use for digital applications and infrastructure in: (1) e-shops (from 14% in 2019, to 17% in 2020), (2) digital

campaigns (from 32%, to 36%), teleconference (from 34%, to 40%), (3) CRM: (from 31%, to 38%), (4) IoT system, (usage surged to 22%)

- Pandemic COVID-19 crisis has hugely **affected** SMEs, since 8 out of 10 had to decide important changes in their business models, while 1 out of 3 completely suspended their operations. Today, 6 out of 10 SMEs state that they have fully **returned** to pre-COVID status.
- The biggest problems SMEs faced concerned commercial and **financial** issues, as well as **logistics**. For example, the **decrease** in sales (for 79% of them), the inability to **collect** debts (67%), the **supply** of raw materials (52%), the **delivery** of services/products (48%), etc.
- Most SMEs (7 out of 10) have used **digital technologies** to overcome the difficulties caused by COVID-19 and return to normality. There was an increase in online orders, sales, and teleworking (50%).
- According to the study, 1 out of 2 micro-SME's (one to nine employees) are in their **first stages** of digital transformation, despite an increase from 2019
- Digital **maturity** is affected by the **size** and **sector**. Larger companies as well as professional-scientific, manufacturing, and technical companies "score" higher.

The same **challenges** are existing in the public sector as well. Low **investments**, lack of **training**, brain drain, and old or not accessible **infrastructure** are main reasons behind low digital transformation. Another reason is the growth model of the economy, characterized by the presence of sectors that are of **high importance for the Gross Value Added** like construction, but their **ICT demand is low**.

Due to the above characteristics DIH **strategy** should:

1. Focus on the **largest sectors** (in number of legal entities, sales, and employees) of the regional economy, to **impact** and **trigger spillover** effects for the whole economy
2. Focus on specific types of SMEs, specific **niches** and public entities that have more **advanced** needs and can quickly **scale up** and internationalize their operations, and
3. Offer several types of services and technologies, **basic and low cost**, easy to be absorbed, by most of the target group with **low digital maturity**

The **needs** of the target groups can be summarized as follows:

- Funding of innovative products
- Follow Quality standards and stay competitive, to avoid further profit deterioration
- Approaching foreign markets
- Finding experienced employees
- Decision making based on real data – continuously

- Cost analysis and cost reduction
- Stakeholders' collaboration and value co-creation

and the target groups' **challenges** include:

- Adopt new tools to identify customer needs, data analysis and decision making in all marketing aspects (channels of distribution, pricing strategies, business models, etc)
- Design of new products, and services for new markets and new targets, in the future
- Design new Process to be future – fit and ready
- Fear of adapting new technologies
- New model transformation

Since target **segmentation** has a crucial role in the whole planning and implementation of the new DIH, RCM must **continuously** analyze in detail all the aspects of segmentation and develop a **guide and a strategy per segment**. The parameters of the segmentation will be among others:

- Private - Public
- Micro, Small, Medium SMEs
- Existence of ICT staff or dept.
- Sectors and Technological needs
- Skills and training needs
- New– existing companies

A proposal to continuously perform a **digital technological assessment**, to better map the needs and the status of the targets, will add value.

D.3. Focus area

These target groups encounter **deficiencies** in different domains, such as existence/absence of R&D department, level of techn44ical knowledge, existence/absence of test bed infrastructure, new ideas beyond, etc. The DIH aims to **enrich** these customers with innovative digital technologies / services acting as a **one-stop-shop**. Starting from domain specific selections that match the aims of the DIH's mission, the above segments are mainly focused on the cross – sector agri-food & nutrition value chains and its interactions including: **Primary sector**, **Logistics**, **Tourism, food services**, **Health**, **cyclical economy, marketing**, **retail technologies**, and **public sector**.

Based on these **needs** the cross-sector agri-food ecosystems DIH should provide the following **services**:

A. **Test before invest.**
    a. Strategic support to Research Development and Innovation (RDI)
    b. Contract research
    c. Technical support on scale up
    d. Testing and validation
    e. Provision of infrastructure & technology platforms

B. **Skills and Training**
    a. Training/Courses/Seminars
    b. Talent and skills matchmaking
    c. Bootcamps / Hackathons
    d. Conferences

C. **Support to find investments**
    a. Strategic and business development
    b. Offering Housing
    c. Legal & IPR Services
    d. Funding lifecycle management support / Access to finance

D. **Innovation ecosystem and networking opportunities**
    a. Events
    b. Joint Participation in National and International projects

The DIH's **strategy** will be fully aligned with the **national and regional RIS3** strategies, since it touches 5 out 8 regional priorities: Agrifood, Tourism, Logistics, ICT, and Environment, and focuses on Health (a national priority) and wellbeing a sector with increased R&D expenditures, number of SMEs and innovation output. The activities will be fully aligned with the investments in research and innovation in the above topics. Supported intervention axes are mainly related to capacity building & strengthening innovation activities of SMEs and the public sector.

With a constantly expanding demonstration infrastructure and services specifically targeted to the needs of target groups, the DIH will be strived to mature into a "go to" one-stop-shop for innovative (not only) companies and public entities; transforming them into competitive and capable actors that will lead the regional economic landscape to a new digital future. It will play a key role in enabling potential target groups to improve their performance and increase their competitiveness/effectiveness through the development of new systemic – platforms transforming the whole environment gradually and in an inclusive manner.

E. DIH Implementation

E.1. Services provided

The new Cross-Sector Agri-Food Ecosystems DIH, will be offering services as an integrated services' portfolio in four service categories. In each service we have also add a ***regional Competence center*** that has the capability and the capacity to offer them:

A. Test before invest

1. **Strategic support to Research Development and Innovation (RDI)**

The DIH will provide services concerning the RDI function, such as: Readiness/Innovation assessment, Consultation, Strategic Research, feasibility & viability services. Guidance will be offered in all stages of the Research Development and Innovation process with services such as technology readiness level TRL, innovation and digitization roadmaps and Cost-Effective - Risk Assessments. Those services will be offered **by several partners**. More specialized services in the ICT sector (e.g. Cyber Security for Prevention, Detection and Response services, AI maturity assessments, Big Data. Etc.) will be offered by partners with relevant expertise, such as **Institute of Applied Biosciences (INAB)** and **Information Technologies Institute (ITI)/ Centre for Research and Technology Hellas (CERTH), Aristotle University of Thessaloniki** and **International Hellenic University.** Also, the scanning & identification of market opportunities, innovation and technology disruption and challenges, the expansion and internationalization with assessments of business/research potential, and the connection with several regional, innovation, marketing entities, both in Europe and globally, are services that will be offered by the **Region of Central Macedonia (RCM)** and **the Regional Development Fund of Central Macedonia (RDFCM), Aristotle University of Thessaloniki, University of Macedonia, International Hellenic University** and **INAB and ITI/CERTH**. Further services, for companies on specific methodologies (i.e. Empathize – Ideate – Prototype – Implement), concerning the assist on product/service development and the set up and management of integrated supporting services to SMEs, will be offered from **Business entities like Chamber of Commerce, development companies, Industry associations, Business and Cultural Development Centre etc.** Finally, services such as: supply chain traceability support, sensor networks & mobile systems, Location-based systems, Content delivery, Network slicing will be offered by **University of Macedonia, Aristotle University of Thessaloniki, International Hellenic University, American farm school** and **INAB and ITI/CERTH.**

2. Contract research

a. Specific R&D

The DIH will apply technological innovation to develop new products/services, while improving the existing ones, through R&D projects, in collaboration with various companies from the wider innovation ecosystem and will manage research and development projects (offered by all technical partners). Further specific services, aiming to help in the Digital transformation of the public sector through the support of demand-side innovation and through Pre-Commercial Procurement - PCP (development of an innovation solution fit for the public need through an R&D services procurement with competition during the contract implementation stage where the generated IPR ownership is left with the suppliers), will be offered by the **Region of Central Macedonia and Regional Development Fund of Central Macedonia.**

b. Technology Concept Development/ Proof of Concept

Aristotle University of Thessaloniki, International Hellenic University, American farm school, ELGO DEMETER and **INAB and ITI/CERTH** will plan & define new services/products & demonstrate the feasibility of the idea/project. Also, will design & test new Product Development processes, and integration through digital means, of various research i.e. health claims, regulations, safety, and quality, to the final the product. All members/partners of the proposed DIH have capacities and experience in testing prototypes in all technology areas.

3. Technical support on scale up

The process of design and creation of prototypes, supported with further ICT oriented services (AI Maturity Assessments, Blockchain for improving security & transparency, big data analytics for food related datasets) related to the food sector (Enhanced nutrition and Packaging design testing & applications, Testing Traceability systems, Evaluation and assessment of Food Quality in Logistics) will be offered from **Aristotle University of Thessaloniki, International Hellenic University, ELGO DEMETER** and **INAB and ITI/CERTH.**

4. Testing and validation

Aristotle University of Thessaloniki, ELGO DEMETER, INAB and ITI/CERTH, International Hellenic University & University of Macedonia will provide services of testing and assessing of difference services (AI/ML applications, crop development of mobile apps uploaded on Google Play & Apple Stores), technologies (Blockchain, Cybersecurity, farming methods) and applications (value chain digitization applications, Traceability i.e. DNA-based traceability, sensors, ICT tools, etc.) for the implementation of digital and other related technologies, thus mitigating risks, timely responding to incidents & raising user awareness though training. Also, **INAB,**

ITI/CERTH will support in product certification for performance & quality assurance tests, manage product testing, oversee quality control, Quality assurance methodologies, and Verify formal ICT specifications. **International Hellenic University** through machine learning, testing, crop management, Smart farming, yield prediction, disease detection, weed detection, plant species recognition and breeding, will bet Testing & Consulting for optimum use of resources.

5. Provision of infrastructure & technology platforms

The **Region of Central Macedonia**, **Regional Development Fund of Central Macedonia**, **Aristotle University of Thessaloniki and INAB and ITI/CERTH**, will provide their infrastructures (HPC, living labs, test bed infrastructure, and various other premises) to test prototypes and demonstrate products' features for: Smart mobility & logistics, Big-data analytics, testing & evaluation of AI applications

Lastly, effort and focus will also be given in Evaluation, assessment, and strategies in identifying target group's acceptance, maturity and fear of certain digital services and strategies, adaptation.

B. Skills and Training

1. Training/Courses/Seminars

All partners will offer training programs/seminars/webinars (short-term, In-house, remote, etc) on skills to promote digital innovation, for companies and public entities, to raise awareness on the benefits of digitization. Each partner, according to its expertise, will offer more specialized training. **American Farm School** will offer Applied digital farming training courses, on irrigation & fertilization. **Region of Central Macedonia** and **Regional Development Fund of Central Macedonia** will offer training and skills enhancement of the public buyers in the Region to attract innovators in the tenders as suppliers and innovative solutions as offers, as well as training and enhancement of the skills of SMEs & Start-ups to find business opportunities through public procurement. **Aristotle University of Thessaloniki** will offer training programs for digital transformation and e-gov services, and exploitation of industrial data which trigger action and lead to knowledge discovery and information documentation as well as any other form of data-based analysis. The creation of such integrated information ecosystems may introduce innovation in almost any industrial process, from supply and production to recycling and final disposal of materials. **University of Macedonia** will offer Internship opportunities, training on various business modelling alternatives and **International Hellenic University** will offer courses on Cyber-crime technologies, Risk Assessment, Social engineering attacks recognition, Attribute-based Access Control, Blockchain & apps. **INAB and ITI/CERTH** uses its testbed infrastructure for real-time demonstrations and educational sessions. It will also offer knowledge

dissemination activities related to the use of ICT in the wider food sector and sharing of best practices & experiences, inviting experts of different industry sectors to give talks, raising awareness about various activities and innovative technologies.

2. **Talent and skills matchmaking:**
Placement of doctoral and postgraduate students in pilot applications and in the provision of services to customers / beneficiaries **(INAB and ITI/CERTH)** and employment of students and graduates in customers projects to improve implementation efficiency **(University of Macedonia).**

3. **Bootcamps / Hackathons**

University of Macedonia, ELGO-DEMETER, INAB and ITI/CERTH and **Aristotle University of Thessaloniki** will organize Bootcamps and Hackathons

4. **Conferences**

All partners will organize conferences.

C. Support to find investments

1. **Strategic and business development**
Co-participation in pilot projects and Pitching & EIC accelerator training, mentoring support will be offered by **Region of Central Macedonia and Regional Development Fund of Central Macedonia**, as well as support in the identification of new market/business opportunities through strategic analysis of the ecosystem & trend watching. All partners have extensive experience on this area and will further co-develop new services that will focus on fast market entry, scaleup and extroversion modelling and consulting.

2. **Offering Housing:** The **Region of Central Macedonia** will offer physical space for the DIH's offices

3. **Legal & IPR Services** will be offered by **Aristotle University of Thessaloniki**

4. **Funding lifecycle management support / Access to finance**
Each of the below partners, offer different services according to its specialization.

   a. **Region of Central Macedonia**
      - Financial evaluation and strategies

- Introducing of new Financial Instruments in the next programming period in its RoP: equity co-investments, innovation vouchers, exports and close to market vouchers, funding events vouchers.
- Investment opportunities for public procurers that aim at implementing Innovation Procurements / Investment opportunities to SMEs/start-ups that are contractors in Innovation Procurements enabling thus their scaling –up

b. **American Farm School**
   - Close to market consulting to boost financial viability

c. **University of Macedonia**
   - Consulting for the improvement of business models to secure investments for SMEs, & Start-ups
   - Collaboration and networking events with private funding agencies targeting SMEs entrepreneurs and Start-ups
   - Guidance for seeking financial support through crowdfunding

d. **INAB and ITI/CERTH** Facilitating access to different funding sources (EU, national, regional, and private)

D. Innovation ecosystem and networking opportunities

a. Events

Matchmaking events with the innovation ecosystem (regional, national & EU), Networking with partners to increase funding for beneficiaries through their participation in national and international projects, Data knowledge sharing events and Awareness creation events, will be offered by all partners, mainly **Regional Development Fund of Central Macedonia**, **ELGO-DEMETER**, **Aristotle University of Thessaloniki, INAB and ITI/CERTH, University of Macedonia** and the **Business Entities,** in order to support the innovation ecosystem and provide networking opportunitiesω

b. Joint Participation in National and International projects

Regional Development Fund of Central Macedonia, ELGO-DEMETER, INAB and ITI/CERTH, **International Hellenic University** & **American Farm School** will put their efforts in collaborative manner, to create consortia, build business relationships, participate in the development of proposals, etc.

All partners will be providing services as they were analyzed previously. All have extensive expertise in many areas. The hub as well as each partner will co-form systemic strategic directions to be both effective, provide quality services for the society and at the same time increase each partner's value.

Some of these are being offered by all partners today. What will differentiate between the activities that are currently being pursued and the ones that would be introduced by the proposed DIH, are:

1. The service mix of DIH will be much more focus on specific target groups
2. The service mix will have a better and deeper range and depth, to better satisfy needs.
3. The services will be offered as a mix, thus would follow certain quality criteria and standards, that we believe would hugely differentiate the whole offering
4. Specific experts and service providers will be involved in the offering, all of them would be certified on a common standard so all competence centers look alike
5. Partners will be strategically forced to follow next rounds of investments based on a more secure and solid basis of target groups, and not only based on future available calls and tenders
6. A systemic approach and culture will be developed since all regional R&D stakeholders will create a long-term viable hub, that would offering digital solutions to all, in the same way, thus creating specific values and boosts the whole ecosystem in more mature stages
7. Last the hub would build expertise and infrastructure would be able to compete in more markets and support its customers in scaling up and win market shares in the global value chains.

E.2. Staff, Management, and infrastructure capacity

All previous services should be offered by the new DIH based on existing or future Infrastructure, experiences, knowledge, expertise, and know-how.

Regarding infrastructure, expertise, and know-how the new DIH will be offering the following assets:

1. **Region of Central Macedonia** and **Regional Development Fund of Central Macedonia**

- Horizonscanning.gr, an interactive platform that would offer horizon scanning, trend analysis, and viability insights
- Region of Central Macedonia's Directorate of Innovation and Entrepreneurship and the innovation/entrepreneurship support agency **"One stop liaison office"**, staff and procedures already offering services, assisting researchers, startups, and SME's on:

  - Innovation assessment and guidance i.e. technology readiness level and roadmaps
  - Digital transformation of the public sector through the support of demand –side innovation and in particular through Pre-Commercial Procurement - PCP (development of an innovation solution fit for the public need through an R&D services procurement with competition during the contract implementation stage where the generated IPR ownership is left with the suppliers)
  - Commercial and market-oriented testing and assessment – such as feasibility and viability services, from the idea, to prototyping, seed, start and scale.
  - Expansion & Internationalization. Assessing the potential of an application – venture, connecting with several regional, innovation, marketing entities, both in Europe and globally.
- The Living lab structure, an initiative started in 2018 when the region won the European Entrepreneurial Region (EER) award, offering the possibility to be a test bed for various applications
- The regional authority through One stop Liaison Office is collaborating with UNESCO foresight unit that specializes on future proof companies, organizations both in terms of planning and training procedures
- Region of Central Macedonia is the only Region that participates with its representative in the Greek National Competence Center on Innovation Procurement. Collaboration with this Centre will be reinforced to organize training courses for procurers and SMEs/start-ups
- "One stop liaison office" mechanism is offering consulting and mentoring to various stakeholders regarding financial planning in close collaboration with innovation strategy and road map
- The regional authority has a specific strategy in boosting and maturing specific real time / market-oriented pilot projects and co-invests with stakeholders.
- "One stop liaison office" provides basic mentoring for pitching events, something that will reinforce in the future
- "One stop liaison office" provides Initial mentoring and training for the EIC accelerator programs.
- The regional authority in its Initial planning for the next Regional operational program has already included financial tools to support DIH itself and customers' needs and investments.
- The regional authority will renovate and offer to the hub a building, for the main hub's headquarters.

  The **Scientific-Technical Support & Programmes Implementation Department** (Regional Development Fund of Central Macedonia) which main activity and responsibilities of is the technical support of the Region of Central Macedonia, particularly in the field of studies and research and the implementation of

programs, particularly E.U. programs which are assigned by the region to the RDFCM for the better utilization of the resources.

2. ELGO – DEMETER

DEMETER rice unit is the only one dedicated to rice research since 1967 and it is responsible for the national research in Greece. It owns a full analytical laboratory and a 50ha campus at Kalochori located inside the main rice cultivation area of Greece. Its cover a range of subjects in rice starting from breeding up to precision agriculture/Internet of Things (IoT) practices and sustainable agriculture.

3. Aristotle University of Thessaloniki

- Enhanced team capabilities and methodologies that have been used in various cases, pilot farms, and a huge number of lab equipment and Infrastructure for Pilots and prototypes testing new and products and ideas in all stages and context of processing, analyses, packaging etc. The labs of AUTh that could get involved in the proposed DIH will develop a new digital platform that will offer added value services to SME's with low cost. The teams possess an extensive capability in using different technologies and sciences to provide state of the art consulting. In: Design and Testing of new Product Development, and process, Test and design the integration through digital means, of various research i.e. health claims, regulations, safety, and quality, to the final the product, Enhanced nutrition testing and applications, Packaging design testing and applications through ICT tools, Technology readiness assessment and Cost-Effective - Risk Assessment, Testing Traceability systems and Evaluation and assessment of Food Quality in Logistics
- AUTH (IT Center) offers an HPC Supercomputer infrastructure, as well as Analytics infrastructure (https://it.auth.gr/hpc) with an organized IT helpdesk to support users for the productive use of Scientific Applications (see https: //it.auth. gr / Services / sciComp)
- AUTH (IT Center) has a cloud infrastructure for the provision of virtual machines, file storage, file sharing services, etc. (https://it.auth.gr/Services/cloudServices, https://it.auth.gr/el/infrastructure/virtualization). Additionally, the Intelligent Systems Laboratory has the following infrastructure that are used for running intensive AI/ ML tasks:
    - HPC with 4 XEON CPUs with 10 cores, RAM 1TB, parallel processing of 80 threads (hyperthreading).
    - Neural network processing computer with graphics card Titan V
    - ML processing computer with CPU i9 with 12 cores, 64GB RAM and card Titan Xp

  - 2 PCs with RTX 2060 6Gb/ i7 9700 3Ghz / 16Gb ram, 1 PC with RTX 2080 super 8Gb / i7 9700 3Ghz / 32Gb ram, and 1 PC with GTX 1080 G1 8Gb / i7 7800x 4.3Ghz /32 Gb ram.
- Platforms for native Android mobile development, native iOS with Titanium and hybrid with Ionic or React Native. Interface with modern backend APIs with REST or GraphQL capabilities.
- AUTH (IT Center) develops and runs the Trust Service HARICA, which is currently the only 'Root CA Operator' in Greece that participates in all major Global 'ROOT CA' Trust Programs and operates as a 'Trust Anchor' in widely used Application Software and Operating Systems. It fulfills the requirements of Regulation (EU) 910/2014 (known as eIDAS) in the areas of "Qualified" electronic Signatures, Seals and Time Stamps.
- AUTH (IT Center) has also a specialized CSIRT team that may support SMEs to implement cybersecurity frameworks, to mitigate risks, to timely respond to incidents and to raise user awareness though training.
- Blockchain infrastructure, AUTH (IT Center) may offer: Hyperledger Fabric and Ethereum nodes hosted at AUTH (IT Center) dedicated servers and VMs. Capable of achieving up to 10k Transactions per second. Can be attached to existing directory services such as LDAP, Active Directory.
- AUTH will also offer complete range of open – source synchronous and asynchronous platforms for both training and awareness services
- A full-blown first and second level helpdesk for AV, eLearning, and general IT issues.
- AUTH offers the Center for Dissemination of Research Results (KEDEA AUTH) and
- AUTH will employ the ResCom information and business intelligence system for boosting collaborations and innovations to market activities

4. INAB and ITI/CERTH

- Blockchain infrastructure, which is based on two different processing infrastructures, CPU and GPU, to meet the computing power need of the blockchain services. The infrastructure offers: Hyperledger Fabric and Ethereum nodes hosted on CERTH, dedicated servers and VMs. Connects to existing LDAP directory services and Active Directory service.
- Pillar-based agri-food chain digitization infrastructure: bioanalysis, supply chain and Information and Communication Technology (ICT) (blockchain). The infrastructure offers personalized contracted innovation solutions to the industry.
- HPC supercomputer infrastructure for bio-analysis and data Analytics. The infrastructure consists of approximately 1,000 cores, more than 5 TB of RAM, 150 TB of high availability online storage and 1 PB of long-term storage in a movie system. The system is constantly being upgraded to meet the growing demand for Machine Learning applications and the development of code for Heterogeneous Big-BioData analysis across all areas of the life sciences.

- 3D printing infrastructure, including bio-printers and suitable software that can be used to grow food and organic scaffolding for industry needs.
- The Office of Entrepreneurship, Extroversion & Networking will support all consulting, mentoring, dissemination, funding activities of the HUB

5. **International Hellenic University**

- Experimental farms for pilots in Sindos Thessaloniki, and state of art equipment for field preparation
- Huge Expertise on field experimentations, data management, and food & Agricultural systems and value chains
- Several servers equipped with high end GPUs suitable for machine learning applications, High Performance Computing infrastructure (GRID) with 1150 cores and 450 Terabytes of data storage
- The Cybersecurity Lab with cybersecurity applications and ready to use solutions. The applications are enriched and updated on a regular basis. The Lab is suitable for testing different security configurations and solutions. It can also serve as a starting point for Penetration testing. There is also the ability to educate personnel in cybersecurity technologies both live and from distance through direct connection to the lab environment.
- Systemic know how and knowledge acquired by the team involved concerning technologies and needs
- Large number of lecture rooms equipped with audiovisual equipment suitable for synchronous distance learning - Moodle asynchronous learning platform
- IHU's labs could connect to end customers and users digitally

6. **University of Macedonia**

- GIS Applications and services to be utilized on the field
- Remote educational support platforms and equipment
- Open Data utilization for Smart Farming/ Precision Agriculture and other Digital Services
- Blockchain services
- Learning and inference for smart agriculture
- THz Communications as 6G enabler, Antenna design for 6G systems,
- Machine learning applications for 6G Networks, Network design and optimization for 6G, NOMA techniques for 6G,
- IoT for 6G, System and network architectures for 6G, Wireless backhaul and fronthaul solutions for 6G,
- Use of robotics and IoT for automations
- Educational Facilities (Amphitheaters and Computer Labs)
- VR Supported educational and training courses

- Training robots
- Heavy duty 3D printer
- Augmented Decision Making educational and training courses
- Virtual Infrastructure for hosting Learning Management Systems (LMS) that will support on-campus and distant courses and seminars
- Accessibility Unit
- Learning models, data analysis
- Career/Liaison Office of the University providing a database of Greek enterprises per economy sector.
- Research Committee offering access to National and European calls for project proposals

7. **American Farm School**

- Pilot & Demonstration Farms (campus, grapes, kiwi & olives)
- Labs, training rooms and platforms for applied training courses.
- Privately operated regional LoRa network consisting of gateways and nodes

Regarding the human assets and staff, the following labs, departments and entities are proposed to be part of the proposed DIH:

1. **Region of Central Macedonia**
   - Directorate of Innovation and Entrepreneurship
   - Innovation Support Department
   - "One stop liaison office" mechanism
   - Regional Development Fund of Central Macedonia

Also, several departments and directorates could support the hub, to name few:

- Department of European Programs and Partnerships
- Directorate of Transparency and e-Government

2. **ELGO-DEMETER**

- Institute of Plant Breeding and Genetic Resources of DEMETER. Rice unit is consisted of 3 researchers (1 permanent) (PhD), 3 scientists (MSc), 1 technician (1 permanent) and 1 field worker most of them under contracts in rice projects.

3. **Aristotle University of Thessaloniki**
   - Intelligent Systems Laboratory, School of informatics, Aristotle University of Thessaloniki
   - "Laboratory of Food Microbiology and Hygiene, Department of Food Science and Technology, School of Agriculture, Faculty of Agriculture, Forestry and Natural Environment, Aristotle University of Thessaloniki"
   - IT Center of Aristotle University of Thessaloniki

4. **INAB and ITI/CERTH**
   - Centre for Research and Technology Hellas/ Institute of Applied Biosciences
   - The Office of Entrepreneurship, Extroversion & Networking

   The rest of CERTH institutes could also support the Hub

5. **International Hellenic University**
   - Department of Information and Electronic Engineering
   - Department of Agricultural Technology
   - Cybersecurity Team, University Center of International Programs of Studies (UCIPS)

6. **University of Macedonia (all schools and departments)**
   - SCHOOL OF INFORMATION SCIENCES
     - Department of Applied Informatics
   - SCHOOL OF ECONOMIC AND REGIONAL STUDIES
   - SCHOOL OF BUSINESS ADMINISTRATION
   - SCHOOL OF SOCIAL SCIENCES, HUMANITIES AND ARTS

7. **American Farm School (all activities)**
   - Academics
   - Farms
   - Services

Apart from the above-described entities, several private and public entities could participate either as a member of the DIH or as a strategic partner and be included immediately in the process of setting up the hub and.

The partnership staff that will be working in the DIH, will be also strengthened by new people, (hiring several experts) in the following areas:

- Coordinator of the DIH

- Finance: Financial experts
- Management
- Sales and marketing
- Project managers
- Communications Manager
- ICT experts
- Senior Technical Staff
- Technical Staff
- Administration
- Business Developer
- Electrical engineers,
- computer scientists,
- life scientists,
- Innovation & Scientific Staff
- Support personnel
- Agronomy Scientists

E.3. Partners profile and expertise

The proposed partnership possesses several strong assets regarding the technologies and the thematic specialization. All regional R&D stakeholders should be present in the proposed DIH, as their activities puts them in the 1st places in several lists regarding innovation output like funding, papers, citations, graduates, R&D expenses, etc.

Specifically:

1. **Region of Central Macedonia**

(1) The 2nd largest region in GVA, exports and the 1st in incoming tourists for 2019.
(2) The region heavily invests in innovation, set up a new Directorate of Innovation and Entrepreneurship with more than 25 fulltime employees, and a new office in Brussels.

(3) It has recently created the One Stop Liaison office, that will contribute in the DIH since they strategically correlate.
(4) OSLO's aims are: (1) setup pilot actions with other stakeholders, (2) empower the ecosystem (2.1 the ris3rcm.eu platform connects R&D with Funds & SMEs, 2.2 horizonscanning.gr co-creation platform informs stakeholders of trends & opportunities, 2.3 Regional Intelligence system, offers easy access to all in statistics, data and insights), (3) promotes the ecosystem both nationally and internationally, (4) forms specific networking activities i.e. European Entrepreneurship Regions' project activities where with several other regions like Ille de France, Lombardi, Catalonia, Flanders, to codevelop action in supporting and funding startups and scaleups, through a interregional soft-landing scheme, and (5) supports the Region in implementing, Monitoring, and Evaluating RIS3 strategy and action plans.
(5) Lastly the Region has decided to support the food ecosystems sectors by offering them funds to promote their products and services in exhibitions around the world, that otherwise several SMEs would not have the capacity to be part.

2. Regional Development Fund of Central Macedonia

The Regional Development Fund of Central Macedonia is a legal entity under private law which belongs to the Region of Central Macedonia with the purpose and basic responsibilities:

- management of credit of the public investment programme, the management of funding of public sector bodies other legal entities and the management of funding from programs of the European Union and other international organizations and bodies abroad, which concern development programs (Law 3852/2010, article 190 (2α))
- The technical support of the region, in particular in the elaboration of studies, research and programs which are assigned by the region to the RDFCM for the better utilization of the resources (Law 3852/2010, article 190 (2d)).
- The provision of services, the conduction of research, the elaboration of technical and economic, development studies and the supervision and implementation of programs assigned to the RDFCM by the Ministries, by the RCM, by the Decentralized Administration, by municipalities and by legal entities governed by public law. (Law.3852/2010, article 190(2θ))

The main activity and responsibilities of the Scientific-Technical Support & Programmes Implementation Department (Regional development fund of Central Macedonia) is the technical support of the Region of Central Macedonia, particularly in the field of studies and research and the implementation of programs, particularly E.U. programs

3. ELGO-DEMETER

The main expertise of the staff is agronomy, precision agriculture, remote sensing, aerial imagery, sensor electronics development, functional food development, plant pathology, and circular economy of rice. All personnel cover a wide range of scientific subjects to support the rice experimentation in projects.

4. Aristotle University of Thessaloniki

AUTh, in the framework of its vision and mission, remains high and consistently oriented to be a pioneer institution, standing out among Greek and many foreign Universities on all levels: education, research, culture, connection with society. More specifically:

(1) the Intelligent Systems Laboratory was founded in 1993, and is part of the Knowledge, Data and Web Engineering Department of the School of Informatics at AUTh. The lab's research interests span a wide area of Artificial Intelligence, including Knowledge Representation and Reasoning, Planning, Machine Learning, Data Mining, Logic Programming, and the Semantic Web. The lab is an active node of the Hellenic Society for Artificial Intelligence and organizes the Hellenic Conference on Artificial Intelligence in the area. The lab has a vast experience in ICT innovations and applications through private agreements and grants in all DIH's thematic and technological specializations

(2) The Laboratory of Food Microbiology and Hygiene, dates back in 1990. The lab's fields of knowledge are: Food Microbiology, Food Hygiene and Safety, Food Quality Control. It is crucial to mix ICT and food relevant labs, offer better and more targeted services.

(3) The IT Center of AUTH is responsible for all network and computing infrastructure, the electronic services of the university, as well as the support of university users. Its activities cover the planning, development, procurement, management, security, and maintenance of these ICT resources. The IT Center's mission is to enable stakeholders accomplish their daily work, and IT needs. The IT center will be the backbone of the service offerings of AUTh since has the capacity and access to the infrastructure analyzed in previous section.

5. INAB and ITI/CERTH

(1) INAB's mission is to address the gap between research excellence in Life Sciences and applications that meet end-user demands!

(2) Its strategy is ONE HEALTH: animal & plant health, healthy environment, and human health.

(3) In close cooperation with producers, businesses, and academic institutions, INAB will (i) identify through omics-based methods, species and varieties of Greek flora and fauna and food products from these species and varieties; (ii) continue to steer the development of improved varieties and develop new foods with particular nutritional characteristics; and, (iii) utilize various microorganisms and plants as "factories" to produce high-value materials in an environmentally friendly manner.
(4) Within this overall frame, the focus areas and objectives include: Multiomics applications and metabolic engineering.
(5) INAB is at the forefront of Big Data across all domains in Life Sciences due to its significant expertise and extensive experience in the analysis of Next Generation Sequencing (NGS) data in studies focusing from microbial communities to plants and livestock to nutrients and large-scale clinical cohorts. INAB exhibits competencies across several technological and methodological approaches, including: (a) whole exome sequencing, (b) DNA methylome sequencing, (c) transcriptome analysis (RNA-seq and Ribo-seq), (c) targeted sequencing, (d) metagenomics approaches, including 16S and 18S amplicon sequencing, and (e) proteomics studies, amongst others, all exhibiting the traits of Big Data. Indeed, a single study can produce several hundred Gigabytes of data, which consequently require the dedicated computational infrastructure, present in-house, for adequate processing that can lead to meaningful and actionable insights.

6. International Hellenic University

(1) Department of Agriculture. R&D&I focus: applied research on agricultural production, optimum use of resources, cultivation techniques, local biodiversity, optimum use of fertilizers, agrochemicals in food production, GIS, etc use of the test bed farms.
(2) Department of Information and Electronic Engineering
Profile: the scientific and research activity of the Department aim at integrating science and technology related to the design, development, implementation, management, maintenance and improvement of software and hardware systems, whether they are autonomous electronic and computing systems, or individual components of wider electronic and computing systems and/or electronics and computing equipment-controlled systems. Networking: Member of the Technopolis Cluster "IBC3- Innovative Business Cluster of Cloud Computing Technologies" aiming at supporting the participating ICT SMEs to tackle key technical and non-technical challenges in the development and promotion of innovative high added-value services based on Cloud Computing thus increasing their international competitiveness.
(3) The School of Science & Technology consists of the Department of Science & Technology/ MSc in Cybersecurity
The program aims to provide education at postgraduate level in the field of

cybersecurity as well as focus on technologies and practices needed to detect and prevent cyberthreats against information systems. The program offers a series of courses while Hands-on labs which are provided giving the students access to state-of-the-art Cybersecurity labs.

7. University of Macedonia

(1) UoM's mission is to pursuit of innovation and the enhancement of knowledge by researchers and students within Departments and Laboratories keeping abreast of the developments of the 21st century in the field of research.
(2) UoM would offer in the proposed DIH an asset that is crucial and that is its capacity and culture to provide hands-on experience in real life business needs, understanding the mentality of SMEs.
(3) More specifically the Dep. of Applied Informatics was established in 1991. It has two specializations: Computer Science and Technology and B) Information Systems, fitting perfectly in the offering mix of the whole hub, since they also possess experiences and know-how on all hub's specialization, with several projects with private entities.

8. American Farm School

(1) The American Farm School is the premier institution in southeastern Europe for education and applied research in agriculture and food systems. Founded in 1904 by enlightened American educators, the School continues to apply its hallmark "learn by doing" approach to educate students of all ages.
(2) The School's campus farm—producing premium milk, yogurt, Omega-3 eggs, turkeys, wine and more—serves as a living laboratory for hands-on education and applied research.
(3) The school manages a suburban Campus that can accommodate demonstration field for pilot applications, brings LoRaWAN antenna network with coverage of N.Greece, the ability to service more than 60,000 sensors of all kinds, Cloud Microsoft Azure database, and B2B platform traceability.

E.4. Governance scheme

The proposed DIH will be a partnership of public & private non-for-profit bodies with responsibilities in regional policy, digital innovation, research, technology, academia, managing EU funds as well as working closely with the market.

The cooperation of the Partnership is necessary for the realization of the purpose of the DIH. For this reason, the governance of the proposed DIH is structured as follows:

1. Steering Committee (SC)
2. Innovation Committee (IS)
3. Coordinator
4. Competence Centers (CC)

The SC will meet in a physical space, provided by the Region of Central Macedonia.

The IC will meet in a physical space, provided by the Body that chairs the Committee.

The seat of the Coordinator and his team will be located in a physical space, provided by the Region of Central Macedonia.

The CC will develop actions and provide services depending on the role of each partner in the hub and in context of the quality standards that will be developed in the initial stages, with the aim to offer all services in the same manner.

The seat of each CC will be in a physical space that will be indicated by the relevant partner, and through him to the SC. The physical space should be proportional to the role that each Body is called to play in the Partnership.

- **Steering Committee (SC)**

The Steering Committee will be responsible for:

- approving the funding proposal to be submitted to relevant call
- approving the Grant Agreements
- approving, the operating framework
- approving all types of DIH's action plans
- approving the extension of DIH's specialization/services
- approving the acceptance of new Bodies as Members/partners
- deciding on any mechanism for certification of procedures, as well as internal expenditure verification system
- deciding, the establishment of a legal entity for the DIH
- approving by an increased majority of those present the amendment of the Agreement Pact.
- any issue that does not fall within the remit of the other bodies.

- **Innovation Committee (IC)**

The Innovation Committee will be responsible for:

- supervising the implementation of the Project and relevant action plans
- preparing the annual action plan as well as its revisions in collaboration with the Coordinator,
- recommending to the SC the extension of the thematic specialization
- collaborating with the DIH's CC.
- the scientific supervision of all actions
- upon the proposal of the IC and by decision of the SC, new members may join the IC.

- **Competence Centers (CC) offering services**

Each member/partner, sets up a CC. The partner will appoint a team and a head of that team. The head will be in close collaboration with the Coordinator, the SC, and the IC.

The Centers will be responsible for:

- implementation of the DIH's activities in close cooperation with the Coordinator
- collaborating with the IC on scientific issues
- the management of their resources
- cooperating with each other horizontally and through the Coordinator for the perfect implementation of the Project.

- **Coordinator**

Coordinator's responsibilities:

- General coordination and overall management
- Prepares the action plans and funding proposal, (approved by the SC)
- He is responsible for communication and cooperation with the CC and regularly meets with them.
- Prepares and presents to the SC a proposal for an internal control mechanism
- Convenes the meeting of the SC, prepares the agenda.
- Prepares DIH's operating framework
- Supports the IC in its work, participates in its meetings (no voting right)
- Ensures in collaboration with the IC and the CC the promotion of DIHs activities.

The work of the Coordinator will be supported by a team that will be set up for this purpose with the availability of staff from the Partners and / or with the hiring of new specialized staff.

F. Expected Impact

The proposed DIH that will be set up so as to have long term viability and will focus on:

a. **Thematic-Sectoral Specialization**: Cross-Sector food, nutrition, and relative ecosystems. The fields covered are: agriculture, manufacturing, services, and environment, tourism, ICT, energy, health, education, social services, defense and military, infrastructure, urban planning, R&D, resilience, sustainability, biodiversity, exports, and global value chains.
2. Our **technological** specialization: due to different type of targets both in terms of digital maturity and ability to invest, would cover different fields, but will focus more on AI/ML and HPC, Blockchain, Cybersecurity, digitization of procedures, advanced digital skills, support to boost investments and last but not least we expect to have an immediate impact form the innovation procurement services.
3. Lastly our strategic decision regarding specialization is based not only on the **place-based** evidence that shows how important the previous sectors are for the regional economy, but also on the fact that the market functions as complex systems. **Innovation**, competitiveness, and growth occur on the interaction points.

Addressing around 136.104 (40% of them are single person enterprises) legal entities, representing almost 60% of total legal entities of the region, with 10.6b€ sales (40% of the regional sales) and 324.237 employees (around 57% of the total employment of the region), is a huge **challenge**, for two reasons:

- Most of them lack basic infrastructure, expertise, capital, and staff for digital transformation and
- Some of them are extrovert with scaleup possibilities, in several niche markets have more advanced needs like AI backed decisions

Our DIH's **strategy is three-dimensional**:

1. Offer a mix of basic, easy to be absorbed and paid services, to be able to systemically increase the whole level of digital expenses, investments, connections, use, skills, understanding etc, of the first target group,
2. Offer very specific, state-of the art services to the entities that can and need to improve competitiveness and profit making, as well as scaling up and enter/compete to foreign markets. Keep in mind the fact that the region has a huge capacity and expertise in exports, and

3. The DIH and especially the Region of Central Macedonia will include funding tools and alternatives, either through its regional program or national and EU sources, to boost investments, thus making it easier for the targets to absorb applications, and even leverage private investments.

Thus, the main **expected impacts** form the short, medium, and long term DIH activities would be the following:

- Boosts the **competitiveness** of SMEs already competing in global value chains.
- Increase all SME's business **strength** through implementation of digital applications in production, marketing, in reducing costs, or through better business strategic decisions that could increase value/profitability, through AI, traceability/certification etc
- Focusing on most entities with **basic needs**, would boost, economy's general competition level, since skills can improve decision making, in all areas of the economy and society
- Increase of ICT **investments** and expenses, would also boost productivity in all sectors and subsectors, thus expecting immediate increase in regional GDP, exports, number of startups, scaleups and GDP per capita that needs a raise.
- Improve the existing **links** of the quadrupole helix, especially the Research and Market ones, increasing tech transfer and innovation partnerships.
- Expected Increase of the regional ecosystem's position in the **global** innovation status and value chain.
- Boosts and empowers **society** in all its functions, since the capability of using new tools also helps self-confidence and democracy as well
- The impact in the long term would for sure be positive in one of the main strategic challenges: **brain drain**. People would slowly find more sustainable jobs & opportunities and a more competent ecosystem
- The whole ecosystem will become more **resilient** and **future proof**
- Hub will improve SME's ability to **compete**, and stay alive
- More **green** and **local based** sustainable products and services will be created
- **Innovation procurement** services would greatly affect the whole ecosystem since public entities would offer new ways of buying innovation products and services

F.1. Networking

Networking constitutes a major activity of the proposed DIH. Regional ecosystem's characteristics are:

- Several large in terms of output (graduates, papers, researchers, funding) R&D centers

- Huge number of SMEs in all RIS3 sectors (mainly food, materials, ICT, textile, tourism)
- Funding alternatives are very few. Due to long-term economic crisis debt is scarce as well as equity funding in the region (that has changed after the equifund setup-initiative of the Greek State and the European Investment Fund)
- Few startups and scaleups, but with an increasing trend
- Local ecosystem stakeholders have started collaborating, and there is more room in the future
- Entities that offer supporting services to the ecosystem, exist, but lack resources, and expertise, thus our DIH would perfectly fit and offer a total range of services
- Most of the entities supporting the ecosystem are funded by grants as projects and are project oriented with the risk to get trapped in the grant's life cycle. Our DIH would be setup as a long-term infrastructure, funded by alternative sources
- All existing supporting efforts in the ecosystem are either partners of our DIH or will work collaboratively with our hub.

Regarding how the DIH will **reach** the customers and **engage** them, the first main point to stress out here is the fact that from day one, all partners have decided to form a **centric-customer culture**, **business oriented** that would last in the long term.

In terms of networking connections, each partner can the specific ones:

1. Region of Central Macedonia

- Apart from many strategic collaborations in the region in Europe and abroad, the region has initiated and is part of a consortium, supporting the development of a CERN incubator in Thessaloniki.
- Focus and resources will be used through in Innovation procurement. In the following paragraphs we analyze the field and offer insights about its added value when offered as a service through our hub, for the whole economy:
    - Acknowledging the importance of Innovation Procurement for the digital transformation, the Region of Central Macedonia participates also in other EU activities that aim at mainstreaming Innovation Procurement in Europe. It participates in the Forum created by the EIC on Innovation Procurement. By including Innovation Procurement in its activities, the EIC has highlighted the importance of this instrument for the scaling up of SMEs and start-ups. The Region of Central Macedonia is collaborating with the EIC on issues related to Innovation Procurement, it participates in the EIC forum on Innovation

Procurement and it represented all EU Regions and Cities in the relevant EIC kick off meeting that took place in Brussels on 18/2/2020.

- The Region of Central Macedonia is the only Greek Region/city that participates in the EU Initiative called Urban Agenda in the Partnership on Innovative and Responsible procurement. (see attached Letter of Support). The aim of this initiative is to help mainstream EU policies in several domains at regional and municipal levels.
- In relation finally to an issue that is associated with Innovation Procurement but it goes beyond that, it has to be noted that the proposed DIH will ensure that there will not be lock-in situations in the digital transformation process that will be supported.

2. Regional Development Fund of Central Macedonia

The RDFCM has developed an important network of collaborations through its participation in European cooperation projects and European networks. Indicative projects in which PTA-KM participated in the field of agri-food are the following:

- "CITYZEN", Enhancing scalable innovations and new business models based on urban farming ecosystem values (INTERREG EUROPE) (https://rdfcm.gr/arthra/ypo-exelixi-efropaika-programmata/interreg-europe/cityzen-2/).
- "RUMORE", Rural-Urban Partnerships Motivating Regional Economies (INTERREG EUROPE) (https://rdfcm.gr/arthra/ypo-exelixi-efropaika-programmata/interreg-europe/rumore/).
- "RUMORE" pilot: "Testing the development of a Digital Innovation Hub in the Agri-Food sector", through field research and a digital application in the rice value chain.
- "CLUSTERPOLISEE", Smarter Cluster Policies for South East Europe (SOUTH EAST EUROPE TRANSNATIONAL COOPERATION PROGRAMME).
- "ENERGEIA", Fostering the use of low temperature geothermal sources through the development of operational exploitation guidelines and green energy solutions of enterprising (Greece - Bulgaria 2007 -2013).
- "AGROLESS", Joint reference strategies for rural activities of reduced inputs (Greece Bulgaria 2007 -2013).

RDFCM also participates in the following networks and thematic platforms:

- "ERIAFF NETWORK, European Regions for Innovation in Agriculture, Food and Forestry", RCM is a full member of this network.
- "HIGH TECH FARMING" (leader: Tuscany Region), Interregional Partnership under the "S3 Agri-Food Thematic platform of the European commission. RCM is a full member of this interregional partnership.

- "NUTRITIONAL INGREDIENTS" (leader: Wallonia Region), Interregional Partnership under the "S3 Agri-Food Thematic platform of the European commission. RCM is a full member of this partnership partnership.
- "Traceability & big data" (leader: Andalusia Region), Interregional Partnership under the "S3 Agri-Food Thematic platform of the European commission. RCM is a full member of this partnership partnership.

3. ELGO-DEMETER

Rice search unit has participated in several projects covering subjects introducing innovating methods, technologies and sustainability in rice cultivation such as: SMARTPADDY, RICEGUARD, ERMES, AGROCYCLE, DEMETER, RICECREAM and RUCEQUBE. Through the projects has developed collaborations with several agricultural associations, farmers, secondary production stakeholders, and many research institutes in Europe.

4. Aristotle University of Thessaloniki

- The laboratory of Intelligent Systems participates in the EU flagship project for the development of a European platform and ecosystem of Artificial Intelligence applications (H2020-ICT-26-2018-2020). 80 partners participate in this project, where researchers upload software and data for AI, and tools and applications can be used with no, or minimum cost by customers with the goal of increasing their competitiveness. The hub will use the platform and extend its features.

5. INAB and ITI/CERTH

- INAB|CERTH has close collaborations with established European e-infrastructures, such as EGI, EUDAT and RDA, and is a member of key scientific networks, such as Euroclonality-NGS, that maintain the competitiveness of the organization in the constantly evolving landscape of computational challenges and provide the opportunities to interact and affect future policies.
- It is also a hub of ELIXIR EU in life sciences, and
- Participates in a proposal to create a Competence Center, on Industry 4.0, called I4byDESIGN.

6. International Hellenic University

- Member of the Technopolis Cluster "IBC3- Innovative Business Cluster of Cloud Computing Technologies" aiming at supporting the participating ICT SMEs to tackle key technical and non-technical challenges in the

development and promotion of innovative high added-value services based on Cloud Computing thus increasing their international competitiveness.

7. **University of Macedonia**

- Member of the OKThess incubator

8. **American Farm School**

Participates in the following clusters

- Internet of Food Alliance
- Agrotechnological Export Partnership
- o eMT Cluster (based in East Macedonia & Thrace Region)

F.3. Awareness raising

Raising **awareness** is crucial for the HUB's **effectiveness** and **sustainability**. It is crucial mainly because one of the target groups, the one with the basic needs, requires an extensive in range and depth campaign, to be informed, boost **trust** and train them to be able to absorb new applications, models, tools and skills.
All partners have the capacity, the network, the resources, and a structure to multiply the effects of any raising awareness activities.
These events will include among others the following tools:

- Creation of Case Studies' booklet
- Creation of Demonstration Projects, Pilot projects,
- Interpretive tools and content
- Public Displays: Street stall, Roadshows
- Educational events
- Content for all media
- Be present in all channels, both digital and non
- Press releases
- Run a blog
- Use ambassadors to multiply our effort and efficiency – people that are well known and trusted

F.4 Publicity and communication plan

The communication strategy of the proposed DIH is designed to help the hub and its members to communicate effectively both internally and externally and meet our objectives. This strategic plan can:

- engage effectively with all stakeholders, demonstrate success of DIHs work and results
- ensure all the target audiences understand the offerings
- change behaviors and perceptions

The main goal of the communication strategy is to influence the knowledge, attitude, and behavior of the defined target groups towards the digital transformation. To reach this overall objective, the activities implemented will aim to:

- **raise awareness**
- **inform** the audience
- **promote** hub's services and activities
- **engage** with partners and stakeholders to better implement its actions plans

The plan must take into consideration the fowling groups:

1. Partners and members of the hub
2. Target groups, the customers the hub will be addressing its services
3. The rest of EU's hubs network,
4. Other stakeholders that might collaborate with
5. Policy makers and
6. General Public

The strategy must in all phases and hub's development have a specific different message per target group and must communicate that message through channels and tools.

The different tools that will be used among others are:

- **Offline communication tools**
    - **Events and meetings** the creation of networks and successful relationships also involves face-to-face meetings, which allow a direct exchange of knowledge and expertise.
    - **Press,** External communication will be favored also by press relations.
    - **Public affairs activities,** the ecosystem building relies on an interconnected network of contacts.

- **Scientific Publications,** could boost trust
- **Posters,** Posters are quick and visual tools to give a first impression
- **Roll-ups** are an important visual tool for display at seminars, conferences, workshops, or similar events.
- **Brochure,** the brochures represent the main source of information on paper
- **Flyers,** Flyers condense the project's goals, messages and actions into a few, impactful words, and infographics.

- **Online communication tools**
  - **Innovation Portal, Site,** Site visits for end-users will constitute an important part of the implementation plan, here we also upload good practices, pilots etc
  - **Social media platforms,** Twitter, LinkedIn, Instagram, and Facebook.
  - **Newsletter,** A monthly / quarterly newsletter will be a useful tool to inform the target audience about the status and the achievements of the services
  - **Promotional videos,** Online animation content is extremely important to convey key messages in a more dynamic and attractive way.
  - **Other Online communication tools,** E-learning tools,

G. Next steps and Funding opportunities

The new DIH will be fully **aligned in strategy and objectives with Digital Europe Program** since:

- It will shape and **support** the digital transformation of our region's society and economy.
- It will focus heavily on boosting **investments** in all relative technologies like hpc, AI, cybersecurity, advanced digital skills, ensuring a wide use of digital technologies across the economy and society
- It will focus on **cross-sector areas and public-private collaborations** and links
- It will **collaborate** with all relative stakeholders and DIHs to succeed in our goals
- The presence of the Regional Authority will ensure that both funding and policies will support DIHs activities

- The selected sector and thematic focus are on manufacturing, and on cross sector agri-food ecosystems that affect **health, climate, and better use of resources**
- We value **open data** and use of AI, ML, analytics, and interoperable, trustworthy digital platforms tailored to communities' needs, offering easy standardized access.

The DIH strategy is planned by taking into consideration both the objectives of the Digital Europe Program and all other EU strategies, goals, and objectives. These **strategies** and **objectives** are:

- EU Biodiversity Strategy for 2030, since our sector focus is based on primary sectors, plants, seeds, waste, and food loss, use of bio-based materials, food security and climate change.
- European Green Deal objectives require significant technological advances in several areas, and digital technologies will be a key tool to improve efficiency and sustainability of any aspect of our lives.
- Epidemic of COVID-19 is imposing a heavy burden on the economy, and digital applications could alter that
- Use of digital means in preventing food waste and boost circular economy
- Farm to fork strategy: The use of pesticides in agriculture contributes to pollution of soil, water, and air. The excess of nutrients in the environment is a major source of air, soil, and water pollution, negatively.

According to a regional mapping performed to identify the existing digital infrastructure and the target group needs, it was realized that as the regional innovation system lacks various pieces to mature, the same holds true for the digital transformation. The digital infrastructure of the R&D centers, the maturity and culture of SMEs and public entities, need more integration, expertise on innovation projects, and more supported policies to overcome certain inefficiencies like low investments, brain drain and innovation and commercialization culture.

Additionally, the proposed DIH could be funded by alternative resources such as the **Regional Operational Program of Central Macedonia, Partnership Agreement for the Development Framework, European projects** or **private resources.**

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