

# Report on Information and Communication Technologies as Key Enabling Technologies and their role in supporting the Entrepreneurial Discovery Process and Research and Innovation Strategies for Smart Specialization in North East Romania

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## **Disclaimer**

This report has been prepared by the expert in the context of the contract CT-EX2002B000951-106. This contribution does not represent the views of the European Commission.

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## **Glossary of key terms**

- EDP – Entrepreneurial Discovery Process
- EFSI European Fund for Strategic Investments
- EIB European Investment Bank
- ERDF European Regional Development Fund
- ESIF European Structural and Investment Fund
- H2020 Horizon 2020
- ICT Information and Communication Technology
- JRC Joint Research Centre
- JTI Joint Technology Initiatives
- KET Key Enabling Technologies
- NE RDA North-East Regional Development Agency
- NW RDA North-West Regional Development Agency
- OP Operational Programme
- PDL Project Development Lab
- RDI Research Development and Innovation
- RIA Research and innovation action
- CSA Coordination and Support action
- PCP/PPI Pre-commercial procurement/ Procurement of
- RIS3 Research and Innovation Strategies for Smart Specialisation
- ROP Regional Operational Programme
- S3 Smart Specialisation Strategies
- S3P Smart Specialisation Platform
- SME Small and Medium Enterprises
- TO1 ...9 Thematic Objective 1...9

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## Introduction

Information and Communication Technologies (ICTs) are major drivers of social and economic change. ICTs not only constitute an important sector themselves, but are also an important enabler of other sectors. ICTs have been selected by regional and national authorities<sup>1</sup> as key areas of local strength, market potential and smart specialisation<sup>2</sup>. ICTs can also have an important spill-over effect on the other sectors identified by the Smart Specialisation strategy in the North-East region.

The present study has been commissioned by the JRC Directorate Growth and Innovation in the framework of the European Parliament's Preparatory Action "Competitive advantage and potential for smart specialisation at regional level in Romania", that provides support to the refinement and implementation of RIS3 in Romania. The aim of the study<sup>3</sup> was to assess the ICT sector in the North East region of Romania<sup>4</sup> and discuss its potential to generate spill-overs in other priority investment areas identified by the region's RIS3 strategy.

The report is structured in five sections. Section 1 presents the methodological approach adopted in the study. Section 2 presents the landscape of the ICT sector in the North-East region. A set of case studies (Section 4) tackles how ICT, as a key enabling technology, can exploit the potential of the ideas developed in the EDP focus groups, and explore which funds could be relevant to the development of the ideas. This analysis is further enhanced<sup>5</sup> by an exploratory, non-exhaustive analysis of complementary funding streams that could be relevant to ICT – related activities (Section 3). The piece of research on funding streams (in Sections 3 and 4) should be regarded as exploratory and non-exhaustive.

Section 5 analyses how to realize the ICT potential for the region, building upon the ICT sector and the ICT capacities of the region (Section 2), the ICT ideas (Section 4) and the funding opportunities (Section 3). Finally, the Conclusions section wraps up the report with a general discussion of findings and implications.

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<sup>1</sup> National Strategy on the Digital Agenda for Romania 2020 at <http://www.mcsi.ro/CMSPages/GetFile.aspx?nodeguid=35df52c5-e1bd-4507-af0f-7c3c67333484> ; National RDI Strategy 2014-2020 at [http://www.research.gov.ro/uploads/politici-cd/strategia-cdi-2014-2020/strategia-cdi-2020\\_-project-hg.pdf](http://www.research.gov.ro/uploads/politici-cd/strategia-cdi-2014-2020/strategia-cdi-2020_-project-hg.pdf)

<sup>2</sup> S3 strategy in North-East region at [http://www.adrnordest.ro/user/file/proiect\\_s3/strategie\\_s3/en/6.%20S3%20Strategy%20-%20Vision,%20mision,%20priorities,%20measures.pdf](http://www.adrnordest.ro/user/file/proiect_s3/strategie_s3/en/6.%20S3%20Strategy%20-%20Vision,%20mision,%20priorities,%20measures.pdf), document prepared by North-East in November 2013; March 2017 Draft Concept note at <http://adrnordest.ro/user/file/news/17/Concept%20Note%20Nord-Est%20-%20draft%2007.03.2017.docx>

<sup>3</sup> This report is deliverable D1b - Report on ICT as a KET and its role in supporting the EDP and RIS3 in North East Romania, as part of the expert contract (CT-EX2002B000951-106)

<sup>4</sup> While the focus is on the North East region, coverage of the North-West region was considered for comparison and contrast. An EDP on ICT was organized in the North West in February 2017 but the outcomes are not available yet.

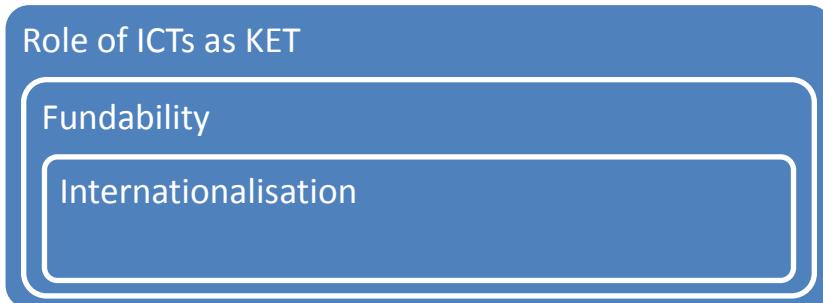
<sup>5</sup> Discussions with the JRC team in DG Growth and Innovation in February 2017

## 1. Methodology

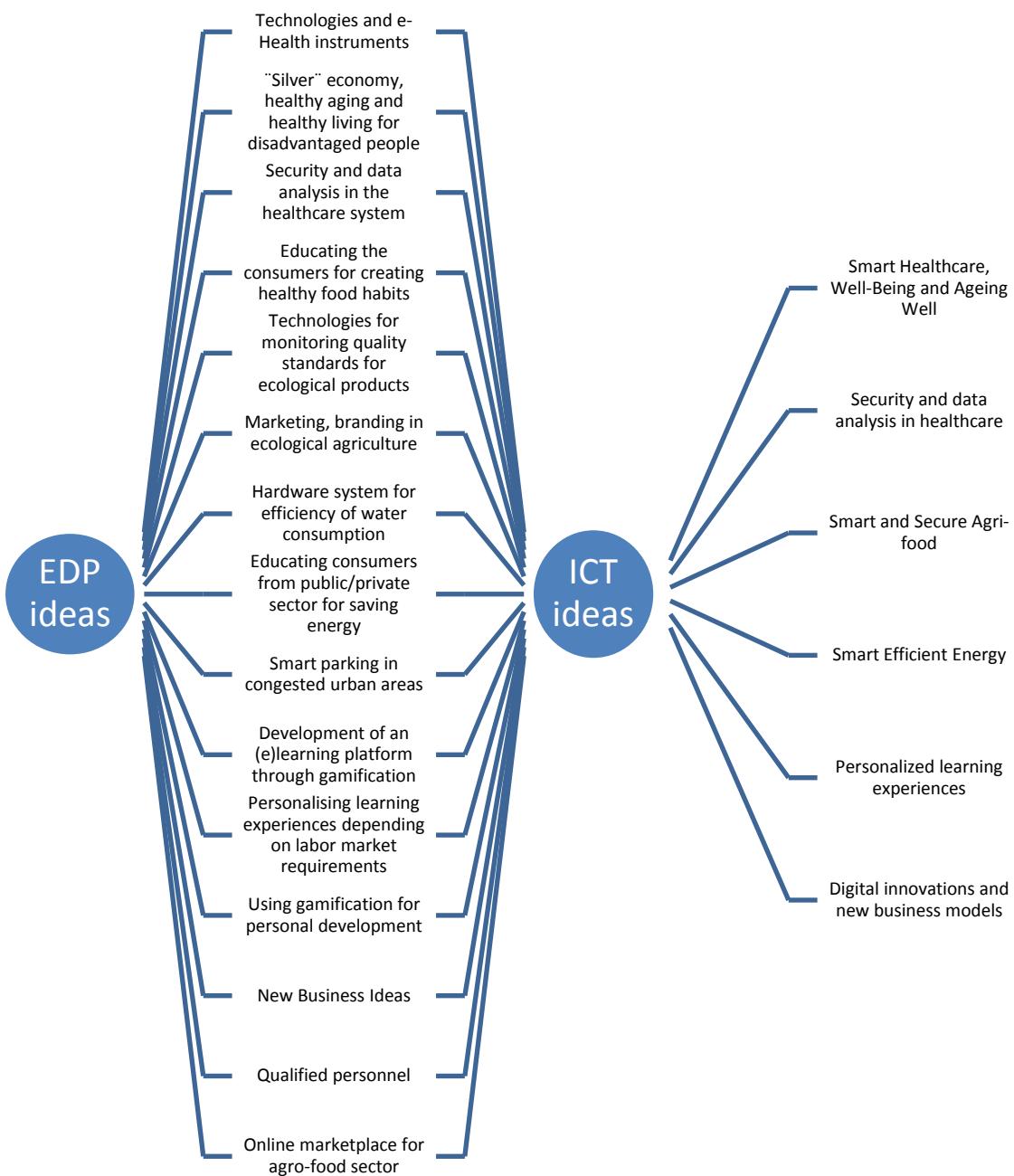
The methodological approach adopted in this study consists of **quantitative analysis** based on multi-dimensional **desk research**:

- (1) Analysis of the **ICT sector and ICT capacities** in the North East region;
- (2) Analysis of the **fundability of ICT activities**: Planned ICT investments and absorbed funding or potential for absorption. *This analysis should be regarded as exploratory, as it does not offer an exhaustive view of all sources of funding for ICT activities;*
- (3) Development of **EDP case-studies** for a number of **EDP ideas** selected, out of a larger pool of regional development ideas developed in the EDP focus groups [Pascu, 2017] for being related to the ICT sector. Figure 1 presents the process of development of the EDP cases studies, Figure 2 presents the process of selection of ideas. Each resulting "ICT idea" was cross-examined to include prospective ICT contribution potential, taking into account the EDP discussions and current opportunities, the perceived knowledge/actors synergy, as initially mapped by the EDP process, indications as to which funds could be relevant to the ideas beyond the ROP to stimulate further the development of the idea, as well the international dimension.

**Figure 1 EDP case studies**



**Figure 2- Selection of ICT ideas**

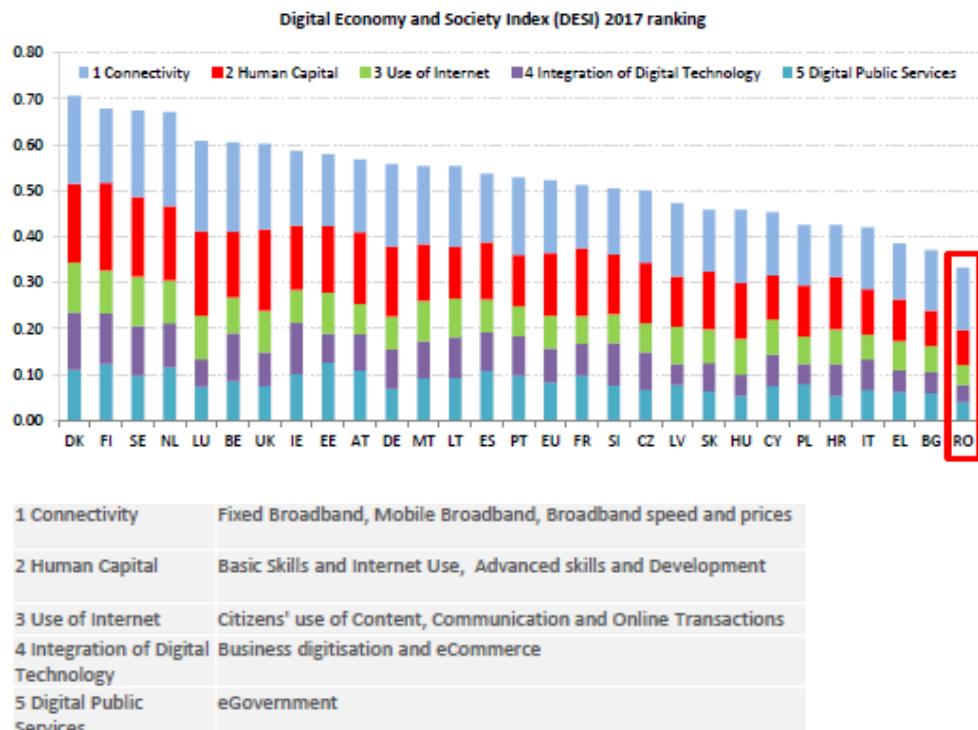


(4) For selected sectors, such as agriculture, energy, textiles/apparel, a **mapping of potential ICT contribution across their value chain** was carried out, building upon desk research of relevant literature (such as OECD, WTO, World Bank, European Commission studies), as to reflect on the prospective ICT contribution potential to enhance the ideas (the case studies in Section 4). *The mapping represents the author's perception of such potential. It does not seek to offer an exhaustive literature and/or innovations review, but to provide food for thought towards the potential of ICT innovations in selected sectors.*

## 2. ICT sector and ICT capacities in the North East region

According to the Digital Economy Society Index (DESI)<sup>6</sup> progress reports, Romania is amongst the countries with the least advanced digital economies in the EU, ranking the 28<sup>th</sup> in 2017 and 2016<sup>7</sup>. Romania has the second highest share of broadband subscriptions in the EU and the take-up of mobile broadband is accelerating. However, the rate of digitisation of the economy, including for public services, and the levels of digital skills are still low.

**Figure 3 Digital Economy and Society index ranking**



Source: Digital Economy Society Index (DESI) 2017  
[http://ec.europa.eu/newsroom/document.cfm?doc\\_id=43037](http://ec.europa.eu/newsroom/document.cfm?doc_id=43037)

The National Strategy on Digital Agenda for Romania<sup>8</sup> addresses both directly the ICT as a sector as well as an enabling technology at a sectorial level, including: eGovernment, Interoperability, Cyber Security, Cloud Computing, Open Data, Big Data and Social Media; the development of broadband and digital services infrastructure; the development of ICT infrastructure in education, health and culture in education. Regional digital agendas are not yet defined.

Information and communication technology (ICT) refers to both different types of communications networks and the technologies used in them. The ICT sector is defined

<sup>6</sup> [https://ec.europa.eu/digital-single-market/en\(scoreboard/romania](https://ec.europa.eu/digital-single-market/en(scoreboard/romania)

<sup>7</sup> [http://ec.europa.eu/newsroom/document.cfm?doc\\_id=43037](http://ec.europa.eu/newsroom/document.cfm?doc_id=43037)

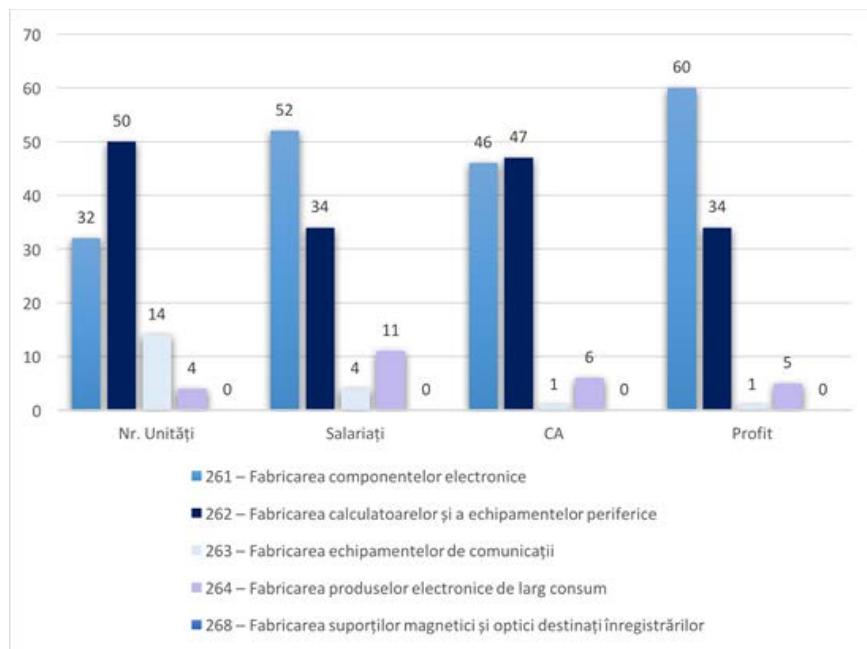
<sup>8</sup> Idem as 1

by the OECD in terms of ISIC rev. 3.1 codes for manufacturing and services<sup>9</sup>. In Romania, the sector is defined by NACE codes rev.2 i.e. codes 26 for manufacturing (261, 262, 263, 264 and 268) and services: codes 465 (Wholesale of information and communication equipment), 582 – Software publishing, 61 – Telecommunications, 62– Computer programming, consultancy and related activities, 631- Data processing, hosting and related activities; web portals and 951 – Repair of computers and communication equipment<sup>10</sup>.

The ICT sector represents the second industry sector by importance after trade in Romania (7% of GDP, 17% growth rate in 2016<sup>11</sup>) and one of the most dynamic economic sectors in the North-East region: 1,505 active units (16% increase in the manufacturing sub-sector and 18% increase in the services sub-sector since 2011<sup>12</sup>), 11,600 employees and MEUR 366.8 turnover<sup>13</sup>.

In the ICT manufacturing sub-sector, most of the active units in the North-East region are in manufacturing of electronic components and boards, and of computers and peripheral equipments (NACE codes 262 and 261)<sup>14</sup>.

**Figure 4 Number of active units, employees and turnover in ICT manufacturing in North-East region, 2015**



Source: List of firms in Romania, 2015, based on Draft Concept Note RIS3, March 2017  
<http://adrnordest.ro/user/file/news/17>

<sup>9</sup> <https://stats.oecd.org/glossary/detail.asp?ID=3038>

<sup>10</sup> <https://www.romanian-companies.eu/caen.asp>

<sup>11</sup> Software and IT Services in Romania 2016 study by Pierre Audoin Consultants (PAC)

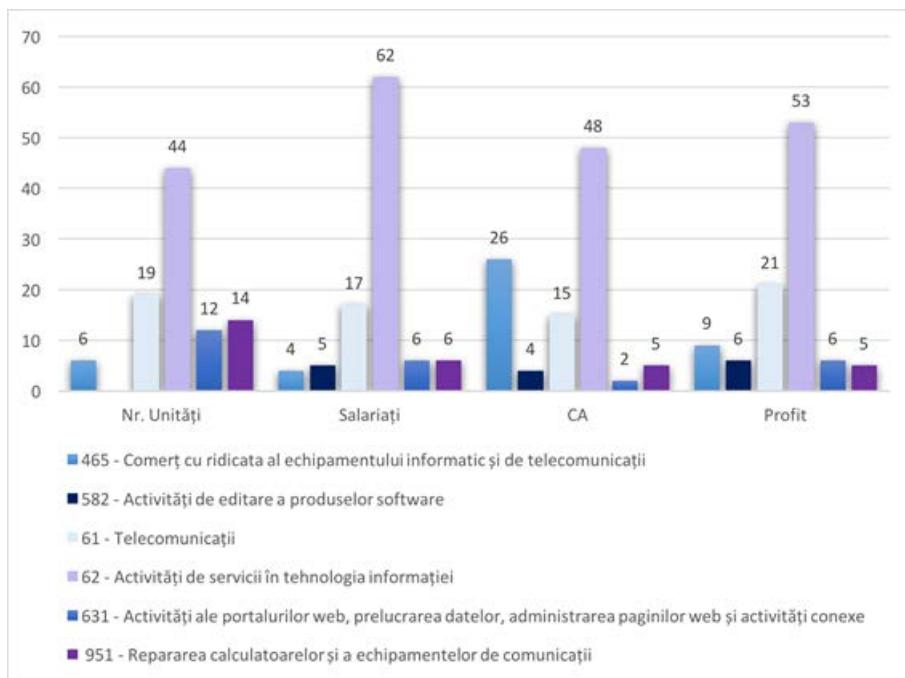
<sup>12</sup> [http://adrnordest.ro/user/file/news/16/Prezentare%20EDP%20IT%26C\\_GM.pdf](http://adrnordest.ro/user/file/news/16/Prezentare%20EDP%20IT%26C_GM.pdf)

<sup>13</sup> [http://www.adrnordest.ro/user/file/news/15/prezentare\\_ADR\\_Nord-Est\\_Bruxelles\\_\[EN\].pdf](http://www.adrnordest.ro/user/file/news/15/prezentare_ADR_Nord-Est_Bruxelles_[EN].pdf)

<sup>14</sup> INS, Tempo Online, 2016

In the ICT services, most of the active units are in computer programming, consultancy and related activities (NACE code 62).

**Figure 5 Number of active units, employees and turnover in ICT services in North-East region, 2015**



Source: List of firms in Romania, 2015, based on Draft Concept Note RIS3, March 2017  
<http://adrnordest.ro/user/file/news/17>

The region has a strong academic infrastructure, education and research. The Innovative Regional Euronest ICT Hub<sup>15</sup> established in 2013 aims to position the North-East region as a European provider of ICT services and technologies. Euronest is the second biggest ICT industry cluster in Romania after Cluj Napoca. It brings together 29 ICT companies, 4 institutions of higher education and research, county and local public authorities, NGOs, external facilitators with relevant experience and third party service providers in the value chain. In 2014, the turnover of companies in the cluster grew by 38.15% over 2013, reaching over MEUR 50 and over 1630 employees.

North East Romania and especially the Iasi County has a long tradition in higher education. The public research and higher education landscape in ICT education at license, master and doctoral levels includes public universities such as Technical University 'Gheorghe Asachi' Iasi, University 'Alexandru Ioan Cuza' Iasi, University 'Ştefan cel Mare' Suceava, University 'Vasile Alecsandri' Bacau, University of medicine and pharmacy 'Gr. T. Popa', which cooperates with the County clinical and emergency hospital Sf. Spiridon in Iasi and the Research Centre in fuzzy, intelligent systems and biomedical engineering, the Iasi branch of the Research institute in theoretical

<sup>15</sup> <http://clustereuronest.ro/ro/>

informatics of the Romanian Academy and the department of digital technologies of the Research Institute for economic and social research Gh. Zane.

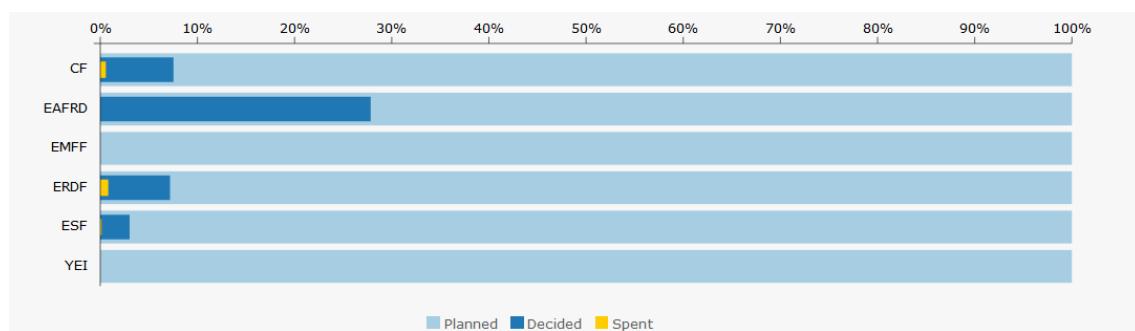
### 3. Fundability of ICT activities

*Disclaimer- This section provides some indications as to which funds could be relevant to funding of ICT activities from ESI Funds, Horizon 2020 and other EU programmes, EIB and Juncker Plan, European Territorial cooperation or national programmes. However, this piece of research should be regarded as exploratory and non-exhaustive.*

#### 3.1 European Structural and Investment Funds (ESIF)

Romania<sup>16</sup> has a total allocation of EUR 30.8 billion from ESI Funds under the programming period 2014-2020. The absorption rate of European funds under the 2014-2020 financial framework under the different ESI Funds (% of planned investments, aggregated at country level) is about 0.5% (data in February 2017<sup>17</sup>), out of which 0.8% for ERDF, 0.6% for Cohesion Fund (CR) and 0.1% for ESF<sup>18</sup>.

**Figure 6 Implementation by ESI Fund for Romania (% of planned) – 2014-2020 period**



Source: European Commission Open Data portal for ESIF  
<https://cohesiondata.ec.europa.eu>

Under the broad theme of ICTs, the ERDF mainly invests in a range of investment priorities to enhance access to and use and quality of information and communication technologies (ICT). Under other themes the ESF through investment in digital literacy, education and training also contributes to human capital development. The analysis below presents major ICT investment areas targeted by the European Structural and Investment Funds (ESIF), as revealed by the ICT Monitoring tool developed by Smart Specialization Platform<sup>19</sup> based on the data retrieved in January 2017 from the SFC2014/Infoview database.

About EUR 14 billion is available for ICT investments for European regions during the 2014-2020 funding period under ESIF<sup>20</sup>. Romania allocated 1.7% of total EU funding for

<sup>16</sup> [http://ec.europa.eu/regional\\_policy/sources/policy/what/investment-policy/esif-country-factsheet/esf-funds-country-factsheet-ro\\_en.pdf](http://ec.europa.eu/regional_policy/sources/policy/what/investment-policy/esif-country-factsheet/esf-funds-country-factsheet-ro_en.pdf)

<sup>17</sup> <https://cohesiondata.ec.europa.eu/overview#>

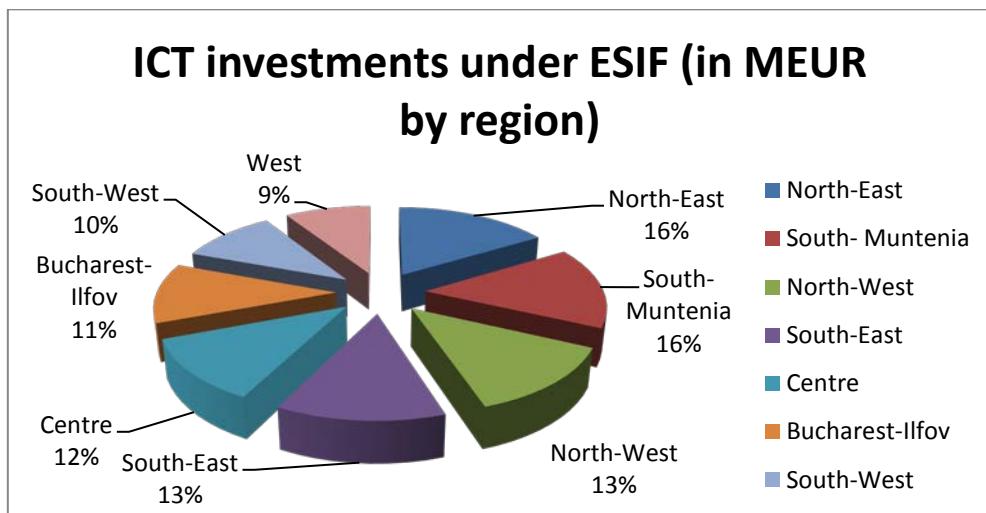
<sup>18</sup> <https://cohesiondata.ec.europa.eu/countries/RO#>

<sup>19</sup> <http://s3platform.jrc.ec.europa.eu/ict-monitoring>

<sup>20</sup> <https://cohesiondata.ec.europa.eu/themes/2#>

ICTs. The ICT investments planned for all Romanian regions amount to approximately to EUR 1 Billion, out of which 16% are for the North-East region (MEUR 167) and 13% for the North-West region (MEUR 133).

**Figure 7 Planned ICT Investments for Romanian regions under ESIF (in MEUR by region)**



Source: ICT Monitoring tool, S3P platform at <http://s3platform.jrc.ec.europa.eu/ict-monitoring>

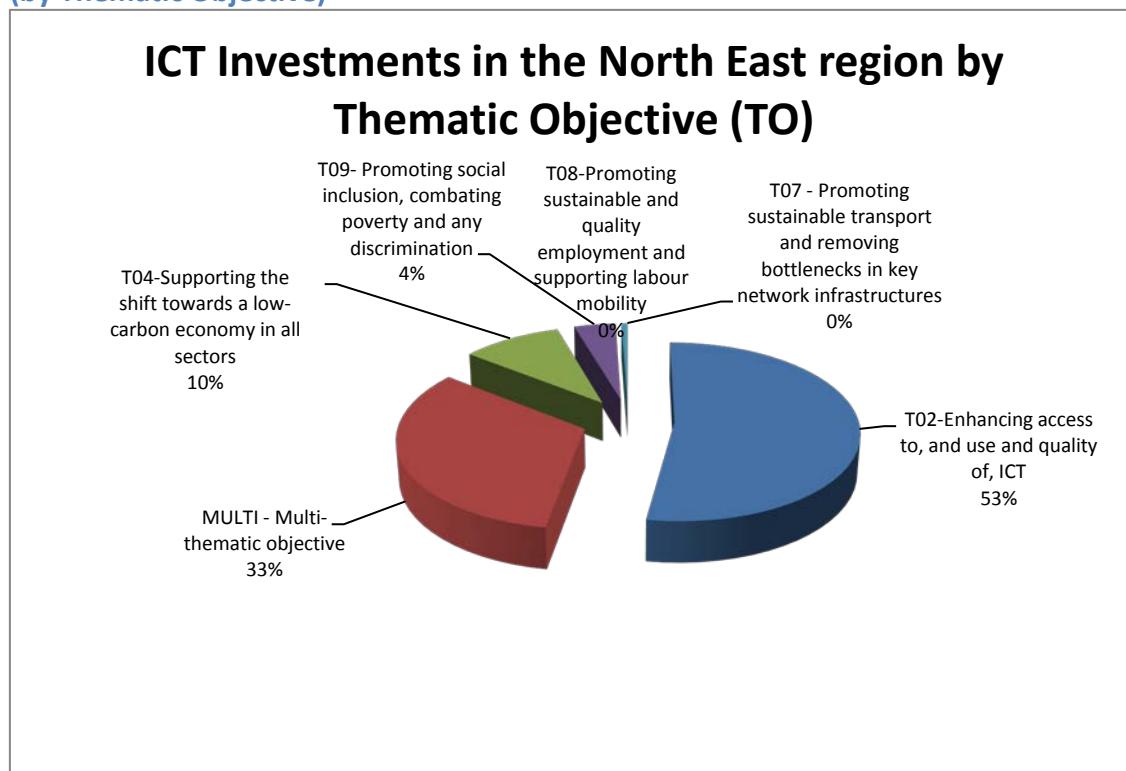
The Thematic Objective 2 (TO2) - "Enhancing access to, and use and quality of, ICT" is the main ICT-related thematic objective. Support for ICT is comprehensive and includes broadband deployment and rollout of high-speed networks, development of ICT products and services, e-commerce and enhancing demand for ICT, ICT applications for e-government, e-learning, e-inclusion, e-culture and e-health, as well as support to IT firms that develop ICT products and services and to the public sector and firms in other sectors (buying and using new or existing e-solutions). ICT is also seen as a tool for socio-economic development and productivity in economic activities and public administration, thus promotion of enhanced use of ICT through the use of technologies such as mobile, cloud, big data is combined with skills measures, organisational and process changes, social media and networking.

The total planned amount of ICT investment for North-East region is almost twice as much as currently encoded under TO2 (MEUR 91). Substantial investments in ICT will be allocated to other categories such as for skills, lifelong learning and social inclusion (the European Social Fund ESF), followed by low-carbon economy (TO4- Supporting the shift towards a low-carbon economy in all sectors), and sustainable transport (T07 - Promoting sustainable transport and removing bottlenecks in key network infrastructures).

The potential for ICTs under different thematic objectives (TOs) is as follows:

- For strengthening research, technological development and innovation (under TO1):
  - o Research and development (R&D), demonstration, pilots and so on in nanotechnology, micro-and nano-electronics including semiconductors, advanced materials, photonics,
  - o Development of e-government and business solutions, KIC (Knowledge and innovation communities)-like platforms and living labs;
- For enhancing the competitiveness of SMEs (TO3):
  - o ICT- based new business models and start-ups
  - o ICT as a facilitator for international value-chain cooperation
  - o ICT as a facilitator for advanced manufacturing and service delivery
  - o ICT as a facilitator of SME innovation
- ICT for supporting the shift towards a low-carbon economy in all sectors e.g. smart energy efficiency, smart energy management, smart urban mobility (TO4);
- E-government solutions for increased efficiency of public administrations and public services (TO11)

**Figure 8 Distribution of planned ICT Investments under ESIF in the North East region (by Thematic Objective)**

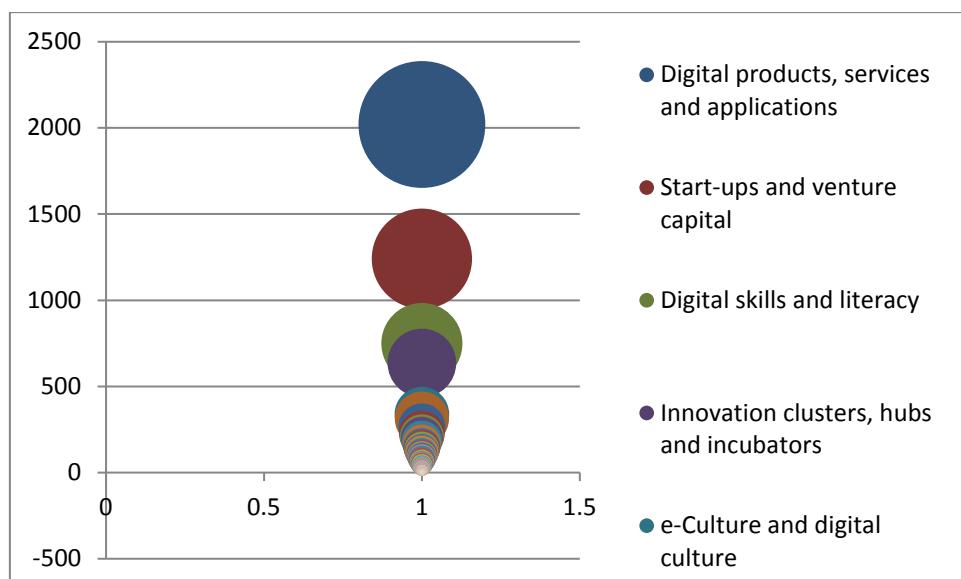


Source: ICT Monitoring tool, S3P platform at <http://s3platform.jrc.ec.europa.eu/ict-monitoring>

The activity areas to be financed under the OP's are related to ICT innovation<sup>21</sup>, e-inclusion, broadband and digital networks, e-Government, e-Health, digital content and creative industries, digital science, advanced computing, trust, security & authentication, components, smart cities and smart grids.

Some of the most frequent ICT keywords in ESIF OP's sections referring to actions to be financed are related to digital products, services and applications, research and innovation, start-ups and venture capital, e-infrastructure and information systems, digital skills and literacy, innovation clusters, hubs and incubators, broadband, e-Culture and digital culture, innovation vouchers, e-Government, e-Health, SME support, cloud computing, security and data protection, ICT and tourism, open and big data, digital content, smart energy, smart cities, smart grids, intelligent transport system, telemedicine and telemonitoring, integrated care, independent living. Amongst the least frequent (e.g. less than 50 frequent) keywords are for instance Big Data, personalized medicine, EHRs, innovation procurement, factory of the future, augmented and virtual reality, open source, games & gamification, multilingual and semantic web, advanced computing.

**Figure 9 Frequency of ICT keywords in ESIF OPs**



Source: ICT Monitoring tool, S3P platform at <http://s3platform.jrc.ec.europa.eu/ict-monitoring>

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<sup>21</sup> According to the ICT Monitoring S3P website, the area ICT innovation includes a number of categories that are searched in a specific ICT context

### 3.2 Digital Single Market

The [Digital Single Market Strategy](#) (DSM) is built on three pillars: Better access for consumers and businesses to digital goods and services across Europe; Environment-creating the right conditions and a level playing field for digital networks and innovative services to flourish; and Economy and society.

Under the Economy chapter of DSM consideration is given to the business environment for web and ICT entrepreneurs, future internet, Big Data, cloud computing, the digitization of the European Industry. Under the Society chapter, consideration is given to e-services and e-solutions, digital skills, smarter and more energy-efficient cities (smart living), online trust, cybersecurity and privacy, content and media.

For **digital skills** in particular, part of the European Structural and Investment Funds (2014-2020) could be considered for ICT education. Under the [European Social Fund](#) more than EUR 80 billion is earmarked for human capital investment. The [Youth Employment Initiative](#) is complementary to other projects undertaken at national level, including those with European Social Fund (ESF) support. For 2014-2020, EUR 3.2 billion will be dedicated to young people not in employment, education or training (NEETs) aged below 25, residing in regions experiencing youth unemployment rates above 25 % in 2012.

[Erasmus+](#) will dedicate EUR 14.7 billion to boost skills and employability. The [Employment and Social Innovation \(EaSI\)](#) programme is a financing instrument for sustainable employment, guaranteeing adequate and decent social protection, combating social exclusion and poverty and improving working conditions. The total budget for the EaSI programme 2014-2020 is MEUR 919.47. EaSI is managed directly by the European Commission. It brings together three EU programmes managed separately between 2007 and 2013: PROGRESS, EURES and Progress Microfinance. The EaSI budget will go 61% to the modernisation of employment and social policies (PROGRESS), 18% to job mobility (EURES) and 21% to access to micro-finance and social entrepreneurship (Progress MicroFinance).

The delivery of the Digital Single Market is supported through a number of funding programmes, which regularly publish competitive calls for proposals for projects. Calls for tenders are also published for services such as policy analyses and communications. Recent call for tenders are for instance [SMART 2016/1015](#) (expertise needed in the area of technical standards related to the accessibility of mobile applications), [SMART 2016/0071](#) for a study on the safety and legal issues of non-embedded software, advanced robots, autonomous, connected, and AI-based vehicles and systems.

### 3.3 Horizon 2020 and other EU programmes

The overall budget for Horizon 2020 in 2016-2017 is EUR 8.5 billion. The level of financing (EU co-financing rate) depends on the type of action i.e. from 100% for Coordination and Support actions, Research and Innovation actions, Innovation actions (for non-profit legal entities), 70% for Innovation actions and Pre-commercial procurement (PCP), 33% for ERANET (Cofund) and 20% for Public procurement of Innovative solutions (PPI). National Co-funding is available for some support measures and instruments through PNIII, priority International and European Cooperation<sup>22</sup>.

Two years into H2020, the applications from the EU-13 increased by 29.6% and from the EU-15 (Member States joining EU before 2004) by 20.6%. However, the success rates have declined in 2015 compared to 2014- the EU average from 15% to 11%, respectively; Romania success rate declined from 11.5% to 7.8%. The decline is due to the increase in the number of eligible applications, rather than a decrease in funding available.

**Figure 10 Success rate per Member States**



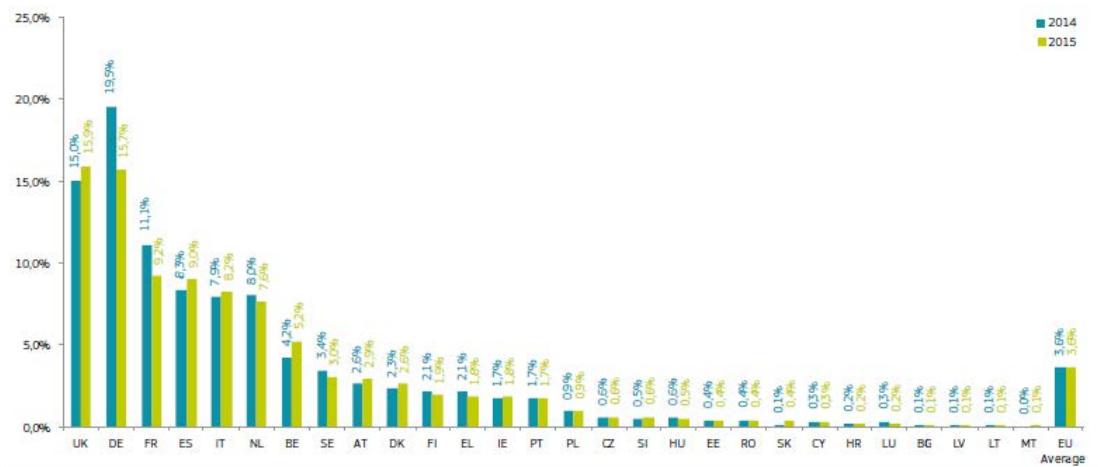
Source: European Commission, "Horizon 2020-Two years on", [https://ec.europa.eu/research/evaluations/pdf/h2020\\_2-years-on\\_brochure.pdf](https://ec.europa.eu/research/evaluations/pdf/h2020_2-years-on_brochure.pdf)

Romania received a 0.4% of the EU financial contribution in the first two years of Horizon 2020 (Romania is one of the three countries that received the lowest share of funding to research and innovation projects i.e. 1.4 EUR per capita in 2015).

**Figure 11 –Share of funding per Member State**

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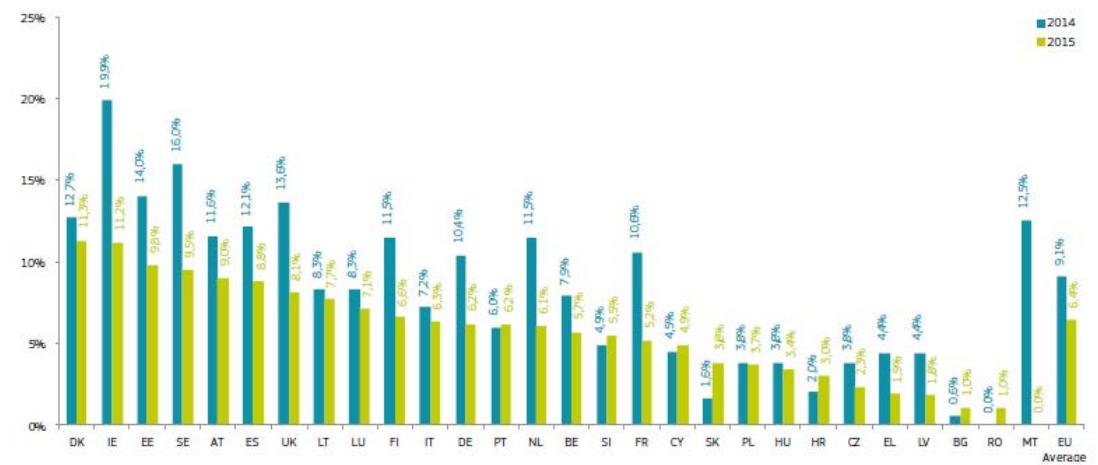
[http://uefiscdi.gov.ro/userfiles/file/PNCDI%20III/P3\\_COOPERARE%20INTERNATIONALA/Orizont%202020/PI%20Premiere\\_H2020\(1\).pdf](http://uefiscdi.gov.ro/userfiles/file/PNCDI%20III/P3_COOPERARE%20INTERNATIONALA/Orizont%202020/PI%20Premiere_H2020(1).pdf)



Source: European Commission, "Horizon 2020-Two years on", [https://ec.europa.eu/research/evaluations/pdf/h2020\\_2-years-on\\_brochure.pdf](https://ec.europa.eu/research/evaluations/pdf/h2020_2-years-on_brochure.pdf)

The EU average success rate in the SME instrument over the two years was 7.5% (9.1% in 2014 and 6.4% in 2015), which is lower than the Horizon 2020 average of 13.1% in terms of overall applications. Romania's success rate in 2015 was 1% (from 0% in 2014).

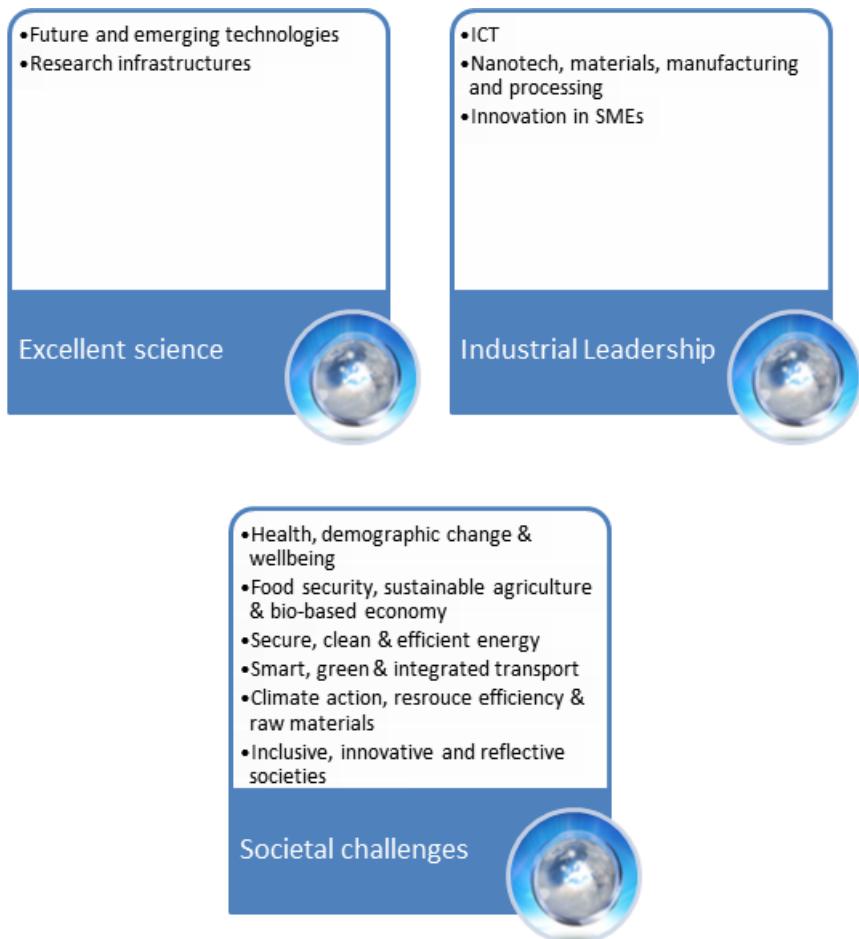
**Figure 12 Success rate per Member State in SME Instrument**



Source: European Commission, "Horizon 2020-Two years on", [https://ec.europa.eu/research/evaluations/pdf/h2020\\_2-years-on\\_brochure.pdf](https://ec.europa.eu/research/evaluations/pdf/h2020_2-years-on_brochure.pdf)

As a generic technology, ICT is present in many of the Horizon 2020<sup>23</sup> areas.

**Figure 13 ICT – related activities in H2020**

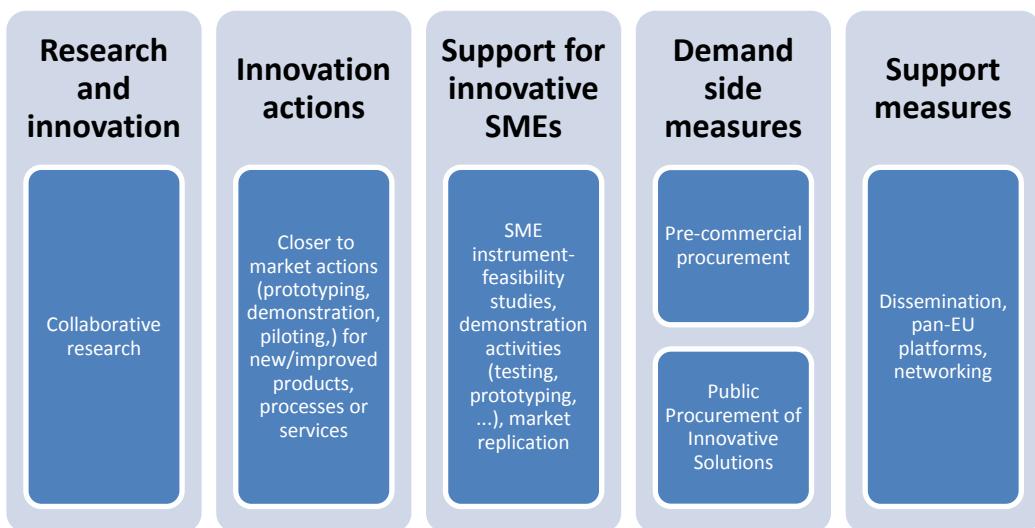


Source: Author's own elaboration based on H2020  
<https://ec.europa.eu/programmes/horizon2020/>

H2020 actions span from collaborative research (either on generic ICT technologies or advanced research to uncover new technological possibilities or to boost emerging technologies or multi-disciplinary application-driven research and innovation leveraging ICT to tackle societal challenges), innovation actions, support measures for dissemination and networking, PCP/PCI measures, support to innovative SMEs and for new approaches to promoting close-to-market innovation activities. Figure 13 presents a non-exhaustive summary of the actions in H2020.

<sup>23</sup> [http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016\\_2017/main/h2020-wp1617-intro\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-intro_en.pdf)

**Figure 14 Actions in H2020**



Source: Author's own elaboration based on H2020  
<https://ec.europa.eu/programmes/horizon2020/>

Table 1 presents the ICT-related activities in the different parts of Horizon 2020.

**Table 1 ICT- related activities in H2020**

H2020 programme	Areas of research
Excellent Science, 'Future and Emerging Technologies' and 'European research infrastructures' ('eInfrastructures'):	<p>Advanced research to uncover radically new technological possibilities, boosting emerging technologies and to strengthen the interfaces between ICT and other disciplines, most notably material science and neuroscience (such as the Graphene flagship, the Human Brain Project (HBP)) and support for the European policies on open research data, data and computing intensive science, research and education networking, high-performance computing and big data innovation.</p> <p>In WP2016-2017 a new activity aiming at stimulating innovation by initiating entrepreneurial activities around results from FET research projects is introduced, the 'FET Innovation Launchpad'.</p>
Leadership in enabling and industrial technologies' (LEIT)	<p>Research and innovation activities on generic ICT technologies either driven by industrial roadmaps or through a bottom up approach.</p> <p>ICT technological areas:</p> <ul style="list-style-type: none"> <li>• a new generation of components and system,</li> <li>• advanced computing and cloud computing,</li> <li>• future Internet,</li> <li>• content technologies and information management,</li> <li>• robotics and autonomous systems,</li> </ul>

## ICT in Societal challenges

- micro- and nano-electronic technologies, photonics.

In the WP 2016-17, cross-cutting activities are foreseen for digital security and the Internet of Things. The ‘Open and Disruptive Innovation’ (ODI) scheme is done using the SME instrument

Multi-disciplinary application-driven research and innovation leveraging ICT to tackle societal challenge:

- Health, demographic change and wellbeing,
- Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy,
- Secure, clean and efficient energy,
- Smart, green and integrated transport,
- Climate action, environment, resource efficiency and raw materials,
- Europe in a changing world - Innovative, inclusive and reflective societies
- Secure societies – Protecting freedom and security of Europe and its citizens

SME participation is encouraged throughout the H2020, especially in the priorities Industrial Leadership and Societal Challenges. Dedicated SME support is channeled through the SME instrument which promotes SMEs’ innovation activities from concept to market. In 2016-17, all topics using the SME instrument are grouped in a continuously open common call. Two of these topics are targeting SMEs from the ICT sector only i.e. ‘Open Disruptive Innovation Scheme’ and ‘Accelerating market introduction of ICT solutions for Health, Well-Being and Ageing Well’. Some other opportunities for ICT SMEs are in calls on ‘Stimulating the innovation potential of SMEs for a low carbon and efficient energy system’, ‘Small business innovation research for Transport and Smart Cities Mobility’, ‘New business models for inclusive, innovative and reflective societies’ and ‘Engaging SMEs in security research and development’. Romania has two Phase 1 projects in SME instrument, namely in Open Disruptive Innovation and in business innovation research for transport.

Complementary ICT funding is available from other EU programmes in the area of research, innovation and competitiveness, particularly AAL JPI -Ambient Assisted Living, EUREKA EUROSTARS, CEF, COSME<sup>24</sup>.

<sup>24</sup> [http://ec.europa.eu/growth/smes/cosme/index\\_en.htm](http://ec.europa.eu/growth/smes/cosme/index_en.htm)

Access to finance for SMEs is also available under COSME, through dedicated financial instruments (for instance in 2017 for a MEUR2 pilot action on the sharing economy<sup>25</sup>) and EUREKA Eurostars<sup>26</sup> programme European funding for R&D performing, internationally oriented SMEs. National Funding is supported through NPIII, priority International and European cooperation<sup>27</sup> (the budget for 2017 is approx. MEUR 1.6, and for 2018 approx. MEUR 4.5). Eurostars supports the development of rapidly marketable innovative products, processes and services in any technological (for instance, electronics, IT and telecoms technology, biological sciences and technologies, industrial manufacturing and transport, energy) and market areas (for instance medical or health-related, industrial products/manufacturing, computer-related or energy).

Complementary support for solutions based on ICT to support active, healthy and independent living of older adults is also available in AAL JPI -Ambient Assisted Living. National funding is supported through NPIII, priority International and European cooperation (funding per year: MEUR 1). The budget for 2017 for integrated solutions based on ICT to support active, healthy and independent living of older adults is approx. MEUR 26.

The national funding in 2017 amounts to MEUR 67 (MEUR 50 for mobility, MEUR 17 for strategic partnerships, MEUR 0.3 for structured youth dialogue).

By end 2016, Romania has signed agreements for EUR 1.2 billion (from the Cohesion Fund) for projects under the Connecting Europe Facility. The most ICT relevant sub-programme is CEF Telecom (deployment of digital service infrastructures and broadband networks). CEF Telecom support is estimated MEUR 300 in the form of grants. In 2017, the focus will be on telecom generic services: e-services public administration, Cyber Security, eDelivery, eHealth, eProcurement, eInvoicing, eTranslation, Europeana, Public Open Data.

### **3.4 Financial instruments for ICT**

EU financial instruments are increasingly used in a complementary way with traditional grants. EU and EIB have stepped-up support a new generation of EU financial instruments for innovative SMEs and small midcaps, to stimulate more investment in research and innovation, to address financing gaps in the research and innovation delivery chain due to high risk to help translate research results to the market. EIB/EU financial instruments come in form of equity products for development of high-growth and innovative SMEs by facilitating access to equity e.g. the Pan-European Venture Capital Fund(s)-of-Funds programme (VC FoF programme)<sup>28</sup>, debt products e.g. SME

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<sup>25</sup> [http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item\\_id=9049](http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=9049)

<sup>26</sup> [https://www.eurostars-eureka.eu/sites/default/files/eurostars-sme-brochure-am-i-eurostar\\_0.pdf](https://www.eurostars-eureka.eu/sites/default/files/eurostars-sme-brochure-am-i-eurostar_0.pdf)

<sup>27</sup>

[http://uefiscdi.gov.ro/userfiles/file/PNCDI%20III/P3\\_3\\_5\\_EUREKA/Competitie%202016/Pachet\\_informa\\_tii\\_3\\_5\\_%20Eureka\\_2016.pdf](http://uefiscdi.gov.ro/userfiles/file/PNCDI%20III/P3_3_5_EUREKA/Competitie%202016/Pachet_informa_tii_3_5_%20Eureka_2016.pdf)

<sup>28</sup> [http://www.eif.org/what\\_we\\_do/equity/paneuropean\\_venture\\_capital\\_fund\\_of\\_funds/index.htm](http://www.eif.org/what_we_do/equity/paneuropean_venture_capital_fund_of_funds/index.htm)

Initiative<sup>29</sup> and SME InnovFin<sup>30</sup>, and microfinance i.e. micro-loans (less than EUR 25,000) tailored to micro-enterprises and self-employed.

Romanian innovative fin-tech start-ups have so far benefited of MEUR 3 financing (0.3% of a total of EUR 2 billion)<sup>31</sup> for investments in research and innovation through the EIB InnovFin initiative<sup>32</sup>.

Financing for Romanian SMEs of MEUR 540 will be provided under the SME Initiative in Romania<sup>33</sup><sup>34</sup> and of MEUR 59 under the EIB Competitiveness Fund-of-Funds with resources from the Competitiveness Operational Programme 2014-2020. MEUR 40 of the Fund of Funds will be dedicated to entrepreneurship and seed funds for innovative companies and MEUR 19 will be dedicated to a portfolio risk sharing loan instrument<sup>35</sup>.

The European Fund for Strategic Investments is a strategic partnership between the European Commission and the EIB, to address market gaps by helping reduce the risk inherent in projects to encourage further investment. A 2016 study<sup>36</sup> confirmed that the market gaps in the EU are significantly influencing risk taking behaviour amongst investors and that there is a need for risk financing for the SME sector. Financing gaps in the SME sector (in % of GDP in 2013)<sup>37</sup> in Romania are: 1.35% -4.02% for loan gap, 4.83%-13.05% for equity gap and 6.18%-17.07% for financing gap.

The EIB will contribute EUR 5 billion to EFSI to the new initiative, alongside a EUR 16 billion guarantee from the EU budget. This will allow EFSI to unlock additional investment of at least EUR 315 billion over the next three years. The key sectors addressed are: the strategic infrastructure, including digital, transport and energy; the expansion of renewable energy and resource efficiency; environmental, urban development and social projects; education and training, research, development and innovation; and support for smaller businesses and midcap companies. The EFSI investment in the digital sector in 2016 amounted to 10% of EFSI funds<sup>38</sup>.

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<sup>29</sup> [http://www.eif.org/what\\_we\\_do/guarantees/sme\\_initiative/index.htm](http://www.eif.org/what_we_do/guarantees/sme_initiative/index.htm)

<sup>30</sup> [http://www.eif.org/what\\_we\\_do/guarantees/single\\_eu\\_debt\\_instrument/innovfin-guarantee-facility/index.htm](http://www.eif.org/what_we_do/guarantees/single_eu_debt_instrument/innovfin-guarantee-facility/index.htm)

<sup>31</sup> [http://www.eif.org/what\\_we\\_do/guarantees/single\\_eu\\_debt\\_instrument/innovfin-guarantee-facility/report-quarterly-innovfin-smeg-implementation-status.pdf](http://www.eif.org/what_we_do/guarantees/single_eu_debt_instrument/innovfin-guarantee-facility/report-quarterly-innovfin-smeg-implementation-status.pdf)

<sup>32</sup> [http://www.eib.org/attachments/innovfin\\_faq\\_en.pdf](http://www.eib.org/attachments/innovfin_faq_en.pdf)

<sup>33</sup> [http://www.eif.org/what\\_we\\_do/guarantees/sme\\_initiative/smei\\_romania/index.htm](http://www.eif.org/what_we_do/guarantees/sme_initiative/smei_romania/index.htm)

<sup>34</sup> <http://www.eib.europa.eu/infocentre/press/releases/all/2016/2016-250-romania-implements-sme-initiative-eur-580m-for-romanian-businesses.htm>

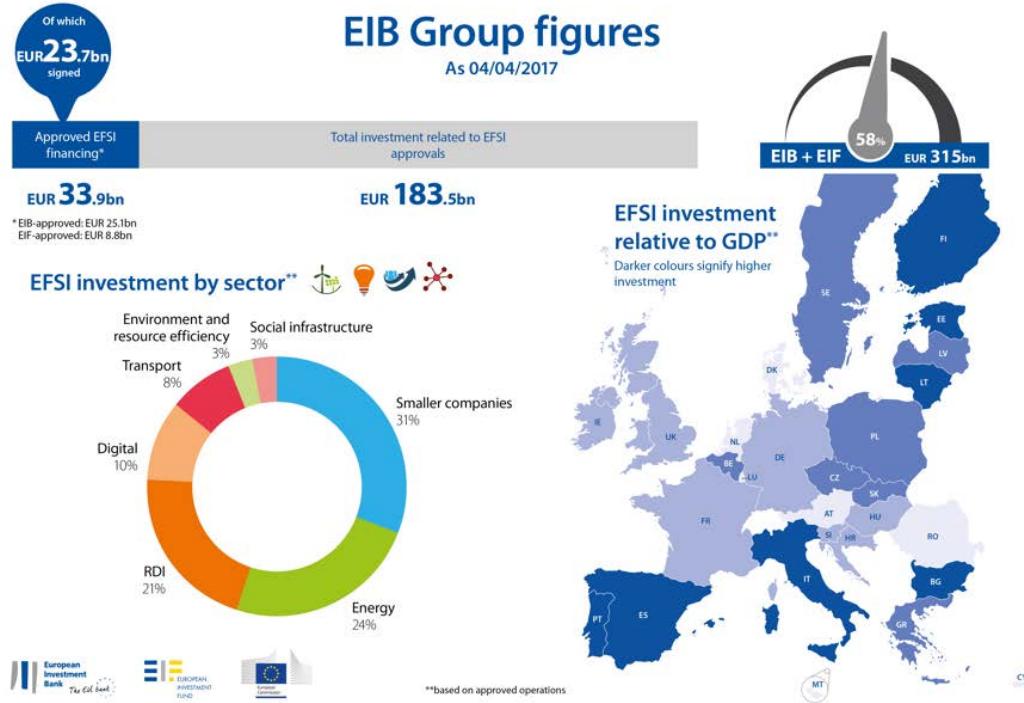
<sup>35</sup> [http://www.eif.org/what\\_we\\_do/news/2016/romania\\_competitiveness\\_Fund-of-Funds\\_for\\_SMEs.htm](http://www.eif.org/what_we_do/news/2016/romania_competitiveness_Fund-of-Funds_for_SMEs.htm)

<sup>36</sup> <http://www.euractiv.com/wp-content/uploads/sites/2/2016/11/EY-EFSI-Evaluation.pdf>

<sup>37</sup> The European Capital Markets Study, Estimating the Financing Gaps of SMEs, 2015

<sup>38</sup> [http://www.eib.org/efsi/efsi\\_dashboard\\_en.jpg](http://www.eib.org/efsi/efsi_dashboard_en.jpg)

**Figure 15 EFSI investment by sector**



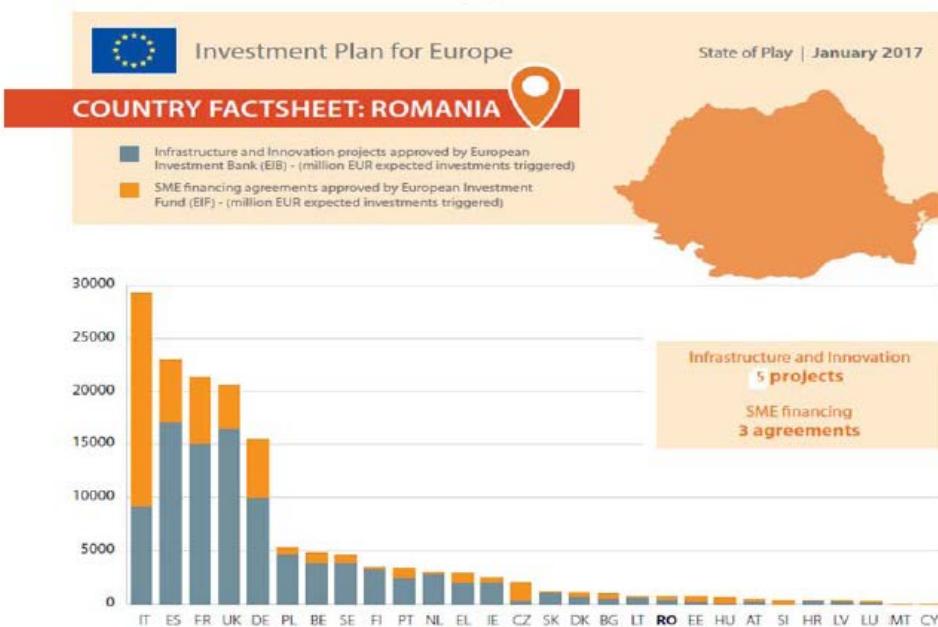
Source: EIB [http://www.eib.org/efsi/efsi\\_dashboard\\_en.jpg](http://www.eib.org/efsi/efsi_dashboard_en.jpg)

Almost two years after EFSI was launched, only **5** infrastructure and innovation projects have been approved in Romania and only **3** agreements with financial intermediaries providing financing for SMEs, even though Romania badly needs funding in the targeted areas. No projects were signed in the digital sector<sup>39</sup> (MEUR 10 approved in 2017 for financing the transition from analog to digital terrestrial television<sup>40</sup>.)

<sup>39</sup> <http://www.eib.europa.eu/efsi/efsi-projects/index.htm?c=RO&se=4>

<sup>40</sup> <http://www.eib.org/projects/pipelines/pipeline/20160522>

**Figure 16 EFSI approved projects in Romania**



Source: EIB

[http://www.caleaeuropeana.ro/wp-content/uploads/2017/03/EN\\_Presentation-IPE-Romania-10032017\\_EC\\_Nora\\_Matei\\_vFinal.pdf](http://www.caleaeuropeana.ro/wp-content/uploads/2017/03/EN_Presentation-IPE-Romania-10032017_EC_Nora_Matei_vFinal.pdf)

### 3.5 European territorial cooperation

European **Cross-Border cooperation (Interreg V-A)** supports cooperation between NUTS III regions<sup>41</sup> from at least two different Member States lying directly on the borders or adjacent to them. It aims to tackle common challenges identified jointly in the border regions and to exploit the untapped growth potential in border areas, while enhancing the cooperation process for the purposes of the overall harmonious development of the Union. For the period 2014-2020, Interreg V-A covers 60 cross border operational programs ERDF allocation (EUR 6.6 billion). Romania is cooperating in two cross-border cooperation programmes, namely Interreg V-A Romania-Bulgaria<sup>42</sup> and Interreg V-A Romania- Hungary<sup>43</sup>, amounting to MEUR 215, respectively MEUR 190.

Another cross-border programme is [the Joint Operational Programme Romania – Republic of Moldova 2014-2020](#) (JOP RO-MD 2014-2020). This joint cooperation programme comprises several ICT-related priorities i.e. Priority 1.2 –Promotion and support for research and innovation and Priority 3.1 –Development of cross border transport infrastructure and ICT Infrastructure, namely Joint investments in ICT

<sup>41</sup> <http://ec.europa.eu/eurostat/web/nuts/overview>

<sup>42</sup> <http://www.interregrobg.eu/en/>

<sup>43</sup> <http://interreg-rohu.eu/en/home-en/>

infrastructure with cross-border impact (e.g. optic fibre services), development of cross-border connections, information and integrated communications networks and services, upgrading existing facilities to enable linkages between communities and public services.

**Transnational cooperation (Interreg B)** involves regions from several EU countries and aims to promote better cooperation and regional development by a joint approach to tackle common issues. Interreg B supports a wide range of project investment related to innovation, environment, accessibility, telecommunications, urban development etc. Themes covered include: innovation, especially networks of universities, research institutions, SMEs; environment, especially water resources, rivers, lakes, sea; accessibility, including telecommunications, and in particular the completion of networks; sustainable urban development. The EU funding opportunities available in the period 2014-2020 for Interreg B amounts to EUR 2 billion. Romania is cooperating in Interreg V-B Danube<sup>44</sup> (MEUR 202).

**Interregional cooperation Interreg C** covers four interregional cooperation programmes i.e. Interreg EUROPE, INTERACT, URBACT and ESPON (MEUR 500 in total) aiming at improving cohesion policy through exchange of experience, transfer of good practices on thematic objectives such as innovation, SMES, low carbon economy and environmental protection (Interreg EUROPE<sup>45</sup>), technical assistance and service delivery (INTERACT), enhancing institutional capacity (ESPON) and promoting sustainable urban development (URBACT). Romania participates to all these interregional programmes.

North East region has been involved (lead partners and partners) in 4 ICT & Digital society Interreg projects<sup>46</sup> i.e. DIGITAL COOPERATIVES and OSEPA (INTERREG IV C), "The Internet: E-friend or E-enemy? IFE and "Information Technology in Cross Border Co-operation "(IT-CBC) (Romania-Ukraine-Moldova ENPI CBC). No projects are recorded in the current 2014-2020 programming period. Romania has a total of 30 ICT-related projects in Romania (ICT and digital society) in finished Interreg projects<sup>47</sup>, all in programming period 2007-2013 (Interreg IVC, South East Europe, Romania - Bulgaria (RO-BG), Hungary-Slovakia-Romania-Ukraine ENPI CBC, Hungary - Romania (HU-RO)).

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<sup>44</sup> [www.interreg-danube.eu](http://www.interreg-danube.eu)

<sup>45</sup> <http://www.interregeurope.eu/> ,  
[http://www.interregeurope.eu/fileadmin/user\\_upload/documents/Interreg\\_Europe - CP\\_final.pdf](http://www.interregeurope.eu/fileadmin/user_upload/documents/Interreg_Europe - CP_final.pdf)

<sup>46</sup> Interreg / Territorial Cooperation projects with aggregated data from KEEP at  
<https://www.keep.eu/keep/search>

<sup>47</sup> Interreg / Territorial Cooperation projects with aggregated data from KEEP at  
<https://www.keep.eu/keep/search>

Summing-up on European territorial cooperation programmes, support to ICTs as enablers of innovation, knowledge creation, employment and thus to smart growth is treated:

- As an **ICT topic by itself i.e. Enhancing access to and use and quality of ICT** (URBACT<sup>48</sup>);
- As a **cross-cutting theme** that links in with the other thematic objectives of interregional / inter-territorial/cross-border programmes, such as for instance:
  - o Part of regional policies for innovation, targeting issues as the availability of research and competence centres with SME support services and ICT infrastructures (INTERREG Europe) or boosting the research and innovation performance of the Danube region (Danube)
  - o Exchange practices on the relevance, the use and the management of ICT innovation vouchers schemes and development of ICT skills for SMEs (INTERREG Europe);
  - o Business support to the digital economy (innovation in digital technologies) or through the development of e-services by SMEs (INTERREG Europe);
  - o ICT-based solutions that play a key role in other regional strategies, for instance contributing to low carbon strategies and environmentally-friendly transport (INTERREG Europe and Interreg V-A<sup>49</sup>); conserving, protecting, promoting and developing natural and cultural heritage (INTERREG Europe); more efficient use of resources (INTERREG Europe); for making accessible territorial characteristics of European regions through mobile devices (tablets, smartphones) (ESPON)

### 3.6 National funding

The range of measures funded in national programmes (national plans and national OPs) includes research and innovation, measures for deployment of broadband infrastructure and research infrastructures, digital skills and digital literacy, ICT in applications, products and services, demand-side measures, support to innovative SMEs and for new approaches to promoting close-to-market innovation activities (prototyping, demonstration, piloting).

**The National Strategy on Digital Agenda for Romania** targets both directly the ICT as a sector as well as an enabling technology at a sectorial level , including: eGovernment, Interoperability, Cyber Security, Cloud Computing, Open Data, Big Data and Social Media; the development of broadband and digital services infrastructure; the development of ICT infrastructure in education, health and culture in education. A specific line of action is dedicated in the digital strategy to the support for research and innovation in ICT. The strategic lines of research and innovation include: the promotion

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<sup>48</sup> [http://urbact.eu/sites/default/files/u\\_iii\\_op\\_oct\\_2015.pdf](http://urbact.eu/sites/default/files/u_iii_op_oct_2015.pdf)

<sup>49</sup> <http://www.interregrobg.eu/ro/>

of innovative clusters<sup>50</sup> and of the competitiveness poles for regional growth concentrated upon the fields with a comparable advantage (virtual clusters<sup>51</sup> can also be considered for investment), the development of the research infrastructures, funding of innovative start-ups.

**The National Research, Development and Innovation (RDI) Strategy 2015-2020 (NS 2020)** counts on the ICTs (priority ICT, security and space) as one of the four priority areas of smart specialization which underpin the national strategy, alongside biochemistry; energy, environment, climate change; and eco-nano-technologies and advanced materials. Three other priority areas are considered of national interest, namely health; heritage and cultural identity; new and emerging technologies.

**NP 2020** will be implemented through the 2014-2020 National Plan for RDI (NPIII) and the OP Competitiveness. The NPIII has five funding programmes: (1) Development of national research and development system (to stimulate young research teams, awards for research results, projects for reintegration of diaspora researchers, projects of investments in research and development infrastructure of regional, national or pan-European interest, projects of specialization on scientific and technological areas); (2) Increase competitiveness of the Romanian economy through research, development and innovation (support for the development of models / solutions for products, technologies, methods, systems, new or significantly improved services, the implementation of prototypes / pilot facilities, support for outsourced research in partnership with public research organizations, to commission production / implementation / operation of products, technologies / new systems to the economic operator or another category of beneficiary of the project); (3) European and international cooperation, program which supports participation in international research projects such as participation in Horizon 2020; participation in Joint Programming Initiatives and Joint Technology Initiatives; participation in international initiatives such as EUREKA, EUROSATRS; (4) Fundamental and border research which aims to maintain and develop niche areas in which basic Romanian research has competitive advantage and critical mass of researchers; and (5) Research in areas of strategic interest (nuclear physics and high-power lasers research, particularly in connection with the future ELI-NP infrastructure; participation in atomic and subatomic physics programmes such as EURATOM, CERN, FAIR, CEA, F4E; STAR programme for advanced space research and technology; research in river-delta-sea systems, particularly in connection with the future DANUBIUS-RI infrastructure).

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<sup>50</sup> Clusters as geographical concentrations of small enterprises, usually SME's, which interact with one another and also with clients and suppliers, and which usually have in common a fund of specialized man power, financial services and for the enterprises, facilities in the field of innovation and formation

<sup>51</sup> A virtual cluster is a concentration of SMEs distributed geographically, but grouped together by common interest through means of technology

**Competitive calls**<sup>52</sup> launched in 2017 for activities that fall within the ICT domain with smart specialization potential, will cover for instance: ICT Innovation vouchers for highly innovative SMEs<sup>53</sup>, experimental demonstrations and innovative solutions<sup>54</sup> (e.g. UAV<sup>55</sup> or software platform for malware analysis on mobile devices)<sup>56</sup> under the sub-programme for Competitiveness through RDI funds experimental demonstration and experimental development projects.

ICT investment in OP Competitiveness covers four main areas for development: a) e-government, interoperability, cyber-security, cloud computing and social networks, b) use of ICT in education, health, social inclusion and culture c) e-commerce, clusters and developing innovation through ICT and d) further deployment of the broadband infrastructure. Investment priorities that include ICT research are related to TO2 - Information and communication technologies, but TO1 - Strengthening research, technological development and innovation would also include ICT research. Currently, there are two open calls (continuous submission) in OP Competitiveness TO1, namely on innovative start-ups and spin offs and on synergies with R&D&I activities in H2020 and other international programmes. Planned new calls in 2017 (aprox. MEUR 300) under TO1 are for innovative technological projects, innovation clusters, TT partnerships, investments in research infrastructures such as [DANUBIUS](#) and GRID-type projects (such as the Romanian educational and research network RoEduNet).

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<sup>52</sup> <http://uefiscdi.gov.ro/UserFiles/File/PNCDI%20III/agenda%20comp/agenda/Agenda-competitionala-PNCDI-III-2017.02.03.pdf>

<sup>53</sup> [http://uefiscdi.gov.ro/UserFiles/File/CI2017/Pachet\\_de\\_informatii\\_cecuri\\_de\\_inovare.pdf](http://uefiscdi.gov.ro/UserFiles/File/CI2017/Pachet_de_informatii_cecuri_de_inovare.pdf)

<sup>54</sup> <http://uefiscdi.gov.ro/articole/4723/Solutii.html>

<sup>55</sup> <http://uefiscdi.gov.ro/articole/4803/Platforme-UAV-vehicule-aeriene-fara-pilot-uman-cu-capabilitati-dedicate-si-infrastructura-suport-pen.html>

<sup>56</sup> <http://uefiscdi.gov.ro/articole/4831/Platforma-software-integrata-pentru-analiza-malware-a-terminalelor-mobile.html>

## 4. Case-studies

This section contains a series of six case studies which develop ideas generated during the EDP focus groups in North-East region. The methodology for the selection of ideas is presented in Section 1. These ideas will be further discussed in future EDP workshops and Project Development Labs (PDL) and planned to be organized in the North-East region later in 2017.

**Table 2 Ideas developed in the "case studies"**

Idea	Prospective ICT contribution as a KET as discussed in the EDP focus groups
Smart Healthcare, Well-Being and Ageing Well	Digital innovations for empowering the patient ICT technologies and applications for health monitoring ICT products, services and solutions for elderly, people with special needs Development of online information portals for education on health
Security and data analysis in healthcare	Big Data solutions for the analysis of overall health Cloud solutions for secure storage of medical information
Smart and Secure Agri-food	ICT solutions for traceability in agro- food sector Development of online information portals on healthy food habits, organic farming and for access to online marketplaces in agro-food sector
Smart Efficient Energy	ICT solutions of smart metering and smart parking Development of online information portals on energy saving and energy efficiency
Personalized learning experiences	Technologies for personalized learning in multiple contexts (schools, workplace, lifelong) e.g. gaming, AI, mobile, cloud, virtual reality Development of personalized learning environments
Digital innovations and new business models	New business models in digital fashion ICT solutions for digital marketing, branding and business promotion e.g. in fashion and agro-food sector

Each resulting idea was cross-examined to include prospective ICT contribution potential, taking into account the EDP discussions and current opportunities, the perceived knowledge/actors synergy, funds that could be relevant to further of the development of the idea, as well the international dimension. Given that participants in the EDP focus groups have not indicated any required expertise from outside the region to implement the project ideas, for the purpose of this study, the international

dimension<sup>57</sup> is explored from the perspective of the international cooperation opportunities in the Work Programme 2016-2017 of H2020<sup>58</sup>, where almost a third of the calls for collaborative research projects are marked as specifically relevant for international cooperation<sup>59</sup>. Other cooperation frameworks are indicated under a separate field, where available.

The template used for the development of the case studies is based on a similar one adopted in previous projects by the JRC<sup>60</sup> and adapted for the particular case of the “RIS3 in Lagging regions” in Romania project.

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<sup>57</sup> Participants in the EDP focus groups have not indicated any required expertise from outside the region to implement the project ideas and no Project Development Labs (PDL) have been organized to date in the Romanian regions to reflect on the ideas developed in the EDP focus groups in order to explore how available funding could potentially support them.

<sup>58</sup>

[https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/ftags/international\\_cooperation.html#c\\_topics=flags/s/IntlCoop/1/1&+callStatus/asc](https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/ftags/international_cooperation.html#c_topics=flags/s/IntlCoop/1/1&+callStatus/asc)

<sup>59</sup> [http://ec.europa.eu/research/iscp/pdf/iscp\\_wp\\_2016\\_17.pdf](http://ec.europa.eu/research/iscp/pdf/iscp_wp_2016_17.pdf)

<sup>60</sup> <http://s3platform.jrc.ec.europa.eu/case-studies>

## Smart Healthcare, Well-Being and Ageing Well

*Disclaimer - This case study also provides some indications as to which funds could be relevant to this idea identified during the Entrepreneurial Discovery Process (EDP) in the North-East region, beyond those provided by the ROP. It is provided to stimulate further the development of the idea in future project development labs and EDP workshops planned to be organized in the North-East region. However, it must be intended as exploratory and non-exhaustive.*

### Title of idea

Smart Healthcare, Well-Being and Ageing Well

### Short description of idea

The idea refers to digital innovations for empowering citizens to manage their own health (health management) and disease (disease prevention), with focus on patients and/or healthy persons, "Silver" economy, healthy aging and healthy living for disadvantaged people.

### How was the idea developed?

The idea is a grouping of ideas developed in the EDP focus group on ICT in NE in "Big data analysis, management and security/ e-Health", "Silver" economy, healthy aging and healthy living for disadvantaged people".

### How can ICT, as a key enabling technology, enhance this idea?

As discussed in the EDP focus-groups, the ICT contribution to enhance the idea is multi-dimensional. It includes the development of ICT applications and solutions for health monitoring (remote monitoring, telemedicine), personalised health technologies, mobile and/or portable and other new tools, new diagnostics, sensors and devices (including software) for monitoring and personalised services , prevention and self-care; digital innovations for empowering the patient ; ICT products, services and solutions for elderly, people with special needs. Elements of the idea would also include the development of online information portals for providing access to a variety of health information.

In the field of ICT for health and wellbeing ('eHealth')<sup>61</sup>, some successful EU research and innovation projects (on-going or recently finished) are in the area of health and care management e.g. in personal health in general, preventive healthcare, mobile health and in the area of innovation in healthcare and services e.g. knowledge sharing & infrastructure for eHealth experts and health professionals, telemedicine, patient empowerment, Interoperability and cross-border healthcare, innovation procurement and mobile eHealth solutions.

<sup>61</sup> [Online brochure: Research and Innovation in eHealth \(updated: June 2016\)](#)

### **Knowledge and actors required**

The role of each element of the 4-ple helix in pursuing the opportunities for this idea as discussed in the EDP focus groups is:

Public sector: adequate legislation (e.g. medical tele-consultation) and infrastructure (e.g. Internet access in remote places), private sector support; licensing programs, providing support, legal guarantees and administrative, monitoring; support for communication and education activities, developing and providing information materials, conducting studies and research, creating the online information portal;

Private sector: development of software and hardware for e-health, technologies and health monitoring and alerting tools, platform development and implementation of the online information portal;

Academia/Research: Proposal of new innovative ideas and prototype development, providing scientific and medical expertise; support for communication and education activities, developing and providing information materials, conducting studies and research, creating the online information portal;

NGOs: promotion, education and information actors involved in the process, volunteering and providing care services, training and employment of unemployed people, support for communication and education actions, participation in the development and operation of the online information portal

### **Which specific parts of the idea could be funded under the TOs of the ROP?**

TO1: Fostering knowledge transfer could in principle be relevant for collaborative research and innovation through technology transfer, for innovative SMEs and spin-offs (including the design and building of a web-based information portal).

TO2: Strengthening SMEs competitiveness (facilitation of commercial application of new ideas and setting-up new businesses, including business incubators) could in principle be relevant for setting-up and development of services, which include websites for promotion of products and services for SMEs.

### **Which specific parts of the idea could be funded under EU Horizon 2020?**

Under H2020, funding opportunities in the area of ICT for health and wellbeing are in the pillar Societal challenges, the 'Health, demographic change and well-being' work programme part. The Work Programme 2016-2017 makes use of the whole range of instruments available i.e. collaborative research and innovation actions, SME instrument, prizes, innovative financing, programme co-fund, ERA-NET Co-Funds, coordinated and support action including support for Joint Programming Initiatives (JPIs). ICT, which has a prominent role in this societal challenge, is addressed in

dedicated topics in three parts of the unique call '[Personalised Medicine](#)': active ageing and self-management of health, methods and data, coordination activities. Innovation procurement for eHealth innovations for empowering the patient and for deployment and scaling up of ICT solutions for active and healthy ageing are addressed in calls for a PCP action (Pre-Commercial procurement) for eHealth innovations in empowering the patient (call [SC1-PM-12-2016: PCP - eHealth innovation in empowering the patient](#)), respectively a PPI action (Public procurement of innovative solutions) for [SC1-PM-13-2016: PPI for deployment and scaling up of ICT solutions for active and healthy ageing](#).

Measures targeting the acceleration of market introduction of the ICT solutions for health, wellbeing and ageing well for innovative SMEs are also foreseen under the SME instrument, call [SMEInst-06-2016-2017 - Accelerating market introduction of ICT solutions for Health, Well-Being and Ageing Well](#). This concerns both interoperable and secure eHealth solutions.

Pilot 1 'Smart Living Environments for Ageing Well' of the focus area call on 'Internet of Things' is jointly implemented by the "Health, Demographic Change and Well-being" Societal Challenge and the "Leadership in enabling and industrial technologies Information and Communication Technologies" (ICT LEIT) -[topic IoT-01-2016: Large Scale Pilots](#) in part 17 of the Work Programme. These priorities aim to support the development of evidence-based health and care policies, resulting from scientific research data, ICT solutions and good practices in interventions improving efficiency and quality of health and care systems.

Health challenges are global and the international dimension can be addressed in any of the work programme calls, where relevant. The international dimension is for instance specifically addressed in the following calls relevant for the idea: SC1-PM-12-2016: PCP - eHealth innovation in empowering the patient, addressing the opportunities for solution uptake across wider international procurement markets by aiming at interoperable solutions that are validated through field testing by participating procurers in multiple countries across Europe; SC1-HCO-01-2016: Valorisation of FP7 Health and H2020 SC1 research results for creating of a European web marketplace referencing all types of innovations such as patents, licensing opportunities, prototypes, products, technologies or services with a potential for future exploitation and/or commercialization (benchmarking of existing initiatives at European, Member States or international level, such as Enterprise Europe Network or the United States National Institutes of Health (NIH) Office of Technology Transfer).

Several topics are relevant to the third Sustainable Development Goal ('Ensuring healthy lives and promoting well-being for all at all ages') agreed by the United Nations in 2015. The use of European health research infrastructures (including e-infrastructures) is also encouraged when appropriate, e.g. research infrastructures established as a European Research Infrastructure Consortium (ERIC) or identified on the roadmap of the European Strategy Forum on Research Infrastructures (ESFRI).



### **Which other EU sources of funding could be relevant and for which parts of the idea?**

The Active and Assistive Living (AAL) programme funds projects in public-private partnership in the field of information and communication technology (ICT) for active and healthy ageing since 2008. The challenge for the AAL 2017 Call for proposals of the AAL Programme is "[AAL packages/Integrated solutions](#)".

EUREKA Eurostars calls are also relevant for R&D performing SMEs active in the health and wellbeing to get their innovation faster to the market.

The [European Fund for Strategic Investments \(EFSI\) funds support to investment in innovative health solutions](#). For instance, for innovative products, services and delivery solutions (including by SMEs, mid-caps and start-ups), new models of health infrastructure especially for primary and integrated forms of care, new technologies and e-health and medical education and training. EFSI and ESIF funding can be combined. EIB also offers financing under its [Health and Life Science line](#).

### **International dimension (other than H2020)**

The [European Innovation Partnership on Active and Healthy Ageing \(EIP AHA\)](#) aims to enable EU citizens to lead healthy, active and independent lives while ageing, improve the sustainability and efficiency of social and health care systems and boost the competitiveness of the markets for innovative products and services, responding to the ageing challenge at both EU and global level, thus creating new opportunities for businesses. The EIP on AHA is not a funding instrument. It aims to bring stakeholders together to exchange ideas, create and partner in projects.

The [Joint Programming Initiative \(JPI\) "More Years, Better Lives" \(MYBL\)](#) seeks to enhance coordination and collaboration between European and national research programmes related to demographic change. Health is one of the areas in focus. Currently 14 European countries and Canada are participating in the JPI "More Years, Better Lives". A call on [Aging in place in a digitising world](#) has been launched in 2017 addressing the ways in which the health and wellbeing of older people, at all stages of later life, is supported and promoted through the design of the social and physical environment, access to opportunities to learn, and the use of technologies of all kinds. The objective is seeking for innovative, transnational and interdisciplinary collaborative projects that investigate the potential of technology, place and learning in relation with the older.

### **Which national sources of funding could be relevant and for which parts of the idea?**

OP Competitiveness and Operational Programme Human Capital fund the implementation of ICT solutions i.e. eHealth, telemedicine, exchange of best practices / supply necessary training programs for staff involved in the use of new equipment and technologies.

In particular, PA1 - Enhancing research and innovation (R&I) infrastructure and capacities to develop R&I excellence, and promoting centres of competence, in

particular those of European interest and PA2. Information and communication technologies for a competitive digital economy, Priority 2c are relevant for the idea. PA1 covers actions for increasing capacity in the areas of smart specialization, CDI and health. PA2 addresses the development of ICT applications for e-government, e-learning, e-inclusion, e-culture and e-health. ICT applications strengthening (e-health) are also funded through OP Human Capital ("soft" investments). OP Competitiveness also funds the creation of online social platforms and data centres, developing unique web portal with access to all public services on websites of public institutions. Complementary support is available through NPIII for integrated solutions based on ICT to support active, healthy and independent living of older adults.

#### **Which other transnational or interregional sources of funding could be relevant?**

This idea could benefit from actions under [INTERREG EUROPE](#) on business aspects e.g. promoting business investment in R&I, promoting investment in product and service development, technology transfer, social innovation, eco-innovation, public service applications, demand stimulation, networking, clusters and open innovation through smart specialisation, technological and applied research, pilot lines, early product validation actions, advanced manufacturing capabilities and first production, in particular in key enabling technologies and diffusion of general purpose technologies (under TO1: Strengthening research, technological development and innovation). In this specific objective, the cross-cutting theme of ICTs can for instance be reflected in regional policy support to innovation in digital technologies. The types of actions to be funded are interregional Cooperation Projects and Policy Learning Platforms. An example of INTERREG Europe funded project is [ITHACA- InnovaTion in Health And Care for All](#) on inter-regional exchange of experiences and good practices on smart health and care innovation.

## Security and data analysis in healthcare

*Disclaimer - This case study also provides some indications as to which funds could be relevant to this idea identified during the Entrepreneurial Discovery Process (EDP) in the North-East region, beyond those provided by the ROP. It is provided to stimulate further the development of the idea in future project development labs and EDP workshops planned to be organized in the North-East region. However, it must be intended as exploratory and non-exhaustive.*

### Title of idea

Security and data analysis in healthcare

### Short description of idea

The idea builds on the identified need for integrated data collection and security for storage of medical information for the analysis of health.

### How was the idea developed?

The idea was developed in the EDP on ICT in NE ("Big data analysis, management and security/ e-Health" working group).

### How can ICT, as a key enabling technology, enhance this idea?

As discussed in the EDP focus-groups, the ICT contribution is seen on Big Data solutions for analysis of overall health and development of cloud solutions for secure storage of medical information.

**Applications of Big Data<sup>62</sup> in health** come in the following areas: (a) increasing the effectiveness and quality of treatments , (b) prevention of diseases, (c) patient safety, (d) prediction of outcomes, (e) knowledge dissemination, and (f) reduction in inefficiency and waste, improvement in cost containment.

In the specific **context of health**, **Big Data<sup>63</sup>** refers<sup>64</sup> to "*large routinely or automatically collected datasets, which are electronically captured and stored. It is reusable in the sense of multipurpose data and comprises the fusion and connection of existing databases for the purpose of improving health and health system performance.*" Data sources for Big Data in health are continuously evolving and include health care records and patient summaries, social media, genomic data, pharmaceutical data, insurance claims, telemedicine, mobile applications and sensors, income statistics, environmental databases and so on. Many healthy

<sup>62</sup> Big Data refers to vast quantities of data generated by economic and social activities as direct consequence of significant advances in technology and fueled by the use of ICTs, electronic devices and networks, and the digitalisation of production processes. Although there is no widely accepted definition, Big Data can be characterized by some specific features or characteristics coined as 3V's or 5V's, such as Volume, Variety, Velocity, Veracity and Variability - Gartner (2001), De Mauro, Andrea; Greco, Marco; Grimaldi, Michele (2016), OECD (2013)

<sup>63</sup> Big Data in Davos <https://www.weforum.org/agenda/2017/01/2017-is-the-year-healthcare-goes-sci-fi>

<sup>64</sup> Big Data in health report

[https://ec.europa.eu/health/sites/health/files/ehealth/docs/bigdata\\_report\\_en.pdf](https://ec.europa.eu/health/sites/health/files/ehealth/docs/bigdata_report_en.pdf)

consumers are taking an active role in maintaining their health and well-being by using smartphones and wearables to track their diets, exercise records and their vital signs. Data collected can be processed to identify patterns and extract meaningful relationships.

The use of advanced computational techniques is increasingly required to demonstrate trends, patterns of care and of illness. The analysis of data can be used to improve therapies and medical practices. The combination of data sources should provide a comprehensive view of the health care pathway, the patient characteristics, the services provided and the health outcomes of the services. The integration of clinical data with other contextual, real-world data provides for the possibility of the development of Big data analytical methods and tools e.g. data mining, living laboratories, rich open data repositories for high-quality analysis of health information.

**The cloud**<sup>65</sup> makes it easier to exploit this data. The Cloud can be understood as the combination of three interdependent elements: the data infrastructures which store and manage data; the high-bandwidth networks which transport data; and the computers which can be used to process the data.

**Cloud technology in healthcare**<sup>66</sup> can be applied in a number of ways: (a) using cloud technology for connecting mobile devices, (b) storing patient-related data during treatment for patient care , (c) using healthcare data for clinical research and public health.

Cloud services can enable remote access at anytime from anywhere to applications and health data via the Internet. **Cloud service offerings**<sup>67</sup> for healthcare, cover a wide range of capabilities, which include health management e.g. tracking diseases, care management support e.g. cloud based practice management, medical records and medical image archiving solutions and diagnostic support, cognitive assistance for practitioners / patients e.g. machine learning, natural language processing and advanced analytics, exchange of health data between organisations, such as electronic health records or patient images.

There are substantial advantages for the utilization of cloud computing in healthcare, however specific considerations must be addressed such as privacy and **security**, service reliability, integration, interoperability and portability and standards. "**Privacy by design**" approaches ensure secure storage of information including personal data but also guarantee safe exchange of these data over a number of architectures of differing security levels preventing unauthorised access, loss of data and cyber-attacks.

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<sup>65</sup> "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." (NIST, 2014)

<sup>66</sup> eHealth Network report on the "Use of cloud computing in health"

<sup>67</sup> <http://www.cloud-council.org/deliverables/CSCC-Impact-of-Cloud-Computing-on-Healthcare.pdf>

A number of H2020 joint research initiatives in the context of the international cooperation on cloud computing have already been put in place with Japan, Brazil and South Korea (workprogramme LEIT). On the topic combining Big Data with cloud computing, the following cooperation frameworks are relevant: (1) an EU-Brazil coordinated call on cloud computing, including security aspects, was published in the first Horizon 2020 Work Programme 2014/2015 as part of the third Coordinated Call jointly funded by the EU and Brazil, which focuses on Advanced Cyber Infrastructures. Two research projects focussing on cloud computing technologies including security aspects have been selected: [SecureCloud](#) (2016-2018) and [EUBRA-BIGSEA](#) (2016-2018). A third one, [EU-Brazil Cloud Forum](#) (2016-2018) will define the research priorities for the next collaboration under work programme 2018-20. Ensuing projects will develop innovative technologies for cloud-based service provision and consider also security concerns. The focus of EU-Brazil collaboration will be on cloud-centric applications for Big Data; (2) as part of the EU-Japan cooperation in H2020, two projects were selected on combining cloud with IoT and Big Data: iKaaS (2014-2017), a project that aims to deliver intelligent Knowledge-as-a-Service, and BIGCLOUD (2016-2019).

#### **Knowledge and actors required**

As an outcome of the EDP, the role of each element of the 4-ple helix in pursuing the opportunities for this idea is:

Public sector: Data collection

Private sector: Application development, maintenance, training users, auditing safety standards

Academia/Research: Selecting the required data collection process

#### **Which specific parts of the idea could be funded under the TOs of the ROP?**

Support for collaborative research and innovation through technology transfer is available under TO1- Fostering R&D&I. In particular, Priority 1.1 Promoting R&D&I investments, developing links and synergies between enterprises, R&D centres and the higher education sector targets support for innovation and technology transfer in smart specialization areas.

Support for innovative SMEs and spin-offs (including changes in business model) is available under PA2 -Strengthening SMEs competitiveness (facilitation of commercial application of new ideas and setting-up new businesses, including business incubators).

#### **Which specific parts of the idea could be funded under EU Horizon 2020?**

Some examples of H2020 funded projects on Big Data supporting public health projects include MIDAS: develop an integrated solution that allows the users to tap into evidence-based actionable information from various sources for health policy;

EVOTION: use of Big Data in supporting a holistic approach to hearing loss ; BigO: use of Big Data for childhood and adolescent obesity ; PULSE: use if Big Data from different sources to change public health from a reactive to a predictive system

### Funding for Big Data for health:

- Collaborative projects (research and innovation action) are foreseen on:
  - o Record linkages and data analysis for health policies –under Societal Challenges pillar, the Work Programme 2016-2017 part on "[Health, demographic change and well-being](#)", the [SC1-PM-18-2016 topic on Big Data For Public Health Policies](#) (part of the call H2020-SC1-2016-2017 on Personalised Medicine)
  - o Support of Big Data for better diagnosis and treatment outcomes of chronic diseases such as cancer – under call topic [IMI2-2016-10-02](#) (Innovative Medicines JTI). In 2015, Big data in the areas of Alzheimer's disease and blood cancers, medicines safety and respiratory disease were the focus of a €93 million Call for proposals launched by the Innovative Medicines Initiative (IMI) (Big Data for Better Outcomes programme). The programme aimed to facilitate the use of diverse data sources to deliver results that reflect health outcomes of treatments that are meaningful for patients, clinicians, regulators, researchers, healthcare decision-makers. A second PPP is foreseen on the Big Data Value to promote best uptake of Big Data Value technologies and services;
- Pilots and targeted demonstrations (innovation actions) in data-intensive sectors, such as health, involving key European industry actors – call [ICT-15-2016-2017 – topic "Big Data PPP: Large Scale Pilot actions in sectors best benefitting from data-driven innovation"](#) (LEIT WP part). Large Scale Pilot actions will propose replicable solutions by using existing technologies or very near-to-market technologies that could be integrated in an innovative way and show evidence of data value;
- Support for innovative SMEs is addressed in the calls under the [SME Instrument](#) e.g. call [SMEInst-06-2016-2017](#) for the acceleration of the market introduction of ICT solutions for Health, Well-Being and Ageing Well. Several funded projects have addressed in 2015 and 2016 the use of Big Data for health, such as : Mind the Byte (phase 1 [SMEInst-1-2015](#) Open Disruptive innovation) on the use of Big Data techniques for processing of omics data (genomics and proteomics) for personalised medicine, WhiteBox EE (phase 1 [SMEInst-13-2016-2017](#)) on a Big Data EEG Recording and Analysis platform and SEIZSAF (phase 2 [SMEInst-13-2016-2017](#)) on a patient-self-adaptive system for detection, recording and alert to caregivers of night-time seizures, linked to private cloud platform for patient tracking and big data exploitation.

A number of other H2020 calls have Big Data strands, such as [CO-CREATION-06-2017 \(Europe in a changing world – inclusive, innovative and reflective Societies part\)](#) on policy development fuelled by Big Data:

- Research and Innovation Actions for methodological development for using big data in policy development, including development of scalable and transferable methods and re-usable tools for mining, compilation, analysis,

- meta-data schemes, data linking or for reconciliation of multiple data sets to render coherent narratives and visualisation of data, for policy modelling to improve the predicative analysis capacity and policy design and implementation (e.g. through the greater use of randomised controlled trials based on behavioural science);
- Coordination and support actions for networking of relevant stakeholders working in the area of data-driven policy-making and policy-modelling ;

A number of H2020 have had **cloud computing** as a topic (not health-related in particular):

- A general call for cloud computing [ICT-06-2016](#) for research and innovation actions (including cloud infrastructure, cloud networking, security and privacy in cloud infrastructures ) and innovation actions (for experimentation and deployment of cloud services and cloud computing for SMEs and Public Sector Innovation)
- A dedicated call in H2020 [H2020-INFRADEV-2016-2017](#) on European Open Science Cloud for Research will focus on the development and early implementation of the governance structure of the cloud.

**Digital security of health-related data** is addressed in the workprogramme part on [Secure societies – Protecting freedom and security of Europe and its citizens](#), for instance call [H2020-DS-2016-2017](#) addresses secure storage and exchange (including cross-border) of data, protection and control over personal data, and security of health related data gathered by mobile devices combined with the usability of the eHealth solutions.

#### Which other EU sources of funding could be relevant and for which parts of the idea?

[EIB support for digital economy](#), in particular of ICT application and services across industries such as healthcare. ICT services include supporting the development of various, typically public sector services such as e-government, e-health and e-business enabled by ICT infrastructures. It therefore also includes investments in datacenter facilities and associated hosted services such as cloud.

#### International dimension (other than H2020)

Big Data Value PPP is a partnership between the European Commission and the Big Data Value Association ([BDVA](#)), the association of the European Big Data community which includes data providers, data users, data analysts and research organisations. The first Horizon 2020 projects implementing the Big Data Value PPP have started in late 2016 and January 2017 (see section on H2020 funding). [Healthcare](#) is one of the priority areas.

### **Which national sources of funding could be relevant and for which parts of the idea?**

Investments in cloud infrastructure in the public sector can come under PA2. Information and communication technologies for a competitive digital economy, Priority 2a (Supporting the expansion of broadband connections and high-speed networks and the adoption of new technologies and networks for the digital economy).

Cloud computing expenses as part of e-health, e-government, e-learning, e-inclusion projects fall under Priority 2c - Strengthening ICT applications for e-government, e-learning, e-inclusion, e-culture and e-health. Action 2.1.1 is specifically addressing development of cloud computing and Big Data (platforms and solutions), also for healthcare.

Innovative projects (new /improved products or processes), R&D for innovative start-ups and spin-offs, innovation vouchers can be funded under PA1 ("R&D&I supporting economic competitiveness and the development of businesses").

Support for thematic R&D projects and public co-financing for Horizon 2020 and for projects run under the bilateral international cooperation agreements, Joint Programming Initiatives (JPI, JTI etc., especially in smart specialization fields and twinning projects (focusing mainly on staff mobility) can be funded under NP RDI 2020. Cloud computing expenses as part of a project to up-skill workers, researchers, etc. can be part of the OP Human Capital.

### **Which other transnational or interregional sources of funding could be relevant?**

This idea could benefit from actions under [INTERREG EUROPE](#) - Research and innovation, Objective 1.2: Improving innovation delivery policies. A [project idea in 2017](#) addresses the understanding and adoption of big data and predictive analytics tool to transform the way public services are co-created and delivered through different models toward open collaborative governments and strengthen capabilities of policy-makers to co-design big-data driven innovation policies for regional development, addressing different societal challenges such as health.

## Smart Agri-food

*Disclaimer - This case study also provides some indications as to which funds could be relevant to this idea identified during the Entrepreneurial Discovery Process (EDP) in the North-East region, beyond those provided by the ROP. It is provided to stimulate further the development of the idea in future project development labs and EDP workshops planned to be organized in the North-East region. However, it must be intended as exploratory and non-exhaustive.*

### Title of idea

Smart agri-food

### Short description of idea

This idea refers to the development of solutions for addressing food safety. Implementation of effective traceability<sup>68</sup> systems improves the ability to implement verifiable safety and quality compliance programs. The resulting visibility of relevant information enables agri-food businesses to better manage risks and allows for quick reaction to emergencies, recalls, and withdrawals. Some elements of the idea concern the dissemination of information and educating the consumers on healthy food habits and organic farming, as well as the development of online marketplaces providing a virtual business space where buyers can find solutions from suppliers and suppliers can showcase their products or services to the community of buyers.

### How was the idea developed?

The idea was developed in the EDP focus group on ICT in NE in "Traceability of food Ecological Agriculture" and in the EDP on Agro-food in NE.

### How can ICT, as a key enabling technology, enhance this idea?

As discussed in the EDP focus-groups, the ICT contribution is seen on two main directions: development of ICT solutions for traceability in agri-food and development of online information portals for education on healthy food habits, organic farming and for access to online marketplace in agro-food.

ICTs have multiple applications in the agri-food industry<sup>69</sup> such as the streamlining of the traditional industrialized supply chain through the application of sensors and the creation of more integrated business processes and creation of new forms of supply chains that augment food products through data and new technologies, as well as the creation of reliable, secure, robust and economically sustainable new forms of supply chains. The use of ICTs for traceability can lead to improved consumer protection and

<sup>68</sup> Traceability is the ability to identify the origin of food and feed ingredients and to follow its movement through specified stage(s) of production, processing and distribution

<sup>69</sup> Ericsson "ICT and the future of food and agriculture"

food safety<sup>70</sup>. ICT technologies and applications related to the development of traceability<sup>71</sup> comprise :

- Sensing applications for monitoring of the condition of crops and livestock on farms and for the supply chain management by using radio frequency identification (RFID) solutions, wireless sensor networks for monitoring of perishable goods, satellite and remote sensing technologies and devices for collection and analysis of data, and combination with GIS tools and development of specific tools such as geoidentifiers and geoindicators for applications of geotraceability systems in supply chains, smart tags and quality sensors as indicators of status of products for sellers and consumers;
- Applications across the value chain (from farmers to consumers) such as block-chain technologies.

Big data and Cognitive Technologies can further improve traceability by allowing farmers and other players in the value chain to make better informed decisions assisted by cognitive technologies such as machine learning and intelligent connectivity.

As an additional element of the idea, web-based platforms can be developed as hubs for education and information on organic farming, healthy food, and ecological agriculture, and for online marketplaces that can provide a virtual business space where buyers can find solutions from suppliers and suppliers can showcase their products or services to the community of buyers. Virtual and augmented reality technologies<sup>72</sup>, recommendation engines based on artificial intelligence and ecommerce solutions can be used to produce a smart marketplace for products customization.

#### **Knowledge and actors required**

Traceability was addressed in the EDP focus groups in relation to the quality standards for ecological products in general and did not include elements on the contribution of ICT to enhance this part of the idea.

The role of the 4-ple helix for the development of online information portals is:

Academia / research: support for communication and education activities, developing and providing information materials, conducting studies and research, creating the online information portal;

Private sector: Participation with information, support for the communication and education actions, participation in the development and operation of the online information portal;

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<sup>70</sup> World Bank 2012, "Mobilising the agricultural value chain" in "Information and Communications for Development 2012" series

<sup>71</sup> S3P Platform Scoping Note "Traceability and Big data" 2017 based on Kumari et al., 2015 and Poppe, 2016,

<sup>72</sup> <http://furnit-saver.eu/>

Public sector: planning the communication strategy, participation with information, support for communication and education actions, participation in the development and operation of the online information portal;

NGOs: participation with information, support for communication and education actions, participation in the development and operation of the online information portal

#### **Which specific parts of the idea could be funded under the TOs of the ROP?**

Support for collaborative research and innovation through technology transfer is addressed under TO1- Fostering R&D&I. In particular, Priority 1.1 Promoting R&D&I investments, developing links and synergies between enterprises, R&D centres and the higher education sector targets support for innovation and technology transfer in smart specialization areas. The design and build a web-based information platform can in principle be covered as support actions for technology transfer activities in TO1-Research and innovation. The development of online marketplaces could in principle be covered under TO2 -Strengthening SMEs competitiveness.

#### **Which specific parts of the idea could be funded under EU Horizon 2020?**

The main work programme relevant for this idea is the [Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy](#). Under this programme, the call Robotics Advances for Precision Farming ([SFS-05-2017](#)) is focused on the design, development and testing of robotics systems for precision farming, including autonomous or semi-autonomous farm vehicles or sophisticated sensors and intervention mechanisms. The actions will prioritise technologies such as selective harvesting, more targeted weed reduction or environment friendly fertilization, and / or livestock management, based on better planning and targeted intervention, using sensors (local and aerial, even maybe earth observation satellite). This will also allow the tagging of agricultural produce or livestock for better traceability and subsequent big data processing, optimizing the whole agricultural process.

Other relevant H2020 calls are in SME instrument, which supports close-to-market activities, with the aim to give a strong boost to breakthrough innovation, particularly [SMEInst-07-2016-2017](#) on stimulating the innovation potential of SMEs for sustainable and competitive agriculture, forestry, agri-food and biobased sectors. In the case of SMEs using ICT as enabling technologies to bring breakthrough and commercially competitive products to the market, examples of relevant projects in the area of food and agricultural traceability are CROPTI or FruitWatcher (phase 1 october 2016)<sup>73</sup>. Fast Track Innovation also promotes close-to-market activities.

<sup>73</sup> [https://ec.europa.eu/research/participants/portal/doc/call/h2020/smeinst-01-2016-2017/1742601-list\\_of\\_beneficiaries - sme\\_instrument\\_phase\\_1\\_\(october\\_2016\\_update\)\\_en.pdf](https://ec.europa.eu/research/participants/portal/doc/call/h2020/smeinst-01-2016-2017/1742601-list_of_beneficiaries - sme_instrument_phase_1_(october_2016_update)_en.pdf)

Calls in the [Information and Communications Technologies \(ICT\)](#) work programme in relation to the use of ICT for traceability are for validation and demonstration of photonic based systems (call [ICT-30-2017](#)) with focus on sensing ("trace and track") for process and product monitoring and analysis targeting the food and pharmaceutical industry, based on compact and miniaturized photonics sensors that include novel key photonics components and modules. Also, a call [ICT-03-2016](#) is focused on the development of and validation of miniaturized smart integrated systems, including micro-nano-bio systems (MNBS) solutions in particular for health and well-being, automotive, food, amongst others. Cross cutting activities include IoT.

Example of past "smart" EU-funded projects for online marketplaces in agri-food are [FOODIE](#) - CIP-ICT-PSP-2013-7 (offering a marketplace where data can be discovered and exchanged with the additional contribute of external companies that can publish their own agricultural applications), [SMARTAGRIFOOD](#) (online marketplace for ICT products (services and applications) for farmers and agricultural producers), [ICT-AGRI](#).

#### Which other EU sources of funding could be relevant and for which parts of the idea?

Access to finance for SMEs is also available under COSME, through dedicated financial instruments and EUREKA Eurostars<sup>74</sup> programme European funding for R&D SMEs. An example of EUROSTARS funded project in the area of ICT solutions for food traceability is [BONAFIDE](#) (Enabling consumer access to food product information and process data through mobile and web applications) (partners Romania and Iceland). [DESUMA](#) is an example of an EUROSTARS for the development of market place application (website) where developers can create working templates for guided selling solutions that can be used by retailers, manufacturers, telcos, etc. to integrate them into their existing online-, mobile and point of sales solutions. Guided selling is an innovative trend to support online-shoppers in their decision making process based on their personal needs.

[EIB support for digital economy](#), in particular of ICT application and services across industries and financing for innovative solutions for current and future challenges in the [agricultural sector, and/or food](#) production.

#### Which national sources of funding could be relevant and for which parts of the idea?

Innovative projects (new /improved products or processes), R&D for innovative start-ups and spin-offs, innovation vouchers can be funded under OP PA1 (" R&D&I supporting economic competitiveness and the development of businesses"). ICT investments fall under OP PA2. Information and communication technologies for a competitive digital economy. In particular, priority 2.1.1 foresees support for development of web portals.

<sup>74</sup> [https://www.eurostars-eureka.eu/sites/default/files/eurostars-sme-brochure-am-i-eurostar\\_0.pdf](https://www.eurostars-eureka.eu/sites/default/files/eurostars-sme-brochure-am-i-eurostar_0.pdf)

Support for development of clusters and ICT products and services for vertical integration of ICT innovative solutions to the economy is available under action 2.2.1. (online shops).

Specific measures for food chain organization are foreseen under in OP for Rural Development, priority 3, 3A -Improving competitiveness of primary producers receiving support for participating in quality schemes. Support for knowledge transfer and innovation in agriculture is also available in NRD priority 1. Support for thematic R&D projects and public co-financing for Horizon 2020 and for projects run under the bilateral international cooperation agreements, Joint Programming Initiatives (JPI, JTI etc., especially in smart specialization fields and twinning projects (focusing mainly on staff mobility) can be funded under NP RDI 2020. Further support for promoting dissemination of information is available in ESF.

**Which other transnational or interregional sources of funding could be relevant?**

[INTERREG Europe](#) cross-border and transnational cooperation programmes may support investments in the agri-food chain. On example is [FoodChains4EU project](#) which addresses innovation for sustainable food chains.

## Smart Efficient Energy

*Disclaimer - This case study also provides some indications as to which funds could be relevant to this idea identified during the Entrepreneurial Discovery Process (EDP) in the North-East region, beyond those provided by the ROP. It is provided to stimulate further the development of the idea in future project development labs and EDP workshops planned to be organized in the North-East region. However, it must be intended as exploratory and non-exhaustive.*

### Title of idea

Smart Efficient Energy

### Short description of idea

This idea is related to innovative solutions and applications to secure a sustainable and energy efficient future, and to the need to activate consumers at the center of the energy efficient system. Energy efficiency is beneficial for security of supply, sustainability, affordability for households and industry and competitiveness of the economy. Although the idea refers to energy, challenges in other utility business areas such as the provision of water, gas or heating bear similarities. Some elements of the idea concern the development of online information portals for educating the consumers on energy saving and energy efficiency.

### How was the idea developed?

The idea was developed in the EDP focus group on ICT in NE in "Increasing energy efficiency of consumers, Smart cities".

### How can ICT, as a key enabling technology, enhance this idea?

As discussed in the EDP focus-groups, the ICT contribution is seen on two main directions: development of ICT solutions of smart metering, smart grids and smart urban solutions (e.g. smart parking) and development of online information portals on energy saving and energy efficiency.

ICT-based solutions can contribute to enhancing energy efficiency by inducing behavioral change of energy end-users (focus on empowering consumers). Such solutions, tools and applications include for smart meters, communication-enabled heat metering tools, smart plugs, smart appliances, in combination with intelligent controls and automation. ICT application domains in the energy value chain<sup>75</sup> include:

- Smart Meters (energy generation, transport, storage, retail and consumption);
- Sensor-based networks, embedded systems and software, integrated software systems and application programming interfaces (APIs), and

<sup>75</sup> OECD, 2011, Working Party on the Information Economy, "ICT Applications for the Smart Grid . Opportunities and Policy Implications"

- communications protocols, including machine-to-machine communications (M2M) (for transport) ;
- End-user interfaces (storage, retail and consumption);
- Smart building technologies, smart electronic devices, data centres and cloud computing, integrated software systems and APIs (consumption).

ICT contribution<sup>76</sup> in smart grids<sup>77</sup> covers four areas: (1) ICT for smart utility processes (e.g. ICT for smart metering and ICT for Smart metering communications, cyber security and big data analytics for secure communications in the smart grid, ICT for portfolio management and forecasting, and ICT for Demand -Side Management), (2) ICT for smart energy consumption (such as ICT for Small , medium and large User Behaviour Management), (3) ICT for grid infrastructure readiness (such as ICT for asset management of transmission and distribution systems like telemeasure and telecontrol, ICT for microgrids and virtual power plants), and (4) ICT for breakthrough industry transformation (such as ICT for energy storage in electric cars — Plug-in Hybrid Electric Vehicles PHEV).

Smart parking systems fueled by ICTs can also lead to reduction in energy consumption, as well as improved transport flow, better management of urban spaces and reduction of the pollution levels. The use of ICT for smart parking in congested urban areas may comprise for instance IoT- sensor driven smart parking applications and mobile applications for accessing parking data remotely, checking parking spot availability and navigating to the available spots<sup>78</sup> and for crowd sensing, open IoT platforms integrating evolving sensing, actuating, networking and interface technologies<sup>79</sup>. The approach could be extended in future, when new technologies become available (e.g. VANETs<sup>80</sup>, Galileo Commercial Service).

As an additional element of the idea, ICT can also contribute to the development of web-based information portals for educating the consumers on energy saving and energy efficiency.

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<sup>76</sup> European Commission, 2009, "ICT for a Low Carbon Economy Smart Electricity Distribution Networks" available at

[http://ec.europa.eu/information\\_society/activities/sustainable\\_growth/docs/sb\\_publications/pub\\_smart\\_edn\\_web.pdf](http://ec.europa.eu/information_society/activities/sustainable_growth/docs/sb_publications/pub_smart_edn_web.pdf)

<sup>77</sup> Smart Grids' are typically described as electricity systems complemented by communications networks, monitoring and control systems, "smart" devices and end-user interfaces ( OECD, 2010 and 2009)

<sup>78</sup> H2020 pilot on IoT Pilot 5: Autonomous vehicles in a connected environment

<sup>79</sup> <http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/iot-03-2017.html>

<sup>80</sup> VANET stands for Vehicular Ad-Hoc Networks; they are created by applying the principles of mobile ad hoc networks (MANETs) i.e. the spontaneous creation of a wireless network for data exchange – to the domain of vehicles. They are a key component of intelligent transportation systems (ITS).

### **Knowledge and actors required**

The role of each element of the 4-ple helix in pursuing the opportunities for this idea as discussed in the EDP focus groups is:

Public sector: Dissemination of information on the responsible use of resources by using energy efficient systems, planning the communication strategy, participation with information, support for communication and education actions, participation in the development and operation of the online information portal; educating drivers, creating the necessary physical infrastructure, designing strategies and urban mobility plans;

Academic/Research: Training of human capital in innovative technologies (e.g. ICT for energy efficient systems); ICT research support, hardware and software development (e.g. ICT for smart parking); support for communication and education activities, developing and providing information materials, conducting studies and research, creating the online information portal;

Private sector: Technology development e.g. ICT for energy efficient systems; creation, development and maintenance of ICT infrastructure, creation, development and maintenance of software and hardware and intelligent parking management solutions in the urban areas ;

NGO: Access to funding sources and capital (e.g. ICT for energy efficient systems); educating drivers, mediator / partner between the public and private, designing strategies for ICT innovation and research; participation with information, support for communication and education actions, participation in the development and operation of the online information portal

### **Which specific parts of the idea could be funded under the TOs of the ROP?**

The idea can be funded through PA3- Supporting the shift towards a low-carbon economy. Support for collaborative research and innovation through technology transfer and for innovative SMEs and spin-offs (including changes in business model) in the smart specialization areas are in principle funded under Fostering knowledge transfer (TO1), respectively TO2 -Strengthening SMEs competitiveness (facilitation of commercial application of new ideas and setting-up new businesses, including business incubators). Priority 2.2 under TO2 funds support for setting-up and development of services, which include websites for promotion of products and services for SMEs.

The design and build a web-based information platform could in principle also be covered as support actions for technology transfer activities in TO1- Research and innovation. Development of online marketplaces could in principle be covered under TO2 -Strengthening SMEs competitiveness.

### Which specific parts of the idea could be funded under EU Horizon 2020?

Relevant H2020 funding would come from the [Secure Clean and Efficient Energy](#) workprogramme, in particular the focus area for Energy Efficiency (research and demonstration activities with focus on buildings, industry, heating and cooling, SMEs and energy-related products and services, integration of ICT). The Smart Cities & Communities activities cover development of technologies and services and integrated approaches (research and development of advanced technological solutions and deployment).

The topic on "Engaging consumers towards sustainable energy" is particularly relevant for the idea e.g. call [EE-06-2016-2017: Engaging private consumers towards sustainable energy](#) for deployment of ICT-based solutions for energy efficiency and information on energy consumption and costs, ICT interfaces and information depiction (including smart metering and related systems); call EE-07-2016-2017: [Behavioural change toward energy efficiency through ICT](#) for development of innovative user-friendly digital tools and applications or services making use of energy end-user generated information or captured from in-home equipment/sensors (like smart meters, communication e-enabled heat metering tools, smart plugs, smart appliances), also in combination with intelligent controls and automation, with the purpose to enhance energy efficiency by behavioral change of end-users.

Synergies are foreseen with topics in the Information and Communication Technologies of the WorkProgramme (LEIT), in particular topic ICT-15-2016-2017 ("Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation").

The topic on Competitive Low-Carbon Energy has several ICT strands e.g. [LCE-01-2016-2017](#): "Next generation innovative technologies enabling smart grids..."

The work programme features a number of topics particularly tailored to the needs of SMEs, including one topic for the SME instrument [SMEinst-2016-2017: Stimulating the innovation potential of SMEs for a low carbon and efficient energy system](#).

Development of web information portals can be covered under Coordination and Support Actions (CSA). The part of Horizon 2020 which is the most relevant to development of web-based marketplaces is [LEIT \(Information and Communication Technologies\)](#). Specific actions for development of different web based and social media linked to the achievement of the objective of the energy efficiency are in principle funded under workprogramme part on ['Secure, Clean and Efficient Energy](#).

### Which other EU sources of funding could be relevant and for which parts of the idea?

Access to finance for SMEs is also available EUREKA Eurostars<sup>81</sup>. An example of EUROSTARS funded project in the area of smart metering is [SMARTGRID](#).

EFSI funding in the area of energy efficiency adds up to the actions undertaken to leverage investments for small and medium enterprises (SME), in particular through

<sup>81</sup> [https://www.eurostars-eureka.eu/sites/default/files/eurostars-sme-brochure-am-i-eurostar\\_0.pdf](https://www.eurostars-eureka.eu/sites/default/files/eurostars-sme-brochure-am-i-eurostar_0.pdf)

the European Investment Fund (EIF) e.g. an example of a funded project is a [smart meters project in the UK](#). Opportunities to secure [financing](#) under EFSI are available on the [EIB website](#). Other funding opportunities in the energy sector are the European Energy Efficiency Fund (EEEF), an innovative public-private partnership dedicated to mitigating climate change through energy efficiency measures and renewables; the European Structural Investment Funds (ESIF), with a dedicated fund for energy efficiency. EIB financing of ICT applications and services and of innovative solutions for current and future challenges with focus on the [energy sector](#) is available through the [EIB support for digital economy](#) sector.

#### Which national sources of funding could be relevant and for which parts of the idea?

OP Competitiveness PA3 is dedicated to support for smart energy and energy efficiency. Innovative projects (new /improved products or processes), R&D for innovative start-ups and spin-offs, innovation vouchers can be funded under OP Competitiveness PA1 (" R&D&I supporting economic competitiveness and the development of businesses"). ICT investments fall under OP PA2. Information and communication technologies for a competitive digital economy.

ICT investments fall under OP PA2. Information and communication technologies for a competitive digital economy. In particular, priority 2.1.1 foresees support for development of web portals.

Support for thematic R&D projects and public co-financing for Horizon 2020 and for projects run under the bilateral international cooperation agreements, Joint Programming Initiatives (JPI, JTI etc., especially in smart specialization fields and twinning projects (focusing mainly on staff mobility) can be funded under NP RDI 2020. Further support for promoting dissemination of information is available in ESF.

#### Which other transnational or interregional sources of funding could be relevant?

This idea could benefit from actions under [INTERREG EUROPE](#), particularly on the introduction of digital technologies for more efficient use of resources (green ICT), transition towards a resource-efficient economy, promotion of green growth, eco-innovation. The types of actions to be funded are interregional Cooperation Projects and Policy Learning Platforms.

Danube priority "[Better connected and energy responsible Danube region](#)" also tackles the challenges related to environmentally-friendly, low-carbon and safe transport systems.

INTERREG IV C includes actions on awareness building and behaviour change. The report on good practices in energy efficiency ([Good Practices report](#)) lists a number of relevant projects. For example, the LoCaRe project uses schools as a way of cascading information on energy efficiency through a local community, and a number of projects use targeted communication tools (videos, web based information etc.) to appeal to specific audiences (e.g. EnercitEE, IMAGINE).



## Personalized learning experiences

*Disclaimer - This case study also provides some indications as to which funds could be relevant to this idea identified during the Entrepreneurial Discovery Process (EDP) in the North-East region, beyond those provided by the ROP. It is provided to stimulate further the development of the idea in future project development labs and EDP workshops planned to be organized in the North-East region. However, it must be intended as exploratory and non-exhaustive.*

### Title of idea

Personalized learning experiences

### Short description of idea

This idea is related to the development of personalised learning<sup>82</sup> in multiple contexts for instance in schools, in the workplace, or depending on labor market requirements (lifelong education) and for multiple topics such as entrepreneurial education, STEM education.

### How was the idea developed?

The idea was developed in the EDP on ICT in NE ("Gamification in learning" working group).

### How can ICT, as a key enabling technology, enhance this idea?

As discussed in the EDP focus groups, the ICT contribution is on technologies for personalized learning in multiple contexts (schools, workplace, lifelong) e.g. gaming, AI, mobile, cloud, virtual reality, and the development of personalized learning environments.

This idea refers to the role of ICTs as enabling technologies from two perspectives: (a) personalization for the needs of the learner and (b) personalization by the learner, in which the learner develops skills to tailor his own learning. The contexts are multiple i.e. schools, outside the classroom (informal), long-life learning.

The focus is on development of high quality educational content and a mix of enabling technologies to enable personalized learning in multiple contexts. ICT solutions<sup>83</sup> could include for instance: (1) tools for easy creation, mix and re-use of content, services, applications and contextual data for interactive learning processes (e.g. authoring and modelling tools; syndication tools; networked objects; electronic publishing platforms; social and collaborative networks); (2) platforms for MOOC aggregation, (3) environments for new learning experiences and experimentation e.g. 3D simulation and modelling technologies, visualisation technologies, augmented and virtual reality, gaming, affective computing, mixed reality learning environments, 3D technologies, wearable technology, (4) tools for learning analytics

<sup>82</sup> There is no widespread agreement on the definition and components of a personal learning environment.

<sup>83</sup> H2020 ICT Technologies for Learning and Skills

for creating, collecting, storing, sharing learner/educational data, (5) technologies for STEM learning (Science, Technology, Engineering, Mathematics, combined with Arts), (6) digital story-telling for entrepreneurial education, (7) cloud-based components, tools and services for use in digital learning scenarios.

### **Knowledge and actors required**

The role of each element of the 4-ple helix in pursuing the opportunities for this idea as discussed in the EDP focus groups is:

Public sector: Strategies and Financing

Academia/Research: educational content development, structuring platform (research), teaching methods, training for human resources involved on using the platform, exchanges (mutual learning)

Private sector: adapting curricula to the needs of the market, CSR (Corporate Social Responsibility) in IT corporate environment (e.g. "Tara lui Andrei" initiative, funding of software development, personal development (human resource) development, (collaborative) module platform

NGOs: Organisation of hackaton(s), development some of the platform modules, input (blog) exchange experience between types of people trained (recommendations for courses on certain subjects, mentoring, volunteering to help others "to learn how to learn", mutual learning, testing of solutions).

### **Which specific parts of the idea could be funded under the TOs of the ROP?**

TO1- Fostering R&D&I is relevant for support for collaborative research and innovation through technology transfer, development of products and technologies.

### **Which specific parts of the idea could be funded under EU Horizon 2020?**

There is a long record in research and innovation in this area. Significant investments have been already made on ICT and education under the previous funding instruments (FP7 and Horizon 2020 2014/15), supporting research and innovation in many learning contexts such as schools, workplace, lifelong learning, on a mix of enabling technologies (adaptive, gaming, affective, AI, mobile, cloud, virtual reality, etc.), looking at technology, pedagogy, organisation and cognitive aspects. This effort resulted in projects funded in areas such as personalisation and intelligent tutoring, open components for remote laboratories, using creativity to foster learning processes, learning analytics and ICT-enabled learning. A series of running projects funded under previous calls are in areas such as mainstreaming ICT in education ([ODS](#) – Open Discovery Space, [Inspiring Science](#), [Go-Lab](#), [iTEC](#) – Innovative Technologies for Engaging Classrooms), MOOCs ([ECO](#) – E-learning Communication Open-data, [EMMA](#) – European Multiple MOOC Aggregator), learning analytics ([LACE](#) – Learning Analytics

Community Exchange, [PELARS](#) – Practice-based Experiential Learning Analytics Research And Support, [Watch Me](#) – Workplace-based e-assessment technology for competency-based higher multi-professional education, [LEA's Box](#) – A Learning Analytics Toolbox. New projects have just started or are about to start, funded under the 2015 ICT calls, dealing with topics like interactive and assistive music teaching, robot-assisted language learning, personalised learning environments for career development, learning analytics for advancing learning in online social environments, large scale pilots for collaborative OpenCourseWare authoring.

The focus in 2016-2017 calls in H2020 is on technological developments in education, integration of technological solutions in the practices of stakeholders and the realisation of personalisation in learning, building on the already developed theoretical models and prototypes ([ICT-22-2016: Technologies for Learning and Skills](#)<sup>84</sup>). Also, [WP 2016-2017](#) foresees calls for development of new approaches ([CO-CREATION-01-2017](#)) for integrated platform and learning pathways e.g. web platforms and using digital tools such as 3D printers in open digital makerspaces, workshops or labs. [Swafs-11-2017](#) forthcoming call would focus on science education outside the classroom (informal education).

SME Instrument calls are also relevant for development of the idea. Projects funded in 2016 ([SMEInst-07-2016-2017](#)) concerned for instance: development of an adaptive learning platform for personalized children education (Infantium 2.0) and development of a smart library of technology and gamification at the service of education (Smart Library) (for New Business models for inclusive, innovative and reflective societies); a web platform for school networks to improve the quality of education through analytics (Edurio)- ODI scheme.

#### Which other EU sources of funding could be relevant and for which parts of the idea?

ERASMUS+ and Marie Skłodowska-Curie actions could be relevant for entrepreneurial and scientific mobility, exchange of best practices and innovative ideas on education and training.

#### International dimension (other than H2020)

The [Lifelong Learning Platform](#) brings together over 40 European networks. The innovative practices and [educational activities](#) of the [EIT Knowledge and Innovation Communities \(KICs\)](#) are very relevant for this idea. KIC players are embedded in the trans-national, national and regional education process, pioneering new types of integrated education.

Synergies with international online educational platforms that are relevant for the idea such as [edX](#), [Khan Academy](#), [Coursera](#), [Futurelearn](#).

<sup>84</sup> [http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016\\_2017/main/h2020-wp1617-leit-ict\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-leit-ict_en.pdf)

**Which national sources of funding could be relevant and for which parts of the idea?**

ICT investments fall under OP PA2. Information and communication technologies for a competitive digital economy, Action 2.1.3. Strengthening the digital competences, digital content and ICT infrastructure in e-education, e-inclusion, e-health and e-culture.

Synergy could be achieved with OP Human Capital, priority axis 6 for interventions concerning the development of digital competences of students and teachers, using ICT in education, training and long life learning.

**Which other transnational or interregional sources of funding could be relevant?**

[Danube programme](#) can be relevant for cluster cooperation, development of joint smart specialization approaches in technological and non-technological areas, internationalization, access to new markets, collaborative research and innovation activities and networking (objective 1.2 in particular is focused on fostering innovative learning systems to increase competences of employees in the business sector, to strengthen entrepreneurial culture and learning contributing to better meet social needs and the delivery of services in the general interest).

## Digital innovations and new business models

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### Title of idea

Digital innovations and new business models

### Short description of idea

The idea refers to the contribution of ICT for improved business practices, creation of new business models, and "smarter" marketing, branding and business promotion e.g. in fashion industry, agro-food sectors.

### How was the idea developed?

The idea is a grouping of ideas developed in the EDP on Textiles in NE ("New business models - Digital fashion/ Digital textiles printing" working group) and in the EDP on ICT in NE ("Traceability of food Ecological Agriculture" working group

### How can ICT, as a key enabling technology, enhance this idea?

As discussed in the EDP focus groups, the ICT contribution is for improved business practices, creation of new business models, and "smarter" marketing, branding and business promotion.

ICT<sup>85</sup>, as a general purpose technology, can improve business practices. ICT is also the main driver that shifts value along the value chain and creates new opportunities in the global supply chain e.g. using ICT to move, for example, into higher-value activities such as fashion design and specialized fabrics or raw materials, or to access niche markets. Smart wearables and related products such as intelligent textiles enable the creation of new business models<sup>86</sup> such as "device as a service" model.

3D systems and software solutions and virtual reality are in use in many industries including fashion, for design as well as marketing, business promotion and branding, and to make content "smarter". Virtualisation is increasingly used by fashion companies to present products online in websites and in configurator applications. 3D designs are integrated with sales configuration solutions including models (avatars) for virtual reality catwalks.

<sup>85</sup> World Bank (2008) "The global textile and garments industry : the role of Information and Communication Technologies (ICTs) in exploiting the value chain"

<http://documents.worldbank.org/curated/en/124691468337235836/pdf/474880WP0Repla10Box334138B01PUBLIC1.pdf>

<sup>86</sup> "Business Models and ICT Technologies for the Fashion Supply Chain", edited by Rinaldo Rinaldi, Romeo Bandinelli, Springer, 2017

An example of a recently completed H2020 project 'fromROLLtoBAG' aimed to create an integrated consumer driven local production system with the help of virtual design and digital manufacturing. Consumers connected with mobile devices can customize the avatar, insert own measurements and virtually try on garments from suppliers' collection. Once done the order is transferred to a local manufacturer which digitally prints, and assemblies and produces the product and ships to the customer in one day.

#### **Knowledge and actors required**

The role of each element of the 4-ple helix in pursuing the opportunities for this idea as discussed in the EDP focus groups is:

Public sector: Promoting regional brands

Academia/Research: Technology transfer, transfer of expertise, mediation

Private sector: Integration into regional brand

Users: feedback, increase participation in the promotion of local identity

#### **Which specific parts of the idea could be funded under the TOs of the ROP?**

Priority Axis 2, investment priorities 2.1- Promotion of entrepreneurial mindset and creation of new enterprises and 2.2 -Support for creation and development of advanced production facilities and services is relevant for funding of activities for promotion of products and services, including websites, on-line sales, as well as the introduction of innovative business solutions (e.g. the use of ICT in the business practices, e-catalogues, e-procurement, e-commerce).

#### **Which specific parts of the idea could be funded under EU Horizon 2020?**

Call [SMEInst-12-2016-2017](#) addresses the creation of new business models for inclusive, innovative and reflective societies. Under the SME Instrument, there are around 13 themes and workprogrammes for SME applicants in the creative and ICT industries. Relevant calls are for instance [SMEInst-01-2016-2017- ODI scheme](#). For SMEs in the agri-food sector, a relevant call is [SMEInst-07-2016-2017](#).

ICT calls from the "Industrial Leadership" programme LEIT ("Leadership in Enabling and Industrial Technologies") are particularly relevant for the development of innovative ICT products, tools, applications and services for the cultural and creative sectors, social media, new technologies, VR. Relevant calls are for instance ICT-20-2017: Tools for smart digital content in the creative industries [ICT-20-2017: Tools for smart digital content in the creative industries](#) or [ICT-21-2016: Support technology transfer to the creative industries](#).

Funding for business promotion, production of leaflets, templates and so on are covered under Coordination and Support Actions (CSA). CSAs are focused on non-research activities such as disseminating results and promoting the use of ICT-driven innovation.

#### **Which other EU sources of funding could be relevant and for which parts of the idea?**

Creative Europe 2014-2020 programme can also be relevant for the creative content. The Creative Europe programme covers 18 different sectors, including fashion and targets small and medium-sized enterprises active in the cultural and creative sectors. A [new financial instrument](#) has been introduced (guarantee investments of financial intermediaries through a fund managed by the EIB) targeting the whole creative content sector.

EIB financing of ICT applications and services and of innovative solutions is available through the [EIB support for digital economy](#) sector.

#### **Which national sources of funding could be relevant and for which parts of the idea?**

ICT investments under OP PA2. Information and communication technologies for a competitive digital economy, priority 2.2 - support for development of ICT products and services, e-commerce, vertical integration of ICT innovative solutions to the economy.

#### **Which other transnational or interregional sources of funding could be relevant?**

[Danube programme](#) can be relevant for cluster cooperation, development of joint smart specialization approaches in technological and non-technological areas, internationalization, access to new markets, collaborative research and innovation activities and networking.

[INTERREG Europe](#) programme is also relevant for capacities and development of SMEs. Most suitable priority is Axis 2, priority 3(d) – Supporting the capacity of SMEs to engage in growth in regional, national and international markets and in innovation processes (objective 2.1)- the [call for 2017](#).

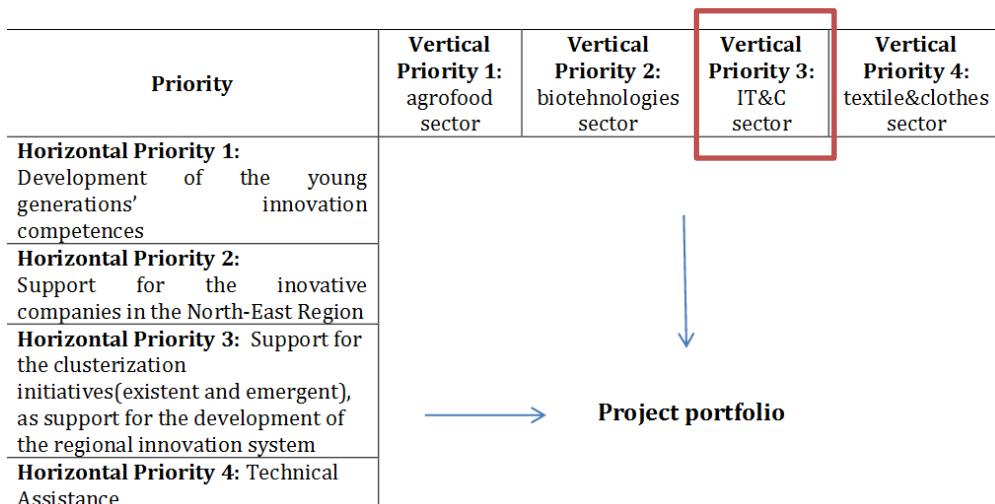
## 5. The potential of ICT for the regional RIS3

This section analyses the potential of the ICT sector to generate spill-overs in other priority investment areas identified by the region's RIS3 strategy.

The design process of the Smart Specialization Strategy (S3) in the North-East Region is an ongoing process. The first version was elaborated during 2013<sup>87</sup> and aimed to identify the regional competitive advantages in order to valorize them. The objectives<sup>88</sup> were twofold: (1) to foster economic competitiveness in the region and (2) to facilitate the transition from resource-based competitiveness to innovation-based competitiveness, a process that implies the development of the research capacities in high-tech areas that generate added value.

The RIS3 strategy includes a number of domains which are seen to contribute to societal challenges: health demography and welfare challenges; food security, sustainable agriculture and bio-economy challenges; reliable, clean and efficient energy challenges; climate change and resource efficiency challenges; and inclusive, innovative and secure society. **ICTs** have been selected by regional and national authorities as key areas of local strength, market potential and smart specialization.

**Figure 17 S3 priorities in North-East region**



Source: North-East Regional Development Agency, 2013<sup>89</sup>

The ICT sector is one of the most dynamic economic sectors in the North-East region. Considering the activity of companies in the ICT industry, the fields of research of the

<sup>87</sup> S3 strategy in North-East region at

[http://www.adrnordest.ro/user/file/project\\_s3/strategie\\_s3/en/6.%20S3%20Strategy%20%20Vision,%20mision,%20priorities,%20measures.pdf](http://www.adrnordest.ro/user/file/project_s3/strategie_s3/en/6.%20S3%20Strategy%20%20Vision,%20mision,%20priorities,%20measures.pdf), document prepared by North-East in November 2013

<sup>88</sup> [http://www.adrnordest.ro/user/file/project\\_s3/strategie\\_s3/en/1.%20Executive%20Summary.pdf](http://www.adrnordest.ro/user/file/project_s3/strategie_s3/en/1.%20Executive%20Summary.pdf)

<sup>89</sup> This strategy has been revised in March 2017 Concept note in the context of Priority Axis 1 of POR 2014-2020 at <http://adrnordest.ro/user/file/news/17/Concept%20Note%20Nord-Est%20-%20draft%202007.03.2017.docx>

research institutes and research centers and universities in the region and the research topics of the PhD students (Section 2), a number of specific **areas of competence in the ICT sector** were identified in the regional RIS3<sup>90</sup>, which can contribute to increasing regional competitiveness.

**Figure 18 – ICT capacities and regional RIS3**

Priority Sector	Fundamental Field	Re-configuration
ICT	Computers & Information Technology	Artificial intelligence (robotics, manufacturing integrated systems, computing systems, voice recognition) Improved energy efficiency, energy-net, Smart city; Cybernetic security
	New Media	Image and graphic processing, Gamification of learning
	Public Health	Big-data analysis applied in health, Tele-monitoring, Telemedicine; Tracking food products along the whole value chain
	Electronic Engineering & Telecoms	Nano electronics, optoelectronics; Industrial software

Source: NE RDA, March 2017 Concept note in the context of Priority Axis 1 of POR 2014-2020 at <http://adrnordest.ro/user/file/news/17/Concept%20Note%20Nord-Est%20-%20draft%2007.03.2017.docx>

The North East region displays a **regional specialisation above the national level** in computer science, biomedical social sciences, engineering and science technology. Existing research areas **below the national level** [Tolias, 2017] are in robotics, telecommunications, medical imaging, instruments instrumentation, optics, while **missing research areas** are in medical informatics.

In the context of smart specialization, “entrepreneurs” in the broader sense discover future areas of regional development through the entrepreneurial discovery process and look for opportunities in existing sectors or in new or emerging sectors. In this

<sup>90</sup> Idem as 89

regard, niches can be exploited in each sector, creating products with high added value and knowledge intensive services. The EDP focus groups, and in particular the EDP on ICT, aimed to reveal the innovation potential in North East region, and served as guidance for the reorientation of industrial and research structure towards emergent industries and services in international markets. The following **ICT areas** have been identified in the EDP focus groups for their potential to create new markets and of cross-fertilisation between sectors:

- (1) **(e-)Health, wellbeing, Active and healthy ageing** is one of the societal challenges for the upcoming decades. The ICT contribution is multi-dimensional: it includes the development of ICT applications and solutions for health monitoring, telemedicine, personalised health technologies, mobile and/or portable and other new tools, new sensors and devices (including software) for monitoring and personalised services, prevention and self-care; digital innovations for empowering the patient to manage their own health and disease; ICT products, services and solutions for elderly, people with special needs; health information portals;
- (2) Smart use of **Big Data in healthcare**, one of the most data-intensive industries around, can increase the effectiveness and quality of treatments, prevention of diseases, patient safety and prediction of outcomes;
- (3) The use of ICTs for **traceability** can lead to improved consumer protection and food safety;
- (4) Innovative solutions and applications to secure a **sustainable and energy efficient** future, and to the need to activate consumers at the center of the energy efficient system (smart metering);
- (5) Technological innovation can transform learning practices, enabling **personalized learning** in multiple contexts i.e. school, workplace, outside the classroom (informal), long-life learning and for multiple topics such as entrepreneurial education, STEM education;
- (6) ICTs, as a general purpose technology, can contribute to improved **business practices** and can enable the creation of **new business models**. ICTs are also the main driver that shifts value along the value chain and creates new opportunities in the global supply chain e.g. using ICT to move, for example, into higher-value activities such as fashion design and specialized fabrics or raw materials, or to access niche markets;
- (7) A cross-cutting theme is the development of **online education and information portals** on a broad spectrum of issues like health, energy saving and energy efficiency, organic farming, ecologic agriculture.

In terms of the potential of fundability of ICT ideas, there are diverse sources of funding that support the full range of actions and in all phases of the innovation cycle: from high-risk, ground-breaking research to innovation that can deliver revolutionary business breakthroughs, often on the basis of emerging technologies. Some sources that stand out are European level funding and financing instruments such as H2020 research and

innovation policy framework, European Structural and Investment funds, the new Juncker investment package, private investments, national, regional and local public actions.

## 6. Conclusions

ICTs are pervasive in all sectors. The transformative power of ICT can also help address many of Europe's most pressing societal challenges, such as health, demographic changes and welfare; food security, sustainable agriculture and bio-economy; reliable, ecologic and efficient energy; climate actions, efficient use of resources and raw materials; and for an inclusive, innovative and secure society.

*"New ways of thinking are needed for dealing with these challenges: more ecosystem thinking, more creative thinking, more synthesis, more thinking about outcomes and impacts, more attention to pattern recognition and awareness of weak signals. More thinking about solutions and less focus on problems. We have to practice thinking together, synthesizing and comprehending: collective and distributed thinking about societal change, real challenges, [...]" (EU Committee of the Region's Smart Specialisation Strategies, 2014)*

Stakeholders in the region will develop these ideas further where they live, learn and work. The "baton" will also pass to the policy makers. Bold action will need to be taken. In the particular context of the North East region, which is the main focus of this report, emerging from this analysis is the need for North East RDA to support future EDP and Project Development Labs (PDL) in stimulating the region to practice the cross-fertilization of ideas, especially in terms of how ICTs could support and enable sustainable development.

The role of the RDA is particularly important on identifying of an **integrated funding framework**<sup>91</sup> that could find a path towards healthy and viable projects. The role of Managing Authorities (MAs) for ESIF and the National Contact Points (NCPs) for Horizon 2020 is very important in the context of building of an integrated funding framework of ideas. These two communities have addressed different target groups and function in "silos" with limited knowledge of the other community. Solutions for coordination, communication, and aligning actions at national level need to be encountered.

In cooperation with regional stakeholders, the RDAs, and particularly the NE RDA, could help on identifying an integrated portfolio containing present business opportunities in the private sector, opportunities that need external financing sources, other than investment and structural European funds of which Romania benefits throughout 2014-2020, available for instance under Juncker Plan. Those investments projects could be in

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<sup>91</sup> [http://ec.europa.eu/regional\\_policy/sources/docgener/guides/synergy/synergies\\_en.pdf](http://ec.europa.eu/regional_policy/sources/docgener/guides/synergy/synergies_en.pdf)

turn passed by the RDAs to national contact centers, for instance for the Investment Plan for Europe.

It would be important to flag however that it is getting harder to win EU funding. Two years into the H2020, the chances of securing a H2020 grant for EU13 and Romanian researchers are continuously decreasing. Juncker plan uptake has also been very low in EU13 and the second phase now offers also technical assistance with the aim to improve access to the funds for those countries. The most significant concern for Romania is the absorption rate of ESI funds. Romania has not managed to draw almost no EU funds from the 2014-2020 financial allocation. Romania's bottlenecks in absorbing EU funds stem from past management and administrative weaknesses<sup>92</sup>. The role of Managing Authorities is particularly important in addressing these bottlenecks.

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<sup>92</sup> Curaj, A, 2015, Starways to Excellence Country Report Romania, [http://s3platform.jrc.ec.europa.eu/documents/20182/117536/S2E\\_Report\\_RO.pdf/f8979011-07e8-4cc1-8fb9-5f988c04fbb0](http://s3platform.jrc.ec.europa.eu/documents/20182/117536/S2E_Report_RO.pdf/f8979011-07e8-4cc1-8fb9-5f988c04fbb0)

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