# RIS3 and Digital Growth Strategy in Greece

## Smart Specialisation, ICT Projects and e-Services

**A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus**

**November 2015**

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# Executive summary

This report summarises the findings of desk research about the ICT related actions proposed by the regional and national Research and Innovation Strategies for Smart Specialisation in Greece. Moreover, it assess these findings with respect to (a) ICT implementation problems in Greece encountered in the period 2007-2013 and the poor performance of the Digital Convergence Programme over this period, and (b) opinions / interviews with public government officials having responsibility for implementing Broadband and ICT actions during the current programming period 2014-2020.

**Introduction**
This section of the report focuses on a series of issues that describe the current developmental impact of the digital disruption based on ICT technologies and infrastructure.

It is clear that in the framework of the Smart Growth – key pillar of the EU 2020 strategy – there is a need to combine the actions that sustain such growth, namely the research and innovation strategies for smart specialisation (RIS3), the digital growth strategies (DGS) for achieving the targets of the Digital Agenda, and the policies for education and employment for the younger generation.

This connection of RIS3 and DGSs should be achieved because the digital economy is turning the traditional rules of making business upside down, introducing disruptions that can happen at any time and in any sector and their effect on traditional organisations and economies are fundamental. In a very summary way, we describe the ongoing digital disruption of business practices, such as the need for a new organisational core for the business, the re-organisation of the production processes, the open marketplace and user-centric ecosystems, the platform-based business models. We describe also some key ICT technologies that most companies are using to sustain innovation and new product development. And the trend towards cloud computing as key change and an emerging paradigm for e-infrastructure and e-services provision.

**Desk survey ICT related actions in regional and national RIS3**
This section presents the findings of desk research on the ICT-related actions and infrastructure proposed by the 13 regional RIS3 and the national RIS3 as well.

Per region and the country, we identify (1) the activities that constitute the sectors of priority for development and creation of competitive advantages, (2) the type of ICT actions included into the RIS3 action plan, (3) the relation of the proposed actions to the sectors / activities of priority, and (4) the budget estimation for the ICT actions.

We should note that four regions (East Macedonia & Thrace, Thessaly, Attica, Western Greece) demand very high funding from the EPANEK and other OPs, without an equivalent elaboration of actions for these high budgets. Clearly these funding estimations should be justified and eventually substantially revised.

**Conclusions**
This section of the report summarises some key findings related to (1) the typology of proposed ICT actions and (2) their budget. It provides also some policy advice and recommendations in order to ensure viable business models for cost reduction and sustainability of ICT actions.

Central recommendation is the turn towards cloud computing, and the creation of repositories for ICT solutions, which will become available to end-users – public administration, companies and citizens – through a system of vouchers for customisation, training, data and content creation.

# 1. Introduction: Smart growth and ICT

## 1.1. Europe 2020 strategy: Innovation and digital dimensions

Designed in 2010 and put in action in 2014, as core component of the EU-2020 strategy for smart, sustainable and inclusive growth, 'Smart Growth' is both a model and strategy of economic development. As a model, it connects development with education (encouraging the population of learn and improve the skills), research and innovation (creating new products, services and more efficient modes of operation), and information technologies and the Internet (strengthening collaboration, real time information, and on online services). As a strategy, it launched 'Research and Innovation Strategies for Smart Specialisation' (RIS3) and 'Digital Growth Strategies' (DGS) to improve productivity, extroversion, and competitive advantages.

'Smart Growth' is conceived as a partnership between the EU and member-states and high-level goals has been defined to monitor achievements and the delivery mechanism, including targets for employment (75% of the population 20-64 years to be employed), research (3% of EU's GDP invested in R&D), broadband networks (bandwidth >30 Mbps for all), and use of electronic services (e-commerce and e-government). These targets were further specified at the level of each member-state and were locked as national targets into the National Reform Programmes (NRP) in April 2014.

'Smart Growth' stands on three engines for implementation:

- The 'Innovation Union' flagship initiative, aiming at the creation of an innovation-friendly environment enabling ideas to be turned into products and services
- The 'Youth on the Move' initiative, sustaining education and employment for the younger population, and
- The 'Digital Agenda for Europe' initiative, enabling individuals and businesses to use digital technologies and regenerate the economy of Europe (EC 2014).

These engines are expected to reverse the impact of the 2009-2013 crisis, reshape long term trends affecting growth, and establish a new growth model away from imbalances, weaknesses and bubbles that were observed in the past.

Within this framework key concern is the interconnection of RIS3 and DGS, namely (1) the type of ICT and digital actions that are proposed by the national and regional RIS3, and (2) the innovation and productive modernisation potential of ICT the actions that are included into the DGSs.

## 1.2. Digital disruption of innovation

RIS3 and DGSs are launched in a period characterised by a digital disruption of innovation, entrepreneurship, and development. A series of reports published by Ericsson on "Digital Business Transformation" provides useful insights into how new and established businesses are responding to the major digital technology-driven trends that are reconfiguring the global marketplace (Networked Society Lab 2015). These insights are based on in-depth interviews with business executives from a range of industries including, among others, finance, retail, manufacturing, media and digital services, as well as with professors from leading business schools, and desk research from sources such as OECD Internet Economy Outlook, MIT Sloan Management and other research institutes, Wired Magazine and other publications on digital transformation, and a number of blogs and websites on the digital economy and homepages of digital companies.

The reports capture technology-driven macro-trends disrupting the conventional business logic; the operating models of new digital enterprises; and the strategies and logic of traditional businesses undergoing various stages of digital transformation. Given the remarkable shifts now taking place, sooner or later most business leaders will be faced with a key question about how modelling and organizing a business for a digitally transformed market?

There is a number of successful digital operations currently reshaping the global marketplace, most of which have been integrated into the strategies and the changing logic of doing business. These concern:

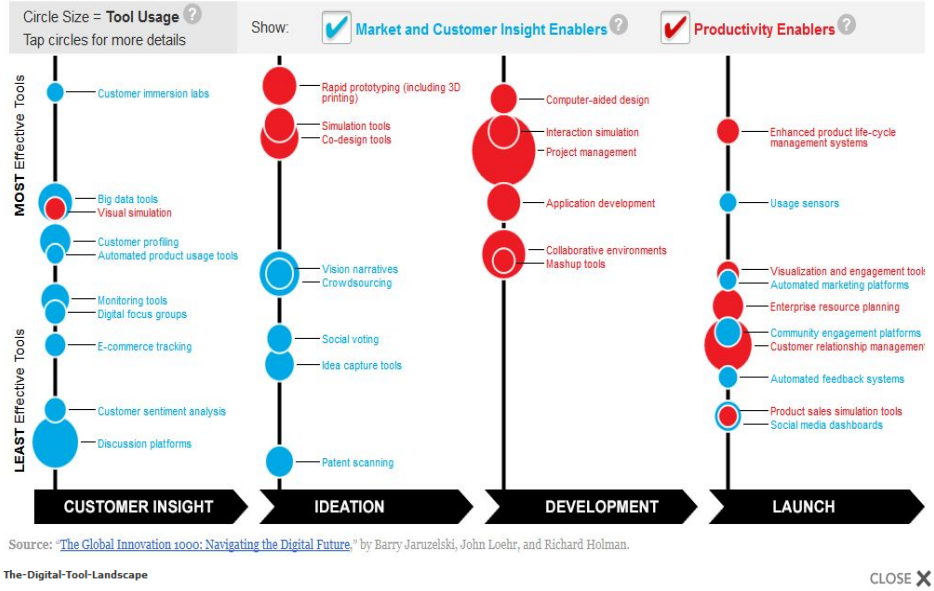
- *The organizational core of companies*. New management strategies, business cultures and technological capabilities are needed to re-organize for markets in a constant state of change, such as putting people and skills first, adopting distributed forms of organisation, working with teams of digitally connected workers, making information and intelligence transparent to all, using digital technology as strategy, organising companies along product lines and small product teams.
- *The production processes*. A wide range of production resources are to be found outside the organizational structure of the company. Open innovation strategies should take advantage of these external resources and re-consider the contribution of the external environment with practices such as on-demand manufacturing, unlimited supply access, crowdsourcing for ideas, designs and production skills, open collaboration, and other.
- *The market approach*. Open marketplaces and user-centric ecosystems can sustain the demand for innovative products and services. The generation of a sea of digital identities is redefining markets and marketing. Using the web, companies and advertisers attempt to insert themselves into the flow of interactions by understanding and practicing digital marketing. 'Intention markets' are created where buyers notify the market of the intent to buy, and sellers compete for the buyers' attention. Physical and digital identities of products have to combine, markets merge with content distribution, requiring businesses to adopt multiple business practices aimed at eliminating friction across a range of contexts and user experiences.
- *The business models*, in particular traditional business models are giving way to platform-based models and logic, versatile technology platforms, open marketplaces, and networked company structures.

## 1.3. ICT tools for innovation and new product development

Another survey by Booz, Allen, Hamilton has identified the most used IT tools by companies globally and provides good insight about the type of digital tools companies need and use. 1000 companies worldwide were studied about the ICT tools used in innovation and new product development (Jaruzelski, Loehr and Holman 2013).

ICT tools identified were classified along the established innovation and new product development stages, such as customer insight, ideation, product development, and product launch. ICT tools and application are distinguished between least and most effective, productivity enablers (red) and market enablers (blue), and the frequency of use (size of circle on the Figure). It appears that most effective and most used IT tools and application are about big data analytics, rapid prototyping, co-design, project management, and collaborative environments. Least effective are traditional business IT, such as ERP, CRM, discussion platforms, customer sentiment analysis, feedback systems, patent scanning. (Figure 1.1).

*Figure 1.1: Most used, most effective digital tools*




This survey clarifies the current meaning of 'e-business', identifying the way companies start using digital solutions and platforms for e-commerce, strategic intelligence, social media marketing, customer profiling, idea capturing, and many other.

Another important feature is that many of the above ICT tools are nor offered as software solutions, but as e-services and business platforms. A good example of such e-business solutions can be found at http://www.boardofinnovation.com/list-open-innovation-crowdsourcing-examples/. A series of platforms are offered such as technology intermediary, marketing and design platforms, collective intelligence and prediction, HR platforms, co-design, product ideas, and many other having a double impact on (1) facilitating business with digital assistants, and (2) creating new services and employment. The trend is clear: ICT tools for innovation are moving away from software towards more holistic solutions combining software, content, users, and operators.

## 1.4. Cloud-based provision of e-services

Cloud computing has also received great attention during the last decade as an emerging paradigm beyond a simple computing system structure (Seo et al., 2014). In simplified terms, it can be understood as the possibility to store, process and use data on remotely located computers accessed over the internet (EC, 2012). It is an all-inclusive solution (Mahmood, 2015) based on the concepts of converged infrastructure, shared services/resources and dynamic reallocation based on demand. Cloud computing has the potential to bring significant benefits to its users (citizens, businesses, government) such as cost savings, increased efficiency, user-friendliness, accelerated innovation (ECPSB, 2014).

Cloud computing can be defined as "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" (Mell and Grance, 2011). Main characteristics are:

- *On demand self-service/High scalability*: Cloud Computing enables the access of computer services on a pay-as-you-go basis, with the flexibility to scale up or down quickly and for little marginal cost.
- *Resource pooling:* The resources provided from a cloud provider may be pooled to serve multiple organisations using a multi-tenant model. Dynamically assigned and

reassigned physical and virtual resources according to an organisations' self-service demand, can provide significant economies of scale which help reduce costs and accelerate innovation.

- *Rapid elasticity:* The service provider's capabilities (e.g. memory space, calculation power etc.) can be elastically provisioned and released, based on demand. A change of configuration is also possible with a short reaction time by the provider.
- *Device agnostic:* Users can access cloud services over a network through a broad range of devices.
- *Broad network access:* The service provider's capabilities are available over the network and can be accessed through standard mechanisms which promote use by heterogeneous client platforms and other services.
- *Metering:* Cloud usage is monitored, controlled and reported so that users can measure their consumption quickly and easily and adjust accordingly.

As an e–service provision model, cloud computing has nowadays gained significant attention, especially in the case of large organisations having IT departments with a high level of complexity which have to devote the majority of time and budget to merely keep existing systems operating. The challenge brings at the centre of the interest public authorities, due to their size and scope of services. Most public sector organisations are very complex in nature with many entities (departments, agencies etc.) sharing large volumes of data, but also having rigid organizational structure and significant funding restrictions in terms of innovation. They also encompass services in diverse business and technological domains, which are often based on monolithic architecture models, disconnected from each other and difficult to be re-used (EC, 2014).

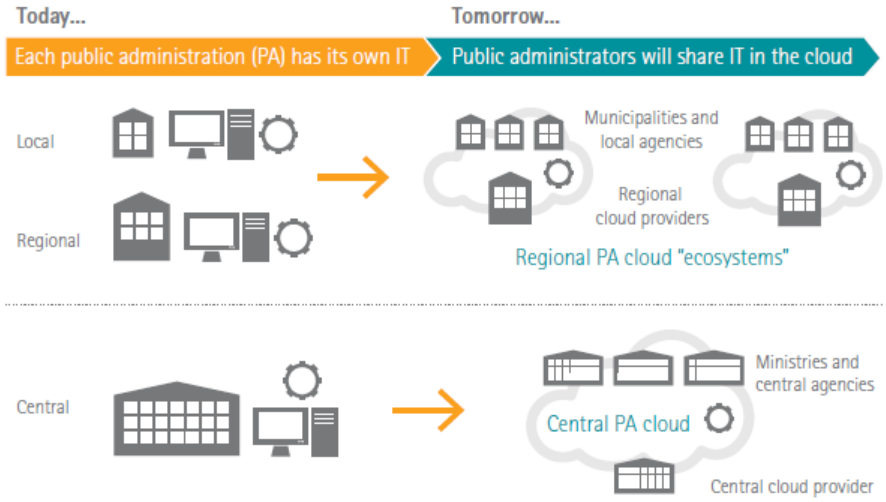
As now many public authorities are seeking new routes to improve their service quality and delivery, transparency, responsiveness as well as the effectiveness of their investments, there is an increasing interest on cloud computing (Seo et al., 2014). In the case of public services the concept of cloud computing is not only relevant due to its significant benefits, such as coherence, flexibility and economies of scale; it is also linked to the idea of open, connected and re-usable public services (EC, 2014). According to Deloitte (2014) the more fundamental services available on the cloud is the higher the opportunity to reuse and combine them with existing services of other governmental departments or to develop new services in collaboration with third parties.

The European Commission has recognized the need for rapid adoption of cloud computing in all sectors of the economy and has therefore set as a priority the development of a wide European single market for cloud services. In 2012, the Commission has released a strategy for 'Unleashing the Potential of Cloud Computing in Europe' (EC, 2012) which is based on three key actions:

- *Cutting through the jungle of standards*, referring to the need for certification of cloud services and the endorsement of such certificates by independent regulatory authorities. Standardisation is crucial for the potential of lock-in, especially in the case of SMEs and non IT companies which are rarely able to evaluate a product's/service's characteristics as to the level of interoperability, data portability and reversibility.
- *Safe and fair contract terms and conditions*, tackling the complex and uncertain legal framework for cloud service providers. The Commission thinks that the development of model contract terms for cloud computing (both between cloud providers and professional cloud users and with regards to consumers and small firms) will increase trust, while improving existing legislation (such as the proposed Regulation on personal Data Protection and the Common European Sales law) will accelerate the take up of cloud computing in Europe
- *Promoting common Public Sector Leadership through a European Cloud Partnership* (ECP) as an umbrella for comparable initiatives at Member State level building

common procurement requirements for cloud computing in an open and fully transparent way.

*Figure 1.2: How IT governance now and in the cloud*
*Source: Accenture (2013)*




Cloud computing characteristics (Apptis, 2010; Zhang et al., 2010; Accenture, 2013; Mell and Grance, 2011) bring significant benefits to all types of organisations such as higher efficiency and effectiveness, as well as the ability for innovation. The main impact of cloud computing in service delivery is that it reduces the need for resources (cost, time), enables the provision of more integrated and user centric services and facilitates the development of innovative services (Deloitte, 2011). Mahmood (2015, xvii) has summarised the benefits of cloud computing adoption in the public sector by grouping them in two categories: the ones that address to public organisations and the ones that address to citizens. More specifically, governments can have "better business process management; cost and time savings; more accurate and timely information; automation and process improvement; easy maintenance and upgrading of services; and seamless collaboration, vertically and horizontally, with other governmental departments". Citizens, on the other hand, have "easy-to-use and on demand access to government e-services; online transactions e.g. payment of bills and filing tax returns; information reliability and ready availability of services around the clock; more accurate and timely information; opportunities for e-participation including e-voting; and citizen oriented decision making by the political leadership".

## 1.5. Aim of the report

Taking into account the above trends, this report focuses on RIS3 actions and demand related to e-business, e-commerce, e-gov., ICT growth, digital media for business purposes, in:

- Research and innovation, such online R&D collaboration, market and technology intelligence, ideas markets, technology brokering, online and development;
- Production, such as online solution for on-demand production, crowdsourcing, finding employment, finding / assessing suppliers, smart metering and saving of resources;
- Funding, such as online start-up / business assessment, crowdfunding, p2p lending, online start-up mentoring and support;
- Markets, such as e-commerce, open marketplaces, digital marketing and branding, social media, export platforms and support.

And how the largest number of companies can profit from the use of ICTs in the above four domains, and the most effective business models in offering such e-services.

# 2. Digital projects, applications and e-services in the Greek regional and national RIS3

## 2.1. East Macedonia and Thrace RIS3

The design of the regional innovation strategy of smart specialisation was based on mapping and assessment of areas for S3 policy and the factors that determine the overall development of the REMTH. The Table 8 of the RIS3 document (pp.79-82) presents the results of the above approach and allocates RIS3 interventions to regional, national-sectoral, and EU funding programmes.

Actions in the ICT sector are proposed to be funded by the ROP EMTH (Specific Objective 2), the OP Competitiveness, Entrepreneurship and Innovation (EPANEK, Specific Objective 2c) and the Horizon 2020 from ICT related calls. These actions concern digital content to be used by the local government and tourism, ICT solutions for companies, and ICT in the domain of the environment for addressing cross-border challenges. Expected funding for ICT related actions is estimated at 4,064,327 from the ROP; 260,533,349 from EPANEK; and 5,000,000 from the Administrative Reform Programme, overall 269,597,676 Euro (pp. 114-117)

The basic operations of e-Government are designed, launched and implemented through nationwide projects at central level, leaving very little scope for intervention at the regional level. The demand for ICT products and services in the region is relatively small. The use of computers and Internet and broadband penetration in households show positive trends over the past three years, but below the average of Greece and the European Union. The sector of ICT in the REMT is characterized by its small size and activities but have little percentage of local added value. Local academic and research institutions are important nuclei with relevant expertise, which could be leveraged for both the dissemination innovation in other sectors of the economy and the commercial exploitation of academic research results.

In broadband networks, local loop technologies dominate (ADSL, with satisfactory levels coverage) and no major - and questionable sustainability solely in economic terms - investments in optical distribution networks.

Goals for the ICT intervention are:
• Digitization and distribution of public open data.
• Development of smart city applications in the city-capitals of the regional administrative departments.
• Implementation of the national strategy for Next Generation Access networks and upgrading of digital services offered by the public administration.

Two types of actions are proposed:

1. Creation of open public data and smart city applications in capital cities of the region, to support both economic development and integrated tourism promotion and destination management (e.g. e-government, e-tourism, e-culture, e-inclusion).
2. Launch a national ICT policy with regard to next generation networks, digital public administration services, digital inclusion actions through interventions in human resources and general national priorities to meet the objectives of the Digital Agenda.

The first type of actions is planned to be financed by ROP EMTH, while the second from Sectoral OPs.

The ICT and digital services proposals of the East Macedonia and Thrace RIS3 can be codified as below:

| Region | ICTs application domain | ICT type | Beneficiaries | Budget ROP & other OPs |
|---|---|---|---|---|
| **East Macedonia and Thrace** | • Agrofood<br>• Tourism<br>• Emerging manufacturing | • Next Generation Broadband<br>• e-Business<br>• ICT for the environment<br>• e-Government<br>• Smart city apps<br>• e-Tourism<br>• e-Culture<br>• Digital content<br>• Open public data<br>• Digital inclusion | • Public administration<br>• SMEs<br>• Citizens / end users | 269,597,676 from the ROP, EPANEK, and Admin Reform |

## 2.2. Central Macedonia RIS3

The development of ICT is an important tool for the development of sectors characterised as "champions" in the region of Central Macedonia. Moreover, ICT is a strategic policy choice to address the current crisis and contribute to sustainable growth. The ICT industry, as a productive resource has horizontal effect in all other sectors (predominantly in information-intensive activities / knowledge) and contributes indirectly to increase the competitiveness of other economic activities and leverage benefits. Therefore ICT is considered as a major driver for growth and development to which can be attributed almost half of the productivity growth in advanced economies. The growth dynamics of the sector ICT is perhaps greater than any other horizontal field. It affects and improves horizontally all activities of the public administration, civic, professional, the business.

Within this perspective, the interventions at the RCM level aim to show off that ICT in key growth pillar for the four areas champions that sustain the development of the region (Agri-food, Building Materials, Tourism, Textile and Clothing), enhancing innovation, extroversion and inflow of foreign investment capital. Also, the strategic framework for ICT development policy seeks to activate affordable, high quality and interoperable public services and the private sector which enabled and supported by ICTs. Even looked forward to increasing use of ICT by citizens, including disadvantaged groups of the population, business and public administration, enhancing extrovert initiatives to development direction of digital domestic value added. Particular importance is given the use of ICT to raise the level to all areas of education, health, tourism, the environment.

Taking also into account the national strategies to meet the goals of the Digital Agenda, the proposed ICT actions focus on

- Open data: Distribution of public open data. It refers to data or datasets that allows free disposal and reuse.
- Interoperability, which is becoming increasingly important as users demand for the provision of integrated e-services. Interoperability in e-Government is becoming a critical issue to improve the productive model of the public administration.
- Smart applications and services, which are using ICT and could potentially transform every area of social and economic life.
- Access: The e-Accessibility defines the initiatives that ensure access for all citizens to e-services and the removal of technical, legal, geographical or other barriers that often arise in the use of digital and Internet services.
- Achieving critical mass: Refers to strengthen entrepreneurship and extroversion in the digital economy and balance demand and supply of ICT services and systems.

- Digital Skills, enabling the familiarization of the population in the use of digital and online products and services, reducing the digital divide, with emphasis on the weaker groups of the population, creating a "digitally mature society" and citizens capable to act, live, operate, progressing in a digital economy.

There is considerable scope for application supporting technological innovations, which will form the basis of new ICT tools and major applications. They may address challenges and needs in the domains of:

The primary sector: ICT tools for quality control, management, monitoring, marketing, implementation of European policy for food quality and compliance of agricultural products and food in specific certification schemes. Forest protection and ecosystem management Internet applications for organic products, food distribution channels, branding, suppliers, packaging, etc. Possibly, software and applications to implement or aiding digital farming systems that lead to production of better quality agricultural products and increase of productivity of agribusiness, and applications for sensing and GIS). Also the creation of a web-based statistical reporting platform for all branches the economy with emphasis on the rural sector.

The food & beverage industry: Software and applications including new generation ERP and CRM tools, modern e-commerce and public procurement platforms. Certification of organic products with the appropriate ICT tools, resulting to significant cost reduction. Creation of a collaborative electronic platform to assist the entire value chain of the F&B industry.

Tourism and culture: Creation of imaging applications for presentation and promotion of tourist destinations with new digital media (software to provide advanced services, augmented reality, mtourism), achieving minimize management costs and fees advertising. Enlargement of the target groups and ultimately expanding the tourism period.

Specialized areas of ICT applications, such as Computer Aided Engineering (CAE) solutions in the automotive sector, software for fuels and lubricants / additives, minerals and plastics (upstream) and after treatment devices industry, chemical industry, transport etc. (downstream)

Health: development of platforms and applications that will lead to a new cost effective telemedicine and homecare for the elderly or patients with chronic diseases or healthcare remotely with devices monitoring and telecare for people with health problems can contribute in distance care, reducing costs for families and health systems.

The ICT and digital services proposals of the C. Macedonia RIS3 can be codified as below:

| Region | ICTs application domain | ICT type | Beneficiaries | Budget<br>ROP & other OPs |
|---|---|---|---|---|
| **Central Macedonia** | • Agriculture<br>• Forest protection<br>• Food and beverage<br>• Tourism<br>• Culture<br>• eHealth<br>• Mobility / transport<br>• eGovernment | • ERP<br>• CRM<br>• e-Commerce<br>• Augmented reality<br>• m-apps<br>• Smart apps<br>• Digital marketing<br>• CAE<br>• Open data<br>• Digital skills | • Public administration<br>• University labs<br>• SMEs<br>• Clusters<br>• Technology intermediary | 37,000,000 |

## 2.3. West Macedonia RIS3

The priority sectors of the West Macedonia RIS3 are (1) Agrofood, including manufacturing and standardization of agricultural products, food and beverages production, (2) Environment and energy, including tele-heating, metal structures, integrated waste management, (3) Breeding of fur-bearing animals and manufacturing of leather products, and (4) Tourism.

ICT is not a priority sector. Nevertheless, ICT related actions are propose to support the environment and energy activities, such as energy saving systems in SMEs, energy efficiency and saving, sensor networks for environmental monitoring.

Also, the use of ICT in tourism is expected to support the individualised customer service, improve of interactivity and reduction of services provision cost; support of digital services for the promotion of cultural heritage, and destination management.

Additionally in the Thematic Objective 2, ICT-related actions are proposed in the Investment Priority 2.3, such as e-government, e-learning, e-inclusion, e-culture, and e-health. In actions to be funded by the Social Fund are included the improvement of digital skills, e-learning for young scientists.

Beneficiaries of the above ICT related actions will be SMES, professional chambers, local authorities, the regional authority of West Macedonia, and public organisations.

The RIs3 Action Plan includes 7 actions for specific informational systems to be funded by the ROP with a total budget 9.050 million Euro. Another action in the Investment Priority 3.2 is about an informational system for destination management (DMS) in West Macedonia, with a budget of 0.75 million Euro.

| N | TITLE | INDICATIVE BENEFICIARY | BUDGET | FUNDING SOURCE | | FUND |
|---|---|---|---|---|---|---|
| **5** | Creation of soil maps of West Macedonia | ANKO SA | 2,000,000 | ROP | EPANEK | ERDF / AF |
| **6** | Pilot implementation of precision agriculture in peaches of N. Kozani | Agriculture Cooperatives of Velvendos | 850,000 | ROP | | ERDF/ AF |
| **7** | Regional Vortal for Agricultural Information | Regional Authority of West Macedonia | 700,000 | ROP | EPANEK | ERDF / AF |
| **8** | GIS of West Macedonia | ANKO SA | 1,000,000 | ROP | EPANEK | ERDF |
| **9** | Recording and analysis of characteristics of the wine producing area Amyndaio-Florina to improve the competitiveness of wine-related products | NGO AMYNDAIO | 1,000,000 | ROP | | ERDF/AF |
| **10** | Valorisation of cultural capital of West Macedonia to improve tourism | Technological Institute of West Macedonia | 1,500,000 | ROP | | ERDF |
| **11** | Information System of Entrepreneurship of West Macedonia | Regional Authority of West Macedonia | 2,000,000 | ROP | EPANEK | ERDF |
| **TOTAL OF THEMATIC OBJECTIVE 2** | | | 9,050,000 | | | |

Overall, the ICT and digital services proposals of the West Macedonia RIS3 can be codified as below:

| Region | ICTs application domain | ICT type | Beneficiaries | Budget ROP & other OPs |
|---|---|---|---|---|
| **West Macedonia** | • Agriculture<br>• Environment protection<br>• Energy<br>• Tourism<br>• Culture<br>• Government | • Precision agriculture apps<br>• Agriculture portal<br>• Destination management<br>• Energy saving<br>• Production improvement for the wine sector<br>• E-Business<br>• Digital skills | • Region of West Macedonia<br>• Local authorities<br>• SMEs<br>• Public sector organisations<br>• Chambers<br>• Technology intermediary | 9,800,000 |

## 2.4. Epirus RIS3

The RIS3 of Epirus defines four broad priority sectors in which the Region has strong comparative advantages and capacity for innovation, new business ideas, and leverage private capital. These areas are: (1) the primary sector, (2) the industry of experience, (3) the ICT and youth entrepreneurship, and (4) health and well-being.

The Agrofood sector is an important growth sector of the region both in terms of self-sufficiency and cover the rest of the country needs, and sustain exports. It might also contribute to tourism through the production of traditional local products and gastronomy.

The industry of Experience (including tourism, culture and creative industries) focuses on upgrading tourism by using green technologies, ICT, and creative industry activities such as the silversmith.

The academic community is an important driver for the local knowledge economy, particularly in the areas of IT and medicine. It can contribute significantly to the development of youth entrepreneurship, especially the IT sector, which has created about 80% of the new companies that have settled in the Technology Park.

Health and well-being is an emerging sector and major area of new specialization of Epirus, which can combine the production of knowledge, medical services, and environmental resources to a large number of residents and visitors from Greece and abroad.

Proposed ICT-related actions are mainly in the third priority area of ICT and young entrepreneurship, and include:

*Promoting research and innovation:*

- Granting scholarships for graduate and postdoctoral students in order to upgrade the skills of staff, mainly laboratories and prevent the brain drain.
- Providing information to research teams on the call of Horizon 2020, in the form of an academic Helpdesk.
- Supporting the participation of Greek research teams in Horizon 2020 and COSME.
- Financing project proposal that have been evaluated positively by the Horizon 2020 and COSME, but did not receive funding because of limited budget.

*Moving from research to innovation*

- Promoting partnerships between businesses and research institutions in the Region, such as evaluation of research results to be used by local businesses, demonstration, and dissemination.
- Meetings between researchers and entrepreneurs to exploit research results and establish cooperation for new business creation (a 'Nursery ideas' action).
- Exploiting research results by demonstrating innovations and new technologies.

*Promoting of youth innovative entrepreneurship*

- Refurbishment of space and operation structure to support youth ICT related entrepreneurship and innovation, by providing spaces for location (even virtual), financial incentives, and guidance for business development.
- New Innovative Entrepreneurship Programmes, including a fund for ICT spin-offs and start-ups, mainly at their initial operation.
- Strengthening partnerships between companies, such as the support of existing clusters or creation of new clusters.
- Strengthening the ICT infrastructure to be used by traditional industries, with a view to the diversification and modernization, and optimization of existing metropolitan networks.

*Mechanism to support entrepreneurship*

- Strengthening the ICT infrastructure in the Region for modern e-government services and civil service, simplification of public services and administration services to the citizen.
- Training the staff of enterprises and upgrading their digital skills

The above 15 actions for the ICT sector sum-up to a budget of 13,350 million Euro to be provided by the Regional Operational Programme, the National Competitiveness Programme (EPANEK) and the Social Fund Programme.

| Region | ICTs application domain | ICT type | Beneficiaries | Budget ROP & other OPs |
|---|---|---|---|---|
| **Epirus** | Development of the ICT sector | • Production modernisation<br>• e-health<br>• e-Business<br>• Start-ups funding<br>• Technology brokerage<br>• e-Goverment<br>• Digital skills | • Young scientists<br>• Traditional SMEs<br>• University and Technology Park<br>• Technology intermediary<br>• Public sector organisations | 13,350,000 |

## 2.5. Ionian Islands RIS3

The priorities of the RIS3 Ionian Islands focus on activities in the sectors of (1) Tourism, which is the most important productive sector, (2) Agrofood, plant and animal production related to the rural character of the islands and a geomorphology favouring traditional forms of rural exploitation, (3) Maritime economy, fisheries & aquaculture, and (4) the Cultural & Creative economy, with information and communication reinforcing the demand for cultural goods, intellectual creation, and new forms of entertainment. An emerging field is Health through Bio-medicine.

ICT applications, broadband networks and e-services for modernisation are proposed to all sectors:

- In the agrofood and tourism, use of digital systems and applications to increase productivity, autonomy and quality services;
- Use of ICTs to promote and market products and services related to agrofood;
- Development of digital solutions for agricultural products, promotion of applications to support electronic registration, information about local agricultural and rural areas, digital platform for agrofood products.
- Reinforcement of tourism entrepreneurship to create e-services and the use of smart devices, such as expansion of the interconnection of individual booking systems with large international booking services, tourist packages to create applications for small hotels, guest management applications, etc.
- In the emerging bio-medicine, utilization of bio-informatics for health, health services for the early diagnosis of neuro-degenerative diseases.

Propose ICTs for e-government and social care and services include

- Smart systems for care provision, telecare with emphasis on isolated areas (remote health state management products chronically ill and vulnerable groups)
- Smart systems for risk management to address specific risks (e.g. seismicity, water pollution early warning systems, earth observation, social media, trend forecasting models etc.)
- Smart systems for the management of environmental services, such as control and reduce drinking water losses in public infrastructure and water supply, garbage collection
- Smart systems for traffic management and parking in urban centres, as well as road safety awareness, travel information systems
- E-Government services, smart applications to optimize the service of citizens and facilitate their participation in local affairs (e.g. provision of electronic administrative services, support to citizens participation in local governance

Also ICT action are proposed to improve the infrastructure for the provision of e-services, such as

- Broadband infrastructure, to deploy Next Generation Access networks, ensure the digital communication and operation, with emphasis on high speed networks in isolated and rural areas
- Developing infrastructure for cloud computing and a G-Cloud for the public sector of the Region.

| Region | ICT application domain | ICT type | Beneficiaries | Budget ROP & other OPs |
|---|---|---|---|---|
| **Ionian Islands** | Agro-food<br>Tourism<br>Health<br>ICT<br>Broadband infrastructure | • Production modernisation<br>• e-Business<br>• e-tourism applications<br>• e-health<br>• Telecare<br>• Smart mobility<br>• Risks management systems<br>• e-Government<br>• Broadband networks<br>• Cloud, G-cloud | • SMEs<br>• University<br>• Clusters and business associations<br>• Local authorities<br>• Public sector organisations | 28,360,000 |

## 2.6. Thessaly RIS3

The priorities of RIS3 of Thessaly are organised in (1) two key pillars and (2) the activities of tourism. The first pillar is the Agro-food complex, including the primary sector, the processing of agricultural products, and the industry of food and beverage as a unified field of intervention. The second pillar is the industry of metal products and construction materials. Creative tourism is another key priority, based on business valorisation of cultural assets of Thessaly.

These core production complexes of Thessaly are coupled by secondary technology-driven activities, such as

- Production and saving of energy and management of the environment
- ICT, reduction of digital gap, and support towards the use of digital services
- Key Enabling Technologies
- Valorisation of advanced technologies in the field of health.

The proposed actions in the field of ICTs focus on business and government services to SMEs and citizens, e-services supporting cultural assets of the Region, integrated IT solutions to businesses, extension of broadband infrastructure, and e-government.

| Axis of intervention | ROP Thessaly 2014-2020 | Sectoral OPs 2014-2020 | European Programmes |
|---|---|---|---|
| **Information and Communication Technologies** | Support the public administration of the Region to create high level infrastructure for the provision of services to citizens, companies, and institutional actors in main social and economic areas | Increase the supply of digital services for integrated ICT solutions to companies | Funding ICT research by the Horizon 2020 |
| | Support the cultural organisations of the Region for the development of services for the electronic promotion of cultural assets of the Region | Expansion of the broadband infrastructure and high speed networks | Funding from the Connecting Europe Facility for trans-European networks and infrastructures in the sectors of transport, telecommunications and energy. |
| | | Increase the public sector use of e-government | |

The ICT-related actions can be summarized as following:

| Region | ICTs application domain | ICT type | Beneficiaries | Budget ROP & other OPs |
|---|---|---|---|---|
| **Thessaly** | • Agro-food<br>• Metallurgy, metal products, and construction materials<br>• Tourism | • Production modernisation<br>• E-Business<br>• E-tourism applications<br>• E-Government<br>• Broadband networks | • SMEs<br>• University<br>• Clusters and business associations<br>• Local authorities<br>• Public sector organisations | 3,125,000 (ROP)<br>80,000,000 (EPANEK & PAA) |

## 2.7. North Aegean RIS3

The North Aegean RIS3 Action Plan is composed of four priority axis

1. Mechanisms and integration of innovation and entrepreneurship in the real economy, is about developing tools and procedures for absorbing innovation in the productive and commercial processes and the gradual transformation of the real economy to an innovative and competitive local economy.
2. Development of agro-food sector, focuses on interventions related to the development and support of the sector, the expansion and rational articulation and modernization of the agro-food production.
3. Tourism - Nature – Culture, this axis relates to the financing of investments or integrated interventions to highlight the comparative resources of the islands with respect to economic growth mechanisms.
4. Islands of equal opportunities, which focuses on the implementation processes and tools that will make local residents to collect more and more upgraded services in their daily lives.

In axis 1, one ICT-related action is included:

- "Strengthening the University of Aegean for research in the field of Intelligent Transport Systems" with a budget around 400,000 Euro.

In axis 2, two ICT-related actions are included:

- Integrating ICT in agro-food enterprises (existing and new). Strengthening through public aid the agro-food businesses to develop digital management services, ensure better internal organization and operation, and development extroversion with logistics. Funding of 300,000 from the ROP of N. Aegean.
- Development of e-commerce activities by the agro-food businesses, sustaining openness and expansion of their sales and economic activity. Funding of 300,000 from the ROP of N. Aegean.

In the axis 3, two ICT-related actions are included:

- Integrating ICT in tourism businesses (existing and new) in order to highlight the comparative advantages of nature and culture and develop specific e-service package to diversify and make their products more attractive to tourists and visitors. Funding of 300,000 from the ROP of N. Aegean.
- Developing applications for e-culture, focusing on the promotion of the islands and the cultural inventory thematically and spatially, and the creation of digital content based on existing resources. Funding of 300,000 from the ROP of N. Aegean.

In the axis 4, three ICT-related actions are included

- A pilot project on Intelligent Transport Systems for transportation of raw materials and finished products from the islands, with a budget of 350,000 funded by the ROP.
- An e-government project for the provision of administration services to citizens by the local and regional authorities, with a budget of 100,000 Euro from the ROP of N. Aegean.
- A pilot project for telecare at home with a budget of 100,000 Euro from the ROP.

Overall, the total budget of all ICT-related actions is estimated at 24,800,000 to be provided by the ROP, EPANEK, and Agro-development programme. Actions related to ICT can be found in all four priority areas.

| Region | ICTs application domain | ICT type | Beneficiaries | Budget ROP & other OPs |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **North Aegean** | • Agro-food<br>• Tourism<br>• Transport | • Intelligent Transport Systems<br>• Production modernisation<br>• E-commerce<br>• E-tourism<br>• E-culture<br>• E-Government | • SMEs<br>• Young scientists<br>• University<br>• Research institutions<br>• Local / regional authorities | 2.150.000 (ROP) |

## 2.8. Sterea Ellada RIS3

The development of agro-food industry, fisheries and aquaculture are central priorities of the development strategy and is expected to increase the food production in the region, meet the rest of the country needs, and sustain the development of exports in niche markets. At the same time, quality, hygiene and local identity nutrition are important competitive advantages of the experience industry (tourism, culture, creative industry) which will be based on the exploitation of natural and cultural assets of the region and the diversification of products.

Information and communication technologies are expected to modernize and increase the productivity of enterprises in the industry of experience, offering advanced services to tourists and visitors, as well as improving the quality of life for citizens in the Region. Use of ICTs is proposed in the industry of experience with the aim to enable productivity increase, direct marketing services, and freeing of tours operators and travel agencies from global brands, enabling a direct access to clients. Also clean technologies and energy saving technologies are expected reducing costs, environmental impact, and more clean and friendly environments suitable for ecologically sensitive tourist markets. Two actions are proposed in this area:

(1) Creation of ICT tools and applications to enrich the experience: It will support the creation of e-services and e-content for PCs, tablets and smart phones that support tourism activities to be developed in the region, including platforms inventories of cultural events; archaeological sites applications; apps for museums; virtual tours, popular exhibits, location maps, new museum; virtual representation of events; promotion of traditional architectural techniques; digitalization of tourist and cultural resources, route, clipart maps; urban guides; applications for flexible tours, attractions, information about offers and markets, hotels, restaurants, events etc.

(2) Use ICT to increase productivity, autonomy and quality services in the industry experience, such as development of websites and applications for tablets and mobile phones to promote accommodation and services; expansion of interfaces between local systems or individual bookings with major international booking services; development and improvement of tourist packages creation applications especially for small hotels; development and dissemination of visitor management applications at all stages of the value chain of tourism.

The budget allocation per OP and final beneficiaries are presented in the table below:

| Region | ICTs application domain | ICT type | Beneficiaries | Budget<br>ROP & other OPs |
|---|---|---|---|---|
| **Sterea Ellada** | • Industry of experience, tourism, culture | • E-tourism applications<br>• ICT to increase productivity and market access | • SMEs<br>• Universities<br>• Public research centres<br>• Clusters and business associations | 2,000,000 (ROP)<br>5,000,000 (EPANEK) |

| | | | | |
|---|---|---|---|---|
| | | | • Local authorities<br>• Public sector organisations | |

## 2.9. Attica RIS3

The RIS3 of Attica focus on three broad sectors of priority:

(1) the creative economy, including activities of tourism, culture, media, design, new materials and ICT;
(2) the blue economy, including activities of agro-food, shipbuilding, intelligent and sustainable transport, environmental technology
(3) the sustainable economy of needs, including activities of pharmaceuticals, health, green energy and energy saving.

| Creative economy | Blue economy | Sustainable economy of needs |
|---|---|---|
| • Crafts, Jewelry Clothing, Furniture<br>• ICT application<br>• Leaning applications<br>• Media and Movies<br>• Culture<br>• Tourism, recreation | • Environmental technology<br>• Water bio-technology<br>• Maritime, smart transport, green shipping<br>• Naval construction<br>• Materials, port construction<br>• Food industry<br>• Sea tourism, recreation | • Drags, health<br>• Smart city, smart building, smart transport<br>• Environmental technology<br>• Renewable energy, energy saving, smart grids<br>• Agro-food<br>• Materials and construction |
| • ICT applications for the space industry and geo-information<br>• Software and applications for micro / nano electronics | | |

These three broad sectors of activities overlap, and ICT, geo-informatics and nanomaterials at the intersection of all. Therefore, ICT-related actions are includes in all three broad-sectors of priority, focusing on:

1) The development of ICT new products and services for the creative economy, the blue economy, and the sustainable economy.

2) The increasing the use of ICT in SMEs, such as

- Development of e-business applications by companies or group of companies and clusters;
- Development of business transaction platforms B2B, B2C, C2C;
- Development of digital infrastructure and digital cooperation applications between the technology intermediary organisations, SMEs, universities, and research centres;
- Development of digital platforms for funding, such as crowdfunding, crowdsourcing, micro-funding, business angels, mentor networks, idea gathering and assessment.

3) Support of ICT applications in the fields of e-government, e-learning, e-inclusion, e-culture, and e-health, with applications for interactive content in the three priority sectors.

An important budget from the ROP and EPANEK is allocated to the above actions.

| Region | ICTs application domain | ICT type | Beneficiaries | Budget ROP & other OPs |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **Attica** | • All sectors of priority, which more or less coincide to national RIS3 priority sectors | • New ICT products and services development<br>• E-business<br>• E-transactions<br>• E-government<br>• E-learning<br>• Smart cities<br>• E-funding | • SMEs<br>• Universities<br>• Public research centres<br>• Clusters and business associations<br>• Local authorities<br>• Public sector organisations | 40,000,000 (ROP)<br>270,000,000 (EPANEK) |

## 2.10. Western Greece RIS3

The sectoral specialisation priorities of the Western Greece RIS3 include three broad sectors

1. Agricultural production, aquaculture, and food production
2. Tourism and culture
3. Materials and Microelectronics

As horizontal priorities to support these productive domains are (1) Information and Communication Technologies (ICT), and (2) energy applications. Therefore ICT actions are to be found both within the priority sector, as well as in all other sectors of specialisation.

In the agro-food sector, ICTs are expected to contribute to the development of the entire value chain from the field and the greenhouse to the points of sale. Indicative use of ICT for food and agriculture can be about databases for the gathering, management and exploitation of agro-food data, technologies for monitoring and recording weather & climate changes affecting the production, monitoring and recording of cultures, water and energy saving. In tourism, ICT can increase the productivity and access to markets, promotion of the region's cultural heritage. In microelectronic components, ICT is a fundamental component in the design and applications in number of sectors such as industrial and consumer electronics.

RIS3 actions related to ICT are:

- Valorisation and expansion of metropolitan fibre optic networks and promoting broadband in remote areas (NGA and Cloud infrastructure)
- Harnessing ICT to promote products and services in dynamic productive sectors of the regional economy with priority to Open Source Software in culture, tourism, agriculture, activities, and applications for smartphones, games, virtual marketplaces, virtual tours, and e-business.
- Development of e-infrastructures and e-services, such as e-government, smart cities, e-ticketing, and smart parking.

The budget allocated to these actions is high with public support from the ROP, EPANEK, and AGRO OP at 135 million Euro.

| Priority sector | ROP | EPANEK | AGRO | H2020 | OTHER EU | PRIVATE | TOTAL |
|---|---|---|---|---|---|---|---|
| **Micro electronics** | 14,200,000 | 45,000,000 | 0 | 10,700,000 | 10,500,000 | 77,300,000 | 187,900,000 |
| **ICT** | 18,829,000 | 64,300,000 | 2,000,000 | 8,200,000 | 9,100,000 | 94,400,000 | 201,829,000 |

## 2.11. Peloponnese RIS3

Regional Research and Innovation Strategy for Smart Specialisation in Peloponnese has selected as priority activities those belonging in the sectors of (1) Agrofood, (2) Tourism, (3)

Culture & Creative Industry, and (4) Manufacturing of wood products, metal products from non-metallic minerals, plastic, packaging, machinery, instruments, building materials, and marble). Horizontal support activities are ICT, energy, environment, transport, and logistics.

ICT related actions are to be found in Investment Priority 2 for bridging the digital gap by

- The development of Next Generation Broadband infrastructure, Cloud infrastructure, and broadband infrastructure in rural areas. Funding from ROP (5,000,000) and EPANEK (5,800,000)
- The development of ICT products and e-services to improve and modernise the production methods in the priority sectors of agro-food and manufacturing, such as e-commerce and e-business for strengthening ICT demand in SMEs. Funding from ROP (1,500,000) and EPANEK (6,200,000). Proposed solutions include e-Business, e-Commerce, digital marketing, e-Procurement and supply chain, digital content applications, applications for logistics, life cycle assessment, energy saving, reduction of environment print.
- The development of ICT applications for e-government, e-learning, e-inclusion, e-culture and e-Health. Funding from ROP (1,000,000). Proposed IT solutions include big data applications, open data, e-Government and informational systems of the public administration, digital real estate services and cadastre. In tourism, ICT actions will be implemented to create new e-services and e-content to support alternative forms of tourism. As a mature proposal for Culture and Tourism sector appeared the creation and operation of a regional Destination Management System under the supervision and responsibility of a Destination Management Organization.

| Region | ICTs application domain | ICT type | Beneficiaries | Budget ROP & other OPs |
|---|---|---|---|---|
| **Peloponnese** | • Agrofood<br>• Tourism<br>• Culture & Creative Industry<br>• Manufacturing | • Broadband networks<br>• Cloud<br>• E-Business<br>• E-Commerce<br>• Digital marketing<br>• E-procurement<br>• E-Government<br>• Destination Management System<br>• Open data, big data | • SMEs<br>• Universities<br>• Public research centres<br>• Clusters and business associations<br>• Local authorities<br>• Public sector organisations | 7,500,000 (ROP)<br>12.000.000 (EPANEK) |

## 2.12. South Aegean RIS3

The aim of RIS3 in the region of Southern Aegean is to support the region in becoming a top destination worldwide for experience tourism (tourism, culture, creative industry) through the adoption of a sustainable development strategy for product differentiation creation and authentic destination.

The development of agro-foods, fisheries and aquaculture are components of this development strategy, because local hygiene, local identity, and nutrition are important competitive advantages for experience tourism in the Southern Aegean. A prerequisite is the respect of the environment, and the enrichment of traditional varieties and cultivation methods with modern knowledge and technologies that will revitalize production activities

Tourism, the food industry and fishing-aquaculture are distinct intervention areas, while exploiting ICT and clean technologies, cut across the priority areas and other economic activities in the Region.

The use of information and telecommunication technologies acquires a double role. The ICT is expected to help differentiating products and increase the productivity of enterprises in the priority sectors, and reduce also the high transaction costs due to insularity of the Region.

Actions in the Thematic Objective 2 focus on mobilizing public and private resources for ICT deployment. However, these actions are not treated as a separate priority but incorporated into the intervention logic of each priority sector. Included are:

- In the agro-food, three action under the Investment Priorities 2b and 2c, with public funding 2,280,002 Euro, concerning ICT tools and applications that increase the productivity, quality of products, and e-commerce.
- In tourism, three actions under the Investment Priorities 2b and 2c, with public funding 2,196,440 Euro, concerning ICT tools and applications for tourism and experience, e-government, e-health, and e-learning;
- The total budget of RIS3 actions under Thematic Objective 2, is 4,476,442 Euro.

The ICT-related actions can be summarized as following:

| Region | ICTs application domain | ICT type | Beneficiaries | Budget ROP & other OPs |
|---|---|---|---|---|
| **South Aegean** | • Agrofood<br>• Tourism | • e-business, productivity and quality of agrofood<br>• e-commerce<br>• e-tourism<br>• e-health<br>• e-learning | • SMEs<br>• Clusters and business associations<br>• Local authorities<br>• Public sector organisations | 4,476,442 (ROP) |

## 2.13. Crete RIS3

The analysis of the innovation system of the region of Crete, taking into account the sectoral specialization of the regional economy and the specificities of the research groups of bodies of knowledge that operate in Crete, led to the selection of four complexes of activities, which define the priority areas for regional Smart Specialisation. These are:

1. The agrofood complex (cultivation / husbandry, processing / preparation and handling / marketing of agricultural products)
2. The cultural - tourist complex (attraction, welcome, hospitality, transportation, food, entertainment, promotion of the cultural resources, museums)
3. The environmental complex (energy saving, renewable energy, rational use of natural resources of Crete with emphasis on water and climate change)
4. The complex of knowledge (research and technology produced by research and academic institutions of Crete in nanotechnology, biomedicine, biology, microelectronics, materials, information technology).

ICT related solutions per priority complex include:

- In the agrofood: Smart greenhouses, smart systems for the supply chain and logistics, sensor networks and applications.
- In the culture / tourism: Smart city services, smart rooms, social media apps, infographics and design, MIS, interactive applications.

- In the environment: smart systems for irrigation and liquid waste management base on wireless networks, sensors, and automation technologies, smart meters, GIS applications
- In the knowledge complex: micro-electronics, ICT.

Main ICT-related actions are to be funded by the ROP and EPANEK and include:

- In the Investment Priority 2a: Extension of broadband networks, NGA, and emerging technologies in the digital economy with a budget 5,800,000 (EPANEK)
- In the Investment Priority 2b: Development of ICT products and services, e-commerce and support the demand for ICT in all the four priority complexes with a budget of 4,000,000 from the ROP and 6,200,000 from EPANEK
- In the Investment Priority 2c: Support for ICT applications for e-government, e-learning, e-inclusion, and e-health with a budget of 5,724,418 form the ROP of Crete,

Overall, the ICT-related actions proposed by the RIS3 of Crete in the Thematic Objective 2 are:

| Region | ICTs application domain | ICT type | Beneficiaries | Budget ROP & other OPs |
|---|---|---|---|---|
| **Crete** | • Agrofood complex<br>• Tourism – culture complex<br>• Environment complex<br>• Knowledge complex | • Smart greenhouses<br>• Smart systems in the supply chain and logistics<br>• Smart city services<br>• Interactive applications<br>• Smart systems for irrigation<br>• Smart water management<br>• Smart meters | • SMEs<br>• Universities<br>• Public research centres<br>• Clusters and business associations<br>• Local authorities<br>• Public sector organisations | 9.724,418 (ROP)<br>12,000,000 (EPANEK) |

## 2.14. National RIS3

In principle, ICT actions for the Thematic Objective 2 and the Investments Priorities 2a, 2b, and 2c described in the regional RIS3 should overlap with ICT actions in the national RIS3, since the design of regional RIS3 covers also resources to be allocated by national Operational Programmes, such as EPANEK, the Programme of Agro Development, and the Social Fund Programme.

However, this doesn't happen, because the majority of regional RIS3 has taken into account ICT actions funded by the Regional OP only. Therefore, is necessary to consider ICT actions proposed by the national RIS3 as complementary to regional ones. Moreover, ICT is a priority sector of activity in the national Research and Innovation Strategy for Smart Specialisation.

The national RIS3 gives priority to eight broad-sectors of activities[1], each of which is organised by a corresponding innovation platform, which drives the analysis, vision, and actions, and at the end of the day the productive restructuring of the sector.

[1] Agrofood; Life Sciences & Health / Medications; Information & Communication Technologies; Energy; Environment, Sustainable development and Climate change; Transport & Logistics; Materials – Construction; Culture - Tourism - Cultural & Creative Industries

Main objectives of the strategy for the field of Information and Communication Technologies are:

1. Strengthening entrepreneurship through research, technological development and innovation, to meet specific user needs (application driven research / user driven innovation) in the priority sectors of the national economy.
2. Promotion of new cutting edge technologies or improving already existing technologies that will enhance the ICT sector capability for innovative products.
3. Strengthening the potential of the regions in the design, ICT management, and implementation of ICT actions.
4. Participating in emerging cutting-edge technologies and strengthening e-based research infrastructures related to smart specialization strategy.

In the detailed national RIS3 Action Plan, three ICT-related types of actions are described with total budget of 145 million Euro.

*Action 2.b.2: Supporting the development of ICT products and services*
The action is addressed to individual companies and /or business clusters with the aim to strengthen the integration and use of ICT products and services, development of digital and interactive content and services in the field of e-government, e-learning, e-inclusion, e-culture and e-health. An equal aim is to promote business cooperation with universities to enable them to develop ICT digital and interactive content applications, such as education applications (e-learning), augmented reality applications that will enhance the tourist experience, facilitate and improve the daily life of citizens in health sectors, welfare, recreation, etc., applications for the management and protection of the environment, etc. Indicative beneficiaries: Individual enterprises, clusters EC RTDI actors. Total budget 92,000,000 € from the Operational Programme EPANEK.

*Action 2.b.3: Supporting the development e-business applications from individual companies or groups of companies*
The action concerns the development of e-business applications with the aim to encourage e-business and e-commerce in all the country's areas of specialisation. Illustrative examples of such applications are those relating to development tools and business and operational planning processes, data mining tools to serve the specialised needs, applications for knowledge sharing and collaboration, use of big data analytics, personalised marketing and targeted distribution. It is expected that ICT will boost productivity growth, autonomy and quality of services in all the country's fields of expertise, and the development of these applications would be supported by innovation vouchers, to cover operational and other expenses and by RTDI scholarships. Indicative beneficiaries: Individual companies, business clusters, EC, Universities, RTDI actors. Total budget 50,000,000 € from the Operational Programme EPANEK.

*Action 2.c.1: Supporting the development of digital business transaction platforms and cooperation platforms between businesses, between businesses and consumers, and between businesses and the public sector*
This aim at the development of digital business transaction platforms and partnerships between businesses (B2B), between businesses and consumers (B2C) and between businesses and public sector bodies (V2S). Some of these platforms are:

- A digital shopping platform (B2B) for tourism value chains and health (hotels, tourist boats, cruise, hospitals, food, supplies, services, etc.);
- A digital marketplace (Dimopratirio), a digital platform for B2C (without intermediaries, after sales services, etc.);
- An e-marketplace for agricultural products, with the aim of establishing and developing short supply and local markets chains;
- A digital platform B2C and B2B, for networking purposes, sales, and crowdfunding,
- A search service platform for crowdsourcing;

- A platform supporting networks (business angels, mentors, coaches, incubators etc.);
- A platform for ideas-gathering and participatory evaluation of proposals, ideas from members of an ecosystem.

Indicative beneficiaries are start-ups, existing businesses, institutions, ministries, GSRT, Regions, etc. Total budget 3,000,000 € from the Operational Programme EPANEK.

# 3. Conclusions: Digital growth actions for RIS3

## 3.1. Typology and demand for ICT actions, infrastructure and e-services in RIS3

The recording of the ICT related actions, which are included in the regional and national RIS3 reveals the priorities of the central and regional government and stakeholders. Given the bottom-up approach and consultation for the design of the strategies, the priorities reflect also those of the Greek economy and society.

In codified way, the typology and demand for ICT- and Internet-related actions is shown on the Table 3.1. Some conclusions from this data are the following:

Most demanded e-services concern the use of ICT for the modernisation of industry. Here we may find high demand for sector specific application (e.g. solutions for agriculture and greenhouses, solutions for the food and beverage industry, the metal industry, etc.) enabling the modernisation of production, increase of productivity, better organisation of processes and the supply chain. In this field of ICT for the industry, important is the demand for e-business and e-commerce (9/14), thought the meaning of e-business is not clear and eventually overlaps with other categories of e-services and solutions. Lower is the demand for digital marketing, and non-existent is the demand for usual business solutions such as ERP and CRM.

A second group of high demand is related to ICT solutions and e-services in the sector of tourism (11/14), such as promotion of localities, virtual tour of Points-of-Interest, archaeological sites and monuments, transaction and booking services, destination management systems. Here, we find a strong relationship between applications and e-services for tourism and applications for culture, and clearly the cultural heritage is seen as an asset for the attraction of visitors and creation of brand name, branding of places, and promotion.

Equal high is the demand for e-government, especially for online administration services (11/14). E-health solutions are demanded by remote or island regions, but also e-health is connected to tourism and online services to be offered to visitors (8/14). On the contrary, very low is the demand for solutions and services that may address the digital gap and more inclusive societies, such as e-learning or the development of digital skills.

**Table 3.1. ICT actions included in regional and national RIS3**

| IP | Actions included in RIS3 | EMT | CM | WM | EP | IOI | TH | SE | AT | WG | PE | NA | SE | CR | NATIONAL | DEMAND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INVESTMENT PRIORITY 2a | **Infrastructure** | | | | | | | | | | | | | | | |
| | NGA | X | | | | X | X | | | X | X | | | X | | 6/14 |
| | Cloud | | | | | X | | | | X | X | | | | | 3/14 |
| | Open data / big data | X | X | | | | | | | | X | | | | | 3/14 |
| INVESTMENT PRIORITY 2b<br><br>Development of ICT products and services and e-commerce and enhancing demand for ICT | **Development of ICT sector** | | | | | | | | | | | | | | | |
| | Research | | X | | X | X | | | X | | | X | | X | X | 7/14 |
| | Start-ups | | X | | X | | | | X | | | | | X | X | 5/14 |
| | Training | | | | X | | | | X | | | | | X | X | 4/14 |
| | Incubators | | | | X | | | | | | | | | | X | 2/14 |
| | Funding | | | | X | | | | X | | | | | | X | 3/14 |
| | **ICT for industry** | | | | | | | | | | | | | | | |
| | Priority sector specific systems | | X | X | X | X | X | X | X | X | X | X | X | X | X | 13/14 |
| | eBusiness | X | X | X | X | X | X | | X | | | | X | | X | 9/14 |
| | eCommerce | X | X | | | X | | X | X | | X | X | X | | X | 9/14 |
| | eLogistics / Supply chain | | | | | | | | | | X | X | | X | X | 4/14 |
| | Digital marketing | | X | | | X | | X | | | X | | | | X | 5/14 |
| | Usual ICT (ERP, CRM, etc.) | | X | | | | | | | | | | | | | 1/14 |
| | **ICT for tourism** | | | | | | | | | | | | | | | |
| | Virtual Points of Interest / AR | X | X | X | | X | X | X | | X | X | X | X | | X | 11/14 |
| | Destination management | X | X | X | | | | X | | | X | X | | | X | 7/14 |
| | eCulture | X | X | X | | | X | X | | X | X | X | X | | X | 10/14 |
| | mTourism | | X | | | | | X | | X | X | | | | X | 5/14 |
| INVESTMENT PRIORITY 2c<br><br>Support of ICT applications for egoverment, elearning, einclusion, eculture, and ehealth | **ICT for Government** | | | | | | | | | | | | | | | |
| | e-Administration | X | X | X | X | X | X | | X | X | X | X | | | X | 11/14 |
| | eEmegency / Risk management | | X | | | X | | | | | | | | | X | 3/14 |
| | eHealth / Tele-care | | X | X | X | X | | | X | | X | | X | | X | 8/14 |
| | eLearning | | | X | | | | X | X | | X | | X | | X | 6/14 |
| | Digital inclusion | X | X | X | | | | | X | | | | | | | 4/14 |
| | Digital skills | | X | X | X | | | | | | | | | | | 3/14 |
| | | | | | | | | | | | | | | | | |
| | Smart cities | X | X | | | X | | | X | X | X | | | X | | 7/14 |
| | Intelligent transport | | | | | X | | | X | X | | X | | X | | 5/14 |
| | Smart energy | X | | X | | | | X | | | X | | | X | | 5/14 |
| | Smart environment | X | | X | | X | | X | | | | | | X | | 5/14 |

Another group of solutions and e-services with good presence in the regional RIS3 is related to smart environments, smart energy, smart cities, and intelligent transport systems (5-7/14), which may offer more advanced infrastructure for the provision of e-services, but also more advanced systems for governance and real-time management based on sensor networks, big data collection and analytics, and open data.

The demand for actions related to the development of the ICT sector itself is limited. Three only regions have selected ICT as a priority sector (Attica and Epirus, and Crete within the Knowledge complex), research on ICT is demanded by the RIS3 of Central Macedonia and partially from the Ionian Islands. The national RIS3 has also selected ICT and micro-electronics as sector of priority, but the actions in this domain are yet to be defined.

Next Generation Networks are demanded by 6 regions only, while the demand for cloud infrastructure and data-related solutions is very limited (3/14).

Overall, the ICT actions proposed in the regional and national RIS3 give a clear priority to the modernisation of production and e-business and have a clear link to the sectors of smart specialisation. However, the type of actions described **is somehow away from the current state-of-the-art** about the digital innovation landscape and the digital disruption that information technologies and the Internet are introducing, as described in the section 1.3 of this report. But, this might be a problem of awareness and entrepreneurial discovery which is under development and ongoing in the regional and national RIS3.

We should underline that the profile of ICT related actions, infrastructure, solutions, applications and e-services included in the regional and national RIS3 **is in sharp contrast with the current discussion and priorities** within the central government and the Operational Programmes managing services about the type of ICT actions to be included and funded by the Investment Priorities 2a, 2b, and 2c of the 2014-2020 OPs, most of which are related to e-government and solutions for the public sector. This is the opposite of the demand recorded in the regional and national RIS3.

Contractual and legal obligations undertaken within the 2007-2013 programming period are channelling the current ICT related actions towards projects such as the "Digital School", the "Cadastre", applications for the Ministry of Justice, emergency services, the Syzeuxis infrastructure, and other. Most of those 2007-2013 actions fall into the domain of e-government and are clearly away from a production modernization and e-business perspective which is dominant in the current programming period.

## 3.2. Budget and available funding

The budget of the ICT actions proposed by the regional and national RIS3 needs further elaboration. Nevertheless, the budget estimation and the available funding from the Regional OP, and the OPs of Competiveness and Administrative Reform outline a number of problems to be addressed.

The Table 3.2 presents the budget estimation for ICT actions included into the regional and national RIS3, and on the other hand the available funding from the OPs (Regional, Competitiveness, and Administrative Reform). Some conclusions and issues for further investigation are the following:

**Table 3.2: ICT actions budget in RIS3 and available funding from OPs**

| | BUDGET IN RIS3 | | | FUNDING FROM OPs | | | |
|---|---|---|---|---|---|---|---|
| | ROP | EPANEK and other | Total | 2a | 2b | 2c | Total budget (EU+ national) |
| East Macedonia Thrace | 4,064,327 | 265,533,349 | 269,597,676 | | | | 4,064,326 |
| Central Macedonia | | | 37,000,000 | | | | 11,280,343 |
| West Macedonia | 9,800,000 | | 9,800,000 | | | | 10,360,311 |
| Epirus | | | 13,380,000 | | | | 9,038,948 |
| Ionian Islands | | | 28,360,000 | | | | 5,032,000 |
| Thessaly | 3,125,000 | 80,000,000 | 83,125,000 | | | | 3,125,000 |
| Sterea Ellada | 2,000,000 | 5,000,000 | 7,000,000 | | | | 5,541,032 |
| Attica | 40,000,000 | 270,000,000 | 310,000,000 | | | | 40,000,000 |
| Western Greece | 33,029,000 | 111,300,000 | 144,329,000 | | | | 5,877,449 |
| Peloponnese | 7,500,000 | 12,000,000 | 19,500,000 | | | | 3,125,000 |
| North Aegean | 2,150,000 | | 2,150,000 | | | | 6,250,000 |
| South Aegean | 4,476,442 | | 4,476,442 | | | | 4,476,440 |
| Crete | 9,724,000 | 12,000,000 | 21,724,000 | | | | 9,724,418 |
| NATIONAL RIS3 | | 290,000,000 | 290,000,000 | | | | |
| TOTAL REGIONS | | | | | | | 117,895,267 |
| EPANEK | | | | | | | 665,520,197 |
| ADMINISTR REFORM | | | | | | | 223,137,223 |
| TOTAL GREECE | 1,240,442,118 | | | | | | 1,006,552,687 |

***ICT actions in RIS3:*** In many RIS3, the budget foreseen refers to funding from the Regional Operational Programme, in other cases to ROP and EPANEK, and in a few ones to ROP, EPANEK and the Programme of Agro Development. Clearly further elaboration is needed, especially in the cases of very high budgets for regional actions demanded from EPANEK (e.g. RIS3 East Macedonia and Thrace, RIS3 Thessaly, RIS3 Western Greece).

***Budget constraints:*** The total budget of ICT actions in the regional and national RIS3 exceeds the available funding from all OPs by 25%. Given the legal and contractual obligations inherited by 2007-2013 actions, it becomes clear that all proposed ICT-related actions cannot be funded by the available budget of the current period. Moreover, the actual demand does not allow for the funding of all phasing-out actions from the 2007-2013 programming period. The need for prioritisation is evident, both among the 2014-2020 actions, and between ICT actions of the 2007-2013 and 2014-2020 periods.

***Funding for NGNs:*** Funding for Next Generation Networks might is expected from the EPANEK only. The Regional OPs do not foresee any such funding. Funding from EPANEK concerns both the Investment Priorities 2a and 2b; and funding from the OP of Admin Reform refers to Investment Priority 2c only. The information we received by the Special Management Service of EPANEK estimates at 388,000,000 Euro or 68.35% of the OP's budget for TO2 to be allocated to NGN funding. Given the low priority towards NGNs in the regional RIS3 and the development contribution of NGNs, this high percentage of the EPANEK budget allocated to NGNs should be re-examined.

***ICT for industry and business services***: Also according to the information we received by the Special Management Service of EPANEK, the available funding for e-business services and industry modernisation ICT solutions is estimated at 120,000,000 Euro. This is by far below the budget of ICT actions described in the regional and national RIS3, most of which fall in the category of e-business, ICTs for business development, and the ICT sector development. These types of ICT actions should be given higher priority with respect to any other type of actions or NGN infrastructure, because it has the higher productivity and

development impact, and is most compatible to 'Smart Growth' productive modernisation and renewal perspective.

***ICT for government***: The budget available by the OP of Administrative Reform (>223 million) might cover the current demand for e-government applications and e-services and part of the Phasing-out projects of 2007-2013, most of which are related to e-government (Cadastre, 112, Ministry of Justice, etc.).

## 3.3. Business models for the provision of e-services: cloud and state aid

Given the above described budget constraints, a radical shift towards cloud-based provision of e-services would offer considerable advantages in the development, cost, and sustainability of ICT-related services for business development and e-government. It will enable to lower down IT applications and e-services development costs and leave more space to accommodate both existing commitments from the 2007-2013 period and new actions demanded in the current 2014-2020 period.

The typology of services and applications described in the regional and national RIS3 includes three main types:

1. ***Platform based e-services*** provided over an open platform, such as open marketplaces or open government platforms;
2. ***Resource pooling based e-services*** for business development, government, and utilities management (energy saving, transport, environment monitoring), which rely on applications or CMSs that can be standardised and used by various stakeholders and end users (businesses, administrations, citizens), which feed the applications with their data and content in order to provide a service.
3. ***Individual applications based e-services***, which are specific for certain business sectors, groups, or clusters, that need on demand design and development, with very low level of standardisation and replication.

Two business models can offer considerable advantages in the above categories of e-services: (1) a state-aid business model, in which various types of state grants and project-based support are offered for the development of services of the type 3 of e-services, characterised by individualised use and low standardisation features, and
(2) a cloud-based business model for the type 1 and 2 e-services, in which the software application may be offered by a central hub and support is offered to end-users (companies or tiers of administration) in order to customize and learn using them.

For the state-aid business model there is considerable experience in the Greek public administration, acquired during the previous programming period. What is actually needed is a clear and simple state-aid regulation towards e-business solutions.

Cloud computing, on the other hand, can help in many ways public administrations shift from responsive entities towards value driven service providers. A recent study analysing the current national initiatives of ten EU countries for the deployment of cloud computing in the public sector, recognized three emerging models which differentiate in the type of services addressed, the nature of cloud infrastructure and level of centralization (Bonneau et al., 2013a). These models are:

- Procurement and Marketplace: this model, adopted mainly by UK, Portugal and partly by the Netherlands, is a very centralized and top-down approach, only for procurement aspects and involves bottom up approaches regarding application development and adoption. It relies mainly on external providers which develop applications that can be used by pubic authorities.

- Resource Pooling: it is also a top-down model, in which resources are pooled to provide a common infrastructure that can be leveraged for IaaS services and for more specific applications
- Standalone Applications: it is a pure bottom up model in which public authorities provide financial support to deploy standalone applications, without being coordinated even if there is a form of central strategy/policy on this.

These models can be used to provide e-services offered by a platform or having standardised characteristics (type 1 and 2 above).

The value proposition of cloud computing in the public sector, involves cost reduction, agility, high transparency and much more, which are described analytically below (Chandrasekaran and Kapoor, 2011):

- *Cost reduction of IT spending:* With cloud computing, public organisations can create a central pool of shared resources, securing at the same time, increased efficiency of infrastructure. The primary savings are created from datacentre consolidation, aggregation of demand and multi tenancy.
- *Higher agility:* It refers to the ability of an organisation to adapt rapidly and cost efficiently to changes in its environment. Public authorities usually operate in a strictly hierarchical manner, in which any type of service provision is a time consuming activity. Cloud computing can help public administrations accelerate operational execution of projects with limited cost as well as to adapt quickly to new policies or operating requirements.
- *Elimination of procurement and IT infrastructure maintenance:* The characteristics of high scalability, elasticity and resource pooling eliminates the need to procure, monitor and maintain IT resources. This has a significant effect in reducing the workload and the need for IT staff, allowing public agencies to focus on their core responsibilities.
- *Access to new technologies:* Cloud computing provides the opportunity to public organisations to access at all times the most updated software and hardware at a very low cost.
- *Universal resource access:* Cloud computing enables universal access to resources while it helps in establishing common platforms for service provision, which are also accessible by the citizens.
- *Flexibility:* Cloud computing allows different governmental departments and organisations to change service providers without lengthy procurement processes avoiding 'lock-in' contracts (Bonneau et al., 2013b).

The fundamental issue public authorities face for moving into the cloud is the identification and implementation of the appropriate strategy which meets the aims of their organisation whilst uptakes the cloud's significant benefits. Migrating to the cloud raises many questions and poses and number of risks for organisations if not handled correctly. In fact, there is not a single strategy: a public service organisation can choose to be one of three things; a user, a provider or both. The complexity also derives from the fact that all key players can get involved, such as regional governments, citizens and service providers (Accenture, 2013).

Many public organisations find the process of migrating to the cloud as a complex process that requires careful planning and deliberation. For this, it is essential that they should primarily consider all risks and challenges and make sure that migration is right for their organisation and their services. Although there is not a single path, planning for cloud migration should entail careful preparation and a defined strategy in a form of a roadmap that will act as a guide, as well as a checklist with technical, managerial, financial and other considerations.

According to Deloitte (2011), strategies for migrating public services to the cloud will be more effective when they adopt a gradual, phased or incremental approach. This means that (i) they should focus on different subdomains (and specific services per sub-domain and subsequently

expand by developing new services) and (ii) reuse existing public services by adding a service layer and exposing this to a cloud of public services. It should also be added, that migrating existing services to the cloud mostly involves an evaluation exercise that examines the readiness of applications and their business models.

Seo et al. (2014) propose a strategy for the implementation of a public service based on cloud computing, which includes three steps and a list of 15 guidelines in six different domains (Table 3.2). According to the authors, the process should start with the establishment of cloud-based common infrastructure and platform, continue with the design of the services according to a list of predetermined guidelines in order to confirm that these are appropriate for the cloud foundation, and conclude with the actual implementation of the services.

*Table 3.2: Guidelines for the implementation of cloud-based public services*
*Source: Seo et al. (2014)*

| Domain | Guideline |
|---|---|
| Governance | - Determination of the system, organization, and function of government-wide governance for service implementation |
| Platform and common technology | - Government-wide CC architecture reference model<br>- Standard model for the construction of cloud data centres<br>- Connection standard for mutual management between PSBCC<br>- Guideline for the use of open software that can be commonly used |
| Security | - Security guidelines for each factor such as the data (information), system, and network |
| Implementation | - Technology guideline to confirm possibility of implementation in the case of new CC establishment<br>- Guideline on the implementation of the cloud work environment in the public sector<br>- Evaluation and authorization standards of cloud-related solutions |
| Migration | - Standards for selection of convertible services<br>- Technology guideline on the conversion of the legacy system into the cloud system<br>- Guideline for economic feasibility analysis |
| Management | - Guideline of standard service level agreements (SLA) for services<br>- Standard for service quality evaluation<br>- Metering system on the service use |

Taken the above orientations into account, the following steps and actions should be needed in order to provide a wide range of e-services for business development and e-government over the cloud, achieving lower development costs and higher sustainability:

**For the marketplace or platform based e-services**, main tasks are

(1) the design of the platform(s) on which the services will offered, and
(2) the creation of one or more central clouds on which platforms and services will operate.
(3) dissemination and training of end-users in using and providing content to the platform / marketplace.

Funding can be provided by the OP Competitiveness for the business development services, and from the OP of Administrative Reform for e-government platforms and services.

**For resource pooling based applications / e-services**, main tasks are

(1) the design of the services and the development of the underlying applications,
(2) the creation of a cloud-based repository / pool from which the applications will be downloaded, supported and updated, and
(3) the design of a coupon-based or voucher system, which will be used by companies or public authorities in order to adapt / slight modify / and learn using the applications.

Tasks (1) and (2) may be central, allocated in two clouds for e-business and e-government. Task (3) may be both central, with the vouchers offered by the OP of Competitiveness and Innovation or the OP of Administrative Reform, and regional, with the vouchers offered by the Regional OPs.

**For individual applications based applications / e-services**, a state-aid scheme should define the conditions of approval and funding on a project based demand. This line may be funded from national and regional OPs.

By deploying the above two business model a radical shift will take place from applications development to the use of e-services. A larger number of end-users, companies, individuals, and citizens can profit as the system works with economies of scope, and the same solution may be used by many users. A substantial saving is expected in new e-services for business development, tourism and e-gov. Commitments of the period 2007-2013 will be possible to be funded from the current OPs. For instance, the majority of previous commitments in the field of e-government (cadastre, ministry of justice, customs, e-learning, etc.) may get some funding from the OP of Administrative Reform. Other commitments for e-gov. not compatible to cloud should be rejected.

The funding for the Thematic Objective 2 from EPANEK (2a and 2b) is sufficient for the NGNs (388 million Euro), while the rest (circa 200 million) together with 117 million from the regional OPs can be allocated to ICT for industrial modernization, tourism, and smart environments, both for applications pooling and vouchers for their use.

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