

The European Digital Agenda and the Impact of ICT on Public Administrations and Small and Medium Enterprises*

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Abstract

Since several years, the importance of Information and Communication Technologies has been well recognized by public and private organizations all around the world. However, its fully adoption, that is possible in almost every sector of economic and social activities, remains a big challenge. In Europe, Member States put digital transformation in the middle of the political agenda. In this paper we intend to review and discuss the progress of the Italian and Albanian digital economies. With the aim of advertise digital transformation best practices, we also present project experiences confirming the impact of Information and Communication Technologies on Public Administration and Small and Medium Enterprise.

1 Introduction

All sectors of modern society have been deeply influenced by Information and Communication Technologies (ICT). The current ICT development process enables a relatively simple diffusion of digital services. Nevertheless, a different perception is evident when their real adoption is considered. To exploit the digitalization potentiality, bottlenecks need to be removed and an adequate environment has to be created. Financial conditions have to support digital investments

that in most of the cases are enabled thanks to public-private partnership. Last but not least, to develop and to maintain ICT skills in the workforce is a prerequisite for a continuous development.

Many countries worldwide are investing in the digital sector to strengthen the current infrastructure and make the real adoption possible. In Europe the “Europe 2020 Strategy” underlines the role of Information and Communication technology to promote smart, sustainable and inclusive economy [EU10b]. Unlocking the ICT growth potential in Europe enables ICT to be a new engine for the growth [DvW13]. Among the seven flagship initiatives Europe promotes the “Digital Agenda for Europe” [EU10a]. It aims to deliver sustainable economy and social benefits to a digital single market based on fast and ultra-fast broadband and interoperable applications. All European countries adopted such an agenda. In Italy the government is implementing a national plan for ultra-broadband development that moves forward the digital divide problem [oED11]. This comes together with a national strategy for digital growth, pushing the role of technology in any fields of the society and stressing the importance of knowledge driven economy [dCdM15]. In parallel, Albania’s government proposed a cross-cutting Strategy “Digital Agenda of Albania 2015-2020” [CoMA14]. Following the European guidelines major priorities of this strategy are improvement of national infrastructure and development of electronic services.

In this paper, we give an overview of the current development state of digital economy in Italy and Albania by means of some relevant data. Stressing the role of Public Administration and Small and Medium Enterprise we also present two project experiences: Open City Platform (OCP) and Private Assisted House (PAss). The OCP project contributes

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in the area of Smart Government exploiting the potentialities of Cloud Computing [AFG⁺10]. The PASS project contributes in the area of Smart Living (Ambient Assisted Living) showing the importance of cross-sector cooperation among enterprises [GBMP13].

The rest of this paper is organized as follows. Section 2 gives an overview of the Digital Agenda, and the impact of ICT on PAs and SMIs. Section 3 and 4 present the mentioned projects experiences related to Ambient Assisted Living and Smart Government, respectively. Finally, Section 5 concludes the paper.

2 The Role of ICT

2.1 Digital Agenda in Italy

In Italy the implementation of European Digital Agenda passes through a national plan for ultra-broadband development [oED11]. It confirms the essential role of telecommunications for the development and competitiveness of all other digital services [dCdM15]. It represents the key factor to ensure greater impact from the implementation of the cross and digital platforms and infrastructure architectures. This plan was proposed together with a national strategy for digital growth organized in three main pillars. The first one refers to enabling infrastructure, the second consists of enabling platforms and then the third one refers to an acceleration program. In particular, Italy's national strategy for digital growth passes through:

- Digital market and investments: improving interoperability, fostering e-commerce, harmonizing fiscal policies
- Internet governance and consumers' trust: increasing safety and security Research & Innovation: releasing the innovative potential through new models of digital manufacturing and startups
- E-government and digital infrastructure: modernising the public sector and the digital network, Big Data and Cloud Computing

2.2 Digital Agenda in Albanian

Albania government proposed a cross-cutting Strategy "Digital Agenda of Albania 2015-2020" [CoMA14]. Following the European guidelines the major priorities of this strategy are improvement of national infrastructure and development of electronic services. More in details the priorities are:

- Policies for the development of electronic governance and delivery of interactive public services for citizens and business

- Policy for the development of electronic communications in all sectors (health, education, environment, agriculture, tourism, culture, energy, transport, etc)
- Establishment of the National Geospatial Data Infrastructure

Among others, Albanian strategy is based on some guide principles, following we report some of them: people come first, Individual empowerment, access to services delivered by the government, national integration of ICT resources, transborder and regional cooperation and beyond, trust and security of information networks, effectiveness and efficiency, quality of digital contents, Private-Public Cooperation Partnership, and technological neutrality.

2.3 ICT Overall Impact

ICT is an important sector for Europe since it plays a fundamental role in the growth and potential employment in the sector itself, and at the same time it also promotes the growth in other business sectors as well as in the Public Administrations. In 2011 a study done by the Management Academy for ICT Executives underlined the importance of ICT investment. It could save the public administration up to 43 billion euro, and impact on GDP with an increase in from 0.4% to 0.9% [MA11].

Even if the ICT sector was affected, as well as other sectors, by the economic crisis the share of value added by the ICT sector as a percentage of the GDP has remained stable at around 4% in 2011 and 2012, driving over 17% of the total Business Expenditure on Research and Development (BERD). The positive effect of information and communication technologies on market performance has been confirmed by empirical studies [DGK03] [MKG04]. They underline how ICT impacts in terms of productivity, profitability, market value and market share. They also state that process efficiency, service quality, cost savings, organization and process flexibility and customer satisfaction can be improved by means of ICT.

Referring to the number of IT companies Italy is with 97.000 active companies, which are employing 390.000 people on second place in Europa behind UK. In Albania there are more than 1.800 companies and over 8.000 professionals that operate in the IT industry. The main business activity is located in the greater area of the capital cities. In Albania, Tirana hosts 47% of the ICT companies. In Italy, Rome shares together with Milan the highest concentration of ICT companies in the country. Approximately 20% of all employees works alone in Rome in the ICT sector. More general, according to the "Measuring the Infor-

mation Society Report - 2015” provided by ITU¹ it is possible to observe a continuous growth regarding the ICT development index, in particular Albania ranks 94th and Italy ranks 38th. Comparing the percentage of households with computer in Albania and Italy we have 28,21% and 73,98% respectively, and considering the percentage of households with Internet access we have 25,94% and 72,61%.

Last but not least, the diffusion of ICT contributes to take advantage of open government data, and public sector information in general. McKinsey estimates global economic value of open data as USD 3.2 Trillion.

3 The Open City Platforms

3.1 Overview

The OCP project² funded by the Italian Ministry of Education and Research within the call “Smart Cities and Communities and social innovation” is 42 months long (from January 2014 to June 2017). It is a research and development project and it involves: 2 public research centers (INFN and University of Camerino) and 18 companies with the support of some Italian public administrations (3 regions, 16 municipalities, and 4 municipalities aggregations). Potentially, OCP impacts on more than 9.000.000 people living in the territory of the involved regions.

The OCP project implements a Smart Government³ solution for Public Administration taking advantage of the cloud computing technologies to close the gap between availability and use of digital services. In particular, the project objectives are following reported.

- Design and Development a fully integrated and interoperable cloud stack (IaaS, PaaS and SaaS).
- Design an innovative organizational models supporting the provisioning of cloud based services by local governments to citizens, businesses and other Public Administrations.
- Promote the diffusion of open-source technologies in Public Administrations.

3.2 OCP Challenges

The project contributes giving input toward Public Administration innovation. Through the development of the OCP platform some of the *benefits of*

cloud computing are guaranteed for Public Administration. They are cost reduction, efficiency, flexibility and speed of service delivery, easier maintenance of technological infrastructure [Cat10]. More in general this allows the national government to make available a set of shared resources avoiding unnecessary infrastructure duplication, freeing up physical space and resources that can be invested to create new growth opportunities.

Other important contributions of the OCP project refers to the *openness* and *transparency* [Gen95]. Openness is broader than transparency. The first one covers active cooperation and communication between Public Administrations, while the latter refers to the access to Public Administrations data and services. OCP contributes to both of them. Indeed, interoperability is a key issue solved by the project both at technical and semantic level. Also transparency is supported by OCP by means of an open service approach. Considering open data as snapshot of data from applications they usually represent a copy of information in a precise time slot; we state that open data updating is an issue. Indeed, the main disadvantages of open data refer to the lack of real time access of original data, the capability to update they in a fully automatic manner and finally the possibility to give meaning to the data. Solve such issues means evolve the concept of open data toward open services. This is what OCP support.

3.3 OCP Main Components

The OCP project objectives refers to the design and development of a fully interoperable cloud stack characterized by the following main components.

- OCP extends the well known IaaS platform, such as OpenStack⁴ for the retrieval of resources (network, computing and storage). In particular, the extension provides a mediation layer between OCP and the underlying IaaS infrastructures in order to avoid differences in the type and terms of services provided by SaaS and PaaS layers in OCP.
- OCP supports a specialized PaaS interoperability solution to orchestrate different PaaS platform and related functionality. Considered platforms are Cloudify⁵ and WSO2⁶.
- OCP extends the PaaS platform to support e-government reusable components, such as multi-channel support, big data Management, cartog-

¹<http://www.itu.int/>

²<http://www.opencityplatform.eu/> (in Italian)

³Smart Government refers to “the implementation of a set of business processes and underlying information technology capabilities that enable information to flow seamlessly across government agencies and programs to become intuitive in providing high quality citizen services across all government programs and activity domains” [Rub14].

⁴<https://www.openstack.org/>

⁵<https://getcloudify.org/>

⁶<http://wso2.com/>

raphy management, payment gateway. They enable the development of digital service at the SaaS level.

- OCP implements a scalable, federation-ready and multi-monitoring infrastructure between the IaaS, Paas and SaaS layers based on Zabbix⁷. It exposes consumption metrics which can be used both for resource usage supervision and for interfacing to existing billing systems.
- OCP supports a federated identity management for both authentication and authorization. It is based on OpenAM⁸ a web-based suitable to provide authentication methods and Single Sign On functionalities. This is in line with the national guidelines given by AGID and the SPID framework (in italian “Sistema Pubblico di Identità Digitale”).
- OCP implements a citizen’s Marketplace. It is a common place in which providers of public services or open data/services (e.g., municipalities, public companies, universities or research institutes), but also citizens willing to propose services, can exhibit their applications in cross-selling and trusted mode.
- OCP implements a services’ Marketplace that enables companies (and service creators in general) to easily activate new cloud digital services based on those provided by Public Administration. It also enables the deployments and use of services across regions and at national-level.
- OCP proposes an Open Service infrastructure based on SPOD⁹. It is set of open-source tools which help to implement open data and support two way interactions (instead of importing static datasets) by means of open services. Semantic enrichment of data is also supported.

Finally, OCP implements a methodology for assessment of the potentiality of porting services towards the OCP cloud. This permits to analyze the impact of the potential software transformation. To do that eight different parameters are considered, that are: workload, loose coupling, number of layers, distribution, database, component type, multi-tenancy and security [CAPS15].

All components and methodology are under validation into practice through the organization of testing environments involving resources of Public Administrations supporting the project.

⁷<https://www.zabbix.com/>

⁸<https://forgerock.org/openam/>

⁹<http://www.opendata.statportal.it/>

4 The PAss Project

4.1 Overview

The PAss project¹⁰ funded by Marche Region was 24 months long (from February 2012 to February 2014). It involved 12 companies (1 big, 3 medium, 5 small, and 3 micro), two institutions for technology transfer, and the University of Camerino.

The Pass project implements an Ambient Assisted Living¹¹ solution for people ageing well in their private homes. In particular, the project objectives are following reported.

- Design an innovative care model.
- Promote the user-centered technology development in the field of smart house.
- Design and development of an integration platform for the governance of smart home.
- Design and development of smart objects.
- Design and development of an invisible and adaptable sensors solution.
- Improve of knowledge asset for orienting the PAss care model.

The project contributed giving input toward innovation to industrial operators in the economic market involving several sectors. In particular, involved sectors were health, construction, and manufacturing. The project introduced services and products with a positive impact on the relationship between economic growth and employment. Also trans-sectors development was promoted. New competences raised acquiring multi-disciplinary skills.

4.2 PAss Challenges

The project contributes to answer open challenges in the area of Ambient Assisted Living, with the care model, the integration platform and a set of smart-objects. All of them are distinctive aspects of a smart home¹².

The PAss care model supports a deep understanding of end users including specific groups, like elderly people, disabled, disabled elderly people, living alone,

¹⁰<http://www.projectpass.eu> (in Italian)

¹¹Ambient Assisted Living can be defined as “the use of information and communication technologies in a person’s daily living and working environment to enable them to stay active longer, remain socially connected and live independently into old age” (www.aal-europe.eu) [MFRR15]

¹²Smart home is “an application of ubiquitous computing that is able to provide user context-aware automated or assistive services in the form of ambient intelligence, remote home control or home automation” [ARA12].

or with a caregiver. Overall, the care model introduces flexibility considering the diversity that evolves during the time. When people get older they change physically, emotionally, mentally and so they have different needs according to the level of sickness and health.

The PAss integration platform combines together heterogeneous solutions (home automation and tele-care) creating a common platform to exchange information between multi-vendors and multi-purposes smart-objects. This gives an answer to interoperability issues and solves problems that may arise when different protocols have to be supported. Indeed, the PAss integration platform can be deployed in existing homes and it can interoperate with the existing infrastructure. Even if several standards related to assistive technology already exist, the situation is still really complex. For many relevant topics, there are no standards, or standards with no market acceptance.

The smart objects designed and developed during the PAss project are able to populate the domestic environments with non-invasive sensors. Generally, sensors are prone to environmental noise, and to improve sensing performance a cross-check validation is needed. Smart objects proposed in the project represent a solution to this problem improving the number and the types of input sensors without impacting on the living environment.

4.3 PAss Integration Platform

The PAss integration platform is based on a conceptual model that is a generalization of the software and hardware components. Relevant aspects are the use of an Home Gateway for the local control of the house together with the integration of a Telemedicine Platform.

The Home Gateway is the core component of the smart home, since it is responsible to run the PAss integration platform implementing the business logic for the local management of the house. It includes a message broker toward smart objects and it is also responsible to store data and to log the messages passing. Its functionalities are exposed by means of a user interface. The Telemedicine Platform is an organized, secure, and highly regulated system for practicing medicine remotely, tracking health data, sharing medical records among physicians. It has an independent communication channel toward health dedicated centers and it enables remote visit through high-resolution video. Both Home Gateway and Telemedicine Platform communicate with the **Cloud Center** that allows storage, normalization and analysis of data. Based on data it performs remote processing to generate actuations, that will be then executed in smart

home by means of the Home Gateway.

4.4 Smart Objects

In the following we present some of the Smart Objects that are designed and developed in the project. Smart Objects are objects able to interact with the surrounding environment and with other objects in order to coordinate the execution of complex actions [KKFS10]. They are interconnected each other and supported by the PAss integration platform thanks to the use of standard interfaces.

- Interior Smart Door - It is a door that can be opened in two directions, the door control is automatically supported by an electric motor even if it can also actuated manually.
- Smart Window - It is a window characterized by a triple-glass with double cavities. The internal space is filled with a gas, while the external contains a liquid shielding. At the base of the frame there is a micro-pump able to push the liquid inside the cavity when it is necessary to regulate the light in the house.
- Smart Armchair - It is an armchair equipped with sensors for monitoring personal health parameters such as pressure, weight, blood sugar and blood oxygen saturation.
- Wearable Smart Sensors - It consists of wearable multi-sensor able to measure simultaneously: heart rate, respiratory rate, body temperature, activities, acceleration and posture. It makes possible to have a complete monitoring of the people during daily activities.
- Smart Panel - It is an interactive panel equipped with configurable buttons used to control functionalities of the home.

5 Concluding Remarks

Starting from Digital Agenda, national plans related to digital development are implemented all around Europe as well as in Albania. They prove the role given to ICT by governments recognizing ICT as an engine for the development of the modern society. However, ICT potentialities are not fully exploited.

In the paper we discussed the importance of ICT for modern society and we present its benefits by means of project experiences concerning Ambient Assisted Living and Smart Government. The projects confirmed some recent technological trends. Cloud computing and Open Data, developed in the OCP project, have the capabilities to positively stimulate the market and

increase business opportunities across Europe. Internet of Things, that is at the base of PASS project, has been identified by Forrester Research as one of the technologies that will change our lives in five years.

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