

# DIGITAL TRENDS IN ITALY

## 2016 Executive Summary





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In collaboration with:



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# Digital Revolution

## DIGITAL INNOVATION

The digital economy has made a quality leap over the last few years, thanks to mobile access to the Internet, and a growing number of interconnected entities and it is bound to accelerate, driven by Big Data, Cloud, the Internet of Things, Additive Manufacturing etc. Digital transformation is not just a technological change. It affects the entire organization because digital innovation, like electricity, circulates and feeds all corporate functions. Therefore, change is a priority for top managers, not only for the IT function; it calls for new skills. These new skills are difficult to find and require new education and training programmes.

Change also affects relations with customers, suppliers and external stakeholders, as well as relations between companies and their employees (mobile working and smart working). Quick response to change is now a crucial factor. The new approaches it requires are difficult to combine with traditional business and sourcing models.

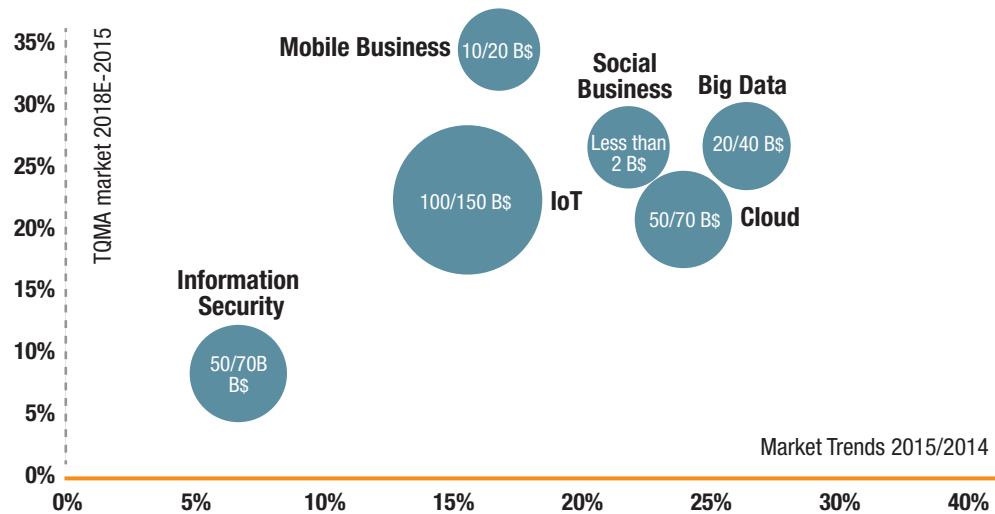
What technological trends are and will be driving digital innovation in the next 3-5 years? This report will only focus on trends affecting company processes, without specifically addressing the ways in which companies communicate and interact with consumers. The concerned trends were grouped in two clusters: the Current Pillars of Digital Innovation and Emerging Innovation. The types of innovation in the first Cluster have already attracted business interest, have generated a market and will continue to develop in the next few years: Business Intelligence and Big Data, Cloud, the Internet of Things, Information Security, Mobile Business and Social Business.

The second Cluster includes innovations still under development: Advanced Machine Learning, Collaborative Robotics, Additive Manufacturing, Wearable Devices, Virtual & Augmented Reality, Blockchain. It is important to analyse the "Current Pillars" to understand trends and better interpret market data.

## THE CURRENT PILLARS OF DIGITAL INNOVATION

The Current Pillars of Digital Innovation are deeply affecting the ICT world market (Figure 1).

The biggest share (from 100 to 150 billion dollars in 2015) is related to the **Internet of Things** (IoT), enabling the smart connection of several devices. IoT pervades across all economic sectors and can have major impacts on business and Public Administration activities as well as consumers. It recorded good growth rates in 2015 (between 15 and 20%) and it will show even higher growth rates in the medium term (between 20% and 25% on average per year). The market is expected to double in 2018 compared to existing figures. Information Security and Cloud are already sizeable markets throughout the world (between 50 and 70 billion dollars in 2015), showing new trends and in relation to the digital transformation as a whole. However, their dynamics are different. Companies must invest on digital innovation in the **Information Security** sector, to face new vulnerabilities and attacks, protect data and monitor devices. Current trends are expected to be confirmed in the next few years, with a lower growth compared to the Cloud segment but higher (between 5% and 10% annually) than the overall digital market.



**Figure 1: Worldwide Trends of Current Pillars of Digital Innovation**

Source: NetConsulting cube from multiple sources (PAC, IDC, Gartner), 2016

Interest is further growing on **Cloud**, that is to say shared computer processing and data provided remotely and on demand to corporate information systems, is further developing: it grew considerably over the last two years (between 20% and 30%) and a slightly lower annual growth is expected in the future (between 20% and 25%). Cloud computing will be the main model for using IT resources and applications throughout the world. It is expected to double its value over the next 3 years.

The **Big Data** market - which includes middleware infrastructure to collect and file data, analytics applications and related services – was worth between 20 and 40 billion dollars in 2015. It performed well (between 25% and 30%), and is expected to keep the same pace of growth in the medium term. It is driven by the pervasive growth of connected objects and by the trends in Mobile and Social, which call for companies to integrate internal and external, structured and unstructured data.

The **Mobile Business** market is part of Enterprise Mobility Management, that is to say business

mobility applications and services in the areas of workplace management, ERP, CRM, SCM and BI, Customer Relations (Mobile Payment, Mobile Commerce), Mobile Device Management. This market is relatively small, being worth between 15 and 20 billion dollars in 2015, but it is expected to accelerate, recording double-digit growth of up to 30% over the next three years. It is driven by the widespread adoption of smartphones and mobile devices and by the increasing reliance on flexibility and mobility in business processes.

Finally, the **Social Business** market, smaller than the other markets (less than 2 billion dollars) is tightly linked to Mobile Business. In 2015, it recorded growth rates between 20% and 25% and these percentages are expected to be confirmed in the next three years. Growth involved areas both inside organizations (Social Intranet, Social Collaboration platforms, Social HR), and outside, linked to reputation and sentiment analysis and monitoring, customer satisfaction and use of Social media as marketing and fidelization channels.

# The Italian Digital Market 2015-2018

## DIGITAL MARKET EVOLUTION AND TRENDS IN ITALY

### Performance of the Digital Market and of its Main Segments

After years of contraction, the Italian digital market grew by 1.0% in 2015, to 64.9 billion euros. 2016 figures should confirm a positive trend, with a 1.5% increase, followed by a 1.7% growth in 2017 and 2% in 2018 (Figure 2). This performance was driven by process digitalization and by the use of ICT to innovate business models and increase competitiveness. Demand for Digital Enablers is increasing also in Italy, especially with regard to Cloud Computing, Big Data, IoT, Social, Mobile Business and Security, which recorded a combined 14.6%

rate of growth in 2015. A similar growth is expected to continue at least until 2018. Without these segments, the traditional ICT market shows very different trends of stagnation: it dropped in 2015 (-1.2%) and the forecast for 2016 and 2017 is negative (-0.6% and -0.3% respectively). Return to growth is expected only in 2018 with a small increase (+0.1%).

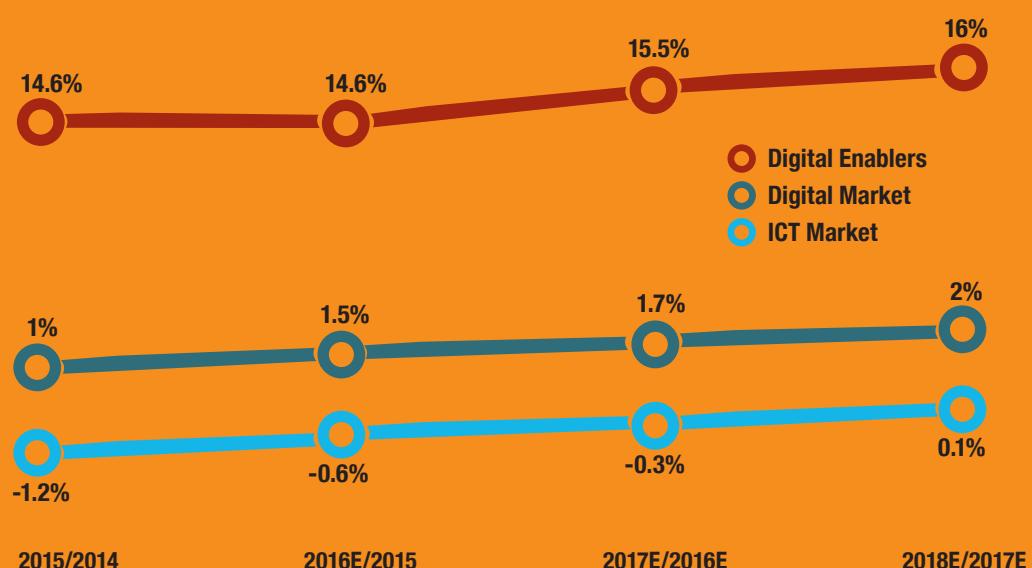
Digital Enablers have a different impact on the digital market as a whole and on different segments. More in detail:

- Cloud computing is changing the way IT resources are used, shifting from purchase to "on-demand" use and it reallocating a growing share of IT costs from capital to operational expenses. This is especially true for infrastructures. As far as software is concerned, System software demand is decreasing, offset by growth in orchestration

**Figure 2: Digital Market Segments in Detail**

% Variations - Innovation

Source: NetConsulting cube



and security tools. Development of Cloud computing in the application segment is slower but inevitable, thanks to its benefits in terms of implementation speed and performance. The impact on Outsourcing services demand is negative (especially with regard to Application Management), but connectivity and data traffic demand are growing;

- Big Data growth will accelerate investment in appliances and engineered systems, adoption and implementation of Information Management tools and Business Analytics solutions;
- The growing demand of IoT solutions supports investment in infrastructure components development, application software adoption and specific engineering and management activities;
- The increased mobility of business users generates growth in the mobile devices market and a higher need for applications, which must be available also from mobile devices, as well as for Mobile Device Management tools. The use of data transmission and VAS services from mobile devices is also growing;
- Business digitalization and widespread digital channels are driving growth in Security Tools adoption and supporting demand for development services and Managed Services, positively affecting Cloud services too.

## Forecast

The above-described dynamics are confirmed by digital market development forecasts (Figure 3). Recovery in the 2015-2018 period will be driven by **Software and ICT Services** (with an average annual growth of 4.5% and 3.5% respectively), due to the impact of Digital Transformation on platforms and solutions demand. IoT platform demand shows the highest increase (with an average annual growth rate of 17.8% in the 2015-2018 period); followed by Web management solutions, supported by an increased penetration of Social platforms to manage customer relations, and of e-commerce.

However, it should be pointed out that Consulting and Systems Integration Services will continue to drop in the next few years due to

a reduction in average project value; the ICT Outsourcing segment will also decrease (-1.5% annual average) due to Cloud effects.

The **Devices and Systems** segment is still showing a positive trend (+0.8% in the 2015-2018 period) but will slow down due to traditional hardware performance both in IT and in TLC. Smartphone growth will continue (+9.4% annual average), while tablets will drop.

The **Digital Contents** segment will grow, with positive trends in all areas.

Downpricing and rates reduction are the main cause for the drop recorded by **Network Services**. A negative trend is expected throughout 2018 (-1% annual average) due to fixed network services, while mobile network services should drop less.

The performance of the digital market in Italy in 2015 will be analysed more in depth below.

## Devices and Systems

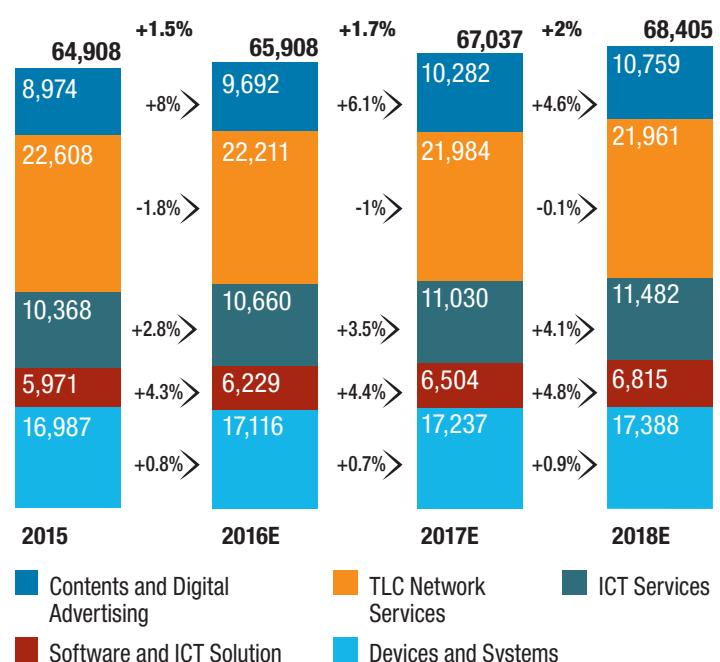
In 2015 the Devices and System market grew by 0.6% to 16,987 million euros (Table 1). Looking at individual segments more in depth:

- **Home & Office Devices** dropped by 1.4% to 2,171 million euros, mainly due to desktop PCs and printers (longer average life);

**Figure 3: The Digital Market in Italy**

Values in million euros  
and % Variations

Source: NetConsulting cube



	Data in million euros	2013	2014	2015	14/13	15/14
<b>Table 1: Devices and Systems Market, 2013-2015</b>						
Home & Office Devices	2,125,0	2,201,0	2,170,8	3,6%	-1.4%	
Enterprise & Specialized Systems	3,729,0	3,734,0	3,673,4	0.1%	-1.6%	
Personal & Mobile Devices	5,902,0	5,705,0	5,653,1	-3,3%	-0.9%	
ICT Infrastructures	5,133,0	5,240,0	5,490,0	2,1%	4,8%	
<b>TOTAL DEVICES AND SYSTEMS</b>	<b>16,889,0</b>	<b>16,880,0</b>	<b>16,987,3</b>	<b>-0.1%</b>	<b>0.6%</b>	

Source: NetConsulting cube

- **Personal & Mobile Devices** went down by 0.9% to 5,653 million euros, mainly due to Notebook PCs and tablets. Notebooks decreased less than tablets thanks to the good performance of high-end products. Smartphones kept growing thanks to new high-performance smartphones;
- **Enterprise & Specialized Systems** continued their downward trend (-1.6% to 3,673 million euros). High-end systems and midrange servers went up because large companies have invested in new datacentre models (software defined solutions, converged systems), but X86 servers and external storage devices declined. Communication systems, which recorded a positive trend in 2014, also went down (-3.7%); the decline involved private communication systems (PBX), networking and videoconference equipment. As for “Other hardware”, medical devices resumed growth; video surveillance systems and ATM installations continued to increase thanks to multichannel banking strategies;
- **ICT Infrastructures** recorded very positive trends thanks to a sharp increase in capital expenditure (close to 5.5 billion euros, up by 4.8% compared to 2014), to support state-of-the-art digital services (including in the IoT area), construction of an FTTC access network, LTE/4G network coverage increase and back-haul infrastructure increase.

## Software and ICT Solutions

In 2015 the on-premise Software and ICT Solutions market grew by 4.7% to 5,971 million euros (Table 2). The various segments show very different trends.

- **Application Software** grew by 6.1% to 4,223 million euros. Office Automation and Collaboration applications, which are shifting to Cloud, went down and ERP and Extended-ERP solutions demand showed signs of stagnation. Growth was driven by IoT and web management platforms, including for e-Commerce and by platform supporting Social Enterprise and Smart Working, customer experience and customer engagement. BI/BA, Data Mining and Data Analysis applications went up thanks to increased demand for analyses (Social/ Web Analytics, Machine Learning and Cognitive Computing). SCM and ECM solutions recorded a small growth.
- **System Software** dropped by 0.5% to 547 million, due to decreased PC and notebook sales and to the gradual completion of migration to new operating systems.
- **Middleware** went up by 2.4% to 1,201 million euros; demand is shifting from IT resources consolidation and virtualization to solutions for hybrid environments management and orchestration. Cloud development is driving growth in IT Security tools, also supported by regulatory compliance. There still is a focus on database management tools, especially with regard to data warehouse revision (real-

	Data in million euros	2013	2014	2015	14/13	15/14
<b>Table 2: On-Premise Software and ICT Solutions</b>						
System Software	555,0	550,0	547,2	-0,9%	-0,5%	
Middleware Software	1,145,0	1,173,0	1,201,1	2,4%	2,4%	
Application Software	3,775,0	3,980,0	4,222,9	5,4%	6,1%	
<b>TOTAL SOFTWARE AND ICT SOLUTIONS</b>	<b>5,475,0</b>	<b>5,703,0</b>	<b>5,971,2</b>	<b>4,2%</b>	<b>4,7%</b>	

Source: NetConsulting cube

Data in million euros	2013	2014	2015	14/13	15/14
Development and System Integration	2,990.0	2,894.0	2,848.5	-3.2%	-1.6%
Technical Assistance	747.0	732.0	725.0	-2.0%	-1.0%
Consulting	809.0	787.0	780.9	-2.7%	-0.8%
Training	360.0	342.0	325.2	-5.0%	-4.9%
ICT Outsourcing Services	3,911.3	3,829.1	3,738.1	-2.1%	-2.4%
Cloud Computing Services	788.8	953.9	1,227.8	20.9%	28.7%
Data Centre Services	638.9	676.9	722.5	5.9%	6.7%
<b>ICT Services</b>	<b>10,245.0</b>	<b>10,215.0</b>	<b>10,368.0</b>	<b>-0.3%</b>	<b>1.5%</b>

**Table 3: ICT Services Market**

Source: NetConsulting cube

time Data Visualization and Data Analysis, unstructured data management). An increase was recorded by Master Data Management to support integration of company data, often scattered in separate silos.

## ICT Services

In 2015 the ICT market went up by 1.5% to 10,368 million euros (Table 3), supported by Cloud computing and by Data Centre services. All other services show downward trends. **ICT Outsourcing** dropped by 2.4% due to decreasing demand for low value-added processing activities, to increasing insourcing and to Cloud computing. As far as infrastructures are concerned, demand for Hybrid Cloud services and Managed Services went up. As for applications, Outsourcing services are negatively affected by lower contract value and increasing application standardization. Demand may be pushed up by migration of the existing fleet to

in-memory platforms and by the increased need for new HR and CRM applications.

Decline in **Development Services** and **System Integration** and in **Consultancy** are due to reductions in the number of application projects, to propensity to DevOps/Agile approaches and to Cloud development. Hardware and software maintenance services dropped due to increased automation. Technical **Assistance** was negatively affected by price reduction, performance and quality of hardware components, extended warranty periods, Cloud competition. **Training** services demand by end users continued to decline, except for training associated to engineering activities.

## Fixed and Mobile Network Services

In 2015 the Telecommunication Services market confirmed its negative trend, even though less than in previous years. It dropped by 2.4% to a total value of 22,608 million euros (Tables 4 and 5).

Data in million euros	2013	2014	2015	14/13	15/14
Fixed Network Voice Services	5,750.0	5,215.0	4,818.0	-9.3%	-7.6%
TD	905.0	875.0	859.0	-3.3%	-1.8%
Internet Access	3,490.0	3,525.0	3,682.0	3.1%	4.5%
VAS	595.0	635.0	641.0	6.7%	0.9%
<b>FIXED NETWORK SERVICES</b>	<b>10,670.0</b>	<b>10,250.0</b>	<b>10,000.0</b>	<b>-3.9%</b>	<b>-2.4%</b>

**Table 4: Fixed Network Services**

Source: NetConsulting cube

Data in million euros	2013	2014	2015	14/13	15/14
Mobile Network Voice Services	7,910.0	6,765.0	5,974.0	-14.5%	-11.7%
TD	5,240.0	4,945.0	5,295.0	-5.6%	7.1%
Mobile VAS	1,120.0	1,215.0	1,339.0	8.5%	10.2%
<b>MOBILE NETWORK SERVICES</b>	<b>14,270.0</b>	<b>12,925.0</b>	<b>12,608.0</b>	<b>-9.4%</b>	<b>-2.5%</b>

**Table 5: Mobile Network Services**

Source: NetConsulting cube

In the **Mobile** area (-2.5%) revenues from voice services dropped while data transmission (including mobile browsing) and VAS went up. SMS revenues went down due to an increased use of mobile applications.

The **Fixed Network Services** segment (-2.4%) was negatively affected by bundle offers and by the almost complete replacement of traditional services with IP-MPLS-based technology, by progressive coverage of new-generation internet access infrastructures and by growing demand for fixed-network VAS (satellite services and free-toll numbers).

The number of active mobile lines confirmed a downward trend (92 million euros) due to the rationalization process started a few years ago. Broadband access to the fixed network increased to 14.6 million, of which about 1.2 on fibre-optic networks.

### Digital Contents and Advertising

Digital Contents and Advertising continued their growth in 2015 (+8.6%) to 8,974 million euros. As far as **Contents** are concerned, most revenues came from pay videos, even though performance in this area was flat, except for on-demand web platforms, which showed very dynamic results. Gaming & Entertainment and Mobile Entertainment showed the highest growth rates, driven by mobile applications. Good growth rates were recorded by digital

music (streaming services), although the value of this segment is smaller, and by e-book contents thanks to VAT reduction and a wider offer by publishers.

In 2015 **Digital Advertising** reached 1,939 million euros, accounting for 26.6% of the total advertising investment. Social Media Advertising recorded the highest annual growth rate. Search Advertising also went up significantly.

## INNOVATIVE TRENDS AND DIGITAL SERVICE PENETRATION IN ITALY

### Overall Scenario

Digital Transformation pillars include Web management platforms (including Social tools), Mobile, IoT, Big Data, Cloud paradigms and Security solutions. Mobile Business and IoT are the most important markets in terms of size and dynamics as a result of their key role to enable business innovation. (Figure 4).

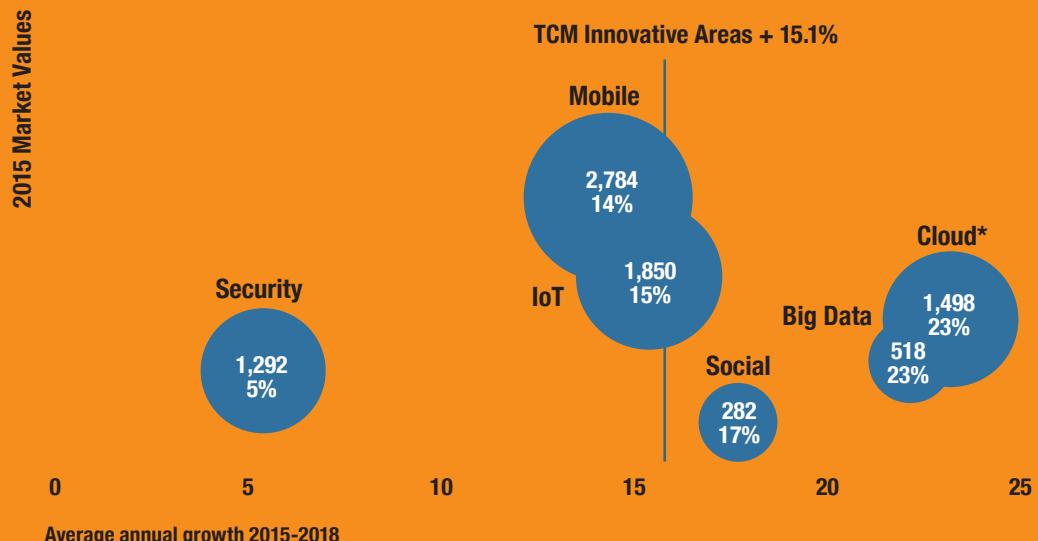
**Mobile Business** went up by 14% to 2,784 million euros, driven by mobile terminals and applications. In 2015 the focus was on mobile applications restyling projects and, above all, evolution and increase in services offered through Mobile Apps to improve customer relations and to increase Customer Experience.

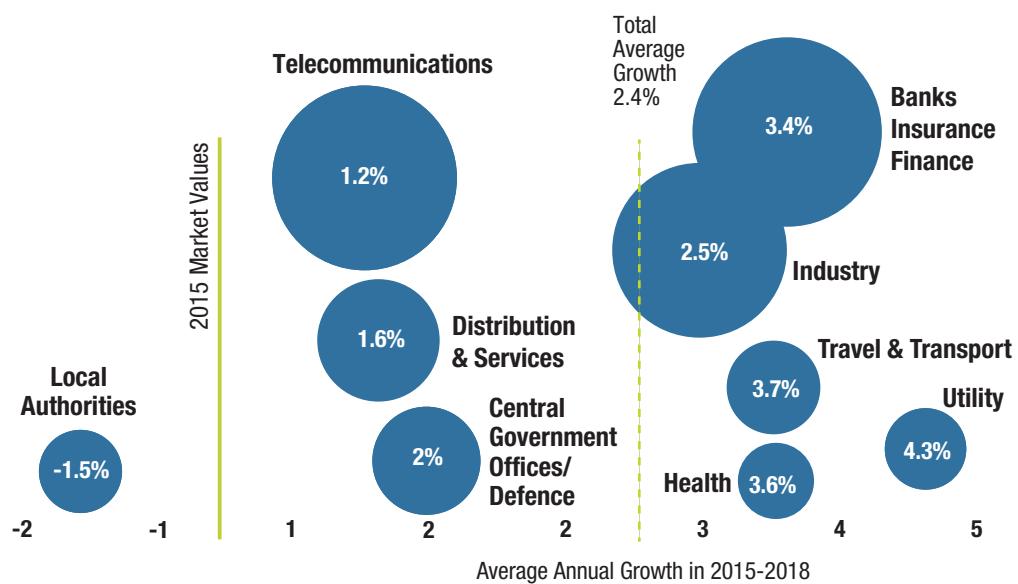
**Figure 4:**  
**Innovative Trends of the ICT Market in Italy in the 2015-2018 Period**

Values in million euros and % Variations

Source: NetConsulting cube

(\*) including Cloud service orchestration and management platforms and Cloud preparation services (e.g. search and elimination of lock-in)





Project activity for mobile applications was also dynamic in the Business Intelligence area especially to support top management and the sales force.

In 2015 the **IoT** reached 1,850 million euros, up by 13.9%, with software and services performing better than hardware. As far as software is concerned, growth was driven by horizontal and vertical platforms enabling data integration and collection and analytics implementation, while services grew mainly thanks to solutions design, customization and integration with company systems.

The **Big Data** market in 2015 reached 518 million euros (+23%) and good growth rates will be recorded also in the next few years. Predictive Analytics solutions are expected to grow in the future. The Data Scientist is a new emerging professional role calling for maths, statistics and programming skills, database knowledge and an ability to interface with Business Units. Cognitive Computing is currently being assessed for potential applications.

**Cloud** computing is rapidly growing, up by 23% to 1,498 million euros, driven by Public & Hybrid Cloud services, whereas Virtual Private Cloud increased less. Private Cloud mainly involves large companies using Cloud technologies for internal datacentre portions. SaaS services still relate mainly to non-mission critical solutions and, to a lesser extent, more

strategic applications that typically remain on premise due to data sensitivity. However, the increased demand for applications from mobile devices is fostering demand for SaaS solutions in these areas. PaaS services still have a marginal share but they are growing, supporting management and optimization of testing and development activities.

Spending on **IT Security** went up by 5% in 2015 to 1,292 million euros. Investment mainly focused on Data Loss Protection, Intrusion Prevention and Firewall tools updating, strengthening of policies and use of Risk & Vulnerability Assessment services. Partly due to the increased use of Cloud computing, demand for managed security services and API security is expected to grow over the next three years, as well as services to ensure compliance with new European data protection regulations.

**Social Business**, intended as Web platform management tools, is still a small and yet very dynamic market. Further growth will be driven by good dynamics of Social tools, increasingly adopted by companies both inside and outside.

## Trends by User Segment

Business spending on digital technologies is expected to grow in the 2015-2018 period, but differences can be observed across the various user segments (Figure 5).

**Figure 5: Digital Business Market by User Segment in the 2015-2018 Period**

Values in million euros and % Variations

Source: NetConsulting cube

In the **Banking** sector, spending reached 6,583 million euros in 2015 and it is expected to grow at an average annual rate of 3.3% until 2018, despite the difficulties suffered by this sector. Digitalization strategies focus mainly on migration to digital banking, through the development of new services, branch automation, better data management and updates of IT architectures to foster evolution. In the **Insurance** sector, after reaching 1,735 million euros in 2015, spending will go up by an annual average of 3.8% until 2018.

New digital paradigms are supporting service innovation – the IoT for example makes it possible to develop new types of insurance policies and pricing models – and process innovation. Mobile and Social channels will be increasingly used for internal and external communication, including communication through the agency network. Applications modernization projects and projects in the Big Data and Cloud areas are key to enable new strategies.

Digital demand in **Industry** will grow between 2016 and 2015 at an average annual growth rate of 2.5% from 6,877 million euros in 2015. Within an overall scenario of moderate recovery, ICT investment shows several growth areas: from traditional areas (ERP and extended-ERP) to innovative ones: the IoT (to support plant efficiency and safety and new business models), Big Data, Cloud.

ICT spending in the **Distribution and Services** sector totalled 3,856 million euros in 2015 and is expected to increase at an average annual growth rate of 1.6% until 2018.

The main goals in this sector are: keeping market shares, develop sales strategies, brand strengthening and better customer knowledge. The focus is on Mobile, Big Data/Business Analytics and Cloud computing.

In the **Telecommunications & Media** sector, ICT spending reached 8,124 million euros in 2015 and is expected to score an average annual growth of 1.2% until 2018. Companies are working to innovate their offering to respond to evolving customer needs and competitive pressure. Investment is mainly focused on upgrading broadband network infrastructures, adoption of mobile solutions to support new content usage models and evolution of customer care services, migration to Cloud computing,

adoption of Big Data solutions to profile customers and to launch personalised offers. In the **Utility** sector, digital demand totalled 1,522 million euros in 2015 and an average annual growth rate of 4.3% is expected until 2018. ICT investment is driven by the need to optimize business processes (Mobile Workforce, Business Intelligence, Augmented and Virtual Reality), to widen targets and markets, to focus on market liberalization (Social channels, advertising, mobile applications).

In the **Travel & Transportation** sector, ICT spending in 2015 was 2,155 million euros and it will increase at an average annual growth rate of 3.7% until 2018. Strategies are aimed at evolving the business activities by using more BI/BA tools (customer knowledge, new offers, monitoring of sales activities); Mobile Apps (new booking, payment and customer care systems); IoT systems (MobilityInfo, Fleet Management, etc.) Spending by **Government** in 2015 went slightly up in central government to reach 2,893 million euros and down in local government to 1,217 million euros; this trend is expected to be confirmed in the 2015-2018 period, with an average annual decline in spending by local government of 1.5% and an average annual increase of 2% in spending by central government, driven by the 2014-2020 Digital Growth Strategy and its major nation-driven coordinated projects.

## Trends by Size of User

The Italian digital market is driven by large companies' investment, which is expected to increase at an average annual rate of 3.1% between 2015 and 2018 from 20,646 million euros in 2015. Spending by medium-sized companies is expected to grow at an average annual rate of 1.9%, from 7,004 million euros in 2015. Investment by small companies shows a much lower development rate.

Small and medium-sized companies seem to be focusing on short-term efficiency goals while lagging behind with regard to investment in Digital Transformation areas. The focus on these areas is expected to increase in the next two years when they will start to prioritize on better understanding customer needs and behavioural profiling so to evolve towards the digitalization of business models and customer experience.

Small and medium-sized companies still consider IoT solutions too expensive and better fit for larger organizations.

## EVOLUTION AND TRENDS OF THE ICT AND DIGITAL SECTOR

### Evolution under Way in the ICT and Digital Sector

Digital Transformation affects the structure of the ICT and digital sector. According to Istat, in 2013<sup>1</sup> it comprised little more than 100,000 companies divided into five macro-segments (hardware, software, services, telecommunications, wholesale trade). Between 2012 and 2013 the number of companies decreased, especially in the services and hardware segments. In 2013 the largest number of companies operated in the services segment, accounting for 61.4% of companies in this sector, followed by software, wholesale trade, telecommunications and hardware. These are mainly small and medium-sized companies, with a total of 578,000 employees (an average of 5.7 people per company). The highest concentration of ICT companies is in the North West and Central Italy.

### New Business and Production Models in the ICT and Digital Sector

ICT companies are reconsidering their offer, go-to-market models and business models. For software solution suppliers, offer evolution is based on technological renewal and, in most cases, on migration to Mobility and Cloud platforms; in other cases the focus is on extending offer along three major directions: development of new mobile solutions, development of Big Data solutions, evolution towards IoT platforms. As for service providers, Cloud computing is of paramount importance especially for outsourcers, with an increasing share of them launching Hybrid IT Management services. Suppliers of Consulting and System Integration services also need to expand their offer to support their business customers with digitalization maps. Hardware

manufacturers projects focus on adopting new processors to increase system performance: performance enhancement is of paramount importance for data management and analysis. To respond to increasing demand for higher processing performance, hardware vendors are also focusing on development of system appliances . Hardware suppliers are also working to expand their offer of mobile devices, in particular tablets and wearable devices. To pursue these three lines of development ICT companies undergo an overall revision of their business models relying on M&A operations, partnerships and alliances, investment in R&D, resource certification, cooperation with technology startups, change of pricing models, extension of business network partnering potential.

### Startups, New Players and New Alliances in the ICT Sector

Startups play a key role in the ICT sector. The Register of Innovative Companies lists 5,443 Innovative Startups (as of March 2016), of which more than half in Northern Italy, especially in Lombardy. Milan is the first province in terms of number of startups. 76% of Innovative Startups provides services to companies, especially IT consulting and software development as well as R&D and professional/technical activities. The Italian ecosystem shows that most startups have a B2B model, mainly focused on the ICT sector. ICT vendors' approach to them has evolved over the years towards forms of coopetition or acquisition. Venture Capitalists (Corporate Venture Capital) set up as legally separate entities by ICT operators have therefore proliferated and accelerated the path of investment. These investment processes normally end up with the acquisition of the startup. As for relations with business customer portfolio, innovative startups' main target is the small and medium-sized companies segment, rather than large corporations. However, large companies are now reconsidering their supplier policies to make it easier for innovative startups to join their suppliers lists.

1 - Last year of available Istat data

## DEMAND AND SUPPLY OF DIGITAL SKILLS

To become digital, companies and institutions are called not only for a technological change, but also for a cultural one. But this is not easy to achieve. According to a survey carried out by *Osservatorio delle Competenze Digitali 2015*, various and consistent reasons drive deep concern around skills vendors suffer from misalignment between demand and supply of ICT skills; in customer companies, budget restrictions are slowing down the use of specialized resources; in government, regulations on public debt control have stopped new hirings. Education and training should play a key role, through effective planning of curricula. Unfortunately, this is not the case yet. Companies and institutions say they have close relations with universities, especially ICT companies, but they mainly focus their hiring on candidates who have already been trained. Few companies try to direct educational curricula. There is no real sharing of objectives and joint development of courses of studies. This is one of the reasons why in Italian universities it is hard to find motivation to create skills in the technological/digital competence areas, as it happens in the other European countries. Collaboration initiatives between companies and high schools are even fewer and they are limited to short stage periods during the school year. Higher technical education and higher technical education and training institutes (ITS and IFTS) are still little known, although they create specialized skills accessible also to small companies.

## DIGITAL SKILLS: GAPS TO BE BRIDGED

According to *Osservatorio delle Competenze Digitali 2015*, companies are aware that digitalization calls for a change in technologies, processes, skills, life and working styles and new skills. Several gaps must be bridged. If we consider the five macro areas of the European framework e-CF 3.0, the low availability of digital skilled ICT workers and the related concerning developments should not be underestimated. The skills required to develop,

implement, enable and manage digital change must be increased. Government bodies and companies claim they are suffering from a lack of such skills, while ICT vendors believe they have fewer problems. It is difficult to find CIOs, Security experts, Business Information Managers and Business Analysts, Enterprise Architects and Digital Media Specialists.

This scenario is confirmed by surveys carried out at European level to quantify the skills shortage: by 2000 it should involve 900,000 jobs in the ICT sector in Europe (CEPIS e-Competence Benchmark 2015) and 176,000 in Italy (Source: Empirica 2013). Other analyses performed at world level have produced interesting results. According to a LinkedIn survey, Cloud-related skills rank first among the requested skills, followed by Statistical Analysis, Data Mining, Middleware and Integration Software.

Companies increasingly need to rely on expert roles who can combine digital, organizational, process and change management skills. Mixed IT and Business functions task forces are more and more often set up to favour sharing and co-working, at least on projects that most affect digitalization.

Difficulties in finding skills that match company needs also depend on the preferred channels for recruiting. ICT companies mainly use the professional network, which involves risks in terms of quality of result, and, for younger people, rely on technical schools and universities. Customer companies utilize recruiting companies and agencies whereas competitive examinations is the main channel for government. The Web is changing the approach to hiring. Companies' Human Resources Departments are increasingly using the company Web portal, as a source to collect applications, and professional Social Networks.

While it is important to develop new resources within organizations, investment is still minor. In fact, on-the-job training prevails and the average number of delivered training days is still low. It should be pointed out that new ways to build and find skills are emerging, from crowdsourcing (access to on-line and community skills) to on-line self-training, while certifications are considered increasingly relevant by ICT companies.

## **Expected Impact of New Initiatives on the Dissemination of a Digital Culture**

While the digital skills gap remains, positive signals emerge from the “La Buona Scuola” reform and the Jobs Act, recognizing incentives (new skills training offer and tax benefits) for the introduction of new digital skills.

Stage-related learning programs are drawing schools and students' attention and will continue in the short-medium term.

Finally, as regards to digital inclusion, projects are under way within civil society focused on promoting digital literacy, mainly prompted by the service sector, with several initiatives aimed to create a digital citizenship at national and European level.

# Digital Transformation Trends in Italy

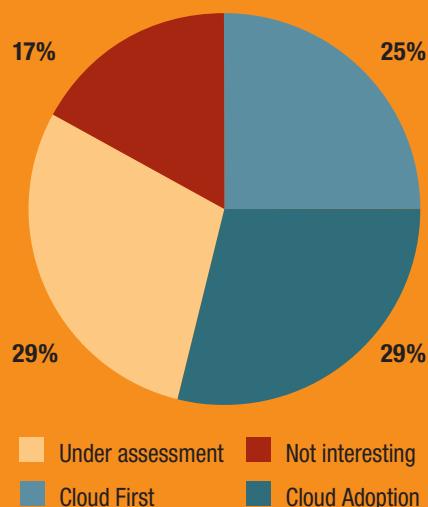
## EVOLUTION OF INFORMATION SYSTEMS TOWARDS CLOUD COMPUTING

The digital transformation of the economy is coupled with the evolution in companies usage of IT technologies and services. Alongside traditional models based on on-premise management of resources, Cloud models based on shared on demand computing resource management are widespread. Cloud computing is not only a new technological architecture, but a new way of looking at IT, which calls for a long-term strategy and specific skills. If knowledgeably adopted, it would bring savings and efficiency benefits, along with the opportunity to innovate products and services through scalable and measurable models well suited to test and develop new types of business.

Adopting Cloud computing means undergo a testing, new knowledge and maturity adoption process. Large Italian companies have now understood the importance of Cloud computing and the opportunities it can offer. They are no longer questioning whether to adopt it, but they are deciding how. It is an important transition (Cloud Transformation) most often towards a hybrid information system (Hybrid Cloud), which can combine traditional information systems with Public Cloud services. A good Cloud Transformation process requires to identify the most suitable ways to evolve internal architecture, plan the investment to create the enabling conditions and ensure integration between local systems and Public Cloud services. For small and medium-sized companies Public Cloud is an opportunity to drastically reduce IT service management costs, simplify processes and continuously update technologies and services.

**Figure 6: Public Cloud Services in Large Companies**

Source: Milan's Politecnico Observatories



## Cloud Penetration in Italy

In Italy Cloud computing has progressed to point to finally have an impact on business decisions and represent an alternative for information system evolution. Based on a survey carried out by the Cloud & ICT as a Service Observatory of Milan's Politecnico on a sample of over 100 CIOs in medium and large-sized companies, 54% of large organizations use at least one Public Cloud service, 29% are considering using it and 17% know Public Cloud services but do not deem them interesting (Figure 6). Among Cloud users, 44 % think Cloud computing is an important ally to meet business needs and 36% believe it allows ICT managers to improve efficiency. 20% think they have to further explore the various

opportunities to understand its real applicability and areas of implementation.

25% of the sample respondents are at an advanced maturity stage called "Cloud first", with an undergoing extension or new adoption of Cloud computing support in at least one application area. This means that once they have adopted Cloud computing, they would tend to consider it as the preferred environment when they have to introduce new services.

The same survey shows that shifting to Cloud often increases the value of company processes, which are enriched with new functions and services. This is the reason why an increasing number of applications close to the core business shift from a traditional on-premise approach to Public Cloud. However, the end point is not the cloudization but a hybrid information system (Hybrid Cloud) which will couple Public Cloud simplification features with an integrated and standardized internal Information System.

Basic Public Cloud services are used in several sectors; differences are mainly due to regulatory compliance requirements. Vertical oriented focus increasingly prevails in the offer of services to support core processes. An example is given by solutions to support the supply chain in the manufacturing sector and video streaming in the media sector.

It is worth mentioning barriers that are still hindering a wider use of Cloud services. Concerns around Security and privacy delay adoption especially of Public Cloud while, in general, the main doubts relate to the adequacy of Cloud-based solutions to meet specific needs and still justify past investment.

## DATA MANAGEMENT AND ENHANCEMENT

As availability of information grows exponentially, more and more companies have understood that analytics data and systems are a competitive factor that may lead to business model evolution. In 2016, for the third running year, Business Intelligence, Big Data and more in general Analytics are the main investment priority for Italian CIOs (44%). For 22% of CIOs, Big Data management skills are a priority.

It is important to clarify what is meant by Big Data and how these projects differ from more traditional Business Intelligence projects.

The expression "Big Data" refers to a dataset of a bigger storage, management and analysis capacity compared to a traditional database. The main features of these data are: volume, speed, variety, trustfulness and variability.

The first two variables relate to the large quantity of data generated by several devices and channels and the speed at which such data are acquired and used. Variety is linked to the various types of data available, both structured and unstructured, inside or outside organizations. Trustfulness and variability better mirror the characteristics of Big Data: the first refers to data quality and reliability; the second is linked to the fact that the meaning and interpretation of data may vary depending on the context in which they are collected and analysed.

Regardless of the type of data treated and analysed, Analytics may be divided into two main categories: Performance Management & Basic Analytics, that is to say Descriptive Analytics tools that perform passive analyses, providing logical insights of what happened, and Advanced Analytics, advanced tools to effectively manage complex decision-making processes through evolved Prescriptive and Predictive Analytics.

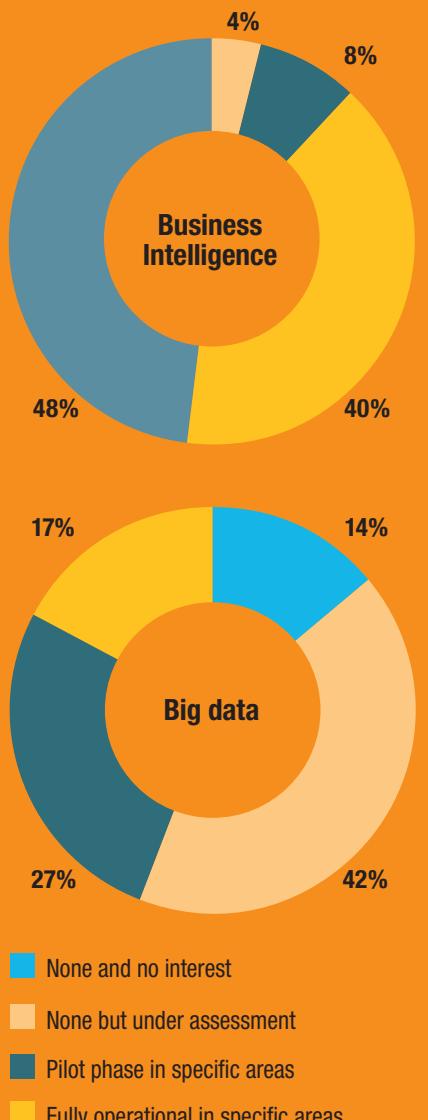
The increased use of advanced Analytics solutions, the ability to develop models that can discover hidden data relations, to predict reality in increasingly heterogeneous and dynamic contexts, call for a thorough maturation process by companies. Even though they have understood the importance of data and have started a change process, most Italian companies are still far from having a data-driven business strategy. The challenge is to leverage on such awareness to start a maturation process that leads to the development of a data-driven strategy, looking at business and organization implications and not just at technological aspects, with a long-term vision.

## Penetration of Analytics Solutions and Main Applications

A survey carried out by Milan's Politecnico Big Data Analytics & Business Intelligence

**Figure 7:**  
**Spread of Business Intelligence and Big Data Projects**

Source: Milan's Politecnico Observatories



Sample: 91 CIOs in Medium and Large-Sized Companies

Observatory in November 2015 on a sample of 91 CIOs in medium and large-sized companies shows a big difference in penetration between traditional Business Intelligence and Big Data projects (Figure 7). Business Intelligence projects are widespread in most application areas in half of the sample (48%) and only in some areas in 40% of the sample. Only a small percentage is still at a pilot phase in specific areas (8%) or in the assessment phase (4%).

The scenario is completely different with regard to Big Data implementation: there is no extensive use yet and 17% of companies are using them only in specific areas. In most cases (56%) there are no Big Data projects at all while 27% of the sample are still going through a pilot stage. These figures show that the Italian scenario is moving the first steps towards maturity in the adoption of Big Data solutions. This also results from the barriers to the adoption of advanced Analytics solutions, which are mainly cultural, organizational and management barriers, cultural resistance to change, lack of specialized professionals and difficulties in assessing return on investment.

Looking at Analytics application areas, current and future adoption patterns help identify two different levels of maturity:

- *growing*, very widely adopted and with high potential interest: CRM Analytics (56%), Finance & Accounting Analytics (52%) and Top Management Dashboard Solution (41%);
- *emerging*, limited adoption but with high potential interest: e-Commerce Analytics (18%), Customer Experience Analytics (11%) and Social & Web Analytics (7%);
- *niche*, very interesting for some selected sectors: Security Analytics (8%), Telecommunication Analytics (8%) and Transportation Analytics (2%);
- *well-rooted*, wide current adoptions but small growth rates: Supply Chain Analytics (29%), HR Analytics (26%) and Production Planning & Sales (26%).

## IT SECURITY AND PRIVACY MANAGEMENT

Digital Transformation is increasing the focus on Information Security and privacy management. Data externalization, fostered by Cloud computing, heterogeneous sources, often unstructured, wider use of connected devices (the Internet of Things) and the pervasive use of mobile devices create new vulnerabilities and areas of attack. Some events have risen the attention level with regard to the implication of a loose approach to company security management. 2015 was the year of Cryptolocker, a ransomware that held hostage data from thousands of

computers, the year of Carbanak, the maxi-theft that hit 100 banks in 30 Countries and the year of several other clamorous attacks.

A strategic vision and real plans to protect data security and privacy and to respond to the rapidly changing digital world are required. Businesses need to anticipate threats, grow top management involvement and overcome such barriers as costs and benefits perception, roles and action scoping, and skills shortage.

For companies, this means creating new roles and organizational models, setting coordination mechanisms and promoting awareness, establishing policies and behavioural guidelines, understanding change to control it. It means adopting Information Security as a pillar for any digital innovation project and as a driver to identify the right mix for sourcing, to assess how and to what extent open company boundaries and identify the collaborative models for information and data sharing. Contract will play a key role: several agreements proposed by vendors are still unsatisfactory from a privacy protection and security guarantee standpoint, especially with regard to innovative services and Cloud. As established by the EU (Article 29 Data Protection Working Party), it is of paramount importance to have such guarantees, which should be adequate to meet the most specific requirements.

For National authorities this means providing a framework, including implementation of EU regulations such as the regulation on privacy. Over the last few years, Authorities had to take steps to regulate treatment and security of personal data. They have also looked at Big Data, the Internet of Things, Mobile, geolocation, Social and Cloud services and have passed specific regulations on security or will soon do so.

Lack of security causes unbearable risks, also in terms of company reputation. This is one of the reasons why legislation now often provides for administrative penalties (financial penalties) in addition to criminal ones. Therefore ICT compliance should focus on privacy and safety. In order to do so, it is necessary to know regulations, map requirements and develop a control and prevention system.

The speed at which strategies and projects are

implemented is also very important to keep up with the evolution of technologies and bridge the gap created in the past due to insufficient focus on information security.

## **Increasing Awareness of the Importance of Information Security**

To face increasingly fast and pervasive innovation models, companies' approach to Information Security should follow two directions: strategic awareness and vision on the one hand, and concrete actions and plans, in terms of organizational roles and technological approaches on the other hand.

According to a survey carried out by Milan's Politecnico Information Security & Privacy Observatory involving more than 150 Chief Information Security Officers (CISOs), CSOs and CIOs of large Italian companies, only 19% of the sample respondents are mature with regard to strategic awareness and vision and with organizational roles, while 48% are fully unprepared. Of the remaining 33%, most companies have developed some strategic awareness and vision (25%) while 8% have established clear organizational roles and technological approaches but lack strategy and vision.

The entire sample believes that Information Security and privacy management deserve attention. However, the following differences can be observed: 67% say that companies must manage this trend in order not to be overwhelmed, while the remaining 33% believe that top management does not see it as an investment priority yet. Awareness of Information Security & Privacy issues has increased over the last 3 years for 86% of the sample, while there have been no major changes for the remaining 14%. The increasing level of awareness is mirrored in budget planning for Information Security & Privacy: in most cases, there is a formal allocation, annual in 42% of cases, multi-year in 32% of cases. In 26% of cases, there is no specific allocation and investment is made as needed. Looking at formal allocations, allocated amounts increased in the last year in 41% of cases, remained unchanged in 54% of cases and went down in 5% of cases.

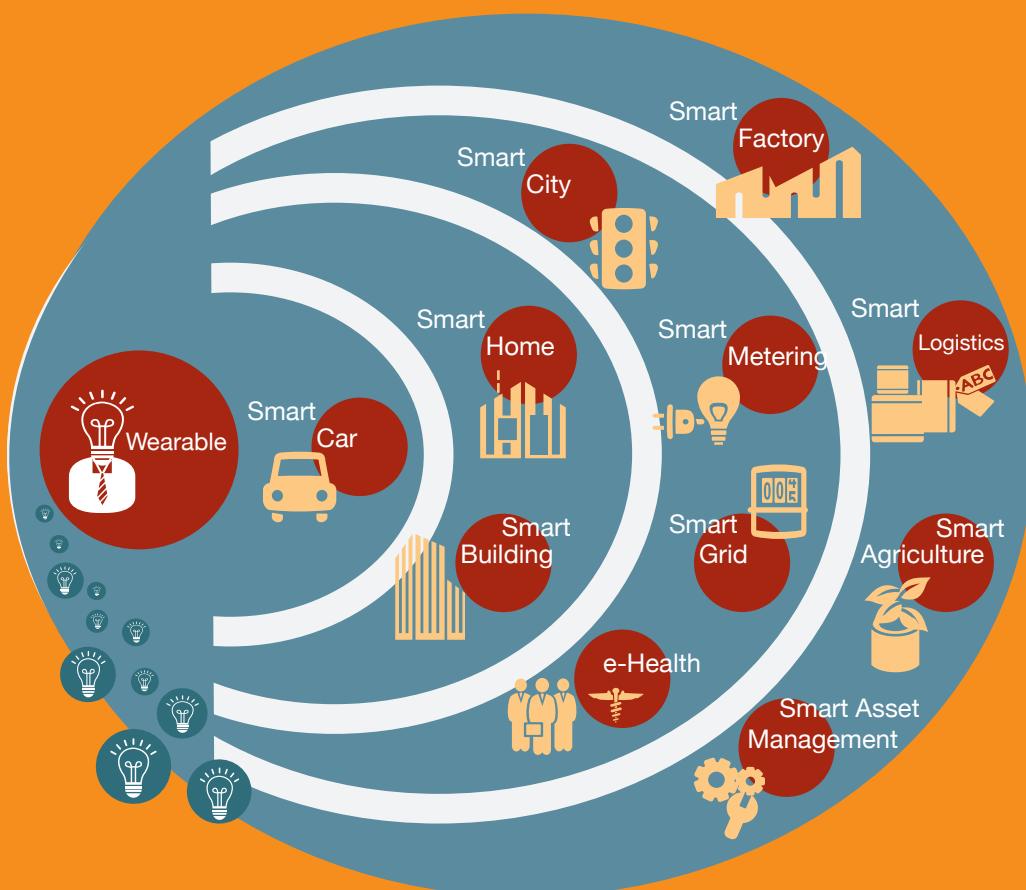
For most organizations (58%), budget decisions are still highly influenced by existing regulations (e.g. Legislative Decree 196/03; Provisions issued by the Data Protection Authority; ISO 27001; Circular letter no. 285 issued by the Bank of Italy on prudential supervision; data retention obligations). For 39% of companies, regulations have a very small or no impact while 3% say they do not know about it. Awareness of compliance needs is higher in the Finance sector (81% of companies), Government and Health (73%) and Telecommunications (67%).

Overall, despite growing awareness of the issue, the speed of adoption of strategies and projects to increase information management security is not keeping up with the pace of evolution of digital technologies and deriving security threats. This is confirmed by the security investment mix with: investment in security solutions for Cloud and Mobility, key aspects for companies digital evolution being still at niche level, but expected to grow in the future.

## BUSINESS OPPORTUNITIES ENABLED BY THE IOT

The Internet of Things (IoT) paradigm is based on the idea that any object can gain its own identity in the digital world through the Internet. This idea has proven appealing also in Italy. The idea has grown its audience also in Italy where in 2015 the IoT has achieved a major share of awareness and fostered its central role in the digital transformation process of the economy. An increasing number of companies started to bet on the IoT to relaunch and diversify their business. The IoT is no longer a niche market innovation but a key element for all types of businesses. Several regulatory bodies are working to foster development of the IoT and, at the same time, ensure privacy and security, as recorded by public consultation on the Internet of Things held by the Data Protection Authority, by round tables held by the Telecommunications Protection

**Figure 8: Internet of Things Application Areas**



Authority (AGCOM) on new communication networks for IoT and new regulations on electricity and gas Smart Metering, promoted by the Regulatory Authority for Electricity, Gas and Water (AEEGSI).

## **IoT Application Areas: Main Trends in Italy**

In 2015 companies have sharpened their vision on how to exploit the opportunities offered by the IoT. In some cases, regulatory compliance obligations drive growth opportunities (Smart Car, Smart Metering) and companies further try to turn the regulatory compliance requirements into an opportunity by expanding the range of services they offer. Smart Cars are a key example: regulations on eCall<sup>2</sup> forces car manufactures to play a more active role. One new car out of five registered in Italy is natively connected and can offer a wide range of vehicle management and safety services. Similar trends can be observed in the Smart Metering sector, although at a slower speed, partly due to a more complex scenario: the need to install a new communication network to collect consumption data from gas meters provides the opportunity to develop other applications (in the Utility or Smart City areas) that can use the same network, thus producing infrastructural synergies. Major developments are expected in 2016 and 2017 in several other areas such as Smart City, Smart Home & Building and Industrial IoT (which includes industrial applications for Smart Asset Management, Smart Logistics and Smart Factory). As IoT adoption grows and consolidates across the various areas, focus shifts on which barriers to bring down to fully exploit IoT potential: from technical issues (e.g. standardization) to legal-regulatory ones, which affect the ability to create value from the data generated by connected objects.

### **Smart City**

Smart City indicates an urban reality concept that goes beyond technological boundaries to include mobility, energy efficiency, eGovernment and active citizen participation to make cities more sustainable, liveable and economically dynamic. The Smart City scenario in Italy still shows lights and shadows. Although 60% of Municipalities with more than 20,000 residents have started

at least one Smart City project in the last three years and 75% are planning projects for 2016, Italian cities are still far from being really smart<sup>3</sup>. 53% of projects are small pilot projects and only 30% are part of structured plans with a clear city improvement strategy. In this scenario, the Internet of Things confirms its flagship role smart city enabling technology: 75% of projects started by Italian municipalities are IoT-based (Figure 9).

Over the last few years, Municipalities have mainly invested on mobility, tourist services and smart lighting (53% of IoT projects are in the mobility area, 48% in tourism and 46% in lighting); waste collection should be a development area in the future (a future priority for 41% of Municipalities).

The role played by the IoT is expected to grow in 2016 thanks to multi-service projects developed by Utilities, starting from the regulatory obligation of gas Smart Metering and thanks to the new Low Power Wide Area - LPWA communication networks intended for the IoT, already installed in several Italian cities (e.g. Bergamo, Brescia, Milan, Rome, Turin).

### **Smart Home & Building**

Smart Home & Building is one of the most interesting areas in today's IoT scenario, because it can be widely used in everyday private and working life and because of the ties with some leading Made-in-Italy sectors.

Looking at Smart Home, 2015 was an important year showing accelerating pace in many areas: improving maturity of consumers, widening offer range and increasing number of sales channels. The number of Italian consumers willing to purchase connected objects increased (79% of respondents, +33% compared to 2014)<sup>4</sup>, even though numbers are still small (only 1 consumer out of 5 has at least one smart object at home) and purchase intentions are not very short-term: only 25% of those with purchase intentions, said they plan to buy within 12 months. Improving services components is key to grow consumers' interest on Smart Home solutions.

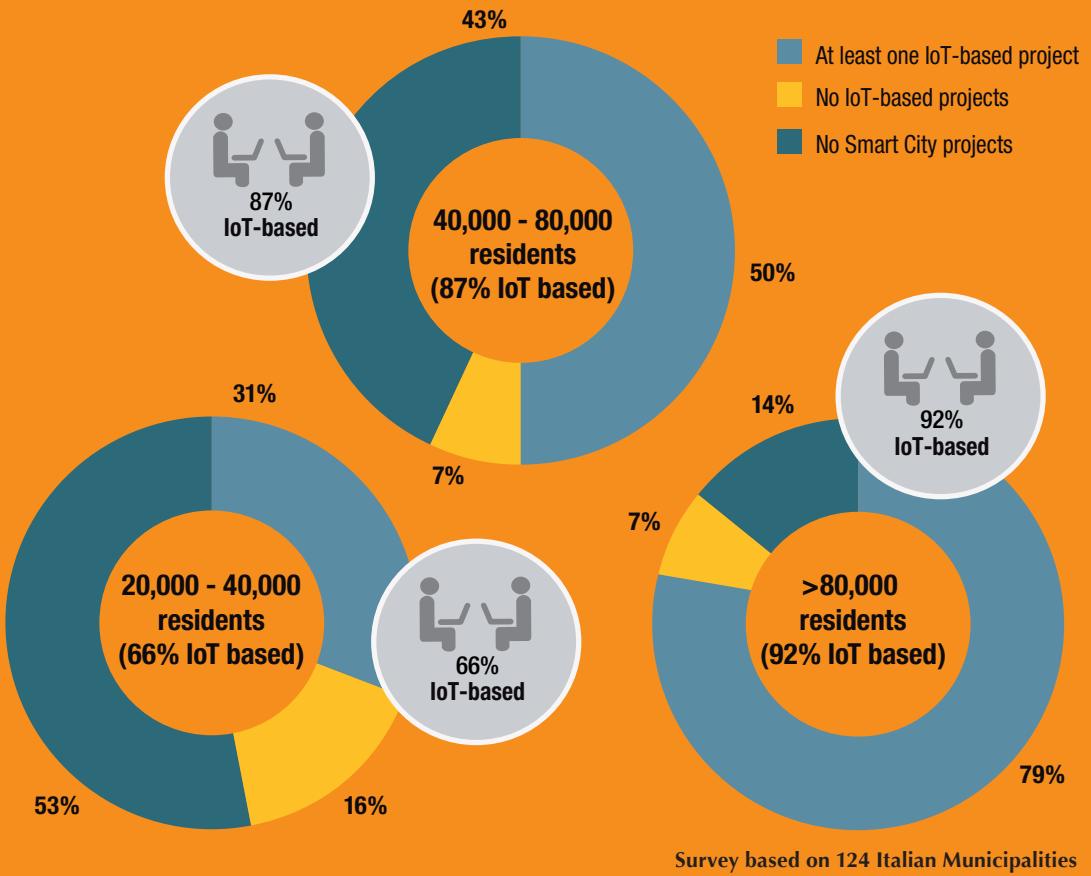
2 - After 31 March 2018, it will be mandatory for new cars to be able to make automatic emergency calls

3 - Source: Milan's Politecnico Internet of Things Observatory (November 2015)

4 - Source: Milan's Politecnico Observatories - Doxa - December 2015

**Figure 9: The Internet of Things Projects in Italy**

Source: Milan's Politecnico Observatories



As for Smart Building, applications differ a lot in terms of maturity, widespread adoption, and adherence to the full IoT paradigm. There are widely used solutions that utilize simple IoT functions: security applications (video-surveillance, intrusion-alarms, access management) and plant maintenance (failure identification, ordinary maintenance management). Other applications such as scenario management (e.g. air-conditioning, lighting, irrigation) better exploit the opportunities offered by the IoT paradigm but show a lower adoption level. Applications in Smart Building are evolving at a slower pace compared to the Smart Home, but there is a lot of interest in this area, as confirmed by the investment collected by startups specialising in this sector.

### Industrial IoT

Industrial IoT will play a protagonist role in factories: availability of information and technologies will make it possible to improve production capacity, energy efficiency, safety and at the same time provide workers with support in their operational tasks thanks to collaborative robots and new human-machine interface tools. The most mature IoT applications are now those associated to energy efficiency in factories and asset monitoring, for instance to optimize their maintenance and operational performance, but there are other important lines of development areas towards unexplored factory areas, such as external supply chain and services associated to industrial activities. The themes associated to the new paradigms of industrial digitalization are addressed more in depth below.

# Industry 4.0 and its Impact on the Economy

Industry 4.0 (or Smart Manufacturing) refers to the application of new digital technologies in the manufacturing sector.

Smart Manufacturing is about adoption of innovative technologies - Smart Manufacturing Technologies - characterised by the ability to increase interconnection of the resources (people, machinery and information) used in the manufacturing and distribution processes both internally to the factory and externally along the value chain. These technologies can be grouped in two major categories: the first, closer to IT, includes the Industrial Internet (of Things), Industrial Analytics and Cloud Manufacturing; the second, more heterogeneous and closer to Operational Technology<sup>5</sup>, includes Advanced Automation, Advanced Human Machine Interface and Additive Manufacturing. Their common feature - as above mentioned - is to enable a higher level of interconnection across the processes that use them: energy data acquired for cost allocation purposes can be used for on-condition maintenance planning; similarly, a mobile device used to display reports or alarms relating to machinery operating conditions can be used to monitor workers safety. The future vision of Smart Manufacturing anticipates the following trends:

- Plants, machinery, workers, goods and materials will have sensors to identify them and monitor their status and their position at all times;
- All these data will be collected and analysed to improve manufacturing capacity, energy efficiency, safety, quality and operations continuity;
- Workers are helped by collaborative robots and by new human-machine interface devices (augmented-reality visors, wearable computers, etc.);

- Factories are connected with the rest of logistics-manufacturing system and with customers; data on products usage are collected to help with post-sale assistance, to develop new products and services and to enable new business models.

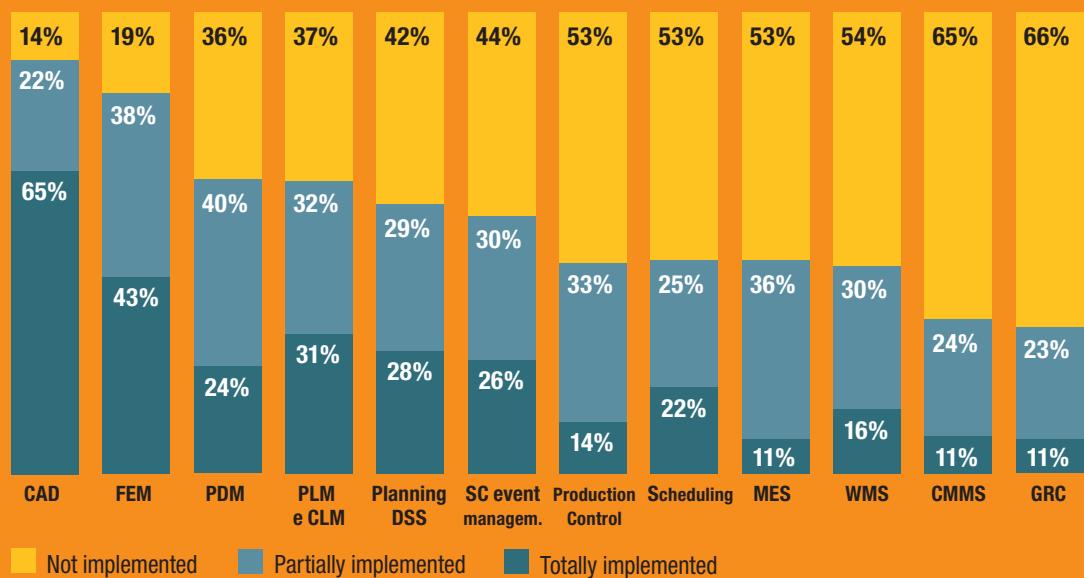
Smart Manufacturing does not mean to adopt a single innovative technology, but to design and exploit the mechanisms that exploit higher resources integration to generate additional value, by reducing inefficiencies, making the most of available knowledge, improving decision-making, planning and response. This is why transition to Smart Manufacturing calls for a long transformation, investment and renewal process. In addition to capital and technologies, it requires a new industrial mindset able to exploit the digital data generated at the factory no less than the physical product manufactured.

It should be pointed out that a wide range of solutions has been developed over time to support industrial processes. These solutions have been supporting manufacturing companies' information needs (product development, production and supply resource planning, maintenance management, etc.), thus making it possible to manage the complexities of a globalizing competitive scenario. These solutions are called traditional just because they have been available for quite a long time and are used quite widely at least in medium-large sized companies. Their role is key: a mature adoption of these technology is

5 - Technologies and systems used to control physical transformation and manufacturing process: fieldbus, PLC, SCADA, process control software, etc.

**Figure 10: Adoption of Traditional Solutions**

Source: Milan's Politecnico Observatories



the necessary condition to have the right starting base to ground the innovation process enabled by Smart Technologies.

## AFFECTED PROCESSES

Smart Technologies can be applied to all the processes of an industrial factory. For an overall structured view, the following three areas outline can be used as reference:

- Smart Lifecycle includes the processes of development for a new product, management of its life cycle and management of suppliers when associated to the first two aspects;
- Smart Supply Chain includes planning of physical process cycles (sales, stock, distribution channels, production, etc.) event management (monitoring and response to event variances) in addition to vendor management when associated to the first two activities;
- Smart Factory includes core manufacturing processes (production, internal and external logistics, maintenance, quality, safety and compliance).

By cross-referencing each Smart Technology with the three above-described process areas, we can identify the potential application areas, such as use of Advanced Automation in internal logistics or application of Big Data to support

quality management processes. This scheme makes it possible to map the adoption of Smart Manufacturing in Italian manufacturing industries.

## SMART MANUFACTURING IN ITALY

A survey was carried out by Milan's Politecnico Observatories on COOs/ Production Managers in 225 Italian companies, of which 157 large companies and 68 small and medium-sized organizations, to assess knowledge and penetration of Smart Manufacturing in Italy.

### Traditional Solutions and New Digitalization

The first evidence suggests that the presence of traditional solutions, required as starting base where to ground Smart Technology-based innovation, varies with weaknesses across company size and industries (Figure 10). More evolved solutions (e.g. MES and PLM) supporting more varied and complex management processes are not widely adopted among Italian manufacturing companies, not even in large ones. The modest presence of these and other traditional solutions is a burden to the achievement of "digital maturity" with

regard to processes, which makes it even more difficult the adoption of new and more advanced technologies such as technologies for factory plant connection or for decision support in planning. The adoption profiles are heterogeneous across industries with higher penetration of applicable solutions in Automotive, Aviation and Defence and Machinery.

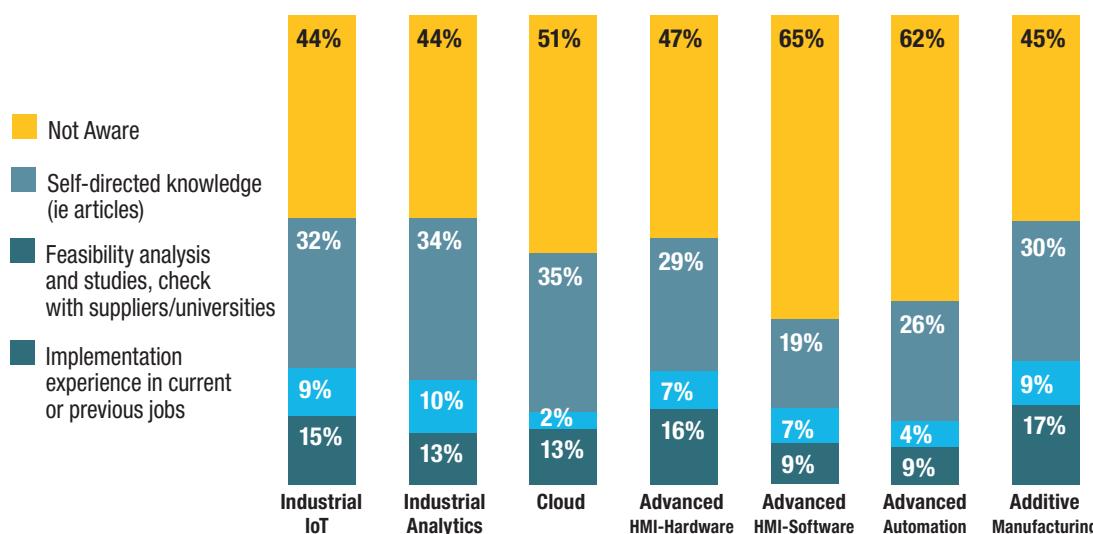
## Knowledge and Adoption of Individual Smart Technologies

Looking at the level of awareness of individual Smart Manufacturing Technologies (Figure 11) the share of "not aware" respondents (40%) would reach 70% if the minimum requirement included experience of preliminary feasibility analysis and not just mere subject-expert article reading. Among the opportunities offered by Advanced Automation (cognitive and collaborative robotics), Advanced HMI software<sup>6</sup> solutions (e.g. augmented reality, solutions to support individual performance) record the lowest level of awareness.

Table 6 shows adoption levels of 6 Smart Technology areas across the three major process areas where they have been implemented. Industrial Analytics and Industrial IoT are more widely used. Industrial Analytics adoption is more balanced across Execution and Planning processes. Cloud technology meets higher

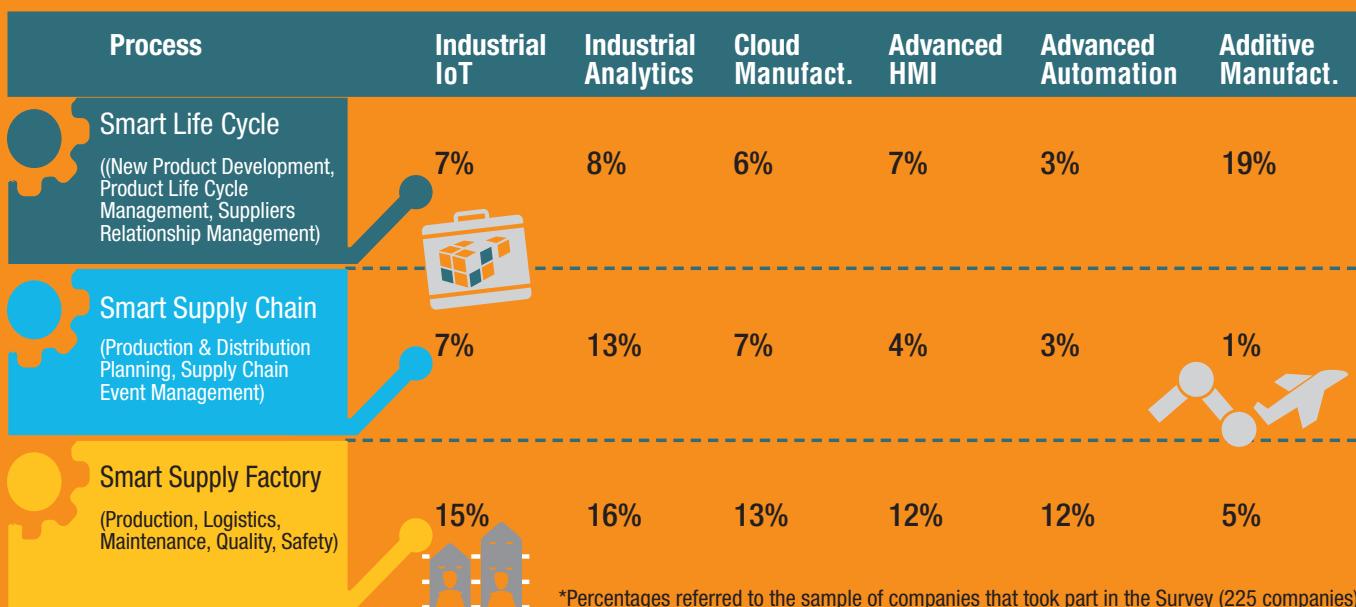
interest in Smart Factory processes, compared to other smart manufacturing technologies, alongside with Additive Manufacturing used by almost one company out of five in the Product Development process (Rapid Prototyping). As for processes, the most widely used applications are those supporting execution activities (production and logistics), with levels of adoption close to 12-15%, except for Additive Manufacturing, whose adoption is still far from taking up in production (Rapid Manufacturing). Applications in the planning process show lower adoption rates: on the one hand, solutions natively developed for the Operational Technologies environment (HMI, Advanced Automation, Additive Manufacturing) have objective restrictions to other application areas; on the other hand, some technological paradigms such as Cloud solutions (SaaS) for collaborative planning are still very new. Data Analytics is widely used in planning (with regard to both data generated by IoT applications and data acquired from transactional and management systems). Finally, adoption is well balanced for the New Product Development process, IT technologies (IoT and Analytics to acquire and process data to improve design, Cloud for collaborative design or use of aaaS design software) and OT (HMI and Additive Manufacturing), thus confirming that product

6 - Different from HW HMI solutions (e.g. mobile devices, touchscreen displays and smart glasses).



**Figure 11: Knowledge of Smart Manufacturing Technologies**

Source: Milan's Politecnico Observatories



**Table 6:**  
**Percentage of Companies That Have Adopted Smart Manufacturing Technologies**

Source: Milan's Politecnico Observatories

development drives innovation in industrial companies.

In general, the overall situation with Smart Manufacturing knowledge and adoption seems moderately positive for two main reasons. First of all, if a high percentage of companies (40%) are not aware of Smart Manufacturing, by focusing on improving awareness levels it is very likely that the number of potential new adopters will almost double. Secondly, in comparison with statistics on the adoption of traditional manufacturing solutions (with many of them at full implementation stage only with less than 20% of respondents), the 12-15% adoption level for Smart Technologies can be considered a successful achievement, also in view of the very new stage of these technologies and their complexity. All companies agree that a critical burden to the adoption of smart manufacturing technologies is the lack of skills. Most companies are not addressing this issue effectively, especially small ones.

Lack of official similar data from other Countries does not make an international comparison on adoption levels possible. However, a qualitative analysis based on indirect sources (including about 60 international best practice cases presented by manufacturing companies or

by their ICT vendors) confirms an application portfolio adoption mix that is quite similar to Italy. The main differences can be observed in Advanced Automation and HMI technologies, recording a more dynamic adoption abroad, with applications examples that help understand and anticipate how the Italian scenario may evolve.

## NATIONAL PLANS OF DIGITAL INDUSTRIALIZATION

In general, digitalization of Italian manufacturing and industrial companies seems to be in line with the international scenario with regard to single companies initiatives and strategies on smart manufacturing. However, major differences emerge when comparing the national strategies of industrial digitalization, which is typically guided by a central program for coordination and guidelines for transformation. The importance of such programs is twofold: on the one hand, they act as a reference point for a long-term transformation process (no less than 10 years), which builds upon a strategic vision and planning to implement changes ; on the other hand, they help define the distinctive features of a Country's industrial capacity

and, as such, act as marketing and competitive positioning tools for the Country. Many Countries have developed national industrial digitalization plans. The two most relevant plans are the German plan (Industrie 4.0) and the American plan (Advanced Manufacturing Partnership). Italy is the second manufacturing Country in Europe and among the top ten worldwide, but it still lacks a national Government plan, that is about to be launched.

Expectations are high on which would be its distinctive features and its expected impact. Italy is an industrial Country where the combined manufacturing and manufacturing related business services industries together generate around 50% of GDP<sup>7</sup> and where it is not by chance that in these industries several examples of national excellence, from technological and academic research to industrial design, polarise.

7 - ISTAT, Industrial sectors competitiveness Report – 2015 edition, industrial sector and related services.

# Assumptions and Forecast in Summary

Many global and national factors influence the expected evolution of the digital market in Italy, including: performance of the world ICT markets as well as domestic macroeconomic conditions (also influenced by the global economy dynamics), government policies, business confidence and trends in the main customer sectors, evolution of the ICT offer, and major technological trends in our Country.

## ICT MARKET TRENDS AROUND THE WORLD

In 2015, the global ICT market almost hit 4,650 billion dollars (+2.4% at constant values). In North America, where users invested heavily in Big Data, Cloud, Mobile and Social solutions and in enabling infrastructures, spending grew faster compared to the global average. The Asia Pacific area ranked second in ICT spending dynamics: the ICT market slowed down because of difficulties in China due to the increased maturity of hardware components. In Latin America demand increased thanks to still growing demand for smartphones, software and digital content, although doubts exist about future performance due to the difficult economic situation in the area, especially in Brazil.

The ICT market in Europe improved as it began to overcome recession in 2014. However, ICT investment seems to be hindered by the difficult economic and geopolitical situation. Segments ahead or more involved with Digital Transformation are growing, whereas more traditional ICT markets are slowing down, partly due to revaluation of the dollar.

From a products and services perspective, in 2015 PCs, tablets and printers suffered most.

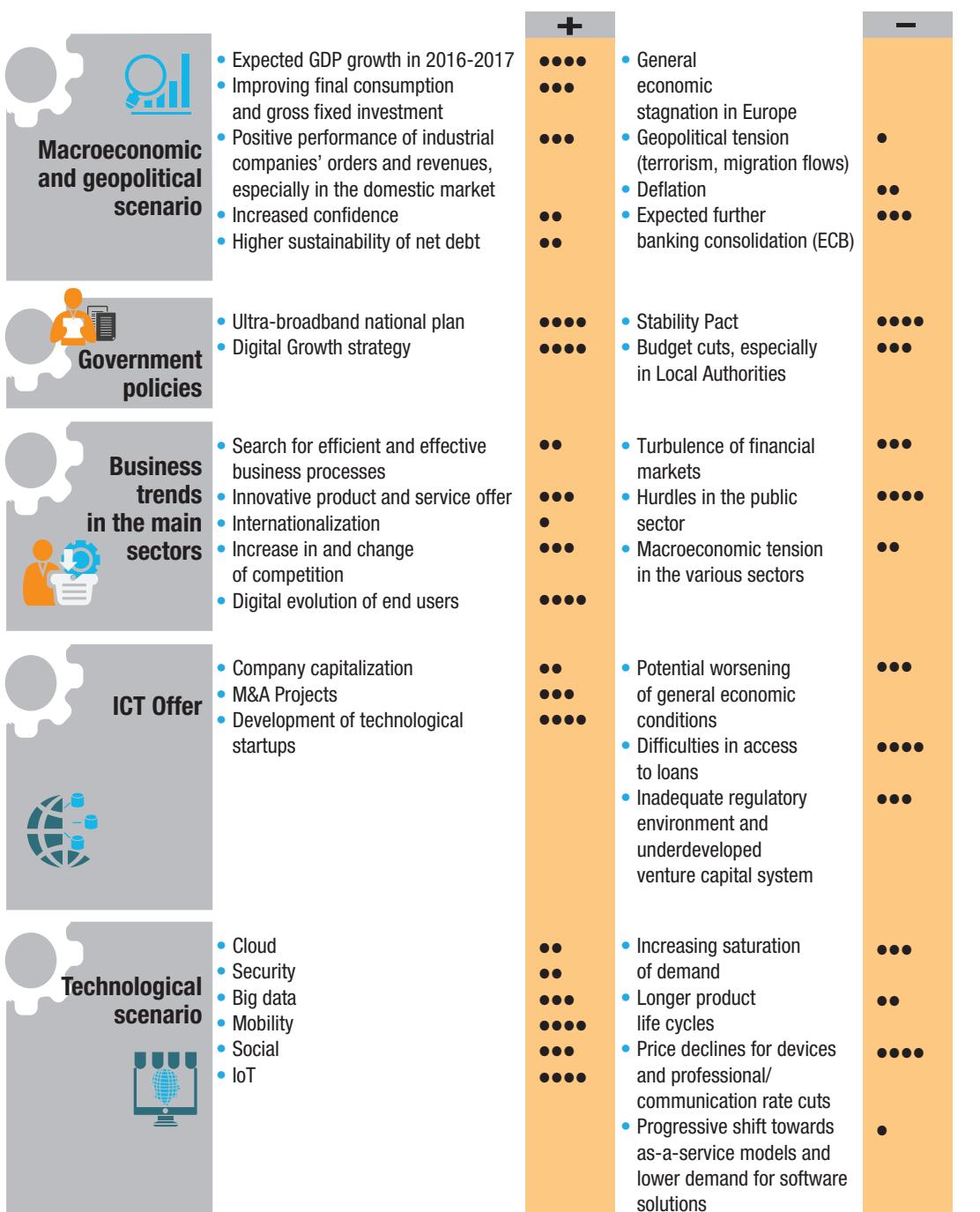
The server market performed well, driven by investment by businesses and service providers in Data Centres and transformation to highly scalable and reliable virtualized environments. Software and ICT solutions associated to Analytics, Security and Social/Collaboration recorded better results. The cloud market sustained growth in ICT Services. Network services suffered from the elimination of Roaming costs in the European Union and in part of North America, the deriving increase in traffic was not enough to offset revenue losses associated to roaming and premium services rates. Digital Contents continued to grow thanks to increasing demand for subscriptions to music, including streaming services, mobile apps and videogames.

## ASSUMPTIONS ON INTERNAL FACTORS AFFECTING TRENDS

The Italian digital market dynamics are also driven by the macroeconomic situation, government policies, business confidence and trends in the main sectors, ICT offer and the technological scenario (Figure 12).

In particular:

- GDP in Italy is expected to grow slowly but steadily, with positive effects on both consumption and investment. Business confidence has improved in all sectors. The debt-to-GDP ratio is expected to decrease, thus prompting ICT investment by government offices. However there are also inhibitors to growth such as the international geopolitical situation, deflation, continuing tensions in the banking and loan systems;
- The Digital Growth Strategy developed by the



**Figure 12: Main drivers and inhibitors of digital development**

Source: NetConsulting cube

Government set a roadmap for the Country's digitalization process and better coordination and planning of public investment in ICT. After long delays, the process has started, even though there are still doubts about Local Authorities' ability to keep up (due to their budget restrictions and competence hurdles).

Progress was made in some areas (central government offices, schools and healthcare), while the availability of ultra-broad band got better widespread and, as a result, all in all the drivers ultimately prevail over the inhibitors, although only slightly;  
 • The ecosystem of ICT suppliers is expected to

	Data in million euros	2015	2016E	2017E	2018E	16E/15	17E/16E	18E/17E
<b>Table 7: The Digital Market in Italy, 2015-2018E</b>	Devices and Systems	16,987.3	17,116.8	17,237.2	17,387.9	0.8%	0.7%	0.9%
Source: NetConsulting cube	Software and ICT Solutions	5,971.2	6,228.6	6,504.2	6,815.4	4.3%	4.4%	4.8%
	ICT Services	10,368.0	10,660.4	11,030.2	11,481.9	2.8%	3.5%	4.1%
	Network Services	22,608.0	22,211.2	21,984.3	21,961.2	-1.8%	-1.0%	-0.1%
	Contents and Digital Advertising	8,973.5	9,691.7	10,281.8	10,758.8	8.0%	6.1%	4.6%
	<b>TOTAL</b>	<b>64,908.0</b>	<b>65,908.7</b>	<b>67,037.7</b>	<b>68,405.2</b>	<b>1.5%</b>	<b>1.7%</b>	<b>2.0%</b>

strengthen in line with ICT market drivers and dynamics. ICT company capitalization projects and acquisitions by stronger international and national vendors are multiplying. The main expected trend is towards an increase in the average size of ICT companies. Over the past few months they have started to strengthen their competencies to support clients with digital transformation and overcoming traditional vulnerabilities. They have optimized sales channels, strengthened R&D, realigned their offer with new paradigms, acquired new technological skills, and established new types of collaboration with startups. This change is taking place although still not adequately supported by the economic and loan-granting system and by the regulatory environment;

- As for the technological scenario, the trends of 2015 are expected to strengthen, thus creating good growth opportunities for ICT components associated to digital transformation and limited opportunities for traditional systems. In the Devices and Systems sector, good results are expected to be obtained by high-end systems, system appliances, fixed and mobile broadband infrastructures, smartphones and by anything that supports the Digital Economy innovative services and the IoT; this should offset the slowdown of PCs, tablets, entry and midrange servers (negatively affected by Cloud). Cloud computing is expected to have a negative impact on the most traditional components of Software and ICT solutions, while Big Data, the IoT and Social/ Web solutions should drive demand for specific horizontal and vertical

solutions. Demand for IT Management & Governance tools is expected to grow, to manage hybrid IT environments and Cyber Security. ICT Services should benefit from the growth of Cloud computing (Public and Hybrid Cloud), which will partly cannibalize demand for Outsourcing services. In Outsourcing services Development, System Integration and Consulting services will keep sustained dynamics, driven by demand for innovative solutions. Network services will continue to be negatively affected by price declines, partly offset by traffic increase. Digital content will continue to evolve thanks to its pervasiveness in supporting innovative consumers' habits and lifestyles and to emerging new business models relying on Digital Advertising platforms.

## FORECAST

Thanks to the above mentioned trends the Italian digital market is expected to show a continued positive trend over the next few years: + 1.5% in 2016, + 1.7% in 2017 and + 2% in 2018 (Table 7). Most importantly, the overall Digital Enablers market - including hardware, applications and services – has already reached 8 billion euros in 2015 and is expected to contribute a 18% share of the overall digital market by 2018 hitting an average annual growth rate of 15.4%. This is the most remarkable trend for the next three years. Digital Enablers are at the core of new digitalization processes and of a competitive use of digital transformation in many sectors. This is where the focus should stay in the near future.



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