Anitec-Assinform

DIGITAL TRENDS IN ITALY 2018 Executive Summary

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Table of Contents

THE IMPACT OF NEW MEASURES

THE TRANSFORMATION OF ITALIAN ICT AND DIGITAL OFFERINGS

CONCLUSIONS

Towards a broader digital revolution

More and more companies are embracing Digital Transformation as it influences organizational and business models, triggering a broader revolution.

Digital paradigms around the world

Accelerators and Digital Enablers: new developments

The global digital scenario has developed in broad strokes based in part on familiar and in part on new thinking (Fig.1).

Big Data (34 billion dollars in 2017, +19.7%), more than a wave of investment, is in fact a lever for activating other digital technologies: Big Data Analytics solutions support Machine Learning and Artificial Intelligence (AI) initiatives, and developments in the IoT and Cloud Computing.

Mobile Business (172.6 billion dollars in 2017), now a key part of any company's operations, is fueling mobile-first and multidevice solutions, mobile apps capable of managing even IoT devices and AI functionality.

Cloud Computing (113.2 billion dollars in 2017, +26.3%) is still fast-growing, and especially in Software as a Service (SaaS). The increase in services within Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) have fostered use of a broad range of Cloud-based applicative solutions, thanks also to Independent Software Vendors (ISV), who have begun to migrate their offerings accordingly as a Service.

The field of IoT solutions (194.7 billion dollars, +24%) is growing primarily in Retail (CRM), in Healthcare (monitoring and remote assistance) and in Industry (optimization of processes).

The need for Security (87.2 billion dollars, +11.8%) continues to increase in line with growing threats, following the advent of new digital paradigms, and in Europe, GDPR compliance.

Emerging Technologies: AI/ML, Blockchain, Wearables

The arrival of Artificial Intelligence (AI – 12.4 billion dollars in 2017, +58%) has passed from trials to broader adoption. A case in point is Cybersecurity, where the algorithms of Machine Learning and Cognitive Computing allow preventive analysis; or customer care, allowing an optimized management of contact centers, an augmented user experience, and an innovative authentication process (facial recognition on smartphones). There are also other examples of Robot Process Automation, for automating repetitive tasks, and Manufacturing Optimization, where a combined AI-IoT leads to new control functionality for equipment.

The Wearables market (20.4 billion dollars in 2017, +26.6%), has gained considerably in size and is showing two-digit growth. It includes technologies that are already part of

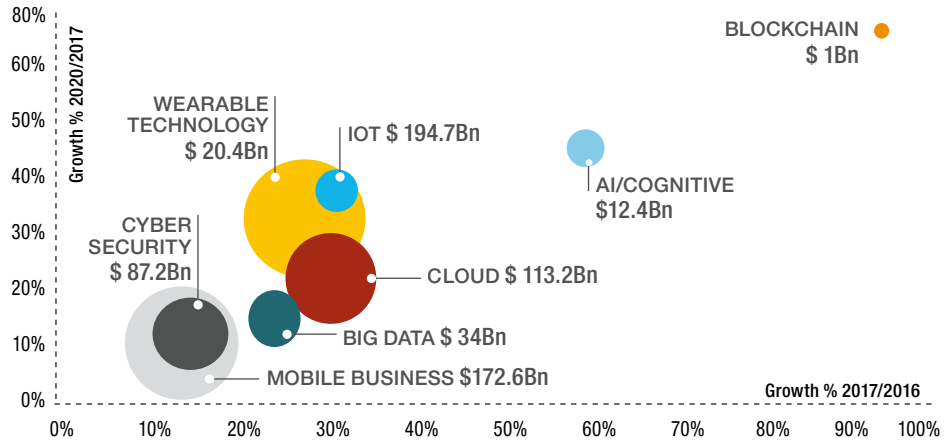


Figure 1: Global trends among Digital Enablers and Accelerators

Value in billions of US dollars and % variations

Source NetConsulting cube, 2018

everyday life (from smartwatches to fitness trackers, to interactive bracelets), now also used in business, from Industry (improving working and safety conditions for employees) to Healthcare (for remote assistance and monitoring).

The growth of **Blockchain** (1 billion dollars in 2017, +76%) is no longer tied to the bitcoin phenomenon, but to the consolidation of its base technology (Distributed Ledger Technology), marking its evolution as a platform for enterprise applications. With the R3 Consortium, the banking world was the first to experiment with Blockchain in managing cross-border payments and is experimenting with other niche applications like those for pool loans and advances based on billing. Other corporate experiments can be seen within the Energy sector (smart contracts for trading activities); Insurance (smart contracts for premium payouts) along with businesses that are more focused on supply chain and traceability.

Digital Lifeplace

The concept of Digital Lifeplace underlies the proliferation of Networking devices and **Digital Workplace** and Digital Citizenship/Life, key areas that are both allow individuals to use and share data unconstrained by time, place or device.

Digital Workplace comprises a wide range of products/services: devices that support mobile or remote work (smartphones, tablets, wall and interactive desks, wearable devices), mobile and Cloud enterprise applications, Unified Communication solutions & Collaboration (UCC), security tools for managing identities and user access, networks, systems and transmission infrastructures.

The scope of **Digital Citizenship/Life** is more enriched, closely matching the wide array of leisure time activities. There are other tools besides mobile devices, such as Smart TV and set-top-boxes, e-readers and others that provide user access to smart IoT services in the domestic sphere (home automation and entertainment), citizens (security, tourism, culture and mobility) and education (interactive learning, e-learning).

Globally, the scope of Digital Lifespace is extensive, as is its potential. Individual Mobile users have surpassed 5 billion, indicating that Digital Lifespace is destined to grow, with excellent opportunities for technology vendors and service providers.

Evolution of the ICT and digital market worldwide

Globally in 2017, the global digital market grew by 3%. Devices and Systems segment grew less (+1.5%), as data center systems were slowed down by the migration to software-defined platforms and the Cloud (especially in North America), and by devices affected by a growing high-end smartphone sector and by the longer PC replacement cycle.

The **Software** and **ICT Solutions** Market has continued to grow well (+7%), despite an increasing migration of on-site applications to the Cloud, which now tends to include the likes of ERP and HCM, etc, traditionally on-premise. In general, the most dynamic areas stem from Digital Transformation.
ICT Services are set on a trend that is improving (+4.5%) following the boost of Cloud and Consultancy and System Integration Services supporting Digital Transformation. **Network Services** reveal a trend that is shrinking slightly (-0.3%), due to decreasing tariffs primarily in developed countries. Downpricing and the saturation of demand are also causing a slight slowdown in **Digital Advertising** and **Content**.
An analysis of the digital market by geographic area shows that spending in North America continues to dominate the market and is enjoying higher growth, fuelled by application development services and deployment, and innovative software. The Asian market is buoyed by spending in China and due to basic computerization initiatives, and by investments in Japan, featuring more evolved approaches. The trend in Europe is improving significantly, due to the growing penetration of Digital Transformation projects in all countries. Investments in South America continue to grow at a fair pace, typical of markets yet to mature, driven mainly by software and services segments, and in spite of challenging economic conditions in Brazil and Venezuela.

Italy's Digital Market 2017-2020

In 2017 the Italian digital market grew by 2.3%, representing an increase on 2016 (+2.0%). Exceeding 68.7 billion euros, forecasts for the years ahead are optimistic, with an annual average growth rate for 2017-2020 estimated at 2.7% (Fig. 2).
Within the market, conventional ICT – which can be traced back to products and solutions that are not part of new entries – has grown more slowly, despite the strong thrust of application software and relative implementation services and management. This confirms how the market is being stimulated by the uptake of Digital Enablers: IoT, Cybersecurity, Cloud, Big Data, Social and Web management platforms, Mobile business, AI/Cognitive Computing, Blockchain and Wearable devices.

Devices and Systems

In 2017 the Devices and Systems market remained flat (+0.2% compared to 2016), as a result of diverging trends within its own macrosegments: decreased spending in Home & Office Devices (-6.0%) and Enterprise & Specialized Systems (-1.9%), was offset by an increase, albeit limited, in Personal & Mobile devices (+2.2%) and in ICT infrastructures (+2.5%).
Personal & Mobile Devices have seen declining spend in Laptop PCs (especially in the business segment) and slowing sales of smartphones that, while still growing, are beginning to show signs of market maturity, boosted by mid- to high-end models. Wearables have continued to enjoy two-digit growth. e-Readers have become a confirmed market niche with a positive trend.

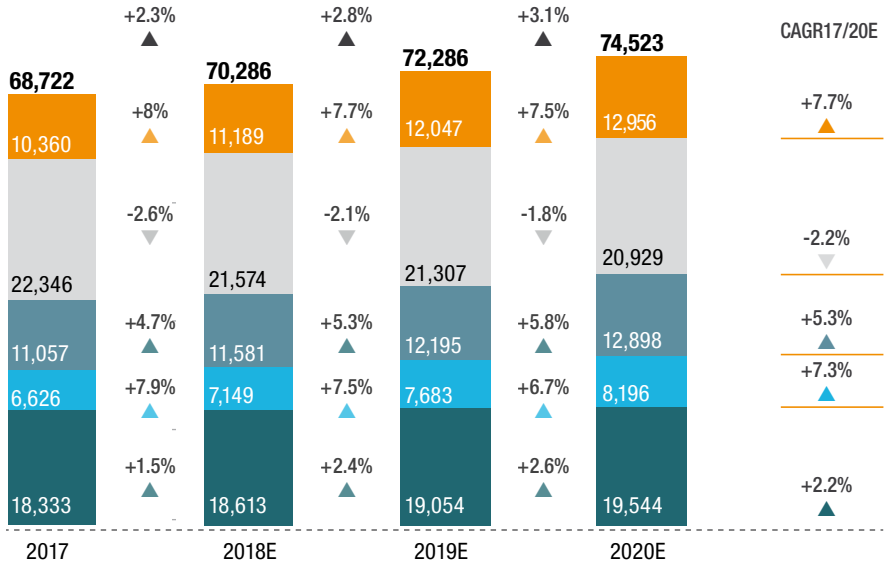


Figure 2: The digital market in Italy, 2017-2020E

Value in millions of euro and % variations

Source: NetConsulting cube, 2018

- Content and digital advertising
- Network Services
- ICT Services
- Software and ICT Solutions
- Devices and Systems

Following the merger between Anitec and Assinform, the analysis of the digital market has a broader scope than in the past. The devices and systems segment now includes the Wearables segment and includes standalone TVs or TV that are not Internet-ready, in addition to Smart TVs, which were already present.

The Home & Office Device market has declined mainly because of declining consumer sales in the non-smart TV and fixed console segments, not to mention the diminishing value of desktops and printers. Smart TVs and smart set-top-boxes however, are bucking the trend and growing.
Within the Enterprise & Specialized System Market, investments in servers and storage equipment declined, the biggest drop being in mid-range servers, followed by X86 servers (in fact the decrease in high-end systems and storage seems much less intense).
The decline is mainly due to a change in demand, as it moves towards IaaS Cloud services. Also worth noting is the impact of increasing SaaS services in the world of management applications, which will continue to compromise the sales of related systems. On the other hand, investments in Networking systems have remained positive and are in line with 2016 As regards ICT infrastructures, growth can be attributed to higher investments both in networked, fixed and mobile equipment, and in satellite, television and IoT infrastructures/systems.

Software and ICT Solutions

At the end of 2017, the Software and ICT Solutions market showed improved growth, with an increase of 5.9% over the previous year. As in past years, application software was the segment that pushed forward. Other segments showed much slower progress (middleware), if not negative movement (system software).
The **Application Software** market (+8.8%) was stimulated by the demand for IoT solutions in many sectors and by disruption triggered by the Industria 4.0 Plan. Web platforms have also contributed to growth, driven by an increase in commercial strategies and marketing across digital channels. There was also an uptick in the use of Social Platforms for internal communications and smart working initiatives. The evolution of horizontal and vertical solutions remained stable, again showing signs of maturing demand (particularly in ERP and traditional CRM segments) and the increasingly competitive force of Cloud SaaS.
The Business Intelligence Solutions market trend continues to be positive, especially in Corporate Performance Management. Demand is also growing for document management solutions, required for the digitalization of company information assets, and a prerequisite for data analysis strategies. Lastly, there is higher demand for production and planning solutions, arising from the Industria 4.0 model, as it supports adoption and upgrade of SCM solutions, production management platforms (MES) and PLM solutions. There is growing interest in SaaS services that is no longer polarized within Office Automation and CRM solutions, due to software vendor initiatives and also to a less cautious use and adoption of Cloud-based ERP and management applications.
The slight growth in **infrastructural Software** (+0.1%) was lifted by demand for components of Cybersecurity and security (identity control and management, data protection) and Information Management, supporting organizations and data management. Growth was good in IT Management and Governance tools, key to managing the hybridization of IT infrastructures. The BPM and Enterprise Service Bus segments enjoyed strong growth, driven by the need to update processes and applications.
System Software (-5%) experienced shrinking demand for hardware even in the face of the emerging need for virtualization components for setting up Cloud infrastructures.

ICT Services

The ICT services market in 2017 also showed significant progress, higher than the year before (+4.0%), thanks to Cloud services, which grew by 23.3%. The Cloud continues to be a priority both for increasing efficiency, effectiveness and flexibility in IT resource management, and as an enabler of Digital Transformation.

Services for **System Development & Integration**, and Consultancy are growing again, respectively at 1.3% and 1.5%. Among the key drivers of System Development & Integration are increased application migration activities (and system revisions) and the move from experimentation to implementation for projects in innovative fields. The service component for ERP and extended-ERP platforms was less dynamic, and attributable to the upgrade of solutions already in use. Consultancy services benefitted from the launch of digitalization initiatives and Security priorities, where the role of GDPR was key. The demand for **Training** also showed a trend reversal (+1.9%), fuelled by the need for broader digital competences among professionals who do not operate in the specialist areas of ICT.

The most mature market, ICT Outsourcing services, closed 2017 with minimum growth (+0.1%) despite having reversed the negative forces of 2016 and regardless of competition from Cloud services. The IT sector has compensated for the continuing downward trends of the Telecom sector, which is suffering from diminishing value in contracts, from competition and the difficulty of downpricing imposed in competitive tendering for Call Center services, especially if in the public sector.

The Data Center Services market has grown (+3.3%) in line with a need for outsourcing basic infrastructure management. Finally, the market for Technical Support has confirmed its trend of slow decline (-1.5%), due to reduced tariffs, the use of more and more reliable hardware components and longer warranty coverage.

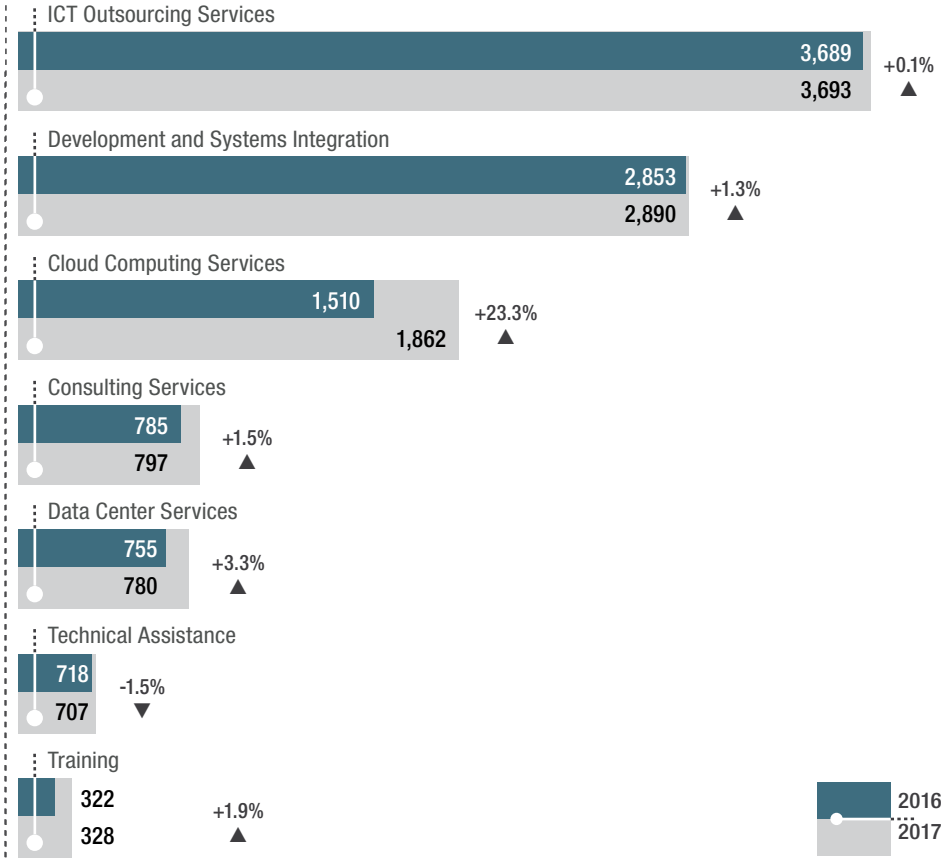


Figure 3: The market for ICT services in Italy (2016-2017)

Value in millions of euro and % variations

Source: NetConsulting cube, 2018

Network Services

In 2017, the Network Services market was stable compared to the previous year (+0.1%), despite a deceleration in the mobile sector.
The fixed sector grew by 0.5%, overturning a negative trend that persisted since 2005. Among the more mature services (telephony, data transmission and VAS) there is a continuing decline due to a gradual shift of customers to Internet-enabled services, which for their part, are showing double-digit growth, thanks to connectivity deals that are aggressively positioned in price and performance.
The mobile environment took on less positive hues. After timid signs of a comeback at the end of 2016, in 2017 it returned to the levels of two years prior. And again, Telephony slowed down, caused by an ever-diminishing status of the service in bundled contracts with Internet connectivity, and also by the increased demand for data traffic, given the disappearance of roaming in the EU.

Content and Digital Advertising

The Content and Digital Advertising market in 2017 exceeded 10.3 billion euros (+7.7%). The Digital Content section alone generated revenues exceeding 8 billion, with good trends in all segments (growth was doubled in mobile entertainment components, digital music and e-book content). The category that generated more in revenues (more than 3 billion euros) remained pay video, including offerings from both satellite and digital terrestrial TV operators, and new online Video on Demand services provided by broadcasters and over the top TV players.
The Digital Advertising market, which includes online advertising, social advertising and TV advertising (Pay TV Sat, Digital Terrestrial and IPTV), exceeded 2.2 billion euros (+7.4%). In the slowly recovering advertising market, the digital sector revealed a positive dynamic, taking second place behind the TV channels. The categories that grew the most were social media advertising and video advertising.

Key Digital Enablers

The trajectories of digital development in Italy are interwoven with world dynamics, from the most consolidated – Cloud Computing, Cybersecurity, Big Data, Mobility, IoT and Social platforms – to those that are still experimental: AI/Cognitive Computing, Blockchain and Wearables, as demonstrated by the high growth rates expected over the short- to medium-term (Fig. 4).

Artificial Intelligence and Cognitive Computing

While still only a small market (0.1 billion euros in 2017, +58.7%) Artificial Intelligence (AI) and Cognitive Computing Technologies are expected to surge in growth over the next three years, at a Compound Annual Growth Rate (CAGR) of 49.6%. The thrust comes from solutions for increasing efficiencies in business processes: Machine Learning, Natural Language Understanding and Processing, Text and Voice Recognition and Computer Vision. The most mature area is Machine Learning algorithms, which allow systems to learn and perform actions without being programmed beforehand, with progressive improvement in results. The range of application is wide. In Finance it varies from fraud and risk management, to customer profiling, to anti-money laundering. Healthcare comprises diagnostic support, and in other sectors, sales forecasting models, preventive maintenance and personalized offers acquired through recommendation engines, etc.
Among the technologies of Natural Language Processing are emerging those of the virtual assistant and Chatbot for customer care, knowledge management, help desk and for the activities of community management and branding. Voice and Speech Recognition

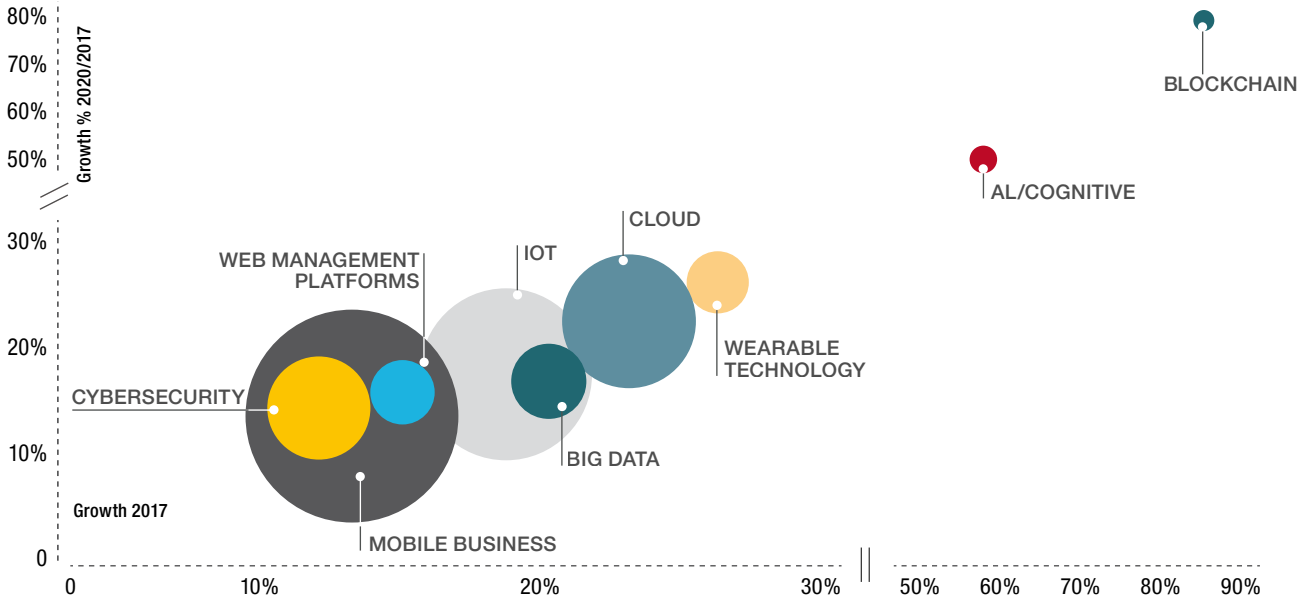


Figure 4: Market trends among key Digital Enablers in Italy, 2017-2020E

% Variations
Source: NetConsulting cube, 2018

systems are used in the contact centers of Banks, Utilities and Telecom; Computer Vision is used in diagnostics, identification of persons and objects in surveillance, and self-driving vehicles. Among Banks, the spread of solutions in Robotic Process Automation is growing, able to carry out repetitive tasks based on specific rules and freeing human capital from routine and time-consuming activities. AI algorithms matched with Big Data architectures have also been adopted in Cybersecurity and incident analyses to improve threat prevention.

Blockchain

Even Blockchain, with fully traceable applications based on Distributed Ledger Technology, is proving to be a growing market: 16 million euros in 2017 but estimated at between 90 and 100 million by 2020.

In business, the most popular apps are based on the Permissioned Ledger: that is, they feature one or two validators who are empowered exclusively for approving new “blocks” and granting access to the network and visibility of data.

The applications are tied to unalterable and fully traceable transactions, so much so that the banks have been the first to experiment with them in different environments, exploring the possibility of increasing the fluidity of certain processes. Some system initiatives (Italian to European) have been launched: one is the R3 Consortium, which develops enterprise applications on Corda, its proprietary platform, and which created a prototype with 22 banks to achieve real-time, international payments; another is Wetrade, used for developing an international payments platform for small businesses. Looking purely at Italian cases, a pilot system for advance invoices was started, allowing banks to check that invoices had not already been submitted to other institutions; on Corda, AbiLab is developing the project Spunta Interbanca Italia, which provides the automatic clearing of accounts among banks.

Important trials have also been conducted in other sectors, like Energy, with trading experiments via Blockchain, and Insurance, with an internal analysis of smart contract usage. Across the multiple areas where Blockchain will be employed, agrifood offers an example of traceability for raw materials and food products, while for industrial and logistics players, the combination of smart contracts and IoT, is showing much promise in supply chain management.

Wearables

Wearables are devices which, when worn, interact in connectivity with application ecosystems and third-party service providers. In 2017 they generated a market of over 526 million euros and promise yet further growth (29% CAGR for 2017-2020). Consumer devices are a key segment today for health and wellness applications (smartwatches, wristbands for monitoring limits of physical activity or clinical cases) and gaming/entertainment (virtual/augmented reality viewers for video games and gaming experiences).

Wearables for business applications, while still representing a minority share of the market, are rapidly accelerating, propelled by Industria 4.0 and smart factory business models. Wearable technologies in the industrial sector allow improvements in productivity and processes in a number of sectors, in factory activities and in those which foresee on-site working operators. Within Italy's national Industry Plan 4.0, Wearables have been included as overdepreciation benefits.

Cloud Computing

The approach of Italian companies towards Cloud Computing (1,861 million in 2017, and an estimated CAGR of 21.8% for 2017-2020) seems conservative. In fact, within the architectures of Hybrid Cloud where the highest spending is concentrated, there is no dominant business model. Different business models, in Public and Private/Virtual Private Clouds, are being adopted according to the areas to be managed and are increasingly merged among themselves with on-premise IT resources. This is also showing up in market analysis according to the type of service being used: the IaaS infrastructural management services stand out, often being the starting point for broader Cloud strategies. These show an increasingly frequent purchase of additional computing capacity and storage and of archiving/back-up capabilities both for disaster recovery and collection and analysis of higher volumes of data, like those derived from IoT. To date, the penetration of IaaS services appears to be high for Utilities, Distribution and Services and is expected to increase across Industry and Finance. Not far behind are SaaS services with a considerable presence in all sectors for Office Automation and Collaboration application environments, being the first to adopt applicative Cloud services.

The use of SaaS appears also to be growing for solutions that respond to specific needs (CRM, BI/Business Analytics, HR Management) or simply attributable to key digital platforms (Mobile, IoT). In this case, the most active companies are in Industry, Telecommunications, Distribution and Services. In the near future, SaaS will be used more and more for the most strategic business applications, such as ERP and management. In effect, fear of uploading management data externally is diminishing. Furthermore, the adoption of ERP and management solutions in SaaS allows them to be scoped and customized in any case, this being often required among companies, especially in the front-end sectors. There still remain some obstacles, one of which and the most pronounced, is the limited spread of broadband networks.

The selective approach of Italian companies towards Cloud models and services is creating space for Multicloud strategies, based on a selection not only of architectures and services but also of suppliers, applying different management approaches among IT providers and available resources. It is a strategy that leads to independence from vendors, to dynamic choices based on workloads, performance and prices, requested as and when required. However, all this depends on the right competences, both technical and contractual.

Internet of Things

The Internet of Things (IoT, 2.5 billion euros in 2017 and a CAGR expected to reach 16.7% in 2017-2020) is also a strategic Digital Enabler in Italy across almost all sectors, from Insurance to Industry, Utilities, Transport and Healthcare. What's more, it is becoming an integral part of system infrastructures. Every company that wants to incorporate

intelligence into its products or processes must be able to interact both with partners and customers providing information, and with the ecosystem of reference (public administrations, service companies, and network infrastructure operators).
In the future, not only will the adaptation of infrastructures count, but also their capacity to cater to the demands dictated by AI, by robotics and by all applications where real-time responses are required. Already today intelligence is splitting: on one side, towards analytical, predictive or decision-type functionality, where computational capacity continues to reside on the Cloud, with results processed on a deferred basis; on the other, for the purposes of immediate intervention, computing capacity tends to remain in the field (or on the edge), near connected objects, as required by site managers and by real-time applications on the ground. And it follows that there is an emerging need to redesign architectures and to introduce hardware systems with higher processing capacity locally – not just in the Cloud, with Edge Computing or Edge Datacenter solutions.

Mobile Business

In 2017, Mobility was an area of investment for almost 70% of companies, proving the growing importance and, by now, proliferation of Mobile Business (3.5 billion euros in 2017 and a CAGR estimated at 11.3% for 2017-2020). The growing proliferation of mobile applications within companies aims to optimize internal processes, for increased productivity, collaboration and flexibility. In addition, for some years now, mobile applications have increasingly been seen as a tool for transforming organizational and process schemes, with impact on business models. This trend is based on the possibility of aggregating the advantages of Mobile computing with those of other fast-growing technologies, such as IoT, Big Data and Cloud. Investments in Mobile computing are being applied both within the companies, and in the area of customer relations, from engagement to post-sales, with the aim of optimizing the user experience. More and more companies are giving Mobile a technological role that fully leverages customer relationships: the number of people tending to manage relationships, and financial and commercial transactions via the Web continues to grow, leading to a complete digitalization of the customer journey and after-sales assistance.

Big Data

The level of maturity of companies in the Big Data sector appears varied, and this also explains the size and dynamics of the market (0.8 billion euros in 2017, but with a CAGR estimated at 15.9% for 2017-2020). In most cases, companies are still creating architectures capable of collecting data from a number of channels and data lakes (logical structures capable of overcoming the rigidity of data silos, data warehouses and the mushrooming of controlled databases).
Companies at the most mature phase, already with a data lake in place, are instead starting to test Big Data Analytics strategies, to get as much value as possible from this new realm of information. Also from a planning perspective, activities in these companies are concentrated:

- on building solutions and algorithms capable of generating information around business phenomena and useful for understanding their applicability in key areas, starting from predictive and scenario analyses. Priority areas are linked to the analysis of customer data to refine marketing strategies, and security data, for more accurate forecasts of threats;
- on the optimization and innovation of processes. By applying Machine Learning to Big Data, correlations can be made between interfunctional kinds of data, generating information that for a business analyst at one time would have been near impossible to codify. In the near future, thanks also to its self-learning capabilities, it will be possible not only to predict phenomena but also to identify the best ways to foresee and challenge them.

Cybersecurity

Cybersecurity (0.9 billion euros in 2017 and a CAGR estimated at 12.2% for 2017-2020) is no longer just a matter for ICT managers, but Top Management. It is becoming a specified prerequisite for any kind of productivity role or service. Increasing attention is being devoted to both increasing threats and the evolution of EU legislation: GDPR regulation came into force in May 2018, with the Network Information Security (NIS) Directive, adopted by the Council of Ministers in March 2017 as part of the National Plan for cyber-protection and cybersecurity in Italy.

Alignment with GDPR is having a major ripple effect on business organization and solutions. Among the measures contemplated some foresee a growing push in spending in Cybersecurity Among these is the mapping of all processed data and a resulting alignment with protection measures; the right of access to processed and discarded data, as well as portability of data for interested parties; notification to Authorities and stakeholders of any incidents of Data Breach.

As concerns business organizations, there is a growing need to create new roles, such as documentation and process auditing among different data management players, leading to the construction of an "organigram of privacy". Training is also expected to grow with an increased focus on quality of software and the so-called "privacy by design and by default", guaranteeing secure applications starting from creation and development.

Security is also critical for Public Admistration: in the Three-year Information Technology Plan for Public Administration 2017-2019, an entire chapter has been devoted to security, with objectives and well-defined action planning. Indeed, no organization is risk-free: the operating systems of global companies were violated in 2017 and the spread of malware is capable of affecting even the smallest companies. Added to that are the risks of mobile technologies and the need within the context of advanced integration, opening systems up to partners, customers and suppliers, and not just for APIs, but also IoT apps and technologies, all representing channels susceptible to attacks.

Digital market accelerators – Digital Lifeplace

The three layers (devices, networks and applications) that make up the ecosystem of Digital Lifeplace have a total value of over 13.3 billion euros, up 12.7% on 2016. Development should continue as follows: CAGR 2017-2020 is estimated at 10.5%%.

Digital Lifeplace as a market is divided into two macro-segments: the first, comprising products, solutions and digital applications serving the everyday needs of end-users (Digital Consumer/Digital Citizen Services); the second, digital support for tasks and activities related to ways of working (Digital Workplace/Smart Working).

Digital Lifeplace: Business and Consumer dynamics

The Digital Consumer/Citizenship market is much larger than Digital Workplace. However, Digital Workplace shows the highest growth (a CAGR of 14.7% for 2017-2020). In fact, it is an investment area that is sustained by companies and their need for increased agility and efficiency, while also reducing costs. Working environments are increasingly aligned with digitalization and employee habits, leading to unhindered interactions between colleagues, anywhere, from any device and at any given moment. From this perspective, Digital Workplace is a pillar of smart working, a business model that helps companies achieve their goals, while enhancing employee relations and providing ICT tools: mobile and UCC applications, business solutions in SaaS and Virtual Desktop, innovative mobile devices (smartphones, tablets, interactive desks/walls, etc.). There are also significant investments being made in Identity and Access Management tools, in Endpoint Security and data Transmission Services.

Digital Consumer/Citizenship, instead refers to the evolving habits of end-users. The growth of the market is driven mainly by a broad spectrum of digital solutions that consumers use throughout the day in an ever extending range of mobile devices. Entertainment features prominently (music, gaming, etc.) but there is also a growing demand for applications that are more useful both in the domestic sphere (e.g. home automation services) and within urban life (infomobility, healthcare, cultural services, urban security, etc.).

Digital Lifeplace: increasingly intelligent devices

Smartphones and tablets are the only devices within Digital Lifeplace that are found both in business and consumer life. To date, evolutions in smartphones focus on the camera; the screen, usually without edges and curved; the user interface, increasingly based on AI; embedded payment systems; fingerprint analysis for added security; offering connectivity with PCs or laptops. The tablet has achieved greater penetration in the business environment where the adoption of 2-in-1 or convertible tablets is growing. The use of tablets, however, is almost always associated with other devices, either PCs or smartphone, both in business and consumer environments.
The business devices behind Digital Workplace/Smart Working market are laptops, which are replacing desktops; interactive desks, touch tables and interactive walls; and wearables, combining with applications in the fields of production, maintenance, quality control and logistics. Among consumer devices used for Digital Citizenship/Citizens are again wearables in the fields of fitness, health and gaming/entertainment, smart TV, smart set-top-boxes and e-readers.

Digital Lifeplace: Apps

Apps are reshaping habits: they are encouraging individuals to handle more and more daily activities on the Web where they can benefit from new services. Among the most popular consumer apps in Italy are Social apps. From simple messaging networks, Social apps have transformed into platforms for the distribution and multichannel use of diverse content (news, films and TV series, music, live events), and into strategic sales channels for Italian companies devoted to e-commerce. In this regard, what stands out is the advent of shopping experiences that take advantage of Mobile-AI, as in conversational commerce, where purchases can be made within a chat, via app. All this is happening while traditional cashdesks at physical points of sale are predicted to gradually disappear, with automatic payments increasing through apps. In urban areas, shared mobility services based on app and geolocation services are already a reality.
Big Data, AI and Cognitive Computing, IoT are the technologies that will support the development of innovative digital services provided through increasingly contextualized and adaptive apps.
As for business apps for Digital Workplace, Italian companies invested over 750 million in 2017, with almost 20% in increased spending. The concept of Digital Workplace has expanded and evolved to include applications and services developed not only to increase employee productivity through mobility, but also to improve organization of work.

Digital Lifeplace: unified access and interconnections

The Digital Lifeplace model rests on the ability to provide access to data and applications via the network from a wide range of devices and from any location. It poses significant challenges for companies.
IT functions must be able to support the mobility of employees, minimizing security risks and maintaining compliance with regulations. In turn, this is precipitating the redesign of IT architectures to provide integrated, on-premise and Cloud environments, overcoming the logic of applicative silos, and developing APIs that can integrate third party services. Greater commitment will be needed to virtualize workstations, to expand the array of

devices in use, to support a wider range of operating systems, to initiate Enterprise Mobility Management strategies, to increase the spectrum of applications, SaaS and Web, and to adopt shared security policies. This convergence will lead to a Digital Workplace where the end-user experience will be unified through integrated and extensive management platforms for the diversity of devices, mobile content and applications, linked to the identity of single users, with highly intuitive benefits. Connectivity service providers are investing in modernizing infrastructures, focusing on speed and optimization of network management. A radical paradigm shift can already be seen in how telecommunications networks are being implemented, as the linkage between hardware and software is loosened, and the development of network and services being developed as though they were software applications.

Sectors

In 2017, all sectors, with the exception of Local and Central Public Administration, increased their ICT spending in the area of Digital Transformation, providing a glimpse of a similar trend for the next few years. Differences between sectors can be seen in the speed of the digitalization of processes and focus areas (Fig. 5).

Banks

Banks are clear drivers of the digital market. 2017 expenditure stood at 7,246 million euros, with a growth of 3.1% over 2016, which is expected to grow stronger (a CAGR of 5% for 2017-2020). For companies in this sector, the Digital Transformation is a strategic competitive lever in a dramatically changing scenario, where Fintech and OTT are taking on areas that just a few years ago represented the undisputed terrain of the banks. Above all, it is the one sector that is adopting digitalization across the board, in all key processes, even though ICT architectures are still a work in progress.
Digital Transformation projects are focusing on the redesign of the model for back office processes – aiming to achieve greater efficiencies, also using Process Automation robots – both in customer relationship management and in commercial activities, where there is a focus on digital channels to innovate the model of engagement, improving customer experience and optimizing use of all touchpoints for marketing and sales activities.
Generally speaking, integration between digital and physical channels continues, aligned with a gradual downsizing of the direct sales network, which has been in progress for some years. At the end of 2017 it touched its historic minimum of 27,419 subsidiaries (1,500 fewer than 2016 and 6,700 fewer than 2008, a peak year). In parallel, in the new model of branch offices, especially in the large banking groups, there is a growing presence of self-service areas, reducing frontdesk workload, with videoconferencing to deliver increasingly tailored advisory services. For the next few years there will be an increase in cashless, unstaffed branches with self-service workstations.

Insurance

During 2017 the insurance sector increased the digital market by 1,913 million euros (+ 3% on 2016). This positive trend is expected to accelerate (a CAGR of 5.4% for 2017-2020). In this sector, Digital Transformation is a competitive imperative, which adds to the digitalization process already under way, with a host of features: from adopting solutions that innovate business models to entering new ecosystems for new offerings, to scouting for Insurtech to help accelerate innovation.
Investment priorities are driven both by the need to focus on a deeper knowledge of customers, and on a new sales model, drawing on the combination of traditional and digital channels that do not marginalize agents. Big Data, IoT and Mobile are the

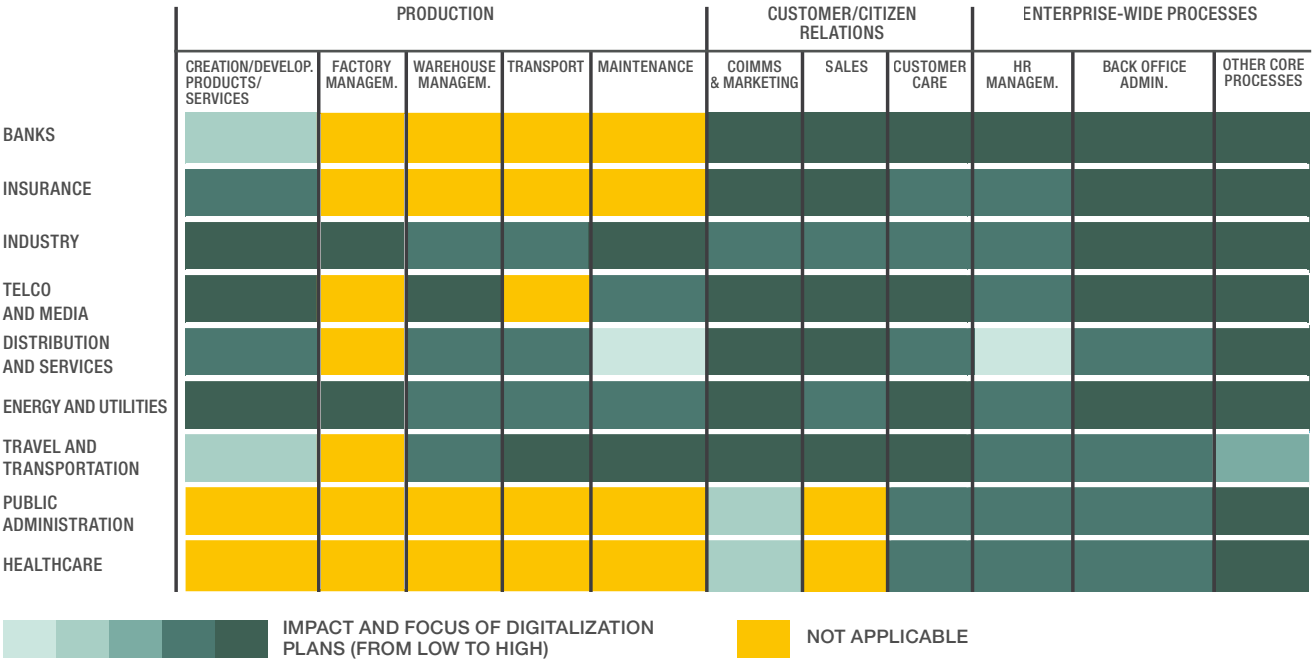


Figure 5: Impact and focus of Digital Transformation Plans on processes in the Utility sector (2017-2018)

Source: NetConsulting cube, 2018

technologies that drive the most progressive company projects. Next, there is an extension of Connected Insurance offerings (based on IoT and already used for Automobile Liability Insurance with the black box) to Smart Home and Healthcare, leading to two other areas of interest for companies: the development of offerings for high-return markets and Preventive Insurance.
Sales digitalization is also being applied above all in traditional channels, run by agents, where in recent years, insurance companies already began investing for the digitalization of agency sales processes, today a part of mobile sales. After-sales is intrinsic to technological investments that both accelerate activities in insurance payouts and activate services that seek to reduce the impact of damage, while showing customers empathy; Big Data platforms offer an example of how claims are being managed, with chatbot to provide assistance.

Industry

Pushed forward by the Industry Plan 4.0 and, more generally, by digitalization strategies across all segments, digital expenditure in the sector increased by 3.7% compared to 2016, reaching 7,538.9 milion euro. In the years ahead that trend is expected to grow sharply (a CAGR of 6% for 2017-2020). Processes that show a stronger concentration of digital investment are those linked to production, where there is an aim to increase efficiency by starting with process redesign. Digital Enablers have played a crucial role in industrial companies, where IoT and Security, followed by Cloud and Big Data have been the leading technologies of transformation.
IoT will be the focus of growing investments in coming years: it is a key technology for site management within Industria 4.0 and for optimization of logistics processes.
As for Big Data, the proliferation of analytical solutions will have an affect on all types of companies in years to come, from the most operational ones (sales force or field services, logistics and transport) to typically more corporate organizations. The Cloud is an area where many companies have made investments and where they will continue to invest. Indeed, there is clearly a progressive hybridization of systems and infrastructures and, in line with this trend, ERP/management solutions will also tend to migrate to the

Cloud platform. Among other Digital Enablers, Blockchain solutions are of interest to an as yet limited number of companies that are seeking to understand its benefits.
Security and regulatory compliance will still represent a high focus area. On one side, many companies are trying to protect their systems from a growing number of cyber attacks using Cybersecurity solutions; on the other, all companies will have to meet their obligations under GDPR, which came into force in May 2018.

Distribution and Services

The digital expenditure of the Distribution and Services sector in 2017 reached 4,250 million euros, with an increase of 3.2% on 2016, and is expected to increase (a CAGR of 5.8% for 2017-2020). The most interesting Digital Transformation projects relate to customer relationship management along the entire customer journey, both at physical and digital touchpoints. The growing adoption of Big Data/Analytics technologies is allowing Sales and Marketing functions to perform in-depth analyses on customers and prospects. Starting from an increased customer knowledge base, companies are empowered in the development of shopping experiences, marketing campaigns and personalized promotions, exploiting digital technologies for proximity marketing, mobile loyalty apps, couponing, totem, kiosks and in-store digital signage. The next evolution in this field, where early trials are showing up, is expected to be the use of AI and Cognitive Computing for interaction with clients via apps and chatbot systems for customer care activities and conversational commerce. The other areas of investment also include Cloud and Mobile computing. The main focus of the former is on migrating infrastructures and core applications, both private and public, to the Cloud. Mobile comprises the development of consumer apps and enterprise solutions for collaboration/document management during in-store and warehouse product management and order collection (for agents). Security has also become a clear candidate for investment, given data protection and compliance (GDPR) requirements. IoT is a minor consideration in the area of planning, with investments being made in logistics and warehouse management to improve the traceability of goods. Again as regards traceability and food products, focus is also being given to experimentation with blockchain technology.

Telecommunications and Media

Once again in 2017, the Telco and Media sectors experienced a period of profound change, which touched the competitive environment, regulatory frameworks and consumer behaviour. Spending for digital products and services as an aggregate of Telco and Media in 2017 went up 1.6%, achieving 8.4 billion euros. Just over half of this can be attributed to investments in fixed and mobile Telecom network infrastructures, and the rest to digital products and solutions.
The areas where the cost of process innovation and digitalization are most concentrated are in commercial and customer support, using Big Data and Business Analytics Solutions in particular, which provide a more tailored delivery of proposals/responses. The area linked to customer care is also impacted, delivering support on a self-service basis. For the benefit of preventive maintenance of network infrastructures, IoT technology is being used more and more. Another bourgeoning field is that of robotic software solutions for repetitive tasks

Utilities

2017 was a very positive year for the Energy and Utility companies, as they stated an increasing focus on innovation. Many projects have driven digital spending, which grew by 4%, to 1,691 billion euros, and expectations of yet more continuous growth in the medium-term (a CAGR of 6.5% for 2017-2020). IoT is fueling this, with initiatives for automated plant control, safety in the field and smart metering. Mobile is attracting

growing interest. Apps are destined to support the salesforce or sales teams at large, and to improve intra-company communication on platforms for Collaboration, Instant Messaging, VideoChat and e-learning; and they are gradually dovetailing with client relations, either as part of customer retention or customer acquisition. Looking forward, the Mobile phone will also play a key role in supporting Smart Home and Smart Assistance services, linked to IoT technologies.
Big Data has distinguished itself as an area of strong interest, and the key to advancing Business Analytics solutions and introducing Machine Learning tools, being applied across many fields (analysis of customers and networks, optimization of trading, etc.).
Cloud computing has garnered powerful interest in its infrastructural component, continuing from 2017 but with a decisive step forward: many players in the industry have defined plans for a gradual transition of all systems to the Cloud, as others are evaluating these Services more specifically (disaster recovery and business continuity).
The importance of Security is also clear, with actions to achieve compliance (GDPR), the formulation of policies for disaster recovery and business continuity, and preventive defense from threats.

Travel & Transportation

In 2017, digital expenditure in the transport sector was 2,357 million euro, an increase of 3.4% on 2016. Growth is expected to be strengthened in the coming years (a CAGR of 5.3% for 2017-2020).
Among logistics and freight transport companies, one of the key technologies of Digital Transformation is IoT, for fleet and supply chain management projects. Collaborative platforms, Big Data Analytics, Mobile Apps and Dematerialization Solutions, based on AI and offering traceability (also experimentally on Blockchain) are further areas of investment, again as a feature of optimization processes along the supply chain.
In passenger transport, however, operators have focused on using solutions to improve the customer experience: Chatbot and natural process language systems on e-commerce sites, and investments in CRM and Mobile Apps, to offer increasingly personalized services. Companies in this sector are interested in Big Data in different areas: for preventive maintenance, through analysis of data on vehicles; to anticipate passenger traffic flows and optimize fleets, and on the sales side, to achieve applications that can provide dynamic pricing of online services. Finally, smart mobility has witnessed the development of new sharing services, innovations in public transport and real progress in autonomous vehicles.

Public Administration

In 2017 the Public Administration (PA) digital market continued to decline, both locally (-2.7% to 1,194 million) and centrally (-1.8% to 1,894 million, excluding defense, which, quantified separately, remained stable). These trends were influenced by the spending review directives under the Law of Stability 2016, and reflected in the Three-Year IT Plan for Italy's Public Administration. However, Public Administration did not appear untouched by the impact and contribution of Digital Enablers.
The question of Security holds a key position within the Three-Year Plan. The most interesting topics are Disaster Recovery, Business Continuity, Cybersecurity (also in terms of governance), the definition of the National CERT led by MISE, the Ministry of Economic Development, (which integrates with Cert Public Administration within AgID), the strengthening role of the Department of Information for Security (DIS) and the creation of the new National Evaluation and Certification Centre. The Cloud is also a question that is constantly in flux, starting with the announcement of Lot 1 of the SPC-Cloud tender in 2016, which defined services (applications, infrastructure and platform) open to participation within the Public Sector.

Another important matter for Public Administration, over the medium-term is Big Data, also included in the Three-Year Plan. The changing landscape sees phases of experimentation within the Data & Analytics Framework throughout 2018 (for optimized analysis processes, the standardization and promotion of Open Data) and of working relationships with Universities and Research Institutions.
Within the Mobile space, Local Authorities represent the majority in projects that innovate interactions with citizens and businesses; current services still dictate the IT aspects for mobile devices, but the growing penetration of PagoPA, SPID and ANPR services is stimulating an evolution. As for other Digital Enablers, Public Administration is still a case study, and in some cases, an experiment.

Healthcare

The digital Healthcare market continues its positive trend: in 2017 it achieved 1,515 million euros, with a slight increase compared to 2016 (+1.2%). This trend, which is expected to strengthen in years to come (a CAGR of 3.1% for 2017-2020), is the result of stable, fixed budgets within hospitals and other health structures nationwide, with an increased ICT budget, designated by Regional Authorities to the Healthcare sector. However, commitment is still not enough to close the the sector's digital gap.
Regional investment policies aim to streamline its systems and increase efficiencies, with actions that will centralize administrative processes, procurement and management of staff, along with standardization of processes such as the central reservation center (CUP), Accident & Emergency, and medical records. Going forward this evolution will result in a range of processes for a variety of national healthcare divisions, managed by applications shared or integrated among themselves through applicative cooperation: guidelines are already being defined for the rationalization of ICT infrastructures.
In parallel with the reorganization of regional health, there are key projects under way that aim to converge hospitals based on proximity and assistance requirements in the territory. For this sector the technological paradigms are IoT and Wearables, translating into remote medical care services and telemedicine and consequently Security, where data is particularly sensitive, given of GDPR rules regarding Data Privacy. Big Data and AI applications are also growing in the sector, as a result of enormous amounts of data available, derived from multiple sources. The news is not so much the amount of data available, but the increased potential for processing them in support of healthcare procedures.

Consumer

The digital spend of Italian consumers in 2017 exceeded 29.69 billion euros, an increase of 2.3% compared to 2016. This was driven mainly by Wearables: smartwatches, fitness trackers and equipment for biomedical applications. The consumer segment of desktop PCs increasingly goes against the grain of market trends, unlike laptop PCs. The consumer segment of tablets was in line with the declining market trend, while consumer purchases of smartphones grew at a faster rate than the sector's overall trend.
The number of connected users on the Internet has increased significantly and with them the percentage of those using e-commerce. Driving the expansion of the web among Italians is also the widespread growth in broadband: the average rate of penetration among families has increased by two percentage points, compared to 2016, and as high as 79%. However, despite this slight increase, Italy is still lagging significantly behind the European average (EU28, 85%) and there is still a large gap between North and South (Istat, 2017).
Smart TVs were the second driving force in the consumer market. The positive trend should become more marked in the coming years, but the forecast does not take into account the transition to the new digital terrestrial standard (DVB-T2).

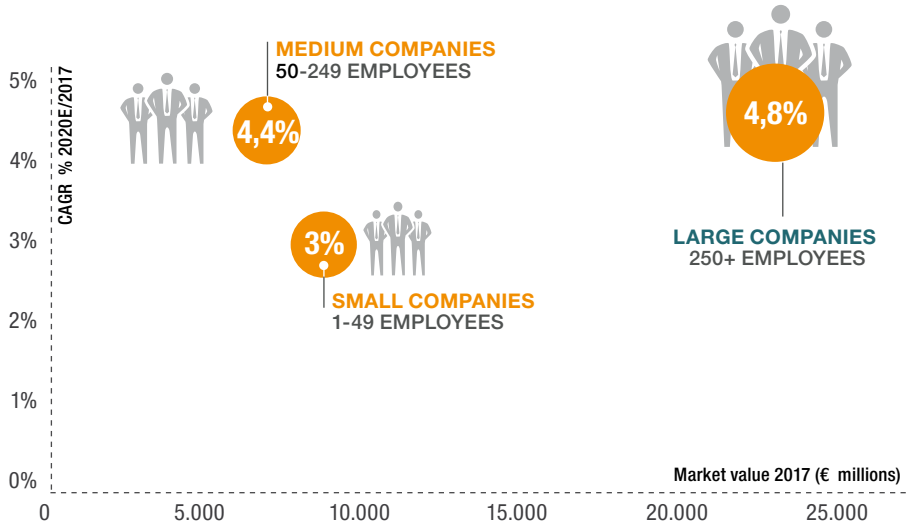


Figure 6: Italian business digital market by company size, 2017-2020E

Source: NetConsulting cube, 2018

The digital market by company size

In 2017, the digital market, generated by the world of Business, and amounting to 39 billion euros, maintained its growth trend, even though it felt the effects of a deceleration of almost one percentage point in investments among large companies with over 250 employees (+2.6% in 2017). Medium sized (50-249 employees) and small (1-49 employees) companies did not show signs of a slowdown in spending despite their lower growth rates, the latter accelerating ahead by almost one percentage point in digital demand. The fact remains that market forecasts for 2020 (Fig. 6) indicate an acceleration in digital business spending at an average annual rate of 4.3%, again driven by companies with more than 250 employees, where digital spending is expected to grow at an average annual rate of 4.8%.

The digital market by region

From a geographical perspective, the regions with the biggest share of the Italian digital market are Lombardy and Lazio. In 2017, digital expenditure, sustained by consumers and companies in these two regions amounted to 40.9% of the total market, with the most substantial result in Lombardy (24.2%). Both regions feature ecosystems that are made up of end-users and service providers, that are quite wide-ranging and that create a virtuous support circle for technology investments and for Administrations with formulated plans for the regional rollout of Italy's Digital Agenda. That said, at the level of development trends, while Lombardy shows investment growth that is well above the market average, Lazio is declining, after a spending review that has led to a reduction in PAC expenditure. The remaining 59.2% of the digital market is scattered among the other Italian regions of Veneto, Piedmont, Emilia Romagna and Tuscany with significant and substantially equivalent weights.

The Impact of new measures

Industria 4.0

The Impresa 4.0 Plan and its impact on investments in digital technologies

In the autumn of 2017 the Government launched the second phase of the National Industry 4.0 Plan under the name Impresa 4.0, highlighting an extended scope of actions incorporating the business organization in its entireity (beyond production and logistics) and the creation of new competences.

Super-depreciation went from 140% to 130% (with software purchasing still at 140%); whilst overdepreciation remained at 250%; amortizations are being used on until 31 December 2018 for purchases delivered within the first six months of 2019; the New Sabatini Act was confirmed; and incentives were made available for training start-ups and innovative companies using tax credits. Other incentives were supported in the area of company competitiveness through Competence Centres and Digital Innovation Hubs (DIH) as foreseen in the first phase.

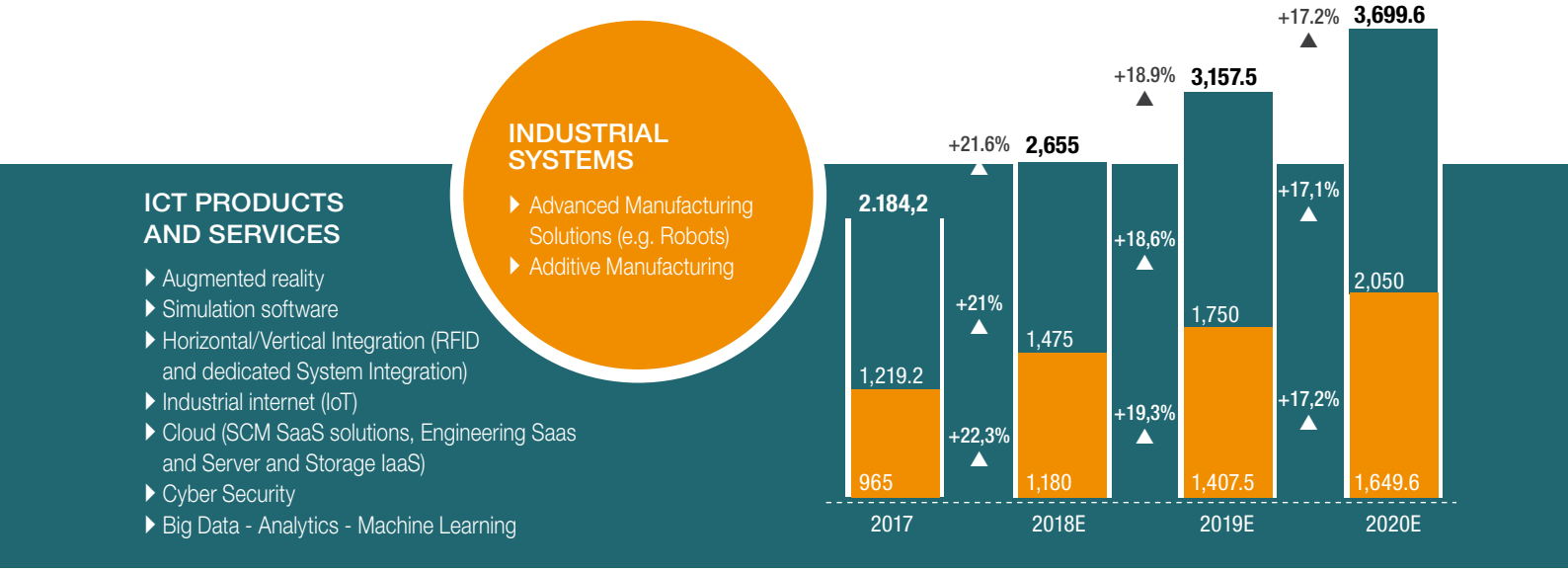
The Plan has already generated significant results, as shown by an uptick in production, investment, orders and confidence among companies in the industrial sector.

Forecasts of the Plan's future impact are also positive. For 2018, almost 46% of companies intend to make investments in software, a third in Machine to Machine (M2M)

Figure 7: Italy's Industria 4.0 market (2017-2020E).

Values in millions of euro and % changes

Source: Anitec Assinform



technologies or IoT, 27% in high-speed connectivity to enable Cloud services, Mobile, Big Data and IT Security. In a similar vein, digital solutions the market for Industria 4.0 could continue to grow, ranging from 2,184 million euros in 2017 to 3,700 in 2020 (Fig. 7).
As regards areas of investment in 2017, companies focused on introducing new natively connected or connectable equipment; on modernizing existing systems through sensors that enable machine connectivity; on cobots, smart robots and connected robots able to exploit AI; on additive manufacturing, not only in planning but increasingly also in production. These trends will continue, as new investment streams open up for enabling technologies, fog/edge computing and the already growing proliferation of wearables and from there the development of augmented reality and virtual reality applications. Stepping back and looking at application areas enabled by Industry 4.0, those with the most appeal among businesses are in the sphere of optimized carpark maintenance, optimized production and cycle times, and reduced waste, asset and energy management. Even from this perspective, companies are focusing on datalayers Another area of interest to many companies, starting from the largest, is the development of digital twins (replicated in the Cloud) for factories or production lines, offering all kinds of simulation.

Competences 4.0

Another fundamental aspect of the second edition of the Impresa 4.0 Plan concerns competences. The objective is to train 200,000 university students and 3,000 managers on the fundamentals of Industria 4.0 by 2020 and to reinforce higher secondary education with new Institutes geared up on the topic. The Plan envisages a tax credit on training according to Impresa 4.0 parameters (marketing, computer science and production technologies and techniques) that increases relative to the cost of staff involved. The objectives of the space assigned to the competencies and training in the Plan are at least two: to close the digital skills gap that exists in Italy; to prepare for major changes also in ways of working and in future professional roles. L'Osservatorio sulle Competenze Digitali 4.0 highlights how, in terms of skillsets, Italian companies need to boost all technological areas touched by the digital paradigm, starting from IoT and Big Data, and underscores how truly innovative candidates are in these areas: robotics and automation managers, IoT experts and engineers, cognitive computing experts.

Ultra-high bandwidth

Italy's Telecommunications sector is currently the target of investments that benefit from plans to spread ultra-high bandwidth and new 5G network architectures, both being part of national and European programmes. The objectives of the Italian Government under the national strategy for ultra-high bandwidth are consistent with the European Digital Agenda 2020. The strategy for ultra-high bandwidth is being rolled out through the activation of public and private investment plans. For public investments, the EU classification of Italy's territorial areas is key: white areas are without ultra-high bandwidth networks, and here private individual investors have no plans to invest for the next three years; the grey areas, show that ultra-high bandwidth network is present or will be developed over the next three years by one operator in the private sector; the black areas, show where at least two ultra-high bandwidth networks are present or will be developed over the next three years, provided by different operators. In the white areas, State funding under certain conditions is feasible; in the grey areas, public intervention risks pushing away existing investors and distorting competition; in the black areas, State intervention not only threatens to utterly distort the market but is incompatible with its rules.
For this reason, delivery of the ultra-high bandwidth network development plan was activated with an action plan for the white areas, authorized by the European Commission

in June 2016. In line with this approach, in July 2017 the decision was made to conduct a second phase of the strategy with infrastructural interventions that would upgrade the quality of connectivity services in the grey areas.
Consistent with the new recommendations of the European Commission, the Italian Government is putting in place actions that also influence demand for connectivity, in terms of promoting and supporting demand for services requiring ultra-fast connectivity. Here, particular focus is given to the Industria 4.0 project, to the Italy WiFi project, and to experimental 5G services initiatives Public support for infrastructural investment in the white and grey areas, must be matched by all these initiatives, so that these two areas can realistically be put in place. Thus, public funding would ensure equal opportunities for growth in different areas of Italy, accompanied by growth both in innovative services and social value, aiding citizens and businesses alike.

The development of 5G

The development of 5G relates to a highly differentiated range of services and applications, which in their entirety can be traced back to the use of varying frequency ranges, each with their own set of characteristics, and of mobile and wireless network infrastructures (including satellite) extensively interconnected with the fixed network and with fibre optics in particular. 5G represents an evolution of the ecosystem, of technologies, of architectures, of the same business models and thereby of working practices along entire supply chains. The new 5G networks will have to match the needs of all Digital Transformation enablers, such as IoT and M2M communications, and support all key sectors and applications considered critical.
In Italy, tests and experimentations began in several sample cities, which will continue until 2022, as the year of its massive launch, once TV broadcasters have also completed the transition to the new version of digital terrestrial (DVB-T2), freeing up frequencies. However, recent frequency bids have clearly demonstrated that traders will push hard to accelerate technology introductions that could become an alternative to some of the fixed-network broadband technologies, and especially in some of Italy's white and grey areas. Unlike earlier mobile technologies, 5G was indeed born from the desire to act on several fronts: to increase the speed of connection in download and upload, to provide coverage via a single antenna to an increasing number of users and, above all, to allow multiple connections among people and objects without any loss of quality. The drastic reduction in network delays via the Internet also promises, above and beyond driving up video streaming, to become a leap into into the future of IoT: from connected cars to intelligent appliances, to medical devices that communicate among themselves, to a multiplicity of applications in the sphere of Industria 4.0.

Digital Public Administration

The citizen's digital identity, open data, e-government, removal of digital divide, electronic payments, digital healthcare and judiciary, education, research and smart city are the key elements of the evolution towards a Digital Public Administration. In March 2015, Italy's plans for Ultra-wide Bandwidth and Digital Growth were drawn up, identifying lines of action and key objectives under the Italian Digital Agenda for 2020 through convergence on System platforms. With less than two years to go before this important milestone (2020) progress relating to the agreed objectives reveal deep discrepancies. Among the projects that are active and are in full motion is Electronic Invoicing (currently with an average monthly volume of over 2.5 million invoice transactions). A growing number of registrations (over 16,000 by March 2018, of which 13,000 are active) is indeed what exemplifies the online payments system, PagoPA. As for Open Data,

the target that was set for involving Administrations has already been achieved (385 versus the 2020 target of 300). SPID, the Public Digital Identity System, which allows citizens to access Public Administration online services with a single digital identity, had engaged over 4,000 central and local administrations by March 2018, with just over 2.3 million digital identities released (1 million more than March 2017). Greater delays are showing up in the consolidation of local population registers (ANPR): only 99 of the 7,978 municipalities (2018 target) were operational within the national database by March 2018, while another 1,000 were still in the experimental phase. However, there has been a progressive adoption of the Electronic Health Record, already in use in 17 regions (the goal for 2020 is 20) with a number of assisted patients with an activated service at 25% (the target for 2020 is 70%), with a coverage of 43% of the total number of reports issued. At local level there is evidence of several smart cities; in most cases these are single initiatives. As yet, these are not part of structured plans to create smart and digital areas for local communities interacting with citizens and the surrounding area.

The transformation of Italian ICT and digital offerings

How the structure of the ICT and digital sector is changing

According to the latest Istat data, for 2015, the ICT sector has 103,187 working companies employing a total of 577,023 employees. Between 2014 and 2015, the sector has seen the number of companies and employees grow (Fig. 8 and 9).
The trends diverge by sector in line with previous surveys, the number of companies appears to be declining in the secors of Hardware (-2.3%), Telecommunications (-0.6%) and Wholesale Trade (-5.5%), namely where maturity of demand and instances of downpricing are more intense and distort business results. By contrast, a growing number of Software companies (+1.1%) and Services companies (+2.2%) are benefitting from the flurry of Digital Transformation.
As for employees Istat data show how progress is being driven by Services (+7.1%) which more than compensate for the fluctuations in the sectors of Hardware (-3.8%) and Telecommunications (-0.3%). These stem from a diminishing number of enterprises, also in the Software sector (-2.5%), that are suffering from downsizing among multinational subsidiaries and the conversion of many companies to the Service sector.
Companies in the ICT sector continue to be concentrated in the North-West and in Central Italy

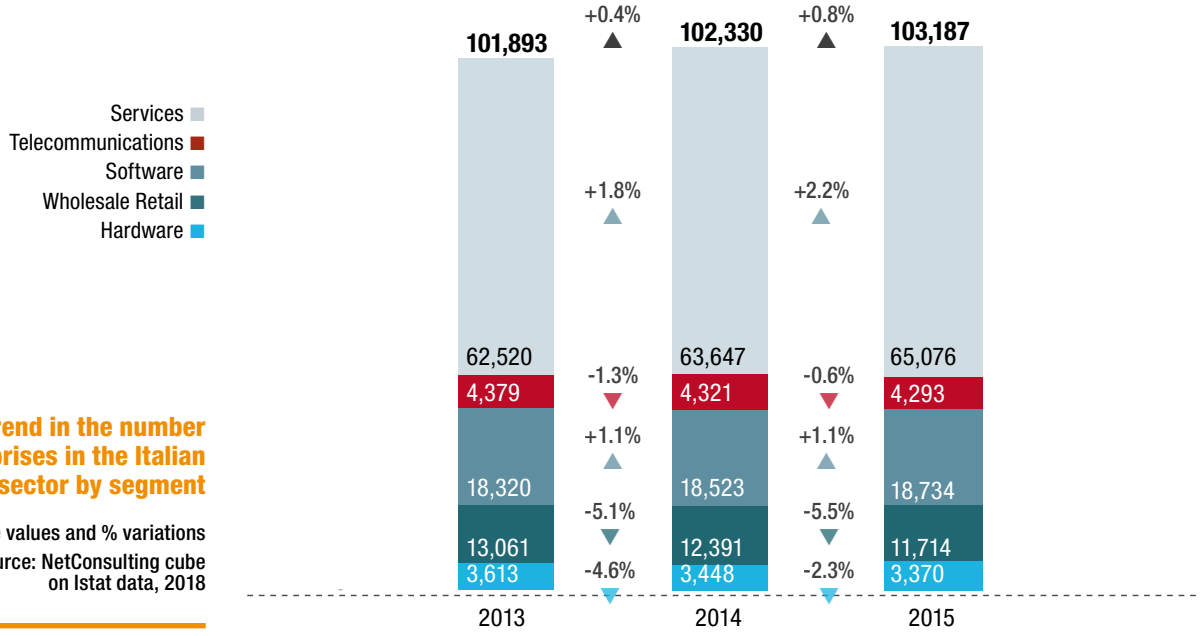


Figure 8: Trend in the number of enterprises in the Italian ICT sector by segment

Absolute values and % variations
Source: NetConsulting cube on Istat data, 2018

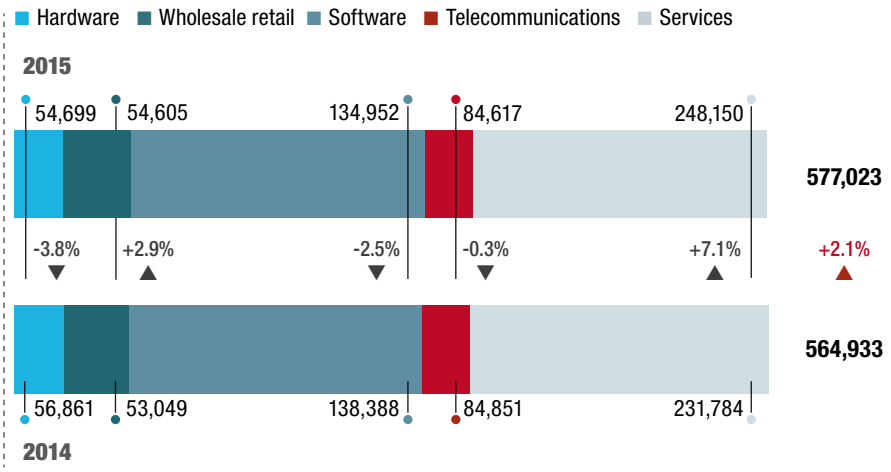


Figure 9: Trend in the number of professionals in the Italian ICT sector by segment

Absolute values and % variations

Source: NetConsulting cube on Istat data, 2018

Major changes in the business models of Software and Services

Digital Transformation is also increasingly involving operators in the field. What emerges from the study, *The IT Sector in Italy (Anitec-Asinform, Istat and NetConsulting cube),* is that 37% of players in this sector have now embarked on Digital Transformation strategies. These strategies are more closely tied to products and services on offer, which must be developed and designed to fully support the new goals of their clients. This implies how the question of Digital Transformation requires a new modus operandi even before getting on with business activities. Indeed, product innovation is largely incremental for companies in the IT sector insofar as it is conducted on existing software solutions as part of the development of new modules and features. Service innovation is focused mainly on consultancy services, formulated to support Digital Transformation planning among user companies, on migrating services to the Cloud and on developing of Cloud-enabled Outsourcing services, offering the Cloud as a support for IT vendors, enabling them in turn to support their corporate customers with the most appropriate sourcing model. These are followed, less frequently, by Agile Development services and support for Cloud Transformation planning, probably included in broader technology consulting activities.

Innovation of business offerings also requires an alignment with technological and commercial competencies, and marketing processes. In this context and in general, the initiatives that succeed are those that expand and diversify the range of partners, making customer channel activities more effective. There also appears to be a widespread preference among IT companies to beef up direct client management. In this regard, vendor software and service providers display distinctive approaches: software players focus on new pricing models and new types of contract; service providers aim also at adopting new models of customer management, on realignment of indirect channels with new areas of technology and on setting up relationships with new operators (start-ups, OTT, digital agency, etc.).

Startups, new players and new alliances in the ICT sector

In 2017, regulatory interventions continued in support of Startups and Innovative SMEs. Innovative Startups can benefit from the measures envisaged by the Industria 4.0 Plan, included in the 2017 Budget Bill. Some of these measures are specifically targeting Startups and Innovation Companies, as is the 30% increase in equity investment incentives; others, such as super and overdepreciation, the tax credit for investments in R&D and the Patent Box (a tax scheme for income generated from use of intangible

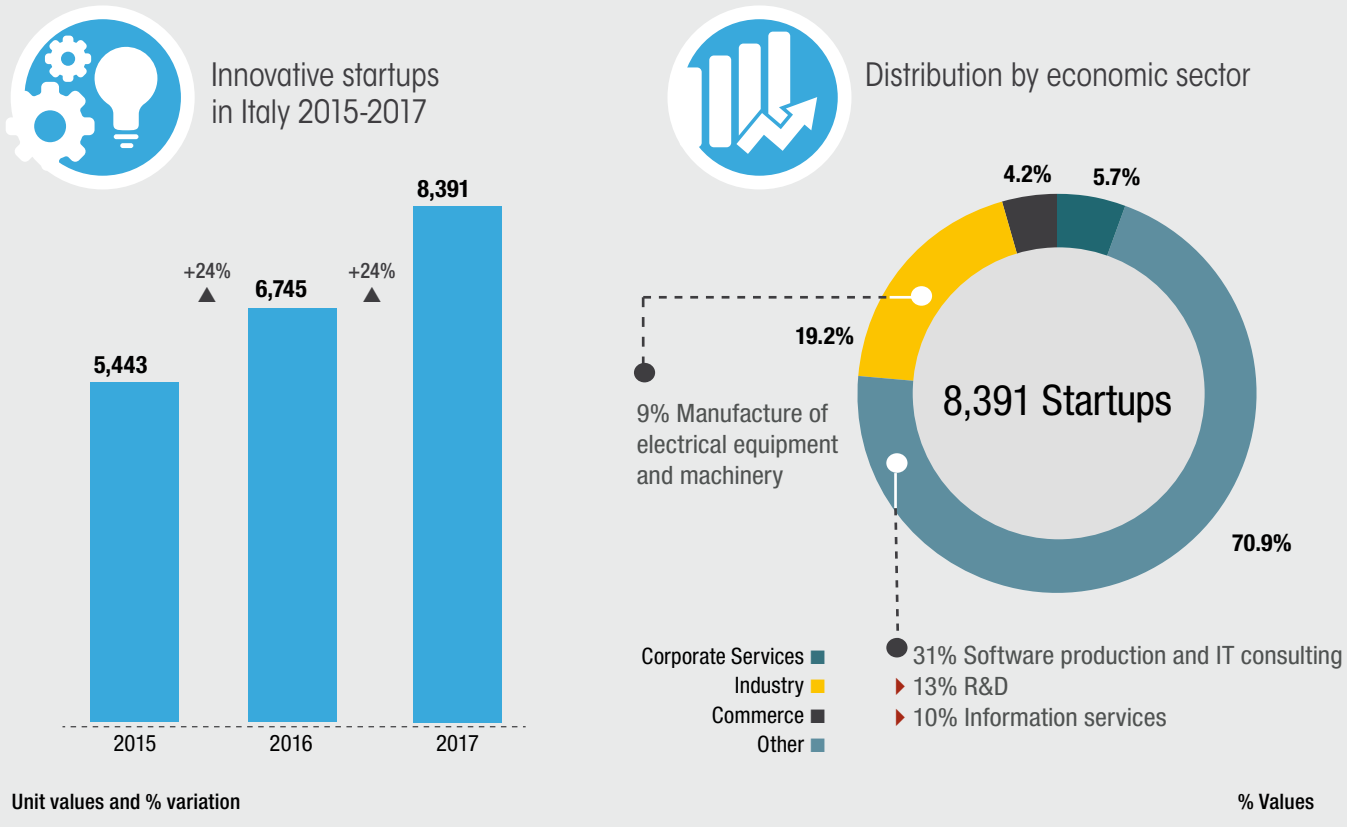
assets linked to R&D activities), are aimed at all companies investing in innovation, and finding much interest among Startups and SMEs. Other measures to be included, as tools that support the Italian innovation ecosystem, are the refinancing of the MIUR Contamination Lab model; the renewal of the Italian Startup Visa and Italia Startup Hub programs; and the update and clarification of parameters qualifying the notion of certified incubators.

On 31 December 2017, 8,391 Innovative Startups were registered within the special section of the Register of Companies. Most provide business services (about 71%), followed by companies operating in Industry (19%). Specifically, it emerges that 63% of startups specialize in activities related to the world of ICT. Also noteworthy is the birth in recent years of the burgeoning FinTech: A Bank of Italy census showed 283 initiatives at the end of 2017, counting in the sector both innovative companies that provide financial services, and enterprises developing information technologies that innovate banking and financial brokerage.

Milan continues to have the largest group of newly formed companies in Italy. But in spite of this, the amount of risk capital funding for Italian Startups derived from Venture Capital and Equity Crowdfunding is still a far cry from what is seen in other countries, such as the United States, Israel, Germany and France. In contrast, 2017 was important for the new partnerships in Italy among large corporations across different sectors and Innovative startups.

Figure 10: Innovative Startups in Italy (2015-2017) and distribution by economic sector (2017)

Source: NetConsulting cube processing of Infocamere data, 2018



Conclusions

Unprecedented growth since 2005

The Italian digital market closed 2017 with 2.3% growth compared to 2016: good if you consider that this rate had not been recorded since 2005. In terms of value, with a total exceeding 68.7 billion euro, the market has achieved the same levels of 2012. If the economic context and incentives continue to build on the trend of the past year, the forecast would close 2018 with growth at 2.3%, 2019 at 2.8% and 2020 at 3.1%. The progression of the three-year period would represent the sum of two different dynamics: the modest "traditional" ICT component (+0.9% of the average annual growth rate or CAGR) and the other much livelier, most innovative, double-digit sector, Digital Enablers (CAGR +16,5%): IoT, Cybersecurity, Cloud, Big Data, Social platforms and the Web, Mobile business, AI/Cognitive Computing, Blockchain and Wearables.

A digital transformation with variable geometries, and one to be accelerated

Italy's digital growth, however, when compared with that of other leading countries, still appears slow. This gives rise to two basic points for reflection: the breadth of Italy's ability to think and act digitally in the current economy and when the digitalized State will mark its transition to the phase of mass-transformation. The study's findings, on many fronts, from the segments of business offerings to the sectors of demand, map out a Digital Transformation with variable geometries showing areas of keen progression and others that are lagging behind.

In business, the mixed dynamic of this transformation can be explained according to the various paths adopted: the most innovative companies are those in the sectors most exposed to the models of networking, innovation and competition, while those that falter are those where there are constraints (for example in the public sector), and still quite inconsistent, where there is a continuing resistance to change, risk or updates or to acquiring new skills. The latter is also considerably influenced by a fabric of national productivity that is fragmented.

Even in the consumer world the variable geography of the Digital Transformation is obvious, made clear by how far the network has spread and is used. The average penetration rate of the Internet among households is 79% and growing (77% in 2016), but it still lags behind the European average (EU28) by four percentage points, with the gap between North and South remaining significant.

The adoption paths of Digital Enablers offer the strongest trajectories

Putting aside their intensity, investments in Digital Enablers show trajectories in Italy that are akin to world trends:

- Big Data, with 0.8 billion euros in 2017 and a CAGR of 15.9% for 2017-2020, is progressing thanks to the more mature stage of adoption in many companies that, after the creation of the data lake, are beginning to structure Big Data Analytics strategies to

extract value from data. At the same time investments are also showing up in Machine Learning applied to Big Data, to test data correlations and extrapolate new information;

- Cloud Computing, with 1.9 billion euros in 2017 and a CAGR of 21.8% for 2017-2020, shows healthy growth and an increasing concentration of Hybrid Cloud Architectures (with a selective approach between Public Clouds and Private/Virtual Private Clouds depending on the IT aims and on-premise IT resources). These dynamics go together with the progressive adoption of multicloud strategies and the need for Cloud competencies and dedicated internal project teams;
- Cybersecurity, with 0.9 billion euros in 2017, a CAGR of 12.2% for 2017-2020, clearly confirms the increase both in threats and regulatory developments (GDPR and NIS). Investments dominate in Security Managed Services and Cloud Security, as well as in Endpoint and Network Security, Application Security and Threat Intelligence (the most dynamic segment) as well as consultancy. Investment has been significant but with less elevated growth in Vulnerability and Security & Risk Assessment;
- IoT, with 2.5 billion euros in 2017 and a CAGR of 16.7% for 2017-2020, growing under the thrust of interconnected ecosystems, is seeing higher proliferation across diverse sectors, from Insurance, to Industry, Utilities, Transport, to Healthcare. A key area of investment is the adaptation of architectures to the demands stemming from real-time response, dictated by AI, robotics and immersive reality, splitting capabilities and computing intelligence on the Cloud to provide analytical decision-making functionality, and executional capabilities with decentralized (on the edge) intelligence nodes in connected objects;
- Mobility, with 3.5 billion euros in 2017 and a CAGR of 11.3% for 2018-2020 and Social Platforms, with 0.4 billion euros in 2017 and a CAGR of 13.2% for 2018-2020, still offer very positive prospects. Both enjoy the spread of an increasingly coherent range of applications that transform internal and external digital processes for companies, due to the ability to amplify the advantages of mobile technology with those of IoT, Big Data and Cloud.

Investment in IoT is lagging, but Edge Computing is growing

The growth rates of almost all Digital Enablers are slightly less elevated than global trends. IoT is an exception, but negative: growth in Italy is less than half of the global trend, even in the presence of Impresa 4.0 incentives. Given the importance of potentially IoT-intensive sectors in Italy, it is important to react so that the our economic capacities are not held back.

Edge Computing is tied to the developments of Cloud and IoT, as a decentralized architecture that responds to the need for bringing processing capacity and storage to areas where data is generated, speeding up analyses and improving M2M communication. The dynamic of this market is higher than that of the Cloud with growth forecasts for the next three years at around 30% per year.

Advancements in AI, Blockchain and Wearables

Also in Italy, over the past two years, the first trials of AI/Cognitive Computing appeared (0.1 billion euros in 2017, a CAGR of 49.6% for 2017-2020) and Blockchain (0.02 billion euros in 2017, a CAGR of 79.2% for 2018-2020). The value of investment is still limited, but growth rates are aligned with world trends. Investments in wearable technologies (0.5 billion euros in 2017, are also in an initial phase, with a CAGR of 29% for 2017-2020).

Given the multiplicity of the application portfolio and the Industria 4.0 incentives, the weight of these technologies in short-medium term investment plans should increase as follows:

- AI/Cognitive, given the widening spectrum of applications. Already today in finance there is a ferment of design and planning, with Machine Learning being applied to

fraud and risk management, customer intelligence anti-money laundering and Robotic Process Automation solutions to routine functions. There are also fields of application common to all sectors (personalized marketing, preventive maintenance, predictive sales and logistics models) or vertical segments (from the exploration in the energetic field to the diagnosis of pathologies). Natural language processing (Virtual Assistant e Chatbot) are emerging in the areas of help desk and community management.

- Wearables, with the advancement of consumer devices (smartwatches, fitness wristbands, smart glasses for virtual/augmented reality, smart clothing) and applications in the business environment, in production, maintenance, field workforce automation, quality control, logistics and training with augmented reality solutions.
- Blockchain, with system projects in the banking sector for international payments, reconciliation of interbank accounts and advance on billing. There have been some promising outcomes in the Energy sector for trading and exchange applications. Other initiatives, less short-term, are expected from smart contract experimentations for customers and third parties in industrial, insurance, agrifood (traceability) and for intellectual property management.

Double-digit growth for Digital Lifeplace

To become widespread, Digital Transformation requires three conditions all at once: infrastructures that match the exchange of all kinds of information (signals, data, voice, video); single access, via different devices and through different networks; and content and apps to enable new activities, new services and new types of consumer behaviors. By intervening as enablers in the key segments of Digital Transformation, Digital Lifeplace technologies are sustaining the market, with cross-sector components that have exceeded 13.3 billion euros in 2017, with an expected CAGR of 10.5% between 2017 and 2020, supported by both sectors:

- The scope of digital Consumer/digital Citizen Services (10.8 billion euros in 2017, a CAGR of 9.5% between 2017 and 2020), animated by the digital habits of consumers and citizens, and the wide spectrum of mobile applications and devices for entertainment (music, gaming), the home (domotics) and urban sphere (infomobility, healthcare, environment, security);
- The Digital Workplace/Smart Working environment (2.5 billion euro in 2017, a CAGR of 14.7% for 2018-2020), with new spaces and work activities that fuel the sustained growth of mobile applications and UCC, and business solutions (collaboration, talent Management) in SaaS, Virtual Desktop, Identity/Access management and Endpoint Security.

Software, Solutions, ICT Services, Content and Digital Advertising sustain growth

In terms of value, the ICT services sector has an important market share and enjoys sustained growth (a CAGR of 5.3% for 2017-2020), benefiting from both the advancement of Development services, System Integration and Consultancy (linked to the adoption of new tools and solutions), and the dynamics of Cloud services, which are tending to replace Outsourcing services.

The progress of the Software and ICT Solutions sector (a CAGR of +7.3% for 2017-2020) is attributable to application products (particularly in the area of IoT solution adoption, Big Data and Social platforms) and, secondly, to middleware tools and IT components of Management & Governance, Information Management (Database Management System, DWH) and Security. Cloud Computing has made a clear impact on reducing licensing components: the adoption of SaaS will continue to play a part in application solutions.

Among the growth engines of the entire digital market Content and Digital Advertising (a CAGR of 7.7% for 2018-2020) are being powered by entertainment content.

Devices & Network Services and Systems are slowing down

Overall market activity is however being held back by the limited growth of Devices and Systems and by a decline in Network Services.

Devices and Systems (a CAGR of 2.2% for 2017-2020) have felt the effects of growth in IaaS services which are tending to substitute some of the demand for hardware. Across the board, there has been a decrease in PCs, printers and tablets, still not compensated by hardware components associated with the digital paradigms, from wearable devices to high-end servers, from storage and networking equipment to mobile devices.

Network Services (a CAGR of -2.2% for 2017-2020) that serve mobile networks are seeing a slowdown, particularly in telephony and fixed networks, caused by declining telephony services and increasingly tested data transmission. Bucking the trend and delivering growth are connectivity services and the data transmission segment for Cloud computing and mobile applications.

Networks are boosting the most dynamic sectors of demand

All sectors, with the exception of Local Authorities and Central Public Administration, recorded an increase in digital demand in 2017, which will continue. The CAGR for 2017-2020 of entire business demand will be 4.3%, reaching up to 6.5% in Utilities and around 6% in the sectors that integrate Industry, Distribution and Services, confirming the widespread proliferation, above all, of projects driven by IoT, Wearables, AI/Cognitive and Big Data. Banks, Insurance/Finance and Transport follow with a CAGR of over 5%, focusing especially on Mobility, AI/Cognitive and Security (in Insurance, besides IoT and Big Data). Regulatory change and the competitive environment are slowing investments down in the Telco/Media environment, leading to stable moderate trends (a CAGR of +2.2% for 2017-2020) with a focus on Cloud, Security and Big Data. Healthcare (a CAGR of +3.1% for 2017-2020) and Central and Local Public Administration (a CAGR of -0.4% for 2017-2020) will tend to focus on the Cloud, Security and Big Data investments.

Digitalization plans are articulated according to the processes of various sectors with two overriding characteristics: intensity and specificity of the functional areas concerned. In terms of intensity, Banks and Telco/Media are the most strategically focused sectors for Digital Transformation, with wide-ranging plans that, in the most progressive cases, are backed by architectural and process redesign. Thereafter follows Insurance, Industry and Energy and Utilities, with a particular focus on processes. In contrast, Public Administration, despite its systemic plan, is held back by restrictions, that can be financial, legislative or even cultural. Large companies within Distribution, Services, Logistics and Transport appear to be progressing well and are benefitting from the Impresa 4.0 Plan.

Within functional areas, Banks, Insurances, Utilities and Telco/Media are heavily focused on customer relations; Production, on logistics, and Industry, on distribution. In Public Administration there is optimization of internal processes and data centers, while the back offices of citizen services are slowing down. In Healthcare there is emphasis on processes for continuous assistance and clinical data management.

SMEs are recovering but the gap with large players remains wide

Smaller companies are catching up in the race towards digitalization but, compared to larger players, the gap remains wide. Istat 2017 statistics on ICT competences among companies reveal very high digitalization but only among 10.8% of companies with between 10 and 49 employees versus 47.4% with 250 or more employees. There is still a marked gap not only in the speed of download connection, but also in software features (particularly ERP), and in the presence of ICT specialists, results which are now non-existent as a result of market penetration in connected PCs, mobile technologies and Social media. The first stage of digitalization in shared processes are giving positive

results but with limited impact on core processes. Indeed, the 4.3% CAGR for 2017-2020 of these companies is sustained mainly by those with over 250 employees (+4.8%), exceeding medium-sized companies with 50-250 employees (+4.4%) and, even more so, small players with fewer than 50 employees (+3%). As the effects of the Impresa 4.0 Plan intensify, short-term investments are focused on Security and Web applications, across companies of all dimensions. The increasing influence of IoT and Big Data is visible in larger companies, as the only ones experimenting with technologies in augmented reality and advanced robotics.

Lombardy and Lazio drive digital volume and growth in the territories

The bulk of consumer and business spending in digital solutions and services (60.1% in 2017) is concentrated in the north-west and central regions, with Lombardy and Lazio contributing 24.2% and 16.7% of the overall total, respectively. This results from the combination of several factors: from the presence of large ecosystems (with many private and public users) and of operators with advanced portfolios of business offerings, to population density and higher digitalization levels, to the presence of influential Universities and of Administrations that have activated regional roll-out plans for the Italian Digital Agenda.

Veneto, Piedmont, Emilia Romagna and Tuscany altogether contribute 30% to national digital spend, with programs and plans for ICT in line with the Italian Digital Agenda. Except for Campania and Puglia, digital demand in regions and islands of the South, continues to be out of step with the rest of the country, even if the situation seems to be improving compared with the past.

From Industria 4.0 to Impresa 4.0, with far-reaching impact

In 2017, the Italian Industria 4.0 market almost reached 2.2 billion euro, growing 19.3%. The highest growth was achieved by intelligent and connected industrial systems (+20.7%) – Additive Manufacturing, 3D printers and Advanced Manufacturing (ready-connected industrial systems and robotic or automated systems) – followed by ICT products and services (+18.1%) with Industrial Internet, Cloud, Cybersecurity, Big Data and Analytics, systems and services for horizontal and vertical integration, 3D simulation software and augmented and virtual reality. In the future, AI and the cobot segment is expected to deliver strong growth.

The renewed Impresa 4.0 Plan, extended to 2017-2020, is covered by an endowment of 18 billion euros and all the various corporate action plans, by investment incentives, (the super- and overdepreciation, New Sabatini, an increase in financial funding for Digitalization vouchers for SMEs); by new skills training (new ITS and tax credits for training and employee conversions); by the strengthening of open innovation (tax credit for R&D, DIH and Poles of Competence).

The Plan is expected to stimulate more than 10 billion euros of higher private investments (not entirely associated with digital technologies), an increase of 11 billion in privately funded research and innovation; all of which will have significant impact on skillsets, with 200,000 students and 3,000 managers trained on 4.0 technologies. This improves the prospects for growth in GDP, industrial production and orders, and increases confidence among companies. Investments in 4.0 technologies will reach 3.7 billion euros in 2020 with a CAGR of 19.2% for 2017-2020. Industrial systems will enjoy an even higher CAGR (19.6%) and ICT systems, slightly lower (18.9%) each with a growth spike in 2018 of 22.3% and 21%, respectively.

Broadband: coverage is behind schedule as 5G arrives

While private and public investment plans are being activated in the white areas (otherwise expected to be of limited interest to operators) and from 2017 in the grey

areas (otherwise with a presence limited to just one operator), the Government has set itself a goal for the distribution of ultra-high bandwidth aligned with the Digital Agenda for Europe 2020: a coverage of at least 100 Mbit/s for up to 85% of the population, at least 30 Mbit/s for the total population, and at least 100 Mbit/s for offices and public buildings in areas of greater interest and in logistic hubs.
In April 2018, real estate units with ultra-high bandwidth coverage were 52.4% versus the 71% target for the end of 2018. The highest coverage is in Lombardy, even with its 100 Mbps at 18.8%. Puglia, Calabria, and Basilicata have the highest coverage rate with a prevalence of 30 Mbps bandwidth presence. Piedmont and Valle d'Aosta are the furthest behind. However, the latest surveys indicate the prospect of a 2020 scenario with an increase in white areas of up to 8.2% of real estate units, a total coverage of 24% for a one gigabit ultra-high bandwidth and 38% for a 30 Mbps ultra-high bandwidth.
To drive equal opportunity for growth across different parts of Italy, state support for infrastructure investments in white and grey areas must leverage actions that increase demand for value-added services that require high-speed connectivity. In this context the Impresa 4.0 Plan, the WiFi Italy project, and 5G service trials are now under way.
The development of 5G covers a very diverse set of services and applications, requiring the use of different frequency ranges. Tests in selected cities have been accelerated and the recent frequency tender confirms 5G as an alternative to some fixed network broadband technologies: unlike previous mobile technologies, 5G increases speed in downloads and uploads, covering bigger groups of users with a single antenna and allowing multiple connections among people and objects without any reduction in quality. In other words, this offers dramatically fewer delays during Internet broadcasts, and better M2M interactions with the Internet of Things. The introduction of 5G is planned for around 2022, with significant coverage from 2023.

Digital Public Administration Projects are under way but not yet aligned with targets

At less than two years before the deadline (2020), various Digital Public Administration projects are moving forward unevenly:

- SPID. The Public Digital Identity System (Il Sistema Pubblico di Identità Digitale, SPID) involved over 4,000 Central and Local Administrations in March 2018, but with no more than 2.3 million digital identities issued (1 million more than in March 2017);
- PagoPA. The growing number of user registrations (16,000 to March 2018, of which 13,000 are active) does not match the expected increase in transactions (again in March 2018, just over 7 million, versus a 2018 target of 50 million and 150 million for 2020);
- Open data. The target for engaging Administrations has been achieved (385 against a target 2020 of 300);
- ANPR. The merging of registration of the local population is significantly behind schedule with only 99 out of 7,978 municipalities on track;
- FSR. Italy's Electronic Health Record (Fascicolo Sanitario Elettronico, or FSR) is operational in 17 regions (versus 20 by 2020): 25% of patients have activated the service (the 2020 target is 70%), delivering 43% coverage of all results issued;
- Digital platform: restructuring of data centers, implementation of the Public Administration Cloud, and increased connectivity with a spending cuts are the three objectives. The package for the Public Connectivity System tenders made by Consip on behalf of AgID should allow Aministrations to evolve their systems towards Cloud services and ensure full interoperability;
- Smart City. These are still one-off initiatives, and not yet included in structured plans, all the while engaging areas of interest (security, road conditions, intelligent lighting, public transport, etc.).

There should be a bigger push from the Framework for Growth and Digital Citizenship in support of the Europe 2020 Objectives, between AgID and the Conference of the Regions. It was signed off in February 2018, and allows Regions to act as coordinator in the territory, focusing on key actions set out in Italy's Three-year Plan for IT for Public Administration 2017-19.

The ICT sector is growing but remains very fragmented

The Italian ICT sector is driving Italy's digital transformation and plays an important role in the productivity system. Demonstrating resilience during the crisis years and retaining its most essential assets it has strengthened its strategic profile.
A sector of at least 103,000 companies, with more than 577,000 employees (according to the latest Istat data pertaining to 2015). In recent years it has grown both in the number of companies and employees.
The number of companies made a recovery, growing 0.8% in 2015, and bringing the sector beyond 2012 values. In line with the geographical distribution of demand, ICT sector companies are concentrated in North-West and Central Italy, where 34.6% and 22.6% are located. Their share is positive also in the North East (21.8%), while in the South and Islands it is much lower (14.4% and 6.6% respectively).
Innovative Startups and Fintech are also increasing significantly. Continuing incentives and a simplification of the procedures for incorporation have resulted in 8,391 Innovative Startups by the end of 2017, an increase of 1,646 for the same period in 2016. Of these almost 5,300 are ICT, of which half operating in software and IT consultancy. A census of Fintech companies at the end of 2017 found there were 283, partly active in the development of digital technologies for financial intermediation.
The dimension of the sector's structure reveals an extremely large number of small and medium-sized companies (proportionately higher than Germany, France and the United Kingdom). What is crucial is not its size, but its diverse mindset and the degree of integration within the innovation network which in other countries is more evenly balanced among large, medium and small companies.
It should also be noted that the number of employees within ICT professions goes beyond the limits of the sector, with a further 450,000 specialist ICT employees in user organizations. And, again ICT candidates are targeted nationally on the Web by job ads (by ICT and non-ICT companies), increasing from 60,000 in 2016 to more than 64,000 in 2017. Of these, in 2016 around 48% (28,000) were for open positions requiring up to two years' experience. Of these 28,000 positions, 62% needed to be graduates and 38% school leavers, resulting in a surplus of qualified school leavers for more than 5,000 jobs (increasing in 2017), and a shortage of more than 4,000 jobs for graduates (worsening in 2017).

Industrial Policy Implications

As a nation, and as an economy, there can be no future without digitalization. The response requires not only access to technology but also to businesses and people who think and act digitally.
It is important to ask what the limiting factors are, which segments and markets must overcome the greatest pressures, what levers can help overcome obstacles and what actions would be required. The scenario outlined by the study, *Digital trends in Italy 2018*, helps describe it.
Firstly, its results suggest that the proliferation of the Digital Transformation is gradually increasing and is feeding the most active technology markets that foster this transition. Leading Digital Enablers are moving ahead of mature technologies; emerging Digital Enablers will gradually take up space among those with greater coverage; large and

medium-sized companies, in all major sectors, from Industry to Finance, from Distribution to Utilities, to Telco-Media, are launching new Digital Transformation projects. And even the Public sector in some areas is showing progress. However, the paths of adoption are not sufficiently widespread and rapid to reduce the gap between our level of digitalization and that of other competitor countries. In fact the gap is growing and threatens to weaken our prospects. There are aspects that can only lead to two considerations:

- On one side, the uneven nature of our system's digital transition, shows how we suffer from regulatory constraint, with a low-risk outlook, and a lack of digital skills and digital vision at the level of senior management;
- On the other, the uneven fabric of national productivity (common also in the ICT sector), does not help, especially concepts of network and digital integration are not spread within the whole value chain, from marketing to sales, to services.

These two aspects need addressing, with focus on opportunities stemming from digitalization. The findings of the study point towards both strengthening actions already under way, and opening up new frontiers.

Actions that have already been laid out by Industry 4.0, by the Ultra-high bandwidth Plan and by Digital Public Administration projects are beginning to deliver results on the culture of change, competences, ecosystem, sectors, innovation, regulation, technological modernization, standardization. Its time to move boldly ahead along the path we have started.

As for new frontiers, we need:

- to strengthen Open Innovation, providing incentives to support new Innovative Startups but also through collaboration programs among universities, research centres and enterprises (primarily SMEs) to improve the quality of technology transfer processes;
- to close the gaps, adjusting priorities, targets and the scope of actions already under way, reducing uneven results at in terms of territory, sector and digital mindset;
- to influence schools, universities and training, to increase the number of ICT professionals and speed up the penetration of digital skills across all aspects of business. From an increased number of ICT graduates and school leavers to a higher quota of digital credits and training hours in all study programs, through increased ITS courses in ICT and a commitment to lifelong learning for employees: all this is urgent so that we prevent the digital skill gap from getting any bigger;
- to define and implement an organic strategy for the ICT sector with two priorities. The first is the optimization of companies according to size, ensuring they have the appropriate scale to attract managerial skills, take risks, and innovate. The second is to provide the right conditions for national champions to drive the sector forward, more than ever. In either case it's about influencing on different levels, through tax breaks to company law, and to integrating existing measures.

An economic and legislative context that is more open to digital transformation can without doubt transform into advantages that lead to growth and employment, even in the short- and medium-term.

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