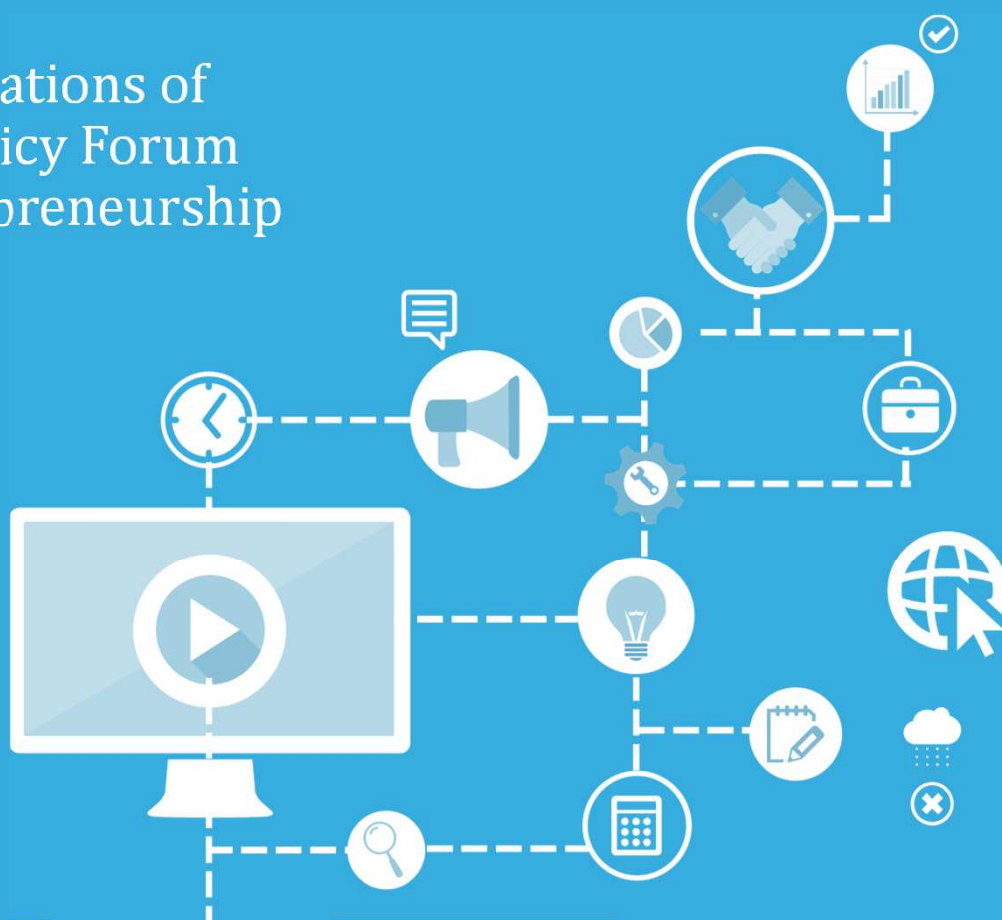


Accelerating the digital transformation of European industry and enterprises

Key recommendations of the Strategic Policy Forum on Digital Entrepreneurship

March 2016

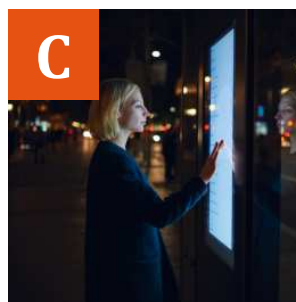
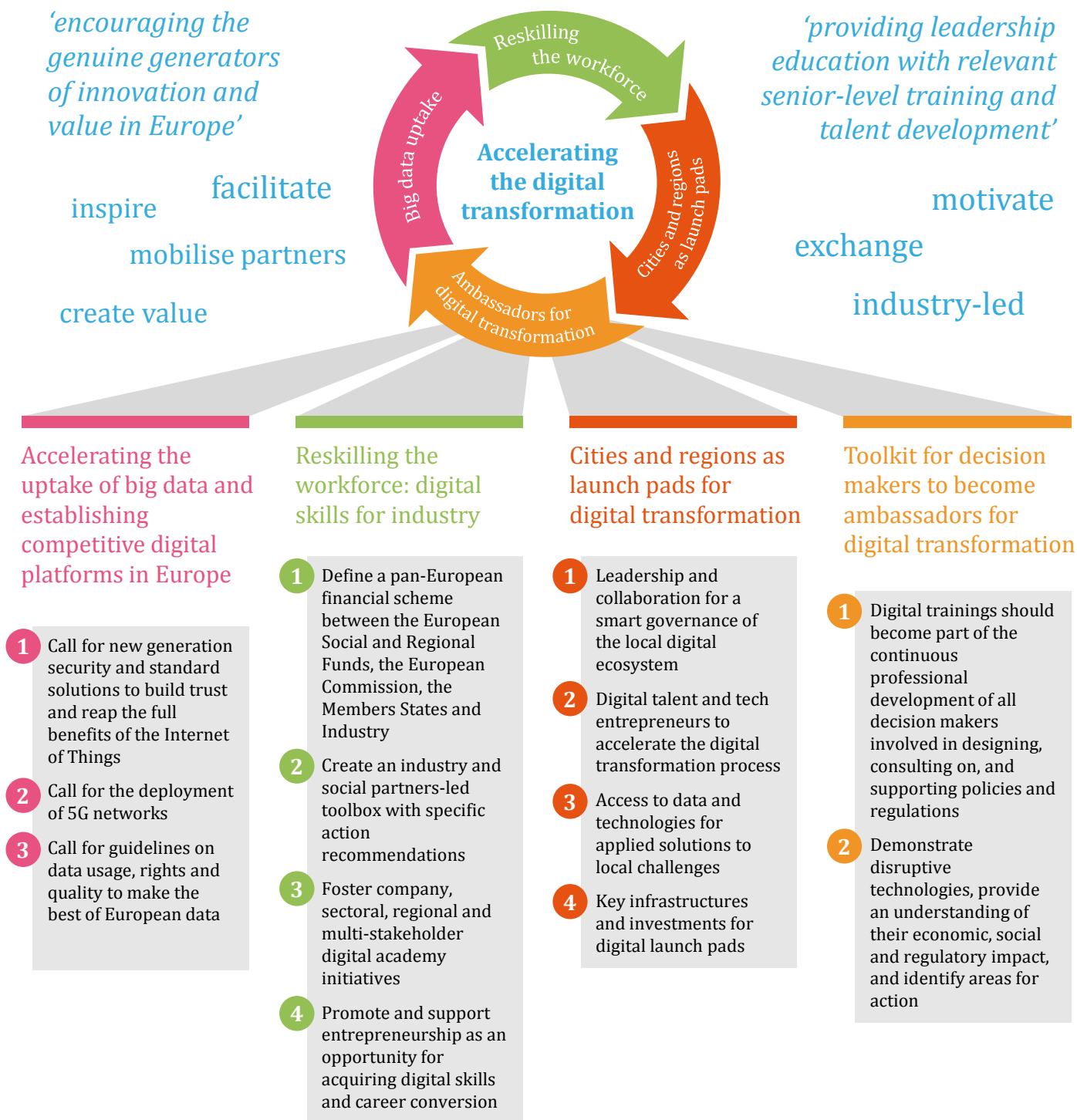


A forum established by
DG Internal Market, Industry,
Entrepreneurship and SMEs



European
Commission

Overview of the recommendations



Introduction

Advanced technologies are currently driving what has been labelled as the **"fourth industrial revolution"**, with the potential of transforming EU industries and a significant social, economic and environmental impact. This digital transformation of EU business and society presents an enormous growth potential for Europe.

The **biggest digital opportunity for Europe lies in the transformation of existing industry and enterprises**. Europe has a leading position in many manufacturing sectors from automotive to pharmaceuticals, or mechanical engineering, but also in many service sectors such as the tourism and leisure industries. Three quarters of the value of the digital economy will come from traditional businesses. It is thus essential to support their transformation for Europe to keep its leading position.

Disruptive business models and improved production processes, empowered by digital investments, will generate **new international market opportunities**. Furthermore, companies making use of newly available digital technologies have proved to perform better than their peers. Europe needs to fully exploit these opportunities to become more competitive and a better place to invest and do business.

Yet, **EU businesses are lagging behind** and missing out by not taking full advantage of digital technologies. Small European businesses are slow to change and over 41% of EU companies have yet to adopt any of the new advanced digital technologies including mobility and mobile apps, social media, cloud, big data analytics and the internet of things (IoT).

The objectives of the Strategic Policy Forum were thus to **shape policy recommendations with a view to prepare the business transformation**. These recommendations are meant to help unlock the unprecedented and still not-fully exploited business opportunities, and allow European companies to take a leading place in the modern digital economy.

The key recommendations and findings contained in this report are the outcome of the work of the Strategic Policy Forum since the publication of its last report on

the Digital Transformation of European Industry and Enterprises in March 2015. Over the past 12 months, the work of the forum has shifted towards implementation, but also on deepening the analysis in four areas:

- **Cities and regions as launch pads for digital transformation:** Cities and regions are one of the major enablers of digital transformation in Europe. They bring together local resources and facilitate collaboration between academia, industry and policy makers, fostering a modern, competitive, resource-efficient and sustainable economy. Cities and regions can therefore be considered as 'launch pads' for the digital transformation of SMEs, creating new business opportunities and encouraging leadership.
- **Digital platforms and big data:** Digital platforms and big data are radically transforming industries, such as automotive, or healthcare and pharmaceutical. The large volumes of data generated through equipment and machines provide significant opportunities to develop new business models, improve products and services, as well as bring about considerable economic and social benefits.
- **Reskilling the workforce: digital skills for industry:** The widening digital skills gap will have an impact on the ability of EU businesses and governments to benefit from the opportunities of digitalisation. At the same time, the advent of digitalisation is making many manual jobs obsolete, while creating demand for new types of skills, thus calling for the need to re-skill and re-employ the redundant workforce.
- **Toolkit for decision makers to become ambassadors for digital transformation:** Policy makers have to understand the social and economic implications of the digital age and how they change the regulatory framework to plan their actions and take full advantage of new opportunities.

The key recommendations contained in this summary report have been developed as a holistic and pan-European response to the need of fully embracing the *fourth industrial revolution* and accelerating the digital transformation across industries and sectors with the endorsement of all stakeholders involved.

Accelerating digital transformation

The rise of digital platforms

81%



of executives say platform-based business models will be core to their growth strategy within three years

Digital platforms are approaching a total market value of

EUR 4 trillion



90%

of chief executives in the automotive and healthcare sectors identify data analytics as having high-value prospects



1.3 million

employees are working directly for digital platforms

A growing investment gap with other regions

To close the accumulated gap with the US in ICT investments, the EU would have to invest



EUR 335 billion

The digital skills gap

54%



of European jobs are at risk of computerization due to key technological advances

77%

of companies consider missing digital skills as the key hurdle to their digital transformation



4%

of companies ensure that their training efforts are aligned with their overall digital strategy

The need for EU entrepreneurs

Europe needs an additional



20 million

early stage entrepreneurs to close the gap with the US

Accelerating the uptake of big data and establishing competitive digital platforms in Europe



The boundaries between industry sectors are blurring. Digital technology companies are entering other sectors, with new value propositions. This means that value is being reshuffled among business partners, old and newcomers, across the value chains.

There are many opportunities to be grasped and challenges to be faced by both new and traditional players across industries as smart products and services become the norm and the benefits of data driven growth become increasingly apparent. Accelerating the uptake of big data and developing digital platforms at EU level is therefore crucial for all industry players, old and new, to increase their competitiveness.

Defining big data and digital platforms

Big data has no single internationally recognised definition. Most definitions are based on the three 'V's':

- **Volume** (a reference to data stores of petabytes or above);
- **Velocity** (the requirement for real-time collection/analysis of data); and
- **Variety** (generation of data in diverse formats from a variety of collection mechanisms).

Big data analytics is complementary to big data, as it is the process of examining the data sets through algorithms. It is defined as the use of mathematics and statistics to drive meaning from data in order to make better decisions.

There are three kinds of analytics²:

- descriptive analytics tell what happened in the past but not why it happened or how it might change;

- predictive analytics uses the past data to model future outcomes;
- prescriptive analytics advise on the best outcomes considering several scenarios.

Digital platforms provide the technological basis for delivering or aggregating services/content and mediate between service/content providers and end-users³. They integrate the components of industrial value chains in a seamless communication between interoperable business processes (e.g. design, production, sales, logistics, maintenance).

Europe must encourage the development of competitive B2B digital platforms by

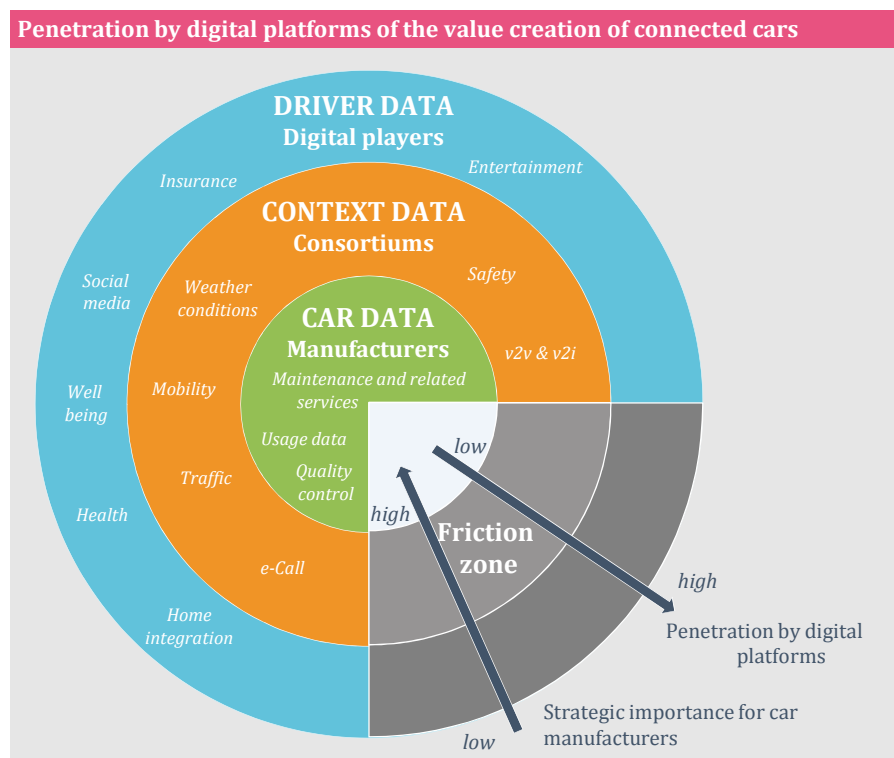
setting the right enabling conditions for their inception and by creating the right framework conditions for their growth.

The shift of value creation towards digital platforms

Data-driven innovation is unlocking new opportunities for Europe to grow its economy and address pressing social challenges. Digital platforms have already become an indispensable tool for the use of data. Digital platform providers are playing an increasingly central role in the value chain and in value generation. Going forward, all EU industries will have to focus on value creation through digital platforms.

For example, in the automotive industry, prospects are that in the near future, 30 to 40 per cent of the value in the automotive value chain may pass through digital platforms⁴. Digital players already have access to 'driver data', produced by people using services offered in connected cars (e.g. insurance, entertainment, social media, health and well-being data). Car manufacturers and digital players are partnering to use context data to offer new services, but are also competing for control of this data (see figure below).

In the healthcare industry data, sensors allow the rise of new innovative business models, which are re-designing health management. The pharmaceuticals value chain is being heavily reshuffled to allow for personalised monitoring and performance-based drug production⁵.



1

Call for new generation security and standard solutions to build trust and reap the full benefits of the Internet of Things



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Internet of Things devices and network architectures raise new security concerns. Digital innovations, such as connected cars and autonomous driving, together with the increase of devices in networks, now offer an even broader scope for hackers and espionage. Security is becoming a real concern for automotive and mechanical engineering, as these sectors are highly sensitive to cyber-attacks.

Global scandals related to data privacy and lack of accountability in data management have damaged consumers' trust in data security.

New applications such as autonomous cars require new generation standards on the use of artificial intelligence, robotics, sensors and several new disruptive technologies. Given Europe's adherence to United Nations conventions signed in 1968 on driving license standards, it may rapidly lose its competitive advantage if it does not keep up with technological developments.

New generation security solutions are not adopted fast enough by industry. Today, an estimated 95% of all enterprise networks have been compromised worldwide⁶. Whereas the loss of intellectual property from Fortune 500 companies can be described as the largest transfer of wealth in history, the cost of ineffective cybersecurity solutions is predicted to rise up to \$3 trillion by 2020⁷.

Digitalisation fundamentally changes our current concept of identity and requires a high-level of interoperability. New

kinds of objects, mobile phones, PCs, vehicles, files, applications or processes are still lacking a unique traceable and manageable system of digital identities.

Identify, test, validate new generation security solutions for Europe

A new generation of security solutions based on the latest artificial intelligence, predictive algorithms and crypto-technology developments is coming to the market. However, in order for these new solutions to be fully implemented at EU level they require infrastructure support, interoperability mechanisms and third party validation.

The validation of new generation security solutions requires neutral and independent validation mechanisms with the capacity to rapidly perform complex tests and issue third party assurance for future clients from comfort letters to certification.

Proof of concept (POC) factories provide such validation settings for innovative solutions that disrupt market channels, revolutionise business processes and organisations, and enhance the customer experience. The scope of POC factories is issue-specific. The aim is to give assurance to large corporates and SMEs, as well as to speed up the adoption of a new generation of solutions.

More coordinated efforts and infrastructure financing should be placed in POC factories through public-private partnerships (PPP) and joint venture collaboration between governments, corporates, business associations and innovation centres.

New generation security solutions will be intrinsically linked to the components and management of new devices. Solutions to manage digital identities are imperative to ensure the full transition to trustworthy and efficient e-commerce solutions.

A digital identity interoperable at EU level would comprise all information that uniquely describes an entity, a person or a device. This legal digital ID (**E-ID**) would include similar properties as ID cards and serve the purpose of identity verification and data authentication. For example, proposed identity management solutions include the centralized management of all digital identities within a company through a single platform, ensuring safe and transparent interactions between the different digital identities.

Rapidly develop new European standards and regulations for connected and autonomous cars

Standardisation is essential for a rapid and cost efficient market development of connected and automated driving. The European Commission should foster the collaboration between mobile and automotive industries to define and agree on priorities in standards development.

Given the rapid development of active technologies based on artificial intelligence and big data, we recommend an EU public consultation and a review of current standards and regulations in order to check how new technologies could significantly help to improve road safety and reach EU objectives.

In particular, Europe's mobility and transport regulations regarding the use of active technologies in the context of autonomous cars need to be reviewed to catch up with international competitors. In early 2016, the National Highway Traffic Safety Administration (NHTSA) in the US recognized that Google's artificial intelligence self driving system may be qualified as a 'driver'.

Impact

Innovative companies with IoT and security solutions will be more successful and will adapt faster to changing environments.

SMEs see the benefit of new generation security solutions through cross-sectoral and issue-specific test centres without supporting the massive effort of individual POCs.

With **E-ID** users will have a better control of the usage of the data they might share with third parties compared to the current situation.

Large companies will reinforce protection, will be less subject to security risk and will generate greater trust in their solutions.

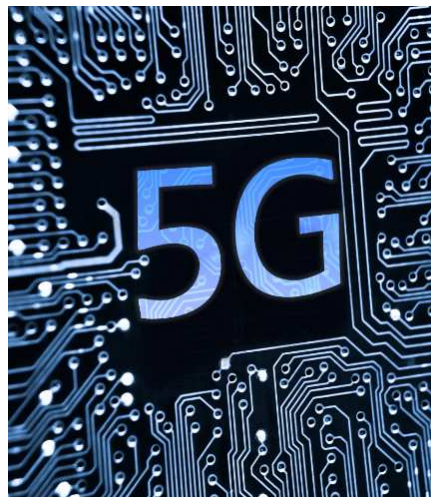
New European Standards will drive the industrialisation and the competitiveness of European autonomous car industry. Lack of new generation standards will result in the European car manufacturing industry lagging behind new players.



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2

Call for the deployment of 5G networks



Fast wireless networks are enablers for multiple industries including healthcare, automotive, and manufacturing. Europe needs to move to the next major phase of mobile telecommunications standards, increase wireless data speeds and extend network coverage. Fifth generation mobile networks and telecommunications standards (5G) are a pre-requisite to position Europe as a key player in the digital future.

The Internet of Things (IoT) needs bandwidth for ubiquitous, reliable and fast connection. Current wireless speeds are not fast enough. For example, autonomous cars will transfer data at 600 megabytes per second connecting with back-ends and their environment. This will only be possible in regions with high speed, stable mobile networks and low latency times.

The EU is lagging behind in the adoption and implementation of mobile infrastructures. At the current rate of adoption, 4G will only reach 50% of the population by 2020 while progressively becoming outdated in the dawn of 5G.

This issue has been widely recognized and 5G development is the subject of multiple ongoing initiatives at the public and private level, including the 5G Infrastructure Public Private Partnership (5G-PPP) EU flagship initiative. There is a need to push this matter further and to develop a coordinated and EU-wide **action plan** with the involvement of all stakeholders (industry, government and associations) for 5G deployment.

Develop test and validation centres for innovative solutions

The development of test and validation centres for innovative solutions and new research centres is essential for the uptake of 5G network at an affordable price for business and consumers.

Focus on implementing 5G networks along highways

Telecommunications companies need to be encouraged to invest in wider network coverage. The business case for investing in 5G needs to be made. Both the private and public sectors should support the development of new financing models. The European Fund for Strategic Investments should facilitate funding.

Considering the strategic importance of 5G networks for multiple industries, and especially for the connected and autonomous cars, our recommendation is focused on the implementation of 5G networks along highways in Europe.

Impact

5G technology will become the lifeblood of all major industries in less than five years. Deployment of innovative solutions using 5G networks will make European IoT industries more scalable, more competitive, create new activities and facilitate mobility.

5G will bring also additional value in unforeseen ways. For example, SMS were not expected to be offered as service to the consumers. However, it quickly became the most popular service in the previous generation of mobile technology. Hence, through the development of 5G, the mobile industry anticipates a paradigm shift in the way that all stakeholders in the mobile ecosystem play their role. Regulators can especially use this as an opportunity to create healthier environments that stimulate continued investment in next generation technology.





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3

Call for guidelines on data usage, rights and quality to make the best of European data

A patchwork of 28 different laws and heterogeneous sets of rules define data protection across EU member states. This leads not only to unequal protection rights for citizens, but also represents significant administrative burdens for business, including the uptake of big data. Common and harmonized guidelines on data usage, rights and quality are crucial for an effective and sustained EU-wide uptake of big data and the digital transformation of industry and businesses.

The agreement on the Commission's EU data protection reform announced on 15 December 2015 now opens the discussion on implementation⁸. Currently, each country's national data protection agency is set to define the interpretation rules, which will likely have the opposite effect and result in greater divergence.

Moreover, consensus has not yet been reached on the usage and exploitation rights attached to different types of data. Exclusive and non-exclusive approaches are central as they will determine the need for complex fair pricing and oversight mechanisms.

A lack of common guidelines also results in data being recorded and saved in different taxonomies, formats, and types depending on the entity or the country producing it. This lack of guidelines and shared common taxonomies for metadata curation and integration limits the development of analytical platforms and the digital integration of data flows.

Most public and private data sources also have to face data quality challenges. Hence, increasing data quality is a fundamental success factor for the uptake of big data.

We recommend two set of actions linked to a better and clarified usage of data and to data quality in order to reap the full benefit of big data.

EU guidelines for companies to make the most of data

The development of common guidelines is an essential prerequisite for the uptake of big data. Companies and industry players must be provided with the certainty that they can **safely and securely generate value from data** without breaching data protection laws or stepping beyond the boundaries of public acceptance.

Without clear guidelines EU companies will both face challenges to use data as a business driver and expose themselves to risks. This will severely hinder the EU's competitiveness, innovation drive and economic growth.

Appointing a Chief Data Officer per member state to oversee the implementation of open data initiatives would be a further step in the right direction. An independent advisory panel made up of national chief data officers could forge consensus around a cohesive vision and strategy for **capturing the full benefits of data-driven innovation** in Europe, guaranteeing similar and fair market conditions for all market players while protecting consumers, workers and business investment.

In the healthcare industry, the development of **multipurpose EU consent templates** should be promoted to enable the creation of pan-European data sets and to encourage the use and exchange of Electronic Health records (EHR).

Promote data quality

Promotion and implementation of data quality standards is a strong enabling factor across industries as quality is linked to credibility and trustworthiness.

A new generation of common curation methodologies and technologies for complex usages such as clinical trials, antifraud or energy savings has to be rapidly promoted.

Impact

Pan-European guidelines on data usage and quality will further support the Digital Single Market by ensuring a harmonised European framework.

Data accessibility is the primary enabler of data aggregation. In order for companies to gather and use data they must overcome the current barriers linked to the lack of **clear consent and exploitation guidelines**. In this sense, the origin, rights and consent attached to different types of data must be well defined. Otherwise, SMEs will have to depend on data gathered outside the EU and face higher costs for obtaining data.

A clear definition of data usage and rights will boost the potential of **pan-European Data Lakes**. A data lake is a subject-specific repository for large quantities and varieties of data, both structured and unstructured. The data lake accepts input from various sources and can preserve both the original data fidelity and the lineage of data transformations. The lakes could help resolve the issue of accessibility and data integration for European businesses and citizens in different industries and application areas. This would enable stakeholders along the value chain in different industries to exchange data within a specific protocol in a rapid and secure manner.

Ensuring high quality data will bring more competitiveness to SMEs. For example, in the healthcare industry, so far, only established players have the resources to clean the data and offer datasets of sufficient quality for clinical trials. Promoting data quality and curation standards will offer SMEs the chance to compete with larger players and bring new innovations to the market.

Reskilling the workforce: digital skills for industry

Reskilling the workforce in different EU industrial sectors is a major priority and challenge. Launching a **comprehensive pan-European training strategy** based on the needs of industry is required to mitigate the economic and social risks that will come from failing to prepare the workforce for the digital future.

An important factor to be taken into consideration is the fact that to a large extent society is not yet fully aware of the importance of this challenge. The general workforce needs to be made aware that in order to stay employed, they must be willing to reskill and possibly shift sectors.

In this sense, it is expected that digital transformation will severely impact between 10% and 30% of the workforce within the EU⁹, amounting to 30-90 million people. The impact of digital transformation on the job market will be threefold: existing jobs will fall into



obsolescence, others will face radical redesigning with the incorporation of new digital technologies (i.e. robotics) and thirdly, new jobs requiring specific and new skillsets will be created.

A second underlying challenge is the considerable gender gap that exists in digital skills. With an average of 15% of women in the digital industry, Europe is already missing out on a substantial share of the workforce that could be mobilised to address the digital skills gap. This gap needs to be addressed early on in childhood and the societal

and environmental impact of digital jobs should be more clearly communicated in order to motivate more women to pursue this educational career and boost their representation.

An effective and adequate response through a new pan-European reskilling initiative is paramount for raising awareness, boosting EU competitiveness, increasing all workers' employability, reducing unemployment and setting the foundations for a strategic resource planning at EU level.

Recommendations

1

Define a pan-European financial scheme between the European Social and Regional Funds, the Commission, Member States and Industry

From a financial perspective, budgets for reskilling initiatives and programmes in education and vocational training are overwhelmingly allocated at Member States level and through the European Social and Regional Funds.

At EU level, the objective would be to define a major pan-European funding scheme or at least a one-stop-shop gateway regrouping, refocusing and building on all available schemes and if needed, new complementary ones.

Traditional calls for proposals funding projects (as in most EU programmes such as Erasmus+, European Social Fund, Horizon 2020) are not suitable for large-scale digital reskilling. Public funding should be aimed at robust models and scalable initiatives with proven success, such as for example the Academy Cube, initially developed in Germany. Its career and online learning platform offers an intelligent matching system, allowing STEM talent to identify and develop the skills and qualifications they require for specific roles in the workplace. The platform offers various training courses. It currently has 17,000 users but aims to

have more than 100,000 by the end of 2017¹⁰.

At Member States level, training schemes and funding mechanisms should be reviewed and refocused to ensure that they provide governments and especially Ministries of Labour, Employment and Education with the right instruments to deploy digital reskilling at scale and at speed and with the support of industry.

At industry and sectoral level, incentives should be made available in order to encourage corporates at all stages of growth and expansion to provide specific reskilling and training programmes to their employees. A special emphasis should be placed on small businesses and SMEs which cannot afford long and costly training efforts but nonetheless are the backbone of the economy.

2

Create an industry and social partners-led toolbox with specific action recommendations

There is a need for an industry and social partners-led toolbox for digital reskilling with a strong sectoral focus, promoting e-skills, economic competitiveness, better jobs and social cohesion.

This toolbox will provide adequate responses to the digital leap that industries will experience in the coming 5 to 10 years. It should be based on designing new ways of creating and delivering training for which the EU needs new flexible models and on the sharing of best practices in order to provide a clear overview of entry points across Europe. See pages 10 and 11 for further details.

3

Foster company, sectoral, regional and multi-stakeholder digital academy initiatives

Digital skills training programmes need an active involvement from industry and social partners in all sectors in defining the curriculum and the sector-specific skills required today and tomorrow. The intrinsic problem is that companies act much faster than the public sector, with a constant lag between supply and demand.

Curricula have to quickly adapt to demand requirements, but also need to be constantly updated in order to stay relevant. In this sense, it is necessary to facilitate multi-stakeholder partnerships and to strengthen concrete and efficient cooperation at regional and national levels between social partners, academic

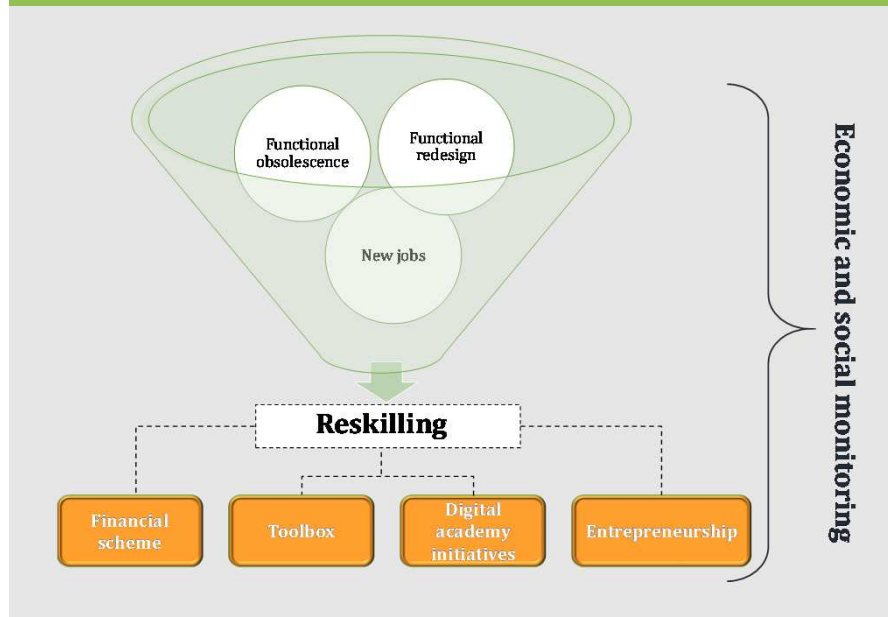


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institutions, industry players and Ministries of Education in order to work towards a common objective. In this evolving context, independent and official accreditations of competences are important to ensure the quality of programmes and learning outcomes.

In particular, public-private partnerships and other forms of public-private collaborations should be strongly encouraged given their complementarity. The public sector has a strategic vision and profound knowledge on territorial problems, social issues and can leverage on large financial and human capacities. On its end, the private sector and entrepreneurs can ensure a more effective and targeted use of these capabilities.

Recommendations for reskilling the workforce



4

Promote and support entrepreneurship as an opportunity for acquiring digital skills and career conversion

Industrial transformations are creating new labour opportunities, but an increasing number of jobs are at risk, with redundancies rising. At the same time, Europe is lacking entrepreneurs. When compared to the US, Europe has a gap of 20m early stage entrepreneurs. Entrepreneurship should be seen as an opportunity and solution for career conversion and reorientation. Digital start-ups and SMEs are a driver of innovation across industry sectors. Significant opportunities exist for European citizens to focus on acquiring specific digital skills, for example in coding or data analytics, by starting a new entrepreneurial venture or joining a start-up.

The "e-Skills for Jobs" campaign has been raising awareness and encouraging European citizens to develop their digital skills and access today's job market. Encouraging digital entrepreneurship is also part of the solution for Europe's digital skills gap.

WATIFY EU Awareness campaign

The first phase of the EU awareness campaign WATIFY, launched in 2014, to inspire people and push them towards concrete action to create their digital start-up, or digitally transform their business, exceeded all expectations. Since the launch event in 2014, almost 200 WATIFY events have been organized in 20 European countries, reaching an audience of more than 18,000 people. More than 30,000 people follow WATIFY on Facebook, Twitter or LinkedIn. WATIFY's videos have been watched more than 290,000 times on Facebook or YouTube.



Spotlight

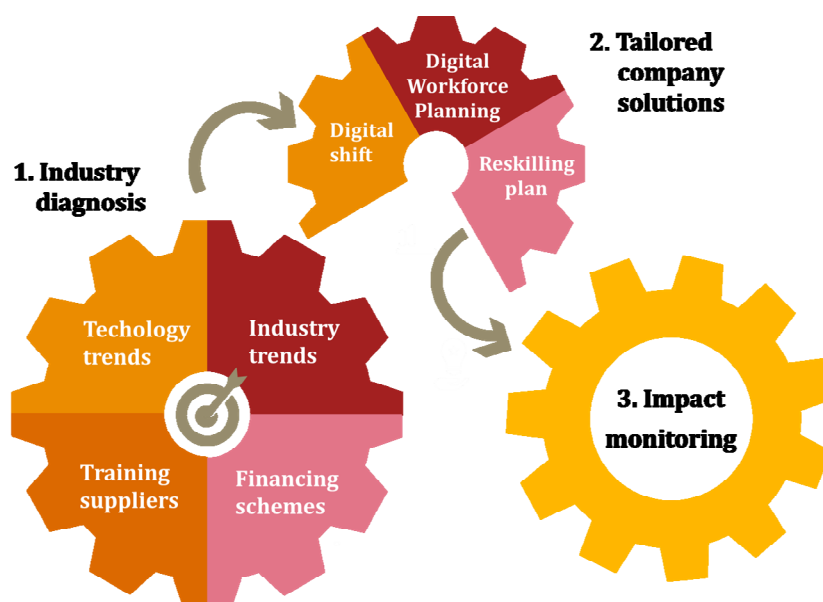
Industry and social partners-led toolbox for reskilling the workforce



The relevance of a training programme is directly linked to their level of customization to the industry needs. The reskilling would include several million employees in key industries in Europe. Hence, the scale and urgency of the challenge requires a solution of unprecedented magnitude. As suggested in the above recommendations, this solution should take the form of an industry-led toolbox.

The toolbox needs to provide tailored solutions for specific digital skills challenges that are particular to Member States and industrial sectors (e.g. Spain is facing particular problems with youth employment, whereas German SMEs have difficulty embracing the digital revolution in their sales model).

Additionally, tools that accommodate for different social and psychological profiles of employees need to be developed in order to ensure a smooth transition to the jobs of the future. The toolbox should be made available to all professions as they are all subject to radical changes due to digitisation.



Step 1 – Industry diagnosis

An initial comprehensive analysis will be carried out with the aim of identifying the key reskilling weaknesses and challenges that a particular industry has to address and anticipate. This analysis will be based on four pillars.

Assessment of specific technological trends. The emergence of disruptive technologies at global scale will have a profound impact on the job market. In this sense, it is essential to anticipate and foresee the digital leap that a given industry will undertake in the coming 5 to 10 years in order for companies to keep ahead of the curve and effectively carry out successful strategic reskilling programmes. Analysis should distinguish between disruptions that will bring a paradigm shift and the evolution of business models, and natural technology evolutions through enhanced features that do not modify significantly business models and the ecosystem.

Assessment of particular industry trends. The analysis of the impact of digital technologies on the whole value chain of a particular sector is also

relevant for identifying the concrete challenges and opportunities faced by the industry players and determining concrete action plans that will enable them to prepare their workforce and reap benefits from the digital transformation. Such analysis will include policy monitoring, an overall vision of the market, the level of adoption of technologies and reskilling efforts by key players, as well as successful reskilling programmes that can be extrapolated.

Identifying the funding and financing schemes at EU, national and local levels that are available for reskilling initiatives. These will include both public and private financing initiatives.

Providing an inventory of the existing training suppliers at country, sector, institutional and private level that are addressing and providing solutions to specific reskilling challenges. Particular attention will be given to new ways of delivering training.

Step 2 – Tailored solutions

The second step aims to provide companies specific solutions based on the industry diagnosis resulting from the analysis described above. The toolbox should provide the necessary means for companies to adequately adapt to, and even anticipate, the potential impacts of the digital transformation on their workforce.

Tailored solutions will include three dimensions:

Assessment of the technology and digital shifts that particular companies will undergo in the next 5 to 10 years. Technological innovation should be pondered and adjusted within the strategy, business objectives and processes of every organizations. This analysis will be extended to the entire workforce within the company as all professions are subject to radical changes due to digital transformation.

Development of a Digital Workforce Planning which will allow companies to project themselves for the next 5 to 10 years by estimating their digital skills and competencies gap, as well as to define the desired characteristics and composition of their future workforce.

To make the industry-led toolbox a success, it is essential to involve all stakeholders and to create political momentum for its institutionalisation. In this sense, EU ministers, trade unions and industry players should be mobilized around it in order to take this initiative forward and put digital reskilling on the agenda.

In particular, as no new financial resources may be available, it will be indispensable to redefine training priorities and refocus funding allocations to address the full scale of the issue. Turning the stakeholders' dialogue and involvement into concrete recommendations and actions will enhance the ownership dimension and will translate into greater and sustained commitment. Creating incentives for different stakeholders will also lead to faster contribution and adoption of the Toolbox.

In order to ensure a deep-dive into the needs and challenges faced by particular industries and companies, the toolbox will follow a three-step approach.



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Step 3 – Impact monitoring

Development and implementation of a tailored reskilling plan responding to the following main questions: How many people need to be reskilled? What should be the scope of the reskilling programme? When should the programme be implemented? How will the programme be implemented and financed? Who can help? In answer to these questions, the Toolbox will deliver specific solutions by determining:

- Which curricula or learning platforms are the most suitable (e-learning courses, traineeships, apprenticeships, communal programmes, private training arrangements, etc.).
- Who are the main industry-specific players and stakeholders and what assistance in terms of open collaboration, partnerships and shared practices they can provide. A special emphasis will be put on public-private partnerships or other public-private collaboration schemes which allow to benefit from the long term strategic vision of the state and the speed of action from the private sector.
- How to finance the programme in the most cost effective manner.

Once the methods to bridge the skills gap have been identified and implemented, it is crucial to establish a continuous system of monitoring progress both at industry and company level. In order to deliver value added solutions, the Toolbox will be regularly updated on technology and industry trends, financing schemes, partnership opportunities and training suppliers. Impact monitoring activities will take a holistic view of the company and industry value generated by the Toolbox solutions. Relevant indicators will include:

- The geographical distribution of companies that are making use of the Toolbox.
- The number of reskilling programmes that have been put in place.
- The number of companies/times accessing particular financing schemes.
- Survey campaigns and periodic meetings to evaluate the progress and benefits of reskilling programmes at industry and company level.



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Cities and regions as launch pads for digital transformation

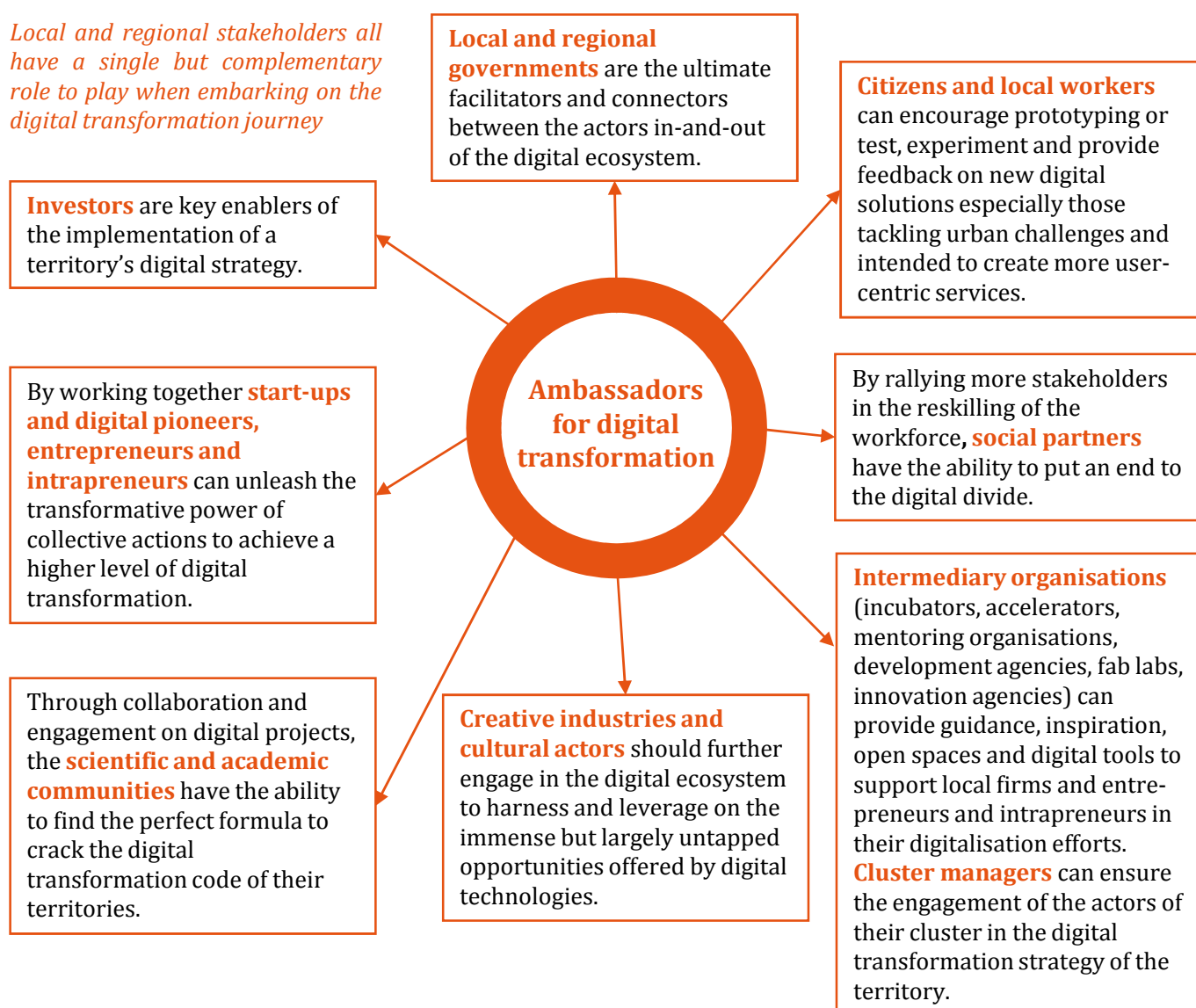


Accelerating the inception of new centres of digital transformation in Europe

Cities and regions have the capacity to create a favourable ecosystem to nurture the modernisation of their local businesses, public administrations and households notably through the uptake of new business models and digital technologies. Digital transformation can radically improve the way businesses work, citizens live and organisations operate. In the new digital era, the inception of new centres of digital transformation is therefore crucial to enable European territories to thrive and compete in the global marketplace.

Engaging the “shakers and makers” of the digital ecosystem

Local and regional stakeholders all have a single but complementary role to play when embarking on the digital transformation journey



Key attributes and success factors

1

Leadership and collaboration for a smart governance of the local digital ecosystem



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Create a forward-looking digital strategy and build a shared vision around it

Forward-looking strategies require local leaders with a global view, high imagination and the ability to paint their vision and achieve a high acceptance rate among the population. The governance perspective is ultimately about taking responsibility to create the necessary platforms and engagement channels for the stakeholders to act out from. These platforms are relationship-based forums serving the needs of the actors for the design of a digital transformation agenda building on the territory's economic strengths.

Build long-lasting partnerships and trust relationships

The ability to create a shared digital strategy relies on the existence of trust relationships between local stakeholders. Long lasting partnerships based upon mutual trust and linked to practical work are therefore critical. These collaborative activities lead to a kind of collective and informal teams that have a great interest in advancing the digital transformation in their territories. This approach actually creates a new leadership model that innovates, redefines and cultivates a multi-helix eco system.

Collaborate across sectoral boundaries and value chains

Territorial leadership is key for the digital transformation of any European city or region. It is about getting an external focus of the leadership independently from where it emanates. It is about coming together and inspiring actors from different sectors and industries to take common actions that change and digitalise daily working operations.

2

Digital talent and tech entrepreneurs to accelerate the digital transformation process

Transform your local population into digital talent

Age cannot be seen as a barrier to digital skills' development. As we enter a digital era, local leaders need to make sure that every single resident in their territory is able to get digital knowledge in the short and long term. In a world where technologies are becoming ubiquitous, there are simply no alternatives to digital literacy. Cities and regions failing to reskill their workforce will inevitably see their economic attractiveness compromised and thus not be able to compete globally.

Attract global digital talents

Throughout Europe, SMEs, large companies, public administrations and other organisations are thinking talent first. European digital leaders are extremely mindful and aware of their talent challenges but often lack the knowledge or capacity to tackle them. Getting these talents entails enhancing the city/region brand attractiveness for talents. Strong cross-sector collaboration between local companies and public sector is one key to enable well-known brand to invest locally and act as a magnet for future talents.

Develop an entrepreneurial culture

Europe needs more entrepreneurs to speed up the digital transformation process. Business entrepreneurs, social entrepreneurs, societal entrepreneurs, innovation entrepreneurs, technology entrepreneurs, academic entrepreneurs, political entrepreneurs, cultural entrepreneurs as well as public and private intrapreneurs are critical to drive forward the digital shift.



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3

Access to data and technologies for applied solutions to local challenges

Develop a digital city strategy

Activities related to governance, planning and city management are reshaped by ICT and real-time digital technologies, which provide a new dimension making it citizen-centric, efficient, accountable and transparent. The way in which many public services, such as mobility services, street lighting, energy, kiosks, parking, solid waste management, physical infrastructure monitoring and controls are developed,

validated and scaled will change as local governments invest in a smart city strategy.

Open access to data through the launch of open data platforms

By opening up their public datasets online, cities and regions have found a new opportunity to spur innovation and economic growth. Interconnectivity and the creation of open and interoperable technological architectures to release public data offer tech companies a live test bed for experimentation and demonstration. Open data strategies have the potential to radically reshape the traditional citizen-local government relationship.

Ensure local access to digital technologies

European cities and regions need to move forward and address issues related to smart innovation and the creation of the right framework and spaces to experiment with more innovation and digital transformation. Digital technologies also offer the opportunity to look for more agile ways to address urban challenges such as rapid prototyping. A test-bedding approach is key to apply algorithms to create smarter European cities and regions.



4

Key infrastructures and investments for digital launch pads

Ensure the availability of critical infrastructures for the digital transformation of local businesses

Cities and regions have the ability to create the right framework conditions for an optimal digital environment by investing first in the required physical infrastructures (e.g. transport infrastructures, corporate offices, social infrastructures, etc.). Institutional infrastructures also have an important role in the digital transformation of traditional industries at city-level.

Secure investments in digital infrastructures

High upfront investments are not always required to finance digital infrastructures. Innovative financial and business models are increasingly

emerging to fund local technological infrastructures. The variety of financial schemes notably include joint ventures, public-private partnerships, crowd-funding, Tax Incremental Financing (TIF) and green or energy revolving funds.

Ensure the economic sustainability of local investments in digital infrastructures

The financing of local digital infrastructures is not merely about

finding public investments; it is rather a question of economic sustainability. Local public authorities need to assess the extent to which digital infrastructures can become sustainable without continued public investments. The mobilisation of all layers of governments and financial institutions is critical to achieve these smart investments.



Digital transformation experiences across Europe

There is no single approach to accelerate the digital transformation of a territory

Each digital ecosystem is unique and requires a tailored approach to match local needs and levels of digital maturity. The transformation of a territory is not merely about digital technologies. It is first and foremost a solution to economic, social, societal, urban and organisational issues. When developing their digital strategy, local stakeholders have to keep in mind the problems faced by local citizens, businesses and organisations and come together to think about digital solutions to tackle them.

Engaging diverse stakeholders to design an inclusive and responsive digital strategy

Digital transformation is ultimately the outcome of the collective efforts of diverse stakeholders sharing a common vision for the transformation of their territory. Their approaches can be inspired by the successful digital transformation experiences of European cities and regions of similar size, economic context and/or level of digital maturity. It is therefore key for local ambassadors for digital transformation to engage and collaborate through European networks.

Leveraging the digital transformation experiences of European regions and cities

There is significant scope for businesses, organizations and citizens from the same or different territories to collaborate and learn from one another. The examples below provide illustrations of different initiatives, collaborative projects, organizational structures, policy measures or programmes initiated by ambassadors for digital transformation at the local level. The inception of similar initiatives is key to accelerate the digital transformation of European industry and enterprises.

BRISTOL IS OPEN
open programmable city region



Open programmable city region



ICT Polska Centralna Klaster:
Promoting cluster excellence in Lodz

Tallinn-Helsinki



first EU cross-border Smart City center of excellence



Stakeholder collaboration to solve urban challenges



Opening up new makerspaces



Urban regeneration project to create an incubator

nyuko
Turning Luxembourg into a start-up nation



Collaboration to harness the city's innovation potential

amsterdam sharing city

Leveraging on the sharing economy to tackle local challenges collaboratively



HCU | HafenCity University Hamburg

CityScienceLab at HCU:
Hamburg as a living lab for digital urbanisation



NYU's seed-stage venture capital fund invests in startups from current NYU students and researchers



Smart city policy as a driver for digitalisation



Territorial governance for digital transformation

D

Toolkit for decision makers to become ambassadors for digital transformation

Digital transformation and technological advances are giving rise to disruptive business models, which are drastically challenging the current regulatory environment. It is therefore necessary for policy makers to understand the functioning of these new technological applications, as well as their social, economic and regulatory implications, so as to be able to take full advantage of the digital opportunities.

Digital transformation impacts all parts of a business and all interactions with stakeholders. Hence, there is the need for leaders who have both digital and business skills, and have an excellent understanding of how the potential of digital technologies can be harnessed to achieve business objectives.

The key to digital transformation is digital leadership. Digital transformation has to be led from the top, with active involvement from policy makers and the higher management, both at the public and private level. Appropriate training should thus be provided through specialised digital trainings, and become part of the professional development of all policy makers, at local, national and EU levels.

Taking politicians, regulators and officials through digital trainings was one of the thirteen recommendations formulated by the Strategic Policy Forum on Digital Entrepreneurship in its report published in March 2015. Policy makers need to move from creating fixed designs for policies to creating designs that are flexible enough to allow others to adapt them to changing circumstances.

The Strategic Policy Forum believes that

policy makers' future skills must include a better appreciation of the possibilities and effects of digital technologies, as well as the capacity to understand that the changing circumstances they have to anticipate will be heavily shaped by the digital transformation.

The recommendation of the Forum is that **digital trainings should become part of the continuous professional development of all decision makers** involved in designing, consulting on, and supporting policies and regulations. They include politicians and regulators as well as decision makers from chambers of commerce and crafts, SME associations and associations of entrepreneurs. Digital trainings should be made available at a European level and MEPs and Commissioners should be encouraged to attend. National and local digital trainings should be part of the mix too.

The objectives of these trainings are to enable policy makers to take full advantage of the digital opportunities in terms of economic and social benefits and to establish business-friendly framework conditions thanks to a deep understanding of the digital transformation.

Pilot experience

The concept was proof tested during the conference "Digital Economy: Let's be ready for the new Jobs!" organised on 10 November 2015 by the Luxembourg Ministry of Labour, Employment and the Social and Solidarity Economy with the support of the European Commission.

The audience was composed of national and European policy makers and industry representatives. Representatives from the University of Luxembourg, and from French, Belgian and Luxembourgish SMEs have demonstrated some of their disruptive solutions.



The three stages of a "Become an ambassador for digital transformation" workshop

1

Demonstrating the technology

Entrepreneurs and innovators are invited to showcase their technologies to an audience of decision makers. This presentation is immersive, with decision makers being invited to try the technologies by themselves so they can develop a better understanding of their applications and their economic and social potential.

2

Focus on the economic, social and regulatory impact

The goal of this stage is to provide key stakeholders with a sound understanding of the social, economic and regulatory implications of each disruptive technology. The impact on jobs, on existing business and on the creation of new businesses is discussed, as well as the implications on skills and education. Finally, the legal aspects are analysed with the issues of adapting the existing legal framework and of the need for new legislation.

3

Going forward

This final stage enables policy makers to reflect on the next steps to take to support the uptake of the technology. Key drivers and obstacles will be identified together with the entrepreneurs and innovators and policy recommendations will be formulated. The objective is to identify topics and areas where action is required in order to take these opportunities further.

Defining the most disruptive technologies is a challenging task. Almost every day, new innovative solutions are emerging and challenging the regulatory framework. Six major technological applications were identified as having the potential to be the most disruptive for policy makers. Yet, the sheer numbers of new technologies only further stresses the need for a rapid and widespread implementation of digital trainings for decision makers.

Autonomous cars

Rapid advances in autonomous driving technology make autonomous cars the fastest-growing segment of the connected car industry, with global sales likely to surge almost fivefold to EUR 35.7 billion by 2020. While fully autonomous cars are still several years away — and face significant legal hurdles — partially autonomous functions already are taking hold. For example, such technologies can take over activities like parking, navigate congested highways, and relieve drivers of the annoying brake-accelerator two step required by stop-and-go traffic.



Blockchains

This technology is based on cryptographic ledgers which are treated in a decentralised and distributed manner. These public and shared databases are maintained and verified amongst the actors participating in the system, ensuring digital transparency and confidence in the records of information blocks. In consequence, information exchanges made through blockchain based applications ensure integrity and validity of the record, and do not require trusted third parties for verification purposes. Blockchains enable cheaper, faster and more secure domestic and cross-border payment systems. Distributed ledgers supporting smart contracts could potentially reduce infrastructure costs of banks by between EUR 13.8 to 18.4 billion per annum by 2022¹¹. Today, the industry is facing regulatory uncertainty, whilst a clear and stable regulatory framework is necessary to provide a confidence environment for the development of blockchain start-ups.

New training solutions

Addressing the paradox of simultaneous skills shortage with increased levels of “over qualification” in the workforce and rising unemployment rates has become vital in securing long-term economic growth and prosperity in Europe, especially in the field of digital technologies. An increased number of Europeans are no longer satisfied with institutional approaches failing to provide graduates with skillsets matching industry needs. As reflected in the European Working Conditions Survey, despite the 27 million unemployed workers in the EU, in 2013, four out of ten employers reported difficulties in finding employees with the right skills¹². According to the survey Employer Insights: skills survey (2015), in the digital sector, almost half (42%) of all firms recruiting tech specialists reported that some or all of these positions had been hard-to-fill.

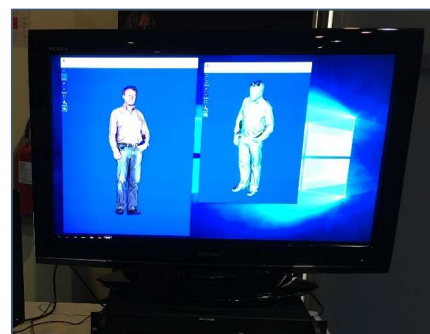


Wearable technologies

They refer to clothing and personal accessories that incorporate advanced computer and electronic technologies. Applications of wearable technologies include wearable cameras, smart clothing, wearable apps platforms, smart glasses, activity trackers, smart watches, as well as health and happiness wearables. The market for wearable technology is already enjoying substantive penetration in the health and fitness arena. The value chain for wearables is highly dynamic. For example, in 2025 an estimated EUR 21.5 billion will be spent on formulations and intermediate materials¹³. As the proliferation of personal devices accelerates, data storage and data privacy will become key areas of concern.

Additive manufacturing

3D printing (or additive manufacturing) processes began in the 1980's when computer-aided designs were used to create layer-by-layer three-dimensional prototypes. The first form of additive manufacturing is referred to as rapid prototyping, which uses a liquid-based process that cures or solidifies a photosensitive polymer when an ultraviolet laser makes contact with the polymer. They were conceived as a fast and more cost-effective method for creating prototypes for product development within industry.



Unmanned Aerial Vehicles (UAVs) and robots

The advances in sensors, hydraulics, mobility, machine vision and big data are making human-robot collaboration a technical reality. The new generation of robots may further overhaul the ‘division of labour’ between man and machine. These robots can be in the factories, but also in the sky. For example, the concept of an Unmanned Aerial Vehicle (UAV) is increasingly changing and the economic and social benefits from their civilian applications are starting to be acknowledged by the population.



About the Strategic Policy Forum on Digital Entrepreneurship

The **Strategic Policy Forum on Digital Entrepreneurship** was set up in 2014 to outline what should be the short and long-term strategy for digital entrepreneurship in Europe, to implement this strategy and advise the European Commission on key priorities. The objectives of the Strategic Policy Forum were to reinforce dialogue between industry, and the scientific and political communities, with the aim of shaping an ambitious EU vision and a European roadmap that will fuel digital entrepreneurship in Europe. The Forum advises the Commission on policy issues and actions to foster digital entrepreneurship and promotes the development of policy by EU countries at national and regional level.



The priority areas to be covered by the Forum's work, include:

- **Identifying new business opportunities for jobs and growth:** the focus is on how digital tools enable the development of new start-ups in all sectors of the economy, as well as the transformation and growth of existing companies (both SMEs and corporates), including social enterprises and organisations.
- **Removing the barriers:** the focus is on removing the most significant barriers, at all levels, spanning education, skills and entrepreneurial culture, technology, regulatory issues, taxation, access to finance, etc.
- **Raising commitment and actions among the key stakeholders:** this includes the public sector, as policy maker, as well as driver and enabler of digital entrepreneurship (e.g. through open government data, public procurement), private stakeholders and public-private partnerships, in support of EU Digital Entrepreneurship policy.

The members are appointed by the Commission, identified among key actors in the digital entrepreneurship field. The European Commission sought to achieve a balanced overall composition, based on broad representation and expertise of the members while keeping the size of the Strategic Policy Forum to a manageable level.

The following key organisations are represented:

- Industry representatives, including digital entrepreneurs, traditional industries (pioneers in the digital transformation of their business), technology service providers to digital entrepreneurs and relevant associations;

- Non-industry/Private organisations supporting and monitoring digital entrepreneurship, including NGOs, trade unions, universities, research organisations, intellectual property experts, equity firms, etc. and
- Public authorities, particularly active in the area of digital entrepreneurship.



President

- John Higgins, *Digital Europe*

Vice-Presidents

- Irene Braam, *Bertelsmann*
- Antonio Murta, *Pathena*

Members

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- Filippo Berto, *Berto Salotti*
- Paul Browne, *Enterprise Ireland Representative in Brussels*
- Nicholas Davis, *World Economic Forum*
- Franc J. Dorfer, *Eierfabrik*
- Daniela Florea, *Geo Strategies*
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- Fabian Zuleeg, *European Policy Centre*

Web page of the Strategic Policy Forum on Digital Entrepreneurship

http://ec.europa.eu/growth/sectors/digital-economy/entrepreneurship/strategic-policy-forum/index_en.htm

About the Member States Board on Digital Entrepreneurship

The **Member States Board on Digital Entrepreneurship** was set up by DG Internal Market, Industry, Entrepreneurship and SMEs, with the aim to reinforce the deployment and implementation of a sound strategy on Digital Entrepreneur-

ship in Europe. The Member States Board assists the Commission in shaping an ambitious EU vision, a short and long-term strategy, as well as in implementing this strategy to fuel Digital Entrepreneurship in Europe.

It promotes a coherent, coordinated EU strategy, and ensures synergies among relevant European, national and regional policies maximise their impacts.

Members

Austria	Gerhard Laga, <i>Austrian Economic Chamber</i> Gabriele Schmid, <i>Federal Ministry of Science, Research and Economy</i>	Hungary	László Korányi, <i>National Innovation Office of Hungary</i>
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Greece	Vasileios Gongolidis, <i>General Secretariat for Research and Technology</i> Elias Kastritis, <i>General Secretariat of Telecom & Post</i>	Slovakia	Boris Miskovic, <i>Ministry of Finance</i>
		Slovenia	Jurji Dolzan, <i>Ministry of Education, Science and Sport</i>
		Spain	Emilio Garcia, <i>Ministry of Industry, Energy and Tourism</i>
		Sweden	Hakan Hillefors, <i>Ministry of Enterprise, Energy and Communications</i> Juha Alskog, <i>Ministry of Enterprise, Energy and Communications</i>
		United Kingdom	Harry Lund, <i>Department for Business, Innovation and Skills</i>

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