EU-Japan Centre for Industrial Cooperation
日欧産業協力センター

DIGITAL ECONOMY IN JAPAN AND THE EU

-AN ASSESSMENT OF THE COMMON CHALLENGES AND THE COLLABORATION POTENTIAL-

Tokyo, March 2015

Disclaimer:

The study is the result of independent research and does not necessarily reflects the views of the EU-Japan Centre for Industrial Cooperation or the views of the EU Commission or Japan authorities. While utmost care was taken to assure the correctness and comprehensiveness of all information used in this study, the EU-Japan Centre may not be held responsible for any errors that might appear.

The study is based on the research undertaken by Marcin Lenkiewicz (Minerva Research Fellow), under the general coordination and supervision of Dr. Silviu Jora and with contributions from Andrew Carroll and Maarten Van Zantvliet.

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Index of abbreviations:

4K/8K – refers to a display device or content having horizontal resolution on the order of 4,000 /8,000 pixels
BEAJ – Broadcast Program Export Association of Japan
CATV – Cable Access Television
CORDIS-Community Research and Development Information Service
CS – Communication Satellite
DDoS – Distributed Denial of Service
EHR – Electronic Health Registry
SME – Small and Medium Enterprise
EU – European Union
ICT – Information and Communication Technology
IoT – Internet of Things
IPTV – Internet Protocol Television
IP-VOD – Internet Protocol Video on Demand
ISPs – Internet service providers
ITA – Information Technology Agreement
ITS – Information Transport System
JPN – Japan
MIC – Ministry of Internal Affairs and Communication
Midcaps – Middle Capitalisation Company
NECOMA – Nippon-European Cyberdefense-Oriented Multilayer threat Analysis
PPP – Public Private Partnership
R&D – Research and Development
S&T – Science and Technology
SDoC – Suppliers' Declaration of Conformity
UHDTV – Ultra High Definition Television
VA – Value Added

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Executive Summary

This study has been independently prepared by the EU-Japan Centre for Industrial Cooperation with the aim of providing a source of inspiration for enhanced EU-Japan dialogue and cooperation on the Digital Economy (with its multi-sectoral components, primarily the ICT) which is expected to play a key role in unlocking economic growth and competitiveness, as well as in the general improvement of societal wellbeing. The study analyses the Digital Economy landscape in the EU and Japan and their related strategic policy agendas and identifies a number of common challenges and matching policy priorities, on the base of which it makes a number of recommendations for cooperation on policy exchange and benchmarking, R&D/Horizon 2020 and on regulatory issues.

The first part provides an overview of the main statistics relevant for the Digital Economy landscape in Japan and the EU, emphasising the important role which the related sectors play in both economies (i.e., only the ICT sector provides 9% of GDP in Japan and 4% in the EU, 7% of employment in Japan and 3% in the EU). It is clear that in both cases the full potential of the Digital Economy is far from being reached due to a mix of domestic challenges, bottlenecks and increased external competition. This study also presents the main policy strategies for addressing the development of the Digital Economy in both Japan and the EU including the main identified challenges.

The second part reveals the strong interlinked relations already existing between the EU and Japan on Digital Economy/ICT, by presenting the level of investment in each other's markets, as well as rapidly emerging cooperation on R&D under the Horizon 2020 framework.

The third part presents a number of recommendations for policy cooperation and benchmarking priority topics, based on the identified common challenges and bottlenecks as well as the EU and Japan's matching policy agendas, which include: ICT Training/e-Skills; ICT enabled Advanced Manufacturing; ICT-enabled Smart City Solutions; e-Government, Open Data Governance; Cyber-security; ICT R&D& Innovation market uptake; Digital Content IPR; Digitally Active and Healthy Society; GNSS-ICT enabled services; "Technology diplomacy"-international standards. The role that the EU-Japan Centre for Industrial Cooperation can play in supporting a number of such activities (through its policy seminars, policy analysis, business training and R&D support) is also mentioned.

The final part is dedicated to recommendations on the potential for regulatory cooperation, most of which are based on the work of the EU-Japan Business Roundtable. These recommendations focus on the expansion of the ITA Agreement; private copy levy reform; trade liberalisation of ICT services through mutual recognition of certificates, etc.

This study is based on existing open sources of information and it is non-exhaustive in character. Its main ambition is to support the stepping-up of dialogue, policy exchange and cooperation between the EU and Japan on such a mutually important topic for competitiveness and growth.

DIGITAL ECONOMY OPERATIONAL DEFINITION:

For the purpose of this report, we are using the definition provided by the Oxford Digital Economy Collaboration Group.[1]

The digital economy enables and conducts the trade of goods and services through electronic commerce on the internet. The digital economy is based on three pillars: supporting infrastructure (hardware, software, telecoms, networks, etc.), e-business (processes that an organisation conducts over computer-mediated networks) and e-commerce (transfer of goods online).

In the present situation where the use of Information Technology (IT) is more and more prevalent in our society, economic activities classified as digital economy are expanding their scale, and becoming diversified in their transaction forms.

Other definitions:

OECD definition: *The digital economy enables and executes the trade of goods and services through electronic commerce on the internet.*[2]

BCS, The Chartered Institute for IT definition: *The digital economy refers to an economy that is based on digital technologies, although we increasingly perceive this as conducting business through markets based on the internet and the World Wide Web*.[3]

United States Census Bureau definition: *It is useful to think of the digital economy as having three primary components--supporting infrastructure, electronic business processes (how business is conducted), and electronic commerce transactions (selling of goods and services online). In addition, it is important to note that a common feature of both electronic business processes and electronic commerce transactions is reliance on the use of computer-mediated networks. The reliance on the use of computer networks, and the benefits they can provide, is the "bottom line" difference between electronic and other kinds of business*.[4]

Note:

All the above-mentioned definitions are missing an essential element related to the role the digital technologies and solutions could play in increasing the performance and competitiveness across the industries, thus contributing to the general economic growth. Therefore elements such as production systems efficiency and advance manufacturing should be included within the scope of digital economy.

Consequently, an enhanced EU-Japan experience exchange and cooperation on Digital Economy should start from working on a joint comprehensive definition of the "Digital Economy" concept, going beyond e-commerce and e-business.

[1] http://odec.org.uk/the-concept-of-a-digital-economy/

[2] http://www.oecd.org/daf/competition/The-Digital-Economy-2012.pdf

[3] http://policy.bcs.org/position_statements/digital-economy

[4] http://www.census.gov/econ/estats/papers/umdigital.pdf

I. THE GENERAL LANDSCAPE OF THE DIGITAL ECONOMY IN JAPAN AND THE EU

Digital economy has become the key to new growth possibilities in established and mature markets such as Japan and the European Union. It is an umbrella term used to describe markets that focus on digital technologies. These typically involve the trade of information, goods or services through electronic commerce. It operates on a layered basis, with separate segments for data transportation and applications.[5] It is crucial to understand that the backbone of the digital economy is the infrastructure provided by various segments of ICT. Therefore, the ICT industry landscape will be analysed in particular.

1.1. The landscape of Digital Economy in Japan

e-Business

The importance of e-business is actively growing in Japan, with e-business-related indicators, such as market size and employment in the sector rising every year. Among enterprises, the internet usage rate at the end of 2013 was 99.9%, a rate that remains constant for the last several years, showing that internet usage among businesses is fully diffused.[6] However, it appears that only 16% of corporations are using ICT to raise profits.[7] Apparently, in Japan it is more common to utilise ICT solutions in order to cut costs.

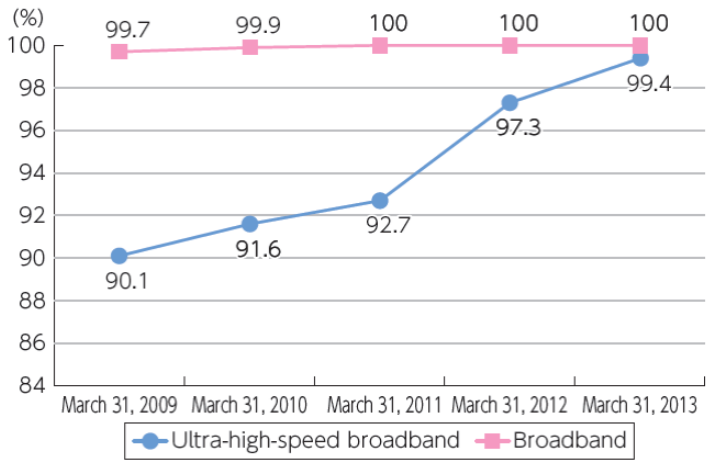
e-Commerce

The business to client e-commerce digital consumer number is at around the 77 million mark, with a market size of €104.29 billion in 2014 and growth of 7.1%.[8] Over 70% of the total population uses the internet. The average ecommerce sale per digital buyer is set to increase from €1,633 in 2013 (EU28 average of €1,500[9]) to €1,846 in 2016 - an increase of about 5% in total online annual spending.[10] 10.2% of Japanese online consumers shop from overseas websites, and the US and China are the main destinations for both cross-border e-commerce exports and imports from Japan.[11] Purchasing or trading goods and services was the second most common purpose of internet use at home with 57.2%;

[5] http://www.oecd.org/daf/competition/The-Digital-Economy-2012.pdf
[6] http://www.stat.go.jp/english/data/handbook/c0117.htm
[7] http://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2014/key-points.pdf
[8] http://www.ekosglobal.com/markets/asia-and-australasia/japan/
[9] http://www.ecommerce-europe.eu/press/2014/online-sales-grew-by-nearly-23-in-central-europe-in-2013
[10] http://www.ekosglobal.com/insights/global-ecommerce-japan/
[11] http://www.thepaypers.com/ecommerce-facts-and-figures/Japan/4

Broadband

Figure 1: Transition in broadband infrastructure



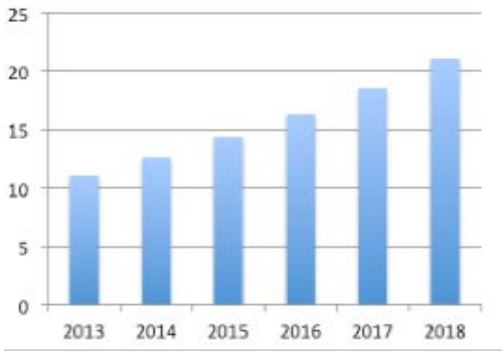
(Source) "2013 Basic survey on the Information and Communication Industry" MIC/METI

At the end of March 2013, ultra-high-speed broadband [12] services were available in 53.81 million households, or 99.4% of all Japanese households. Broadband services were available in 100% of Japan's 54.16 million households.

The number of subscriptions to broadband services at the end of FY 2013 increased by 47.1% from a year earlier to 89.73 million. The number of DSL service subscriptions fell by 17.5% from the previous year to 4.47 million, continuing a downward trend. FTTH subscriptions, on the other hand, climbed 6.3% to 25.35 million, and 3.9G (LTE) mobile phone service subscriptions shot up to 46.41 million. FTTH subscriptions account for 28.3% of all broadband subscriptions, whereas 3.9G (LTE) mobile phone service subscriptions now make up more than half (51.7%). DSL is continuing to experience a net reduction in subscriptions, while FTTH has consistently seen a net increase. The number of subscriptions to broadband wireless access services has also increased in recent years.

Internet of things (IoT)

Figure 2: IoT market in Japan, Trillion yen



(Source) IDC Japan 2014

Gartner Dictionary defines the IoT "as a network of physical objects containing embedded technology that interacts with their internal states or external environment."[13]

The Japanese government expects Japan's ICT industry to double in value between 2011 and 2020 and much of this growth is expected to come from the IoT/M2M sector as Japanese network operators create partnerships with foreign device manufacturers, providing domestic and export customers with cost-effective solutions.[14]

According to IDC, the IoT market was valued at 11.1 trillion yen in 2013 and will grow to 21.1 trillion yen in 2018. 495 million devices were shipped over the course of 2013, giving an average cost of 22,424 yen per device. Japan's telecom industry has high hopes for the Internet of Things. It is expected to boom in sectors such as telemetering, transportation management, e-payment, surveillance, digital signage, and data backup, thereby bringing huge business opportunities by creating new areas of growth in the already saturated Japanese mobile market.

Currently, the most popular IoT services in Japan involve vending machines, transportation

[12] Ultra-high-speed broadband services cover FTTH, CATV Internet, FWA, BWA, and LTE services. (Besides FTTH and LTE services, this definition includes only those services with download speeds of 30 Mbps or more).
[13] http://www.gartner.com/it-glossary/internet-of-things/
[14] http://www.soumu.go.jp/main_content/000296880.pdf

management, surveillance, and e-wallet services.

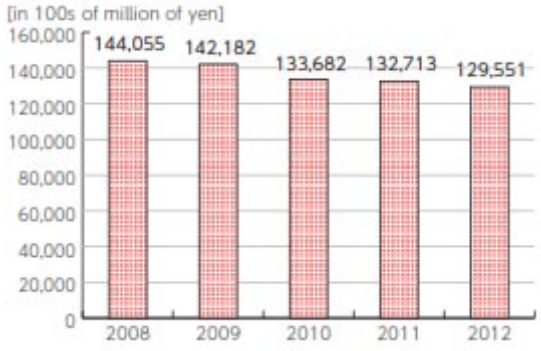
While still committed to industrial development, operators such as NTT DoCoMo and SoftBank believe that IoT applications can be scaled up quickly for consumer products such as digital photo frames, e-books, communications devices for children, and electronic pet collars. To promote IoT growth, Japan's communications industry is working to adjust its business model; measures include standardisation of communications modules to attract more industries, strengthening partnerships to enter new industries, and shortening of the IoT industry chain so that costs are reduced and efficiency is enhanced.

Telecoms

Most of the population is mobile: as of 2014, there are 66 million Japanese mobile internet users (66%) set to increase to 93 million (84%) in 2016.

While the number of smartphone users has increased consistently over the last few years, growth is expected to plateau at around 76 million users (60%) in 2014, with growth declining to single-digit growth figures in the future.[15] Mobile communications accounted for about 60% of sales in the telecommunications sector, while, by service category, the share of data transmission services has been rising year by year. Sales in the telecommunications sector in FY 2012 amounted to 12.9551 trillion yen (€95.7 billion) (a decrease of 2.4% from the previous year) Fixed-line communications accounted for 32.1% of all sales, and mobile communications (mobile phones and PHS handsets) for 52.3%. Looking at sales by service category reveals that voice transmission services accounted for 37.6% and data transmission services for 46.8%. The average revenue per user (ARPU) for mobile phones in FY 2012 was 4,513 yen (€33.3).[16]

Figure 3: Transition in telecommunication sales



(Source) "2013 Basic survey on the Information and Communication Industry" MIC/METI

Subscriptions to fixed-line communications are declining while subscriptions to mobile communications and 0ABJ-IP phone services have increased steadily

The ICT sector in Japan - short introduction

Japan has been historically strong in the ICT sector with a significant market share and consumer electronics brands leading the way. However in the current economy where the service segment is the main source of wealth acquisition, Japan's competitiveness has suffered. Big players are forced to refocus their efforts to remain relevant and new businesses are looking at possibilities to enter the market.

Market size and competitiveness of the ICT sector [17]

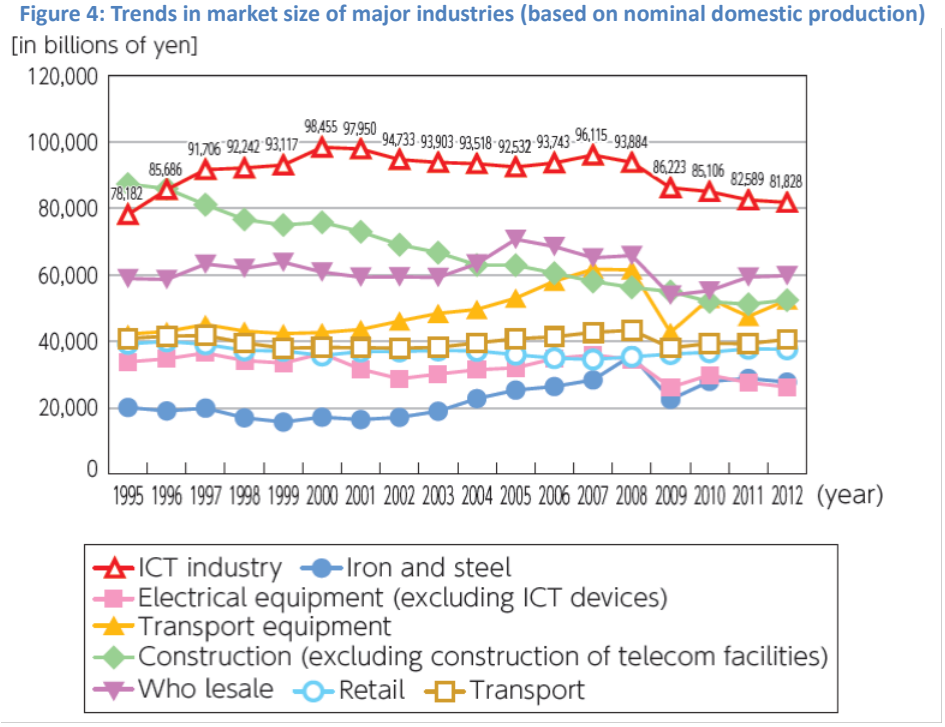
The ICT market accounted for about 8.9% of all industries, with a total size of 81.8 trillion yen (€604 billion) in 2012, making it the largest in the country. The market's growth levelled off between 2000 and 2005 before declining along with markets in most other industries from 2008. Growth rates declined sharply in 2009 due to the financial crisis, and this trend continued in 2012.

[15] http://www.ekosglobal.com/insights/global-ecommerce-japan/
[16] http://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2014/chapter-5.pdf
[17] Ibidem.

Looking at the transitions in market size (based on real domestic production value) of the main industries in constant 2005 values, reveals that the ICT industry grew in 2010 along with most other industries, but decreased in 2011 and 2012 (Figure 4).

The ICT industry's market size (based on real domestic production value) in 2012 declined slightly by 0.6% from the previous year to 96.9 trillion yen. The industry's average annual growth rate from 1995 to 2012 was 2.5%.

Figure 4: Trends in market size of major industries (based on nominal domestic production)



(Source) "Study on Economic Analysis of ICT" MIC (2014)

According to the Japanese Ministry of Internal Affairs and Communications' "ICT International Competitiveness Index"[18] the size of the ICT World market is 2,537.5 billion dollars (an increase of 9.8% from 2010) of which Japan's share is 10.8%, decreasing from 12.3% in 2013. Strictly in terms of exports, Japan has lost almost half of its share (ex: from 5% in 2012 to 3.3% in 2014) in contrast with the rest of the Asia-Pacific region which witnessed a steady increase.

Japanese competitiveness is strong in 7 and weak in 10 out of 38 measured items. Compared to 2013, its share decreased in 33 out of 38 measured items and increased in 5.

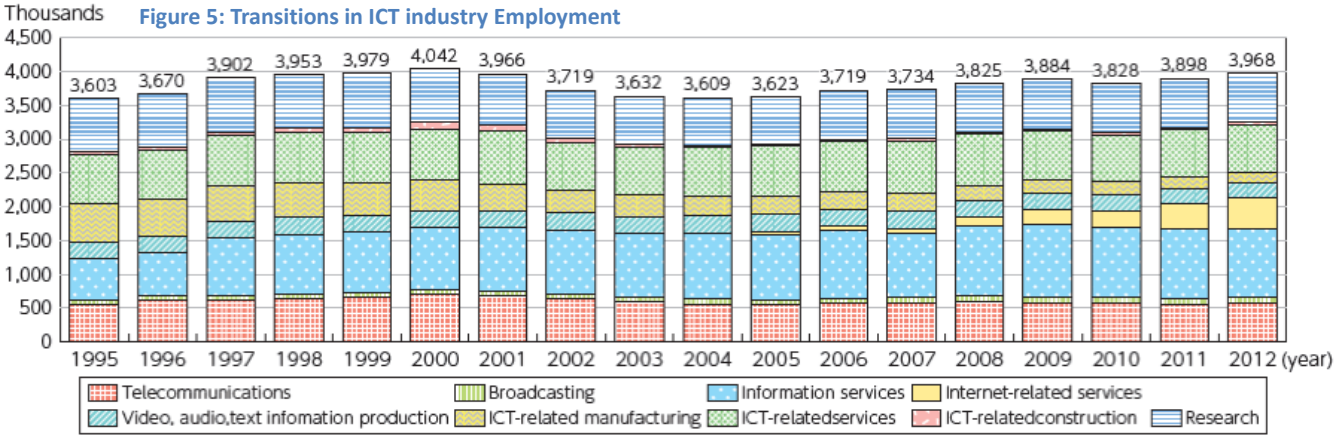
The top 3 items with the highest market share value in terms of physical goods are copy machines, liquid crystal TVs and notebook PCs, and all are showing a decrease in market share, which may suggest that Japans' ICT sector is shifting towards services. However, all Japanese ICT services measured apart from hardware product support are losing their market share.

[18] http://www.soumu.go.jp/main_content/000319905.pdf

Employment

The ICT industry employed 3.968 million people in 2012 (up 1.8% from the previous year), accounting for 7.1% of total employment in all industries. Employment declined by 20% relative to 2011 in the ICT-related manufacturing sector, by 2.2% in the video, audio, and text information production sector, and by 1% in the information services sector. But employment in the internet-related services sector and the ICT-related construction sector jumped by 20.9% and 14.1% respectively (Figure 5).

Figure 5: Transitions in ICT industry Employment



(Source) "Study on Economic Analysis of ICT," MIC (2014)

The Japanese ICT market is substantial in terms of employment, GDP participation and value added potential. Due to its saturated and matured domestic consumer base, this market proves to be a challenging but rewarding business environment. The spill over effect is also most evident in the ICT service sector which benefits and affects virtually every other segment of the Japanese economy.

1.2. The Japanese Digital Economy /ICT Strategic Policy Agenda

Japan's digital economy and ICT strategic policy agenda is based on a number of policies presented by various Japanese ministries. The main ones taken into account in this report are:

- ICT Growth Strategy II (2014)
- ICT Growth Strategy (2013)
- ICTs for inclusive social and economic development in Japan[19] (2013)
- Japan Revitalisation Strategy[20] (2013)
- Declaration to be the World's Most Advanced IT Nation[21] (2013)
- MIC White Paper on ICT (2014)[22]

The Smart Japan ICT Strategy [23] was developed by the Ministry of Internal Affairs and Communication (MIC). It consists of two main parts: the ICT Growth Strategy (the national strategy) and the Initiative on Intensification of International Competitiveness and Global Outreach in the Field of ICT (the international strategy).
The ICT Growth Strategy can be divided into these 9 priority areas:

- Smart Platinum Society – Super- aged society & ICT
- ICT in new business creation / Open Big Data / Education & ICT

[19] http://unctad.org/meetings/en/Presentation/cstd2013_ppt26_Ichikawa_en.pdf
[20] http://www.kantei.go.jp/jp/singi/keizaisaisei/pdf/honbunEN.pdf
[21] http://japan.kantei.go.jp/policy/it/2013/0614_declaration.pdf
[22] http://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/whitepaper.html
[23] http://www.soumu.go.jp/main_content/000301884.pdf

- Broadcast content
- Broadcast service sophistication
- Urban development & ICT
- Creation of ICT Innovation
- Geo-space & ICT
- Information Security / Person data
- ICT infrastructure development

The Initiative on Intensification of International Competitiveness and Global Outreach in the Field of ICT has 4 priorities:

- Improvement of Business Environment
- ICT human resources development and utilisation
- Development and strengthening of “technology diplomacy”
- Construction of “Public-Private All Japan system”

In February 2013, the Council on ICT Strategy and Policy for Growth was established. Its task was to study various policies relating to ICT, including the utilisation of ICT as one of the key means of boosting the growth of Japan’s economy, and of contributing to global society as well as to report the findings to MIC. The following priorities have been presented:

7 priority fields were identified for implementation by industry, academia and government

- Data utilisation
- Broadcast/contents (4k/8k)
- Smart Agriculture
- Regional revitalisation (expansion of ICT Smart Towns)
- Disaster prevention (social infrastructure using sensors, etc.)
- Medicine, nursing and health
- Resources (Marine Broadband utilising satellite communications)

4 tasks were outlined for the Japanese government to create the right environment for ICT development:

- Promotion of Open Data
- Strengthening of Cyber-security
- Building world-class ICT infrastructure
- Promotion of R&D to create innovation

Supported by conclusions from a report by the Information and Communication Council on the Desired Course of ICT Policies toward the Creation of Innovation (27 June 2014) the following sectors were highlighted as areas of focus.

- ICT and healthy and active ageing
- ICT Smart Town
- Disaster prevention
- Creating a society with no traffic accidents or road congestion

1.3. Identified bottlenecks and challenges for Japan

The type and range of challenges encountered varies greatly, however Japanese authorities have identified and addressed a number of issues in current ICT policy. The following challenges are discussed in the Smart Growth Strategy II, MIC White Paper 2014 and Japan Revitalisation Strategy 2013:

- Low marketability of R&D advances and innovation
- Only 16% of corporations are using ICT to raise profits
- Slow acceptance rate of new ICT solutions
- Legacy technologies, lack of interoperability, major role of System Integration companies (SI)
- Limited early ICT adopter potential
- Concentration on the home market with little outlook on expansion
- Limited society interest in active use of eGovernance procedures
- Lack of trust and confidence in digital solutions
- Quality standards unique to Japan – mainly in hardware, less so in software
- Fragmented business environment
- Risk averse business practices
- Lack of ICT-trained human resources
- Lack of business knowledge and skills and entrepreneurial culture
- Access to capital
- Problems with scaling up the smart city solutions
- High level of urbanisation slows down the implementation of smart solutions
- Regulatory environment not fit for purpose in the digital age
- Small size of companies: even Midcaps may be too small for some smart solutions

For a detailed comparison of challenges and cooperation options for Japan and EU see section 3.1 of this report.

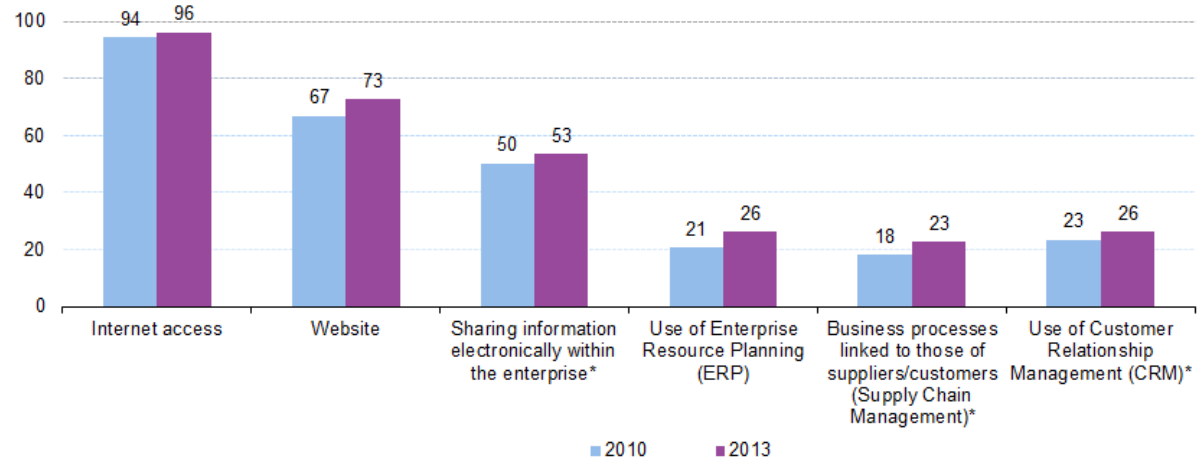
1.4. The landscape of Digital Economy in the EU

e-Business

At the average EU level, the digital economy is not yet being used to its full potential: 41% of EU businesses are still non-digital, and only 2% are taking full advantage of new digital opportunities. This is remarkable since new digital trends such as cloud computing, mobile web services, smart grids, and social media are radically changing the business landscape, creating new business opportunities and ways to engage with customers. With the aid of technology, small businesses can go international from day one, reaching overseas markets as well as talented potential employees. Businesses that fail to get digitally connected, however, risk becoming excluded from the global market.

Fortunately, there are some signs that the EU is catching up with other major economies. The percentage of EU enterprises with internet access seems to have reached saturation level in 2013, at 96%. Moreover, 73% of EU enterprises[24] have a website, and this figure is expected to grow.[25]

Figure 6 Adoption of e-business technologies in enterprises, EU-28, 2010 and 2013 (% of enterprises)



(*) 2012 instead of 2013

(Source) Eurostat

e-Commerce

Shopping via the internet continues to grow. A 2013 study "Consumers at home in the single market" determined that as many as 45% of European consumers made at least one online purchase during the previous year. This represented an increase of 2% since 2011 and a 5% increase since 2010. [26] This growth rate resulted in a proportion of internet shoppers of 50.2% in 2014, in line with the target set out in the digital agenda for Europe.[27] Meanwhile, business-to-consumer e-commerce grew by almost 20% in volume between 2011 and 2012 in the EU to reach around €270 billion.[28] According to Eurostat, 15% of EU enterprises are selling their goods online as of 2014 (at least 1% of turnover) and a similar percentage of EU enterprises were making purchases online in 2013. Despite the ongoing economic difficulties in many European countries, Europe's e-commerce total revenue increased by 16% in 2013.[29] For 2015, e-commerce sales in Europe are expected to increase by 18.4% to €185.39 billion. This is the same growth rate as in 2014 (from €131.61 billion in 2013 to €156.28 billion in 2014). [30]

[24] Distinguishing between small and large enterprises, the figures were 70% and 93%, respectively.
[25] http://ec.europa.eu/eurostat/statistics-explained/index.php/E-business_integration
[26] http://ec.europa.eu/consumers/archive/consumer_research/editions/docs/9th_edition_scoreboard_en.pdf
[27] http://ec.europa.eu/digital-agenda/create-graphs
[28] http://ec.europa.eu/consumers/archive/consumer_research/editions/docs/9th_edition_scoreboard_en.pdf
[29] http://etc-digital.org/digital-trends/ecommerce/ecommerce-insights/regional-overview/europe/
[30] http://ecommercenews.eu/ecommerce-sales-europe-will-increase-18-4-2015/

Mobile commerce is on its way to becoming the next big trend in online commerce from 2014 onwards. In 2013, nearly 13% of online sales already were conducted via mobile devices. As smartphone purchases have grown by 97% in 2013 and tablet shopping by 60%, m-commerce is expected to account for a growing share of online sales.[31]

Broadband

According to the European Commission's 2014 Digital Agenda Scorecard, basic broadband access is now available to everyone in the EU. In addition, fixed technologies currently cover 97% of the EU, leaving 6 million homes unconnected. Next Generation Access (NGA) coverage is currently at 62%, compared with 54% one year previously. However, access to broadband in rural areas remains relatively low, especially in terms of NGA.[32]

The results of the Commission's 2014 study on broadcasting coverage in Europe show that over 213 million EU households (or 99.4% of the total) had access to at least one of the main fixed or mobile broadband access technologies at the end of 2013. If satellite coverage is included, then basic coverage is at 100%, in line with the Commission's "Digital Agenda for Europe" target of 100% coverage by the end of 2013.[33]

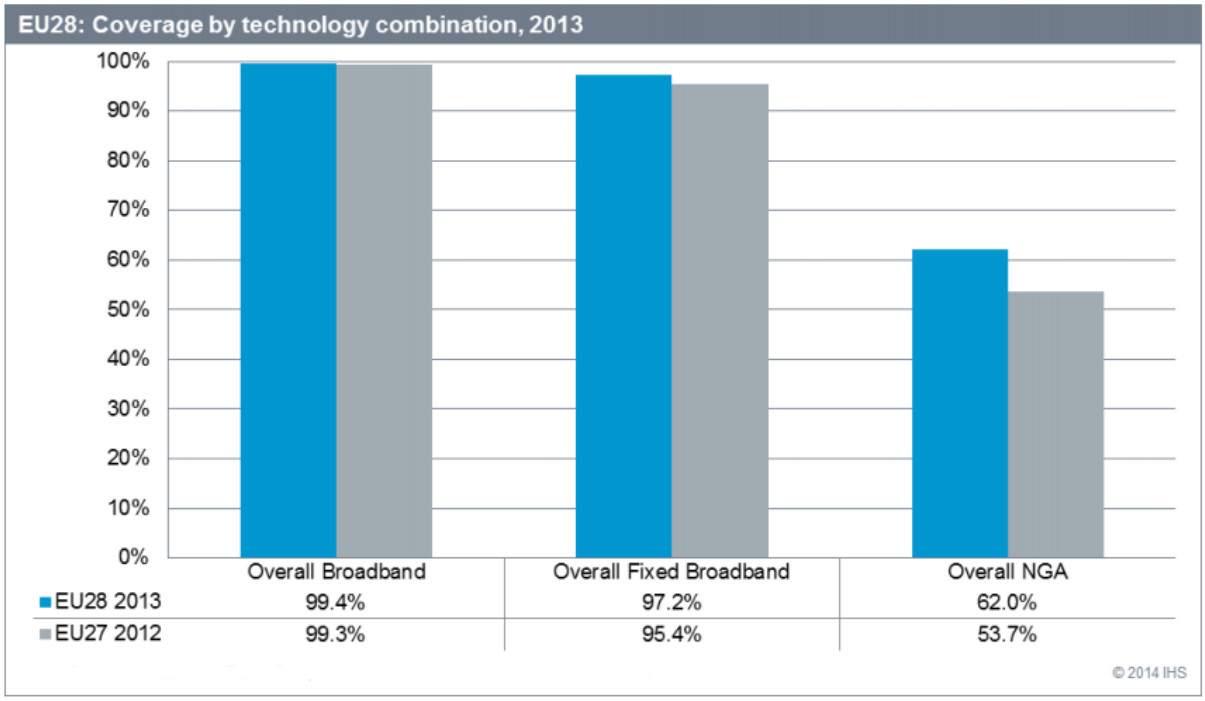


Figure 7: Fixed Broadband rates in the EU, 2013

(Source) Eurostat

In addition, availability of access for next-generation access services (VDSL, DOCSIS 3.0 and FTTP) increased by 8.3 percentage points over the same period (or 20.5 million additional households). By the end of 2013, 62% of households across the EU Member States had technical access, compared with 53.7% in 2012.

There are currently 30 fixed broadband subscriptions per 100 people in the EU, which indicates a subscription rate of 76% of EU households. This number is increasing, but the growth rate remains sluggish at between 1 and 1.3% per year. This slowdown is primarily caused by broadband coverage reaching saturation point in the wealthier EU member states as well as a modest migration from fixed to mobile technologies. The market grew by 5.4 million subscriptions in

[31] http://etc-digital.org/digital-trends/ecommerce/ecommerce-insights/regional-overview/europe/
[32] http://ec.europa.eu/digital-agenda/en/news/scoreboard-2014-trends-european-broadband-markets-2014
[33] https://ec.europa.eu/digital-agenda/en/news/study-broadband-coverage-europe-2013

2013.

4G (LTE) mobile broadband coverage reached 59% in 2013, up from 27% one year previously. 4G has been commercially launched in all but 3 EU member states (Bulgaria, Cyprus and Malta). LTE deployments have focussed so far on urban areas, and are most widely developed in Sweden, Portugal and the Netherlands.

Due to the increasing availability of NGA networks in Europe, fast broadband subscriptions are becoming more and more widespread: There are currently 6.3 fast broadband subscriptions per 100 people in the EU. Ultrafast connections however currently represent only a fraction of fixed broadband subscriptions. In January 2014, only slightly more than one in five subscriptions were at least 30 Mbps and only 5.3% at least 100 Mbps.

In addition, there are currently 62 active mobile broadband SIM cards per 100 people in Europe, up from 26 three years ago. However, mobile broadband is primarily used as a complimentary connection rather than a substitute for fixed broadband.[34]

Internet of Things (IoT)

In 2013, it was estimated that there were about 2.5 billion connected objects in the EU. By 2020, the expectations are that this number will have increased to 25 billion.[35] The development of this new market has a lot in common with the creation of cellular mobile services in 1994. The impressive expansion of this market during the past two decades was impossible to predict. Nevertheless, the pace of developments is likely to be much faster with IoT. This means that the adoption of IoT could generate billions of Euros that easily translate into growth and employment.[36] Since both public and private sectors are looking for ways to adapt to the uncertain economic climate and to help boost economic regeneration; the Internet of Things is seen by many stakeholders as one of the main answers to these challenges.[37] For this reason, the European Commission decided to fund the IERC-Internet of Things European Research Cluster under the Seventh Framework Programme.[38] The Cluster groups together the IoT projects funded by the European research framework programmes, as well as national IoT initiatives. The requirements of IoT will also be fed into the research on empowering network technologies, like 5G Mobiles.[39]

Telecoms

Today there are more than 250 million daily internet users in Europe, and virtually every European owns a mobile phone.[40] Voice services (fixed and mobile) are still the main contributor to revenues of EU telecom operators, accounting for 59%. However, their relative size continues to decrease (-7% growth in fixed voice telephony and -2.7% in mobile in 2012). Data revenues, accounting for 41% of the sector, continue to grow, in particular revenues for mobile data services (6.3% growth compared to a 3.5% growth for fixed data).[41] Despite this, revenues in the European electronic communications sector declined by 3.3% in 2012 (from €334.7 billion to €323.6 billion) in clear contrast with the trend in the rest of world: the USA experienced growth in revenues of 5.1%, Japan of 0.11% and overall global growth was 4.2% in 2012. Paradoxically, at the same time, there was a 1.4% increase in investments in Europe (from €41.5 billion to €42.1 billion). [42]

[34] http://ec.europa.eu/digital-agenda/en/news/scoreboard-2014-trends-european-broadband-markets-2014
[35] http://ec.europa.eu/dgs/connect/en/content/network-technologies-smart-networks-and-novel-architectures
[36] http://ec.europa.eu/digital-agenda/en/internet-things
[37] http://ec.europa.eu/digital-agenda/en/news/6th-annual-internet-things-european-summit-0
[38] http://www.internet-of-things-research.eu/about_ierc.htm
[39] http://ec.europa.eu/digital-agenda/en/internet-things
[40] http://ec.europa.eu/competition/sectors/telecommunications/overview_en.html
[41] https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/DAE%20SCOREBOARD%202013%20-%201-THE%20eCOMM%20SECTOR.pdf
[42]https://ec.europa.eu/digital-agenda/en/news/2014-report-implementation-eu-regulatory-framework-electronic-communications

The European Commission's Flagship Initiative on a Digital Agenda for Europe, launched in August 2010, sets out the Commission's priorities in the field of the digital economy and highlights the creation of a single market for content and telecom services as a vital tool to regain progress lost during the economic crisis. [43] One of the most visible shortcomings of the digital single market, namely the difference between roaming and national tariffs, should be addressed in 2015. Furthermore, it also sets ambitious targets for fast and ultra-fast internet access in Europe.

The Commission has had success in increasing competition in the mobile communications sector, bringing new entrants into the telecoms sector throughout Europe, forcing established providers to raise their standards of service and reduce their prices, and applying the competition rules to maintain competition between telecoms operators.[44]

Market size and competitiveness (in terms of value added of the ICT sector[45])

The EU ICT sector value added (ICT VA) amounted to 507.61 billion euro in 2011. The EU ICT VA represents around 4% of total GDP. Between 2006 and 2007, ICT VA and GDP grew by 2.92% and 3.20% in real terms, respectively. However, during the first year of recession ICT VA growth fell to 0.09% and GDP growth fell to 0.41%. Both indicators experienced a drop of around -4.5% in 2009, but recovered again in 2010. ICT VA growth continued to recover in 2011, from an annual growth rate of 0.40% in 2010 to 1.10% in 2011. However, in the same period, the GDP annual growth rate went in the opposite direction, declining from 1.96% in 2010 to 1.70% in 2011.

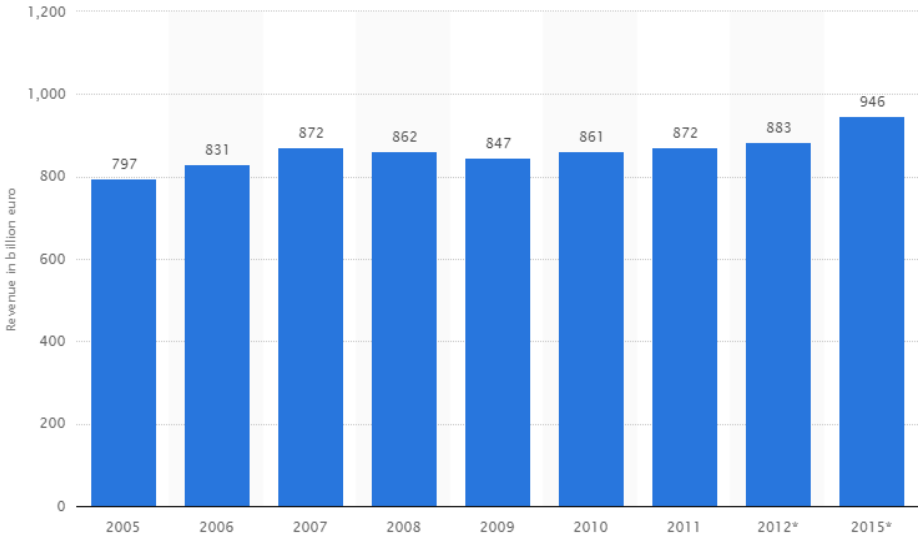


Figure 8: Revenue from the digital ICT market in Europe

(Source) Statistica.com

In 2011, 44.3% of European companies in the ICT sector bought goods online while 21.4% were engaged in online sales. Across all industries, 19.1% of enterprises shop online and 13% offer their goods online.[46]

The competitiveness of the EU ICT sector varies considerably between the member states. According to a 2012 study on economic growth and competitiveness of the EU ICT sector, Finland and the UK had the most competitive ICT sectors, (representing 8 and 8.5% of their respective GDPs) whereas Greece and Lithuania (just under 3% each) had the least competitive ICT sectors when measured on the Global Competitiveness Index.[47]

[43] http://ec.europa.eu/competition/sectors/telecommunications/overview_en.html
[44] http://ec.europa.eu/competition/sectors/telecommunications/overview_en.html; http://ec.europa.eu/competition/sectors/telecommunications/mobile_en.html
[45] http://is.jrc.ec.europa.eu/pages/ISG/documents/PREDICT2014.pdf
[46] http://www.oecd.org/sti/ieconomy/Final_7.b_Internet%20selling%20and%20purchasing%20by%20Industry_2012.xls
[47] http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2173340

One of the many avenues that are being explored by the European Commission in order to raise competitiveness is the integration of digital technologies in the manufacturing process in light of the growing importance of the industrial internet and the use of "big-data" in the manufacturing process.

Employment[48]

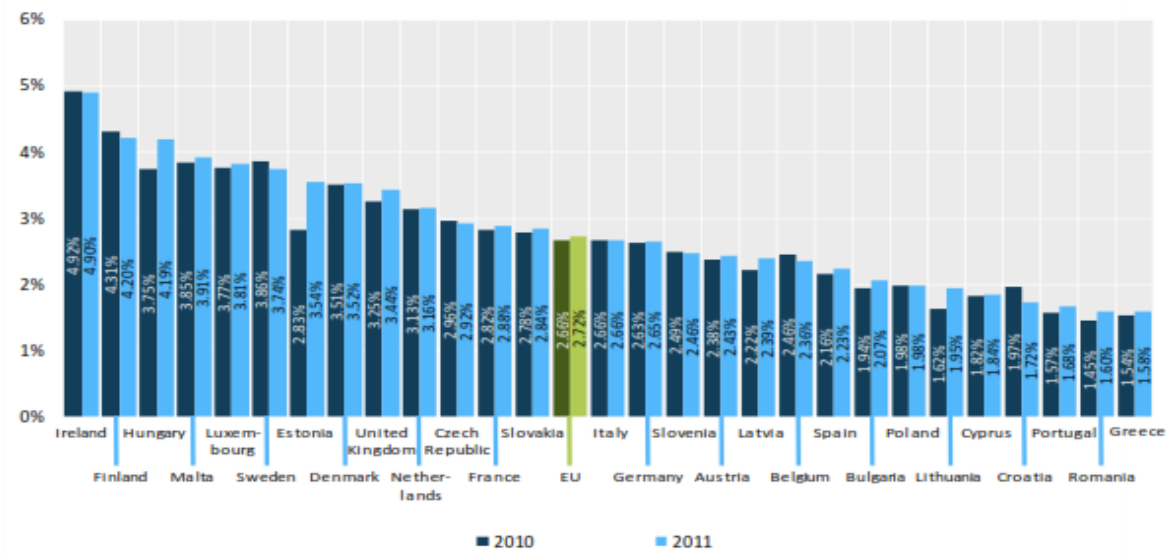
Total ICT sector employment in the EU amounted to 6.13 million people in 2011. The ICT sector's employment share was 2.7% of total EU employment in 2011. In contrast to the case of VA, ICT sector employment increased during the first few years of the recession that started in 2008, falling since this year until 2011, when it increased to 2.72%.

Employment in the ICT service sectors did not suffer due to the economic crisis to the same extent as ICT manufacturing employment or overall employment. In fact, while manufacturing contracted by -14.10% in 2009, ICT service employment only contracted by -0.27%. In 2011, both ICT manufacturing and ICT services employment began to grow, especially ICT services, whose annual growth rate (2.85%) was almost three times higher than in ICT manufacturing (1.03%).

Figure 9: ICT sector employment and total employment annual growth rates

Source: Eurostat, elaborated by Ivie and JRC-IPTS.

Figure 10: ICT sector employment share of total employment



Source: Eurostat, elaborated by Ivie and JRC-IPTS.

[48] http://is.jrc.ec.europa.eu/pages/ISG/documents/PREDICT2014.pdf

1.5. The EU Digital Economy/ICT Strategic Policy Agenda

The European Union's strategic agenda for Digital Economy and ICT is based on a number of policy documents developed by the European Commission services. The main ones taken into account for this report are:

- Digital Agenda for the Europe 2020 Strategy[49] (2015)
- Digital Single Market[50] (2014)
- The Grand Coalition of Digital Jobs[51] (2014)
- Implementation of the EU regulatory framework for electronic communications report[52] (2014)
- Digital Agenda Scoreboard Reports[53] (2014)
    - Research and Innovation: Research Projects in the ICT domain (FP7 ICT and CIP)
    - eGovernment
    - Digital Inclusion and Skills
    - Digital Agenda Targets Progress report
    - Use of Internet Services
    - The EU ICT Sector And Its R&D Performance
    - Broadband Markets
- Digital "to-do" list: new digital priorities for 2013-2014[54]
- Communication From The Commission: Smart Cities And Communities - European Innovation Partnership[55] (2012)
- Europe's digital challenge[56] (2013) + conclusions
- Horizon 2020 [57](Industrial Leadership, Societal Challenges – ICT related sections)
- EU Industrial Policy Communications[58] (2010,2012,2014)
- Fostering the digitalisation of industry – DG GROW[59] 2014

Digital Agenda for Europe - brief introduction

The Digital Agenda for Europe (DAE) is the EU strategy to help its citizens and businesses get the most out of digital technologies. It is the first of seven flagship initiatives under the Europe 2020 Strategic Agenda. Launched in May 2010, the DAE contains 101 actions, grouped around seven priority areas. It is estimated that the full implementation of the Digital Agenda would increase European GDP by 5% over the next eight years. Part of the 'Digital Agenda' is the ambition to complete an integrated European Digital Single Market (DSM) by 2015, in particular by adopting measures to boost confidence in online trade and by providing better broadband coverage. Potential Japanese investors or companies seeking industrial cooperation should follow developments in the implementation of DSM closely, since it will certainly create further growth and investment opportunities in the EU (ICT sector) and beyond (improving the productivity and competitiveness for companies operating in Europe).

[49] http://ec.europa.eu/digital-agenda/en/digital-agenda-europe-2020-strategy
[50] http://ec.europa.eu/priorities/digital-single-market/index_en.htm
[51] http://ec.europa.eu/digital-agenda/en/grand-coalition-digital-jobs
[52] https://ec.europa.eu/digital-agenda/en/news/2014-report-implementation-eu-regulatory-framework-electronic-communications
[53] http://ec.europa.eu/digital-agenda/en/download-scoreboard-reports
[54] http://europa.eu/rapid/press-release_IP-12-1389_en.htm
[55] http://ec.europa.eu/eip/smartcities/
[56] https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/140245.pdf
[57] http://ec.europa.eu/programmes/horizon2020/
[58] http://ec.europa.eu/enterprise/policies/industrial-competitiveness/industrial-policy/index_en.htm
[59] http://ec.europa.eu/information_society/newsroom/image/eu_co-operation_workshop_on_innovation_in_digital_manufacturing_terms_of_reference_and_agenda_8512.pdf

The main objective of the Digital Agenda is to develop a digital single market in order to generate smart, sustainable and inclusive growth in Europe. It is made up of seven pillars:

- Achieving the digital single market
- Enhancing interoperability and standards
- Strengthening online trust and security
- Promoting fast and ultra-fast Internet access for all
- Investing in research and innovation
- Promoting digital literacy, skills and inclusion
- ICT-enabled benefits for EU society

Digital Single Market priorities

The Digital Agenda aims to update EU Single Market regulations to be relevant and accurate in the digital era. Action undertaken in the Digital Single Market framework has the purpose of boosting the number of music downloads, establishing a single area for online payments and expand the protection of EU customers in cyberspace.[60]

EU Digital Single Market priorities as stated by President Juncker's Political guidelines[61]:

- Rapidly concluding negotiations on common EU data protection rules.
- Giving more ambition to the ongoing reform of telecoms rules.
- Modifying copyright rules to reflect new technologies.
- Simplifying consumer rules for online purchases.
- Making it easier for innovators to start their own company.
- Boosting digital skills and learning.

The Grand Coalition for Digital Jobs: Key Priorities

The Grand Coalition for Digital Jobs is a multi-stakeholder partnership launched by the European Commission to tackle the lack of digital skills in Europe and to fill the thousands of unfilled ICT-related vacancies in the EU labour market. Its key priorities are:

- Training and matching for digital jobs: to match the skills of workers with the requirements of digital business.
- Certification - to improve recognition of qualifications across the EU;
- Innovative learning and teaching – to offer more aligned degrees and curricula at vocational and university level education so that students get the skills for success;

[60] https://ec.europa.eu/digital-agenda/en/our-goals/pillar-i-digital-single-market
[61] http://ec.europa.eu/priorities/digital-single-market/index_en.htm

- Mobility – to help those with the right skills get to where they are needed, to avoid shortages and surpluses in different geographical areas
- To attract young people to ICT, which offers rewarding and enjoyable careers to both women and men.
- Coding - to raise awareness on the importance of coding skills (European Coding Initiative)

"Digital Economy" in the EU Industrial Policy Strategy

The "Digital Economy' elements and priorities are also part of the EU integrated industrial policy approach which is outlined in the European Commission's Industrial Policy Communications of 2010 and 2012 and particularly in the latest 2014 Industrial Policy Communication "For an EU Industrial Renaissance" [62] which, among other things, prioritises the need for industrial modernisation, uptake of innovation and a horizontal development of advanced manufacturing technologies (i.e. integrating digital technologies into production processes) for increased productivity and competitiveness.

It is also worth mentioning that, a dedicated Task Force for Advanced Manufacturing Technologies for Clean Production was established in 2013 which produced in 2014 a report called "Advancing Manufacturing-Advancing Europe". [63] The report presents an overview of measures taken recently to foster the adoption of advanced manufacturing by European industry, many of which are digitally/ICT based, in order to increase the competitiveness of European industry.

Examples of EU Member State strategies

Individual EU Member States have also adopted their own strategies for Digital Economy and ICT. Coordination between these national initiatives, and synergy with the EU level strategies, is be improved in order to generate and maximise an EU wide aggregate impact.

- Germany is following the agenda "Industry 4.0" to use the potential of cyber-physical systems ('the Internet of Things') to maintain industrial leadership. 'Industry 4.0' thus covers manufacturing, services and industrial design. One focus is on intelligent production systems and processes and the realisation of distributed and networked production sites. Under the heading 'Smart Production', there will be a stronger focus on intra-company production logistics, human-machine interaction and the use of 3D manufacturing.

- Finland's innovation agency Tekes focuses R&D&I support in manufacturing to ICT-enabled manufacturing and sustainable manufacturing. The focus is set on renewing services and production by digital means (new ICT-enabled business processes, knowledge and information-based business concepts, connecting the real and the virtual worlds)[64]

- France has included "factories of the future" and robotics among its 34 initiatives for reindustrialisation.

[62] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0014
[63] http://ec.europa.eu/enterprise/policies/innovation/policy/amt/index_en.htm
[64] http://www.tekes.fi/en/community/Home/351/Home/473

Digital Agenda Targets

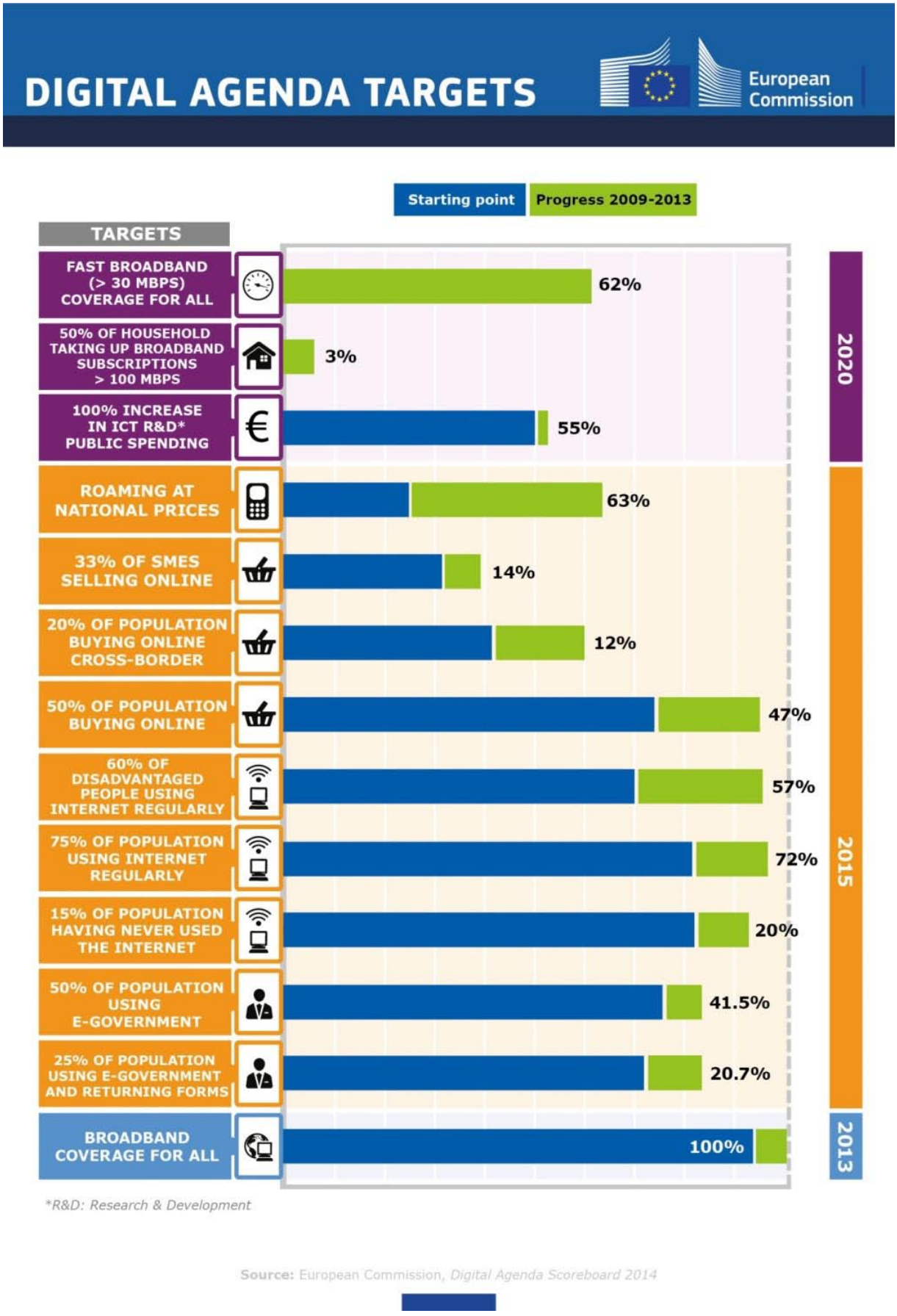


Figure 11: Digital Agenda Targets

1.6. Identified bottlenecks and challenges for the EU

The European Digital Agenda has established a solid framework of recommendations and has identified a number of areas that need to be addressed:

- EU businesses invest less in ICT than Japanese and US businesses
- Insufficient business investments in ICT
- Lower innovation in advanced ICT technologies
- Rigidities in labour and product markets
- Digital transformation is still in its infancy
- Only 1.7% of EU enterprises take full potential of big data, cloud computing, mobile and social solutions
- Stagnant eGovernance spread rate
- Shortcomings in the performance of the Internal Market
- Technical barriers and lack of interoperability
- Fragmented business environment
- Risk averse business practices
- Lack of business knowledge and skills and entrepreneurial culture
- Access to capital
- Lack of ICT-trained human resources
- Lack of trust and confidence in digital solutions
- Problems with scaling up the smart city solutions
- High level of urbanisation slows down the implementation of smart solutions
- Regulatory environment not fit for purpose in the digital age
- Small size of companies: even Midcaps may be too small for some smart solutions

For a detailed comparison of challenges and cooperation options for Japan and EU see section 3.1 of this report

1.7. Benchmarking – "Industry 4.0"

A possible benchmark for the EU – Japan digital economy endeavours is presented by Germany's "Industry 4.0" Strategic Initiative

'Industry 4.0' was conceived as part of the German government's High-Tech Strategy, focusing on information and communication technologies. It was then further developed to include production research and user industries. The initiative builds on European strengths in (software-intensive) embedded systems, particularly in the car industry and engineering. So called Cyber-Physical Systems are becoming increasingly important in this context, e.g. through the networking of embedded ICT systems both with one another and with the internet.

The initiative considers that industrial production in the future will be characterised by a strong customisation of products with highly flexible (large series) production, extensive integration of customers and business partners in business and value-adding processes, and in linking of production and high-quality services leading to so-called hybrid products.
Along with increased automation in industry, the development of intelligent monitoring and autonomous decision-making processes is particularly important in order to steer and optimise both companies and entire value-adding networks, almost in real-time. The aim is to develop completely new business models and tap the considerable potential for optimisation in the areas of production and logistics.[65]

[65] http://www.bmbf.de/en/19955.php

II. EXAMPLES OF ICT INVESTMENTS AND R&D COOPERATION PROJECTS

2.1. Examples of Japanese ICT/Electronics investments in Europe

Japanese direct investments in Europe in the ICT sector are rapidly increasing by about €10 billion per year, and amount to about €160 billion in total, almost twice as high as European investments in Japan.

In an effort to overcome the lack of growth in Japan, Japanese companies over the last few years have been extremely active in acquiring European companies. Japanese companies are particularly active acquiring European technology companies – in 2015 alone, the EU-Japan investment registry shows Japanese acquisitions in Europe totalling € 6 billion (far more than European acquisitions in Japan this year).

Examples of the most recent Japanese investments in the EU's ICT sector include Sosei Group's acquisition of UK-based Heptares Therapeutics Ltd for €357.8 million (2015); Hitachi's acquisition of the rail manufacturer AnsaldoBreda STS SpA and of 40% of the signalling and rail system company Ansaldo STS SpA. Hitachi is expected to acquire the remaining 60% of Ansaldo STS SpA in a tender offer. Total estimated acquisition costs are about € 2 billion (2015); NTT Communications is expected in 2015 to acquire German data centre operator E-shelter Facility Service GmbH for €751.4 million.[66]

For detailed list of Japanese ICT/Electronics investments in Europe see Table 2 in Annexes

2.2. Examples of European Investments in Japan

European companies have been investing in Japan for the past 100 years and total FDI amounts to over 80 billion yen. Nevertheless, compared with Japanese ICT investment in the EU, the presence of the EU ICT industry in Japan is rather limited and therefore there is still a lot of unexplored business and technological cooperation potential.

The most recent EU investments in Japan's ICT sector include NOKIA's acquisition of Panasonic's mobile phone base station unit Panasonic System Networks for 8.7 million Euro (2014); the acquisition by Colt, "The information delivery platform" of Tokyo-based KVH, "Asia's information delivery platform" for 130,3 million Euro (2014) and BOSCH Packaging Technologies acquisition of Eisai Machinery (2012).

Some major European ICT investments have failed, such as the case of Vodafone – Japan. Had this endeavour been successful, the EU's direct investment stock in Japan today would be much greater[67]

2.3. The Current Status and the Potential of EU-Japan R&D cooperation on Digital Economy - the "Joint Projects" under the Horizon 2020 Framework

The R&D plays a fundamental role in the development of "Digital Economy" and all the basic premises are in currently place for an increase in EU-Japan R&D cooperation. The EU and Japan concluded the Science and Technology Cooperation Agreement in November 2009, which then came into effect in 2011. This has been the legal basis for wider EU-Japan cooperation in science, technology and innovation (STI) since then. STI has indeed become one of key elements of the

[66] http://eu-japan.com/investment/japan-to-europe/
[67] http://eu-japan.com/investment/europe-to-japan/

EU-Japan partnership and, among others, ICT cooperation has been one of the most important topics.

Moreover, in the Joint Press Statement of the 22nd EU-Japan Summit (the so called "Innovation Summit"), the importance of EU-Japan cooperation on ICT was highlighted and acknowledged.

The long-running EU-Japan ICT Policy dialogue has recently become supplemented (since 2014) by an EU-Japan "Cyber dialogue" (focus on cyber-security). The agenda for the bilateral ICT dialogue scheduled for March 2015 in Tokyo is very relevant with topics which include: internet governance, cyber-security, 5G cooperation, R&D under Horizon2020 cooperation etc.

The EU and Japan have already been seeking opportunities and best modalities for strategic cooperation in the area of Future Internet (New-Generation Network in the Japanese terminology). Since 2008, a series of symposia has been jointly organised by the European Commission and the Japanese National Institute of Information and Communications Technology (NICT), which served as an effective platform for partnership building towards collaborative projects. At the 3rd such symposium (Finland, 20-21 October 2010), more than 20 topics for cooperation were presented, which was then materialised as the 1st EU-Japan Joint (Coordinated) Call under FP7 (ICT-2013.10.1). In addition, the 2nd Joint (Coordinated) Call was launched under Horizon 2020 and, as of March 2015, 10 collaborative projects are running, jointly supported by the European Commission and NICT as well as the Japanese Ministry of Internal Affairs and Communication (MIC) through these coordinated calls.

More details of these EU-Japan ICT focused joint (coordinated) projects are presented below:

1st EU- Japan coordinated call

In May 2012, European Commission Vice President Neelie Kroes met with the Japanese Minister of Internal Affairs and Communications, Mr Tatsuo Kawabata, to reaffirm their close partnership in the area of ICT. In particular, they discussed Internet policies, Internet security, cloud computing, safer Internet for children, cooperation on ICT R&D and healthy ageing.
This meeting preceded the first ICT Japan-EU coordinated call, published in October 2012. The Call focused on generic ICT topics: wireless communications, optical networks, cyber security, cloud computing/IoT, federated test beds and green networking. Six projects were selected and received around €18m in funding. They attempt to develop solutions to challenges such as cyber security, network capacity, storage, high-density data traffic and energy efficiency.[68]

The STRAUSS project: This project aims to define a highly efficient and global (multi-domain) optical infrastructure for Ethernet transport, covering heterogeneous transport and network control plane technologies, enabling an Ethernet ecosystem. The proposed architecture leverages on software-defined networking principles, on optical network virtualisation as well as on flexible optical circuit and packet switching technologies beyond 100 Gbps. Proposed solutions will be experimentally validated by means of demonstrations on large scale testbeds in the EU & Japan. STRAUSS will provide technological roadmaps, technical approaches and deployment strategies aiming at shortening innovation and exploitation cycles in the area of future optical Ethernet transport networks for both academia and industry in the EU and Japan.[69] The European partners for this project include Centre Tecnològic de Telecomunicacions de Catalunya (Spain), ADVA Optical Networking SE (Germany), Telefónica Investigación y Desarrollo (Spain), University of Bristol (UK) and Fraunhofer Gesellschaft e.V. (Germany). They are joined by following Japanese organisations: Osaka University, KDDI R&D Laboratories Inc. and Fujitsu Ltd.

[68] https://ec.europa.eu/digital-agenda/en/node/67100
[69] http://www.ict-strauss.eu/en/

ClouT Project - €1,5M EC funding; €1,5M NICT funding[70]: The overall goal of ClouT is to take advantage of Cloud Computing to bridge the Internet of Things with the Internet of People via the Internet of Services. This would enable the establishing of an efficient communication and collaboration platform, exploiting all possible information sources to make the cities smarter and to help them face the emerging challenges such as efficient energy management, economic growth and development. The project will provide infrastructure, services, tools and applications that will be reused by different city stakeholders such as municipalities, citizens, service developers and application integrators, in order to create, deploy and manage user-centric applications. ClouT's ultimate goal is to create a long-lasting synergy for smart city initiatives between Europe and Japan.[71] The overall ClouT consortium is made of 13 partners, 6 from 3 different European countries and 7 from Japan comprising: 2 research centres, 2 universities, 5 large industrials and 4 cities.[72]

MiWEBA Project: In order to meet the capacity requirements of future cellular networks in the long term, MiWEBA aims to establish an overlay of mm-wave cells on top of the current cellular network. This approach involves network densification and spectrum extension and promise the highest gains to increase network capacity. Furthermore, a huge frequency bandwidth can be exploited, globally harmonised over more than 6 GHz spectrum. Once sufficient market penetration with terminals supporting mm-wave technology is reached, direct link type device-to-device communication will enable direct user data exchange when in close vicinity.[73] The consortium is composed of Fraunhofer Heinrich Hertz Institute; Intel Mobile Communications GmbH; Orange Labs, France; Politecnico di Milano (Italy); CEA-LETI (France); Panasonic AVC Networks Company; Osaka University; Tokyo Tech and KDDI R&D Laboratories.[74]

FELIX Project: The objective of FELIX is to allow users to build their own virtual slices using the resources of remote Future Internet facilities. In order to accomplish its goals, a FELIX federation framework will be produced, a European-Japanese test-bed infrastructure will be created, and these will be validated with the execution of real-use cases. The project is not limited to single resources type or technology, but rather integrates various type of resources to offer world-wide services.[75] The partners for this project include Poznan Supercomputing and Networking Center (Poland), the National Institute of Advanced Industrial Science and Technology (Japan), Nextworks (Italy), I2CAT (Spain), SURFnet (Netherlands), the European Center for Information and Communication Technologies Gmbh (Germany), iMinds (Belgium) and KDDI (Japan).[76]

NECOMA Project: NECOMA addresses the aspect of data collection, aims to expand existing mechanisms and orient them towards threat data analysis. The project addresses threat data analysis not only from the perspective of understanding attackers and vulnerabilities, but also from the point of view of the target and victim, needing to protect itself in real-time and in the most efficient manner possible. This will be achieved through the development of metrics that allow to measure the impact of attacks on the protected infrastructure or endpoint. Finally, it aims to develop and demonstrate new cyber defence mechanisms that leverage these metrics for deployment and evaluation.[77] The consortium includes Institut Mines-Telecom (France), the Nara Institute of Science and Technology, Atos, Internet Initiative Japan Inc., the Foundation for Research and Technology – Hellas, the National Institute of Informatics (Japan), the Research and Academic Computer Network (Poland), Keio University (Japan), 6cure (France) and the University of Tokyo.[78]

[70] http://clout-project.eu/about/; Total cost: €2,3M European cost; €1,6M Japanese cost.
[71] http://clout-project.eu/clout-concept-the-cloud-of-things/
[72] http://clout-project.eu/consortium/
[73] http://www.miweba.eu/?page_id=80
[74] http://www.miweba.eu/?page_id=142
[75] http://www.ict-felix.eu/
[76] http://www.ict-felix.eu/?page_id=33
[77] http://www.necoma-project.eu/
[78] http://www.necoma-project.eu/newpartners/

GreenICN Project: Information Centric Networking (ICN) is a new approach where the network provides users with named content, instead of communication channels between hosts. Research on ICN is at an early stage, with many key issues still open, including naming, routing, resource control, security, privacy and a migration path from the current Internet. Furthermore, current proposals do not sufficiently address energy efficiency. GreenICN aims to bridge this gap, addressing how the ICN network and devices can operate in a highly scalable and energy-efficient way. The project will exploit the designed infrastructure to support two exemplary application scenarios:

- The aftermath of a disaster e.g., hurricane or tsunami, when energy and communication resources are scarce and it is critical to efficiently distribute disaster notification and important rescue information.
- Scalable, efficient pub/sub video delivery, a key requirement in both normal and disaster situations.[79]

The consortium is coordinated by Georg-August-Universität Göttingen (UGO, Germany) for the EU-side, and KDDI R&D Laboratories Inc. (KDD, Saitama) for the Japanese side. The other participants include NEC Europe Ltd., CEDEO (Italy), Orange Labs (Poland), University College London, Consorzio Nazionale Interuniversitario per le Telecomunicazioni (Italy) in Europe; and NEC Corporation; Panasonic Advanced Technology Development Co., Ltd; the University of Tokyo; Waseda University and Osaka University from Japan.[80]

2nd EU-Japan coordinated call

In early 2013 two workshops were held in order to identify further topics of cooperation in Brussels and Tokyo. This was followed by the launch of the second EU-Japan coordinated call under the Horizon 2020 programme. Four projects where set forth with a total of 12 million Euro of joint funding.

The SAFARI project - €1.5m of Horizon 2020 funding: The SAFARI (Scalable And Flexible optical Architecture for Reconfigurable Infrastructure) project's aim is to develop new technologies to support high-speed data networks. Researchers from the University of Southampton's Optoelectronics Research Centre (ORC) in the UK will share the EU funding with Coriant GmbH and the Technical University of Denmark. The project also involves Japanese-based firms Nippon Telegraph and Telephone Corporation (NTT) and Fujikura Ltd.[81]

The RAPID project: Many low-power devices such as smartphones, tablets, notebooks as well as several other embedded systems can't always cope with the increased demand for processing power, memory and storage required by modern applications in gaming, vision, security, robotics, aerospace, etc. RAPID tackles this challenge by taking advantage of high-performance accelerators and high-bandwidth networks. It will use innovative radio network architectures to advance 5G technology, and will support smart phone internet downloads of more than 1Gbs bandwidth to each user in an Olympic stadium and other crowded public areas by 2017. This means users will be able to download a 1-hour HD movie in just 30 seconds.[82]

The iKaaS (intelligent Knowledge-as-a-Service) project: The focus of the joint research is the development of innovative global cloud platform technologies to meet the new challenges of big data, mobile and IoT (Internet of Things). It aims to address requirements from business and industrial applications, such as robotics or factory automation and/or societal applications, such as health management for an aging society. The consortium includes Atos; University of Oulu (FI);

[79] http://www.greenicn.org/
[80] http://www.greenicn.org/consortium/
[81] http://horizon2020projects.com/global-collaboration/uk-and-japan-join-forces-in-h2020-funded-high-speed-data-project/
[82] http://www.rapid-project.eu

Wings; CREATE NET; University of Surrey (UK); INNOTEC; City and Region of Madrid; Hitachi; KDDI Labs; KDDI Research Institute; Kokusai Kogyo Co., Ltd. and RIKEN.[83]

The FESTIVAL project - Federated interoperable Smart ICT services development And testing platforms: The project's vision is to provide IoT experimentation platforms, providing interaction facility with physical environments and end-users. Experimenters will be able to validate their Smart ICT service developments in various domains such as smart city, smart building, smart public services, smart shopping, participatory sensing, etc. The consortium is coordinated by CEA-LETI and Osaka University (JP), and further includes Engineering Ingegneria Informatica SpA, Universidad de Cantabria, Easy Global Market, inno TSD, City of Santander, Sopra, JRISS, Kyoto Sangyo University, Knowledge Capital, JR West Japan Communications, Ritsumeikan University and ACUTUS.[84]

Additionally the 5th EU-Japan Symposium on ICT Research and Innovation (Brussels, 16-17 October 2014) has identified 5 priorities for future joint research projects with the EU:

- 5G Radio Access / Network Management
- Big data driven by IoT and Cloud
- Future internet Experimentation Testbeds
- Speech-to-speech translation
- Social ICT

2.4. Examples of further opportunities for potential investments and technological cooperation:

- Participation in ICT Projects/Tenders from the 'EIT ICT Labs' European network' – one of the first 'Knowledge and Innovation Communities' created by the European Institute of Innovation and Technology as an initiative of the European Union. Since 2010, its mission has been to encourage European leadership in ICT innovation. The EIT ICT Labs build upon nodes in Berlin, Eindhoven, Helsinki, London, Paris, Stockholm and Trento and their partners representing global companies, leading research centres, and top universities

- Joint R&D cooperation with EU ICT companies on common research themes e.g. big data, cyber-security, network capacity, storage, high density data traffic, and energy efficiency

- Other opportunities would be offered by the setting up of joint research facilities in some of the EU's ICT Clusters (for example):
    - Ireland - 9:10 of the world's top US ICT companies – SAP, HP, Google, eBay, Oracle, IBM, Microsoft, Apple, Dell and Intel – have operations there along with many other leading names in the sector. Over 200 ICT companies, directly employ c. 36,000 people

    - Estonia - a small and dynamic EU country where 'SKYPE' originated and where the use of e-services, digital signatures and id-cards has been widely adopted, in public offices as well as in private banks. Due to high-tech solutions for preventing fraud and cyber-attacks, the usage of e-banking in Estonia has become very trustworthy

    - France - where Rakuten opened its third global R&D centre and where there is also an "EIT ICTS Labs" node) or in Finland (where the IoT consortium consists of more than 250 scientists and international experts

[83] http://ics-iot.weebly.com/ikaas.html; http://ikaas.com/
[84] http://www.festival-project.eu

III. EU - Japan Policy Cooperation Potential on Digital Economy/ICT

In today's digital environment, ICT penetration in society is at an all time high. Our lives are now connected and shared in many more ways than we could have imagined just a decade ago. Online Education, Internet of Things or Smart Technologies are just a few of the advancements that we benefit from.

The digitalisation of economy, presents us with a number of potential growth avenues alongside several challenges that need to be addressed. The EU and Japan face many similar challenges on the way to achieving a true Digital Economy and now have the opportunity to get inspiration from each other relevant experiences and even look for common strategies and solutions.

General recommendation:

An enhanced EU-Japan experience exchange and cooperation on Digital Economy should start from working on a joint comprehensive definition of the "Digital Economy", going beyond e-commerce and e-business. Currently, all the commonly know definitions are generally missing essential aspects related to the role the digital technologies and solutions could play in increasing the performance and competitiveness across the industries. Therefore, a more comprehensive definition should include elements such as production systems efficiency and advance manufacturing.

3.1. Recommendations based on common challenges and bottlenecks in the EU and Japan

1. **Common challenge**:
   Shortage of sufficiently-trained, ICT-proficient workers

   Both Japan and Europe have taken steps and set policies in place to address this problem. Europe has focused on e-enterprise and e-leadership solutions, while Japan hopes to create a new pool of ICT talent by introducing online courses for its youth, teaching coding in schools and by tapping into foreign-based human resources.

   Recommendation:
   Cooperation and exchange of best practices addressing this challenge is highly advised. Collaboration based on initiatives such as the international student movement and eEntrepreneur training projects, Erasmus +, EU-Japan joint training programs such as Vulcanus could be feasible.

2. **Common challenge**:
   Japan and Europe's high urbanisation levels pose a challenge to the rate of adoption of smart technologies.

   New technologies can only be easily implemented in new construction/infrastructure projects. Solutions that allow for the retrofitting of the existing urban environment with smart technologies are few and come at a high cost. The application of smart technology is prevailing in new projects, however, the overall impact remains low, due to their limited scale.

   Recommendation:
   Both Europe and Japan could work on new R&D projects concerning the creation of retrofitting methods and solutions that will allow the upgrading of already present smart technology infrastructure.

3. **Common challenge**:
The scaling up of smart city solutions

The EU and Japan both have smart city policies in place: whereas European policy is more detailed and can be found in one dedicated document, Japan does not have such a standalone strategy. Smart technology providers engaged in the same area often neither communicate nor cooperate with each other. This leaves their smart solutions isolated from one another and makes scaling and interconnectivity difficult. Furthermore, large smart technology providers are more likely to present a more generic approach which is not tailored to the actual problems of the serviced communities.

Recommendation:
The EU and Japan should cooperate in the creation of policies aimed towards establishing international/shared standards on smart city project implementations and interconnectivity. Their standards should be flexible enough to enable some degree of adjustment to local needs. Smart city projects located in the same area and serviced by more than one company should possess regulations enabling the engaged parties to cooperate with the goal of interconnectivity and long term viability in mind.

4. **Common challenge**:
The manufacturing sectors (mostly in the hands of SMEs) of the EU and Japan still occupy a major place in their respective economies, yet most production and control processes are obsolete and inefficient.

Recommendation:
The EU and Japan could cooperate on best solutions and benchmarking for the implementation of digitally based advanced manufacturing technologies. Particular attention should be paid to ICT-enabled intelligent manufacturing, i.e. integrating digital technologies into production processes (e.g. "smart factories"), industrial internet, and the use of Big Data in the manufacturing process. From an export competitiveness perspective, the advance manufacturing/factory digitalization equipment and solutions is in high demand in the developing economies and it has proved to be key in the selling revitalization strategies of many traditional Electronics/ICT giants, such as Mitsubishi Electric. For experience exchange and training, the EU-Japan Centre for Industrial Cooperation could offer a suitable framework for piloting the implementation of the cooperation on this important topic. For example, the "World Class Manufacturing in Japan" Training Program for business executives could be calibrated with a focus towards ICT-enabled intelligent manufacturing. Same for the corresponding "LEAN in Europe" programme which can be extended to Japanese entrepreneurs and production managers.

5. **Common challenge:**
Lack of tailor made solutions to enable "digitalisation" of SMEs.
Available solutions that may be adapted from large scale projects can be too expensive to implement in an SME setting, and dedicated SME solutions are not being designed due to the large variety of companies and their significant specialisation.

Recommendation:
The EU and Japan could establish a policy exchange and cooperation dialogue on support instruments that allow for a more tailored approach for smart digital solutions suitable for SMEs. Japan's experience with providing support for testing in the real production conditions of ICT based advanced manufacturing technologies to promote their uptake in the industry could be opportune for policy exchange and benchmarking. The EC initiative of "ICT Innovation for manufacturing SMEs" can be another useful source of inspiration for joint projects. The EU-Japan Centre for Industrial Cooperation can adapt its policy seminars and training (WCM) agenda to support the bilateral policy exchange and

cooperation on this topic.

6. **Common challenge**:

The lack of Digital business knowledge, entrepreneurial skills and venture capital

In today's digital world where the United States is setting the standard in entrepreneurship and business development, the EU and Japan are still lagging behind, including in the critically important digital/ICT sector. Japan is hindered by its long standing corporate culture with limited governmental backing for newly established companies alongside a small and stagnant venture capital scene. Options for new endeavours are limited and the social stigma of failure is significant. In Europe, while some policies are in place, similar issues as in Japan prevent the expansion of entrepreneurial culture: fear of failure, limited access to capital and administrative red tape are the most commonly mentioned reasons against starting your own business.

Recommendation:

Japan and the EU have yet to embrace the venture business culture already present in North America. A key objective is the stimulation of ICT and digitally oriented start-ups in both the EU and Japan. In this context, addressing the red tape, facilitating the access to ICT venture capital development and risk sharing financial instruments (ex: InnovFin Guarantee Facility), development of publicly supported business incubators, as well as ICT entrepreneurship training would be suitable topics for experience exchange and policy cooperation. The EU-Japan Centre for Industrial Cooperation can offer a suitable framework for joint policy seminars, debates, roundtables and ICT entrepreneurship benchmarking and training curricula. The Centre's "Step in Japan" in house business incubator could also support a pilot ICT oriented project, if the necessary additional funding is made available.

7. **Common challenge**:

The Regulatory environment in both the EU and Japan is not yet fully fit for the purpose of the digital age.

Both Europe and Japan already have policies in place addressing and updating their regulatory framework to allow the development of digital economy however there is still space for improvement through exchange of best practices and benchmarking, a process which can naturally evolve in regulatory harmonisation and cooperation on setting international standards in the domain.

For example, areas such as private coping tariff or copyright solutions are outdated and not suitable for use in the digital age.

Recommendation:

The digital economy/ICT should be included among the priority topics for the EU-Japan regulatory dialogue with a selection of sub topics which are either more urgent or more suitable for cooperation. For example, such a sub-topic to be addressed with priority could be the private copying levy system which needs a fundamental reform which takes into account the evolution of technology and distribution channels for lawful digital contents.

The EU-Japan Centre for Industrial Cooperation can offer its framework for policy exchange and benchmarking seminars and elaboration of impact studies and topical reports.

8. **Common challenge**:
Lack of trust and confidence in digital solutions
While in both the EU and Japan the first generations of "digital natives"[85] are approaching adulthood, the majority of workforce still consists of "digital immigrants"[86] who were introduced to and trained in the use of solutions presented by "E-Society". Lack of knowledge translates into lack of confidence in digital solutions.

Recommendation:
Cooperating on the most effective educational campaigns for digital literacy would be opportune.

9. **Common Challenge**:
The threat of cybercrime is a contributing factor to people and businesses' reluctance in using digital solutions.

Recommendation:
An EU-Japan bilateral dialogue on cyber-security is already in place and thus cooperation towards a common framework of best practices would be opportune. More specific joint actions for a compatible regulatory framework addressing data privacy issues could be also considered.

10. **Common challenge:**
eGovernance development is stagnating
The European eGovernance spread rate has stagnated and its use has fallen to 41% in 2013 from 44% in 2011. The eParticipation rate of EU Member Countries varies from 80% for Netherlands to 20% for Italy. In the case of Japan, although it enjoys very high levels of "ePreparedness", with most of the statistics concerning eGovernance above 80%, the public interest in eGovernance appears to be relatively low, with only 2% of interactions with public administration being online, and less than 5% of filled forms coming through digital channels.[87]

Recommendation:
The EU and Japan could cooperate on best practices for improving eParticipation (looking into the experience of countries such as Netherlands or Estonia which are champions of eGovernance popularisation).

11. **Common challenge**:
Low level of R&D market uptake /commercialisation
Investment in R&D is a necessary, but not a sufficient condition for industrial leadership. It is not the excellence in research, but the commercialisation of research results on the market that generates turnover and jobs in industry. Even though the amount of expenditure on R&D in Japan is higher than in Europe and the number of patent applications exceeds that of any European country, Japan appears to struggle to introduce new ICT solutions that can be successfully marketed overseas. This challenge is also present to a significant extent in the EU which suffers from weak industrial exploitation of new technologies stemming from R&D. Both japan and the EU are firmly aware that industry participation in research programmes plays an important role in improving the industrial exploitation of research results.

Recommendation:
The EU and Japan should share their experience and cooperate in promoting best practices

[85] Digital natives – people born after year 1990
[86] Digital immigrants – people born before year 1990
[87] http://unpan3.un.org/egovkb/Portals/egovkb/Documents/un/2014-Survey/E-Gov_Complete_Survey-2014.pdf

for ICT R&D market uptake. In particular, they should cooperate on promoting public private partnerships for faster commercialisation of R&D output. The European Commission supported initiatives such “Factories of the Future” PPP under Horizon 2020 could serve as potential example for EU-Japan led projects. Probably the most feasible option would be for Japanese research institutes and companies to join the European partners under the Horizon 2020 related projects. The EU-japan Centre for Industrial Cooperation in its capacity as Japan National Contact Point for Horizon2020 can provide assistance in disseminating the related projects calls and facilitating partnerships.

3.2. Matching EU and Japanese Strategic Policy Actions: the potential for common strategic policy approaches

3.2.1. Information Security /Personal Data

EU Priority: Rapidly concluding negotiations on common EU data protection rules
JP Priority Area: Information Security/Personal Data

In light of recent events, and in particular the acts of cybercrime committed by various groups around the globe, cybersecurity has become a major priority for both EU and Japan and both have already started a number of initiatives for addressing this issue.

Recommendation: In the framework of EU-Japan annual ICT Policy dialogue, more recently, a cyber-security dialogue has been initiated. Research-related cooperation opportunities are available already through projects like NECOMA and various MIC founded R&D projects while business opportunities are best pursued using the yearly trade shows such as Japan ICT Week. Additional attention should be directed at the other line ministries with a focus on emerging policies and bilateral cooperation possibilities. The EU-Japan Centre managed National Contact Point for Horizon2020 in Japan can assist with information and partners searching and matchmaking for joint projects under Horizon2020.

3.2.2. Broadcasting content

EU Priority Area: Giving more ambition to the on-going reform of telecoms rules
Modifying copyright rules to reflect new technologies
JP Priority Area: Broadcasting content

Japan continues to exercise considerable soft power through initiatives like “Cool Japan”, and “Visit Japan” to create a strong position on the international market. However with the out dated digital rights management rules neither Japan nor the EU can effectively manage their online image and brand. Additionally digital content distribution poses a challenge to the traditional copyrights approach.

Recommendation: Actions towards standardisation and modernisation of intellectual property rights have been initiated on both sides and now a closer cooperation on digital content IPR would be necessary and opportune, including in the area of international standards development

3.2.3. ICT in new business creation / Open big data / Education & IT

EU Priority Area: Making it easier for ICT innovators to start their own company
JP Priority Area: ICT in new business creation / Open big data / Education & IT

-Japan and the EU are incorporating ICT and smart technologies into an ever-expanding variety of sectors. The direction towards IoT and the evolution towards a digital economy is evident through

the actions taken by both parties. The EU and Japan are both strongly focused on entrepreneurship, spreading and maintaining the pace of innovation while creating a digital society that encompasses all ages.

Recommendation: Japan is historically strong in establishing effective value chains and now, with the addition of the ICT component, some solutions like "Smart Agriculture" or route management could be very attractive topics of cooperation with the EU.

- Both the EU and Japan have a high level of urbanisation which effectively supports demand for the implementation of smart technologies.[88] The current approach in Japan is to integrate smart technologies into new projects built from the ground up, with very little being done in terms of retrofitting existing areas.

Recommendation: The EU and Japan could jointly tackle the R&D of smart retrofitting technologies (following the example of the Amsterdam Smart City project) in order to scale up existing infrastructure and increase the rate of adoption of smart urban technologies and solutions.

-Japan aims to apply big data in areas such as "Platinum Society"[89], Open Data Government and e-Government[90] initiatives as well as Public-Private Intelligent Transport Systems initiatives.[91] The EU, on the other hand, is providing support towards fostering SME and start-up innovation alongside PPP and e-Government initiatives.

Recommendation: Policy exchange cooperation on Open data, Public Private Partnership and eGovernment initiatives should be established and benchmarking instruments set in place.

3.2.4. "Digitally Active" and Healthy Aging Society

EU Priority Area: Boosting digital skills and learning
JP Priority Area: Smart Platinum Society

Both the European Union and Japan are struggling with the issue of aging societies. Utilisation of ICT based technologies, big data and cloud services are expected deliver new insights in dealing with this challenge. Improving the digital literacy of the elderly will empower them in a world where electronic goods and services are more present than ever.

Recommendation: EU-Japan policy exchange and research cooperation in the area of "Digitally Active" and Healthy Aging would be very opportune. A dialogue on the topic is already in place however it should be more specific and results/project oriented. For "digital literacy" the former Grundtvig Program, now integrated under the Erasmus + framework could be an example for joint EU-Japan related projects. For policy exchange, research and technological partnerships the EU-Japan Centre can provide a suitable framework for piloting such initiatives (via its policy seminars, policy analysis, business training, EEN, Horizon2020 Helpdesk).

3.2.5. Broadcasting service sophistication

As part of Japan's Growth Strategy utilising ICT, the development of UHDTV broadcasting technologies is advancing the next generation of world-leading broadcasting services through the

[88] http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=3178
[89] http://www.soumu.go.jp/main_content/000296880.pdf
[90] http://cio.go.jp/assets/JAPN_OGD.pdf
[91] http://japan.kantei.go.jp/policy/it/20140603_ppitsirm.pdf

cooperation of the public and private sectors, including major broadcasters and manufacturers. Active efforts are being made in the standardisation of UHDTV satellite broadcasting technologies, as well as the launch of a test 4K broadcast in June 2014 with a full launch planned for March 2015. Experimental 8K broadcast is expected to start in 2016 with a transition to full 8K broadcast in 2020.

There are a number of broadcasting service policies in the EU, however a direct match addressing service sophistication has not been found[92].

Recommendation: It is recommended for the EU to establish a broadcasting policy exchange with Japan and to jointly set up benchmarking instruments. Actions aimed at measuring the feasibility of adoption of 4K and 8K broadcasting standards should be undertaken.

3.2.6. Urban Development & ICT

Japan and Europe have both developed plans for the establishment of ICT Smart Cities and Communities, however, both are struggling to scale up their initiatives. The European Commission, through its "Smart Cities and Communities"-Innovation Partnership Communication, has presented a detailed list of actions that need to be taken in order to achieve measurable and replicable results.

Japan operates with Smart City related actions attached to various policies. At the same time, a challenge in Japan is the fragmented coverage of the centrally initiated projects. These projects are numerous but there is still space to improve their coordination, long term viability and local interconnectivity. Priority is given to energy related smart technologies. This results in a patchwork of "smart" energy-efficient areas and "non-smart" energy consuming neighbourhoods. A bottom-up trend is emerging in Japan with local municipalities looking for SME partners in Smart City Technology in order to have more control over the revitalisation and energy efficiency of their area. Initiatives taken this way are smaller in scale, but can address and adapt their solutions for issues faced by the community directly and show real scaling-up potential.

Recommendation: EU-Japan cooperation possibilities exist in the areas of urban development and Smart City policy exchange, advancing the use of smart technologies with interconnectivity in mind and supporting the bottom up implementations of Smart Solutions based on local needs. For further analysis and recommendations please see the **Smart Cities in Japan** report by the EU-Japan Centre for Industrial Cooperation.[93] The EU-Japan Centre can further support the policy exchange in this area.

3.2.7. Generating ICT Innovation

The EU and Japan have a long history of improving upon acquired technologies and releasing high quality products, however in the last few years, the innovation impetus has slowed down in parallel with increased competition from other high growth developing countries. Both the EU ("Digital Agenda", "Innovation Union", "Industrial Policy Strategy") and Japan ("Smart Growth Strategy II") aim to remedy this situation through various supply side and demand side measures.

Recommendations: The EU and Japan could enhance their cooperation on innovation policy development with a particular focus on ICT and market uptake of ICT R&D output. Support mechanisms present for this purpose in both Horizon 2020 and Smart Growth Strategy II should be synergised. The EU-Japan Centre for industrial Cooperation can support this policy exchange

[92] http://eur-lex.europa.eu/search.html?qid=1424147929904&text=broadcasting&scope=EU_SUMMARY&type=quick&lang=en
[93] http://eu-japan.eu/sites/eu-japan.eu/files/SmartCityJapan.pdf

through seminars, topical debates, Horizon2020 helpdesk services.

3.2.8. Satellite Navigation/GNSS-ICT enabled services and products

The EU and Japan are both aiming towards developing their own Satellite Navigation/GNSS (GALILEO and QZSS) systems with related wide range of ICT enabled services and applications, which open a myriad of industrial cooperation and business opportunities in the upstream and particularly downstream sector (receivers, software applications etc). A "Space Dialogue" has been recently initiated with a focus on interoperability and synergy of the systems as well as the potential commercial applications of the GNSS services.

Recommendation: The EU and Japan should continue their Space/GNSS dialogue with a particular focus on the cooperation and business development on the downstream segment. For a more in-depth analysis and recommendations in this area, please refer to the GNSS-Japan reports of EU-Japan Centre for Industrial Cooperation[94]. The EU-Japan Centre has initiated since 2012 activities towards the promotion of Galileo/GNSS cooperation and a number of policy exchanges, reports and business brokerage events were been held (the latest one in Tokyo, 9-11 March 2015). The Centre is further committed to support EU-Japan policy exchange, R&D cooperation (under Horizon2020) and business development in this sector.

3.2.9. ICT Infrastructure Development

Focus on super high speed ICT infrastructure including a 71% penetration of fibre optic connections to households has made Japan the world leader in this field.[95] In the EU the situation is more fragmented with only Sweden reaching the 30% penetration mark.

Recommendation: Policy exchange focusing on the Japanese experience on fibre optics infrastructure implementation would be very opportune.

3.2.10. Digital/ICT human resource development

In the EU the demand for ICT practitioners is growing at a rate of 3% per year while the supply cannot keep up with the demand considering the decrease in the number of ICT graduates.[96] Japan is facing a similar shortage of ICT human resources. This challenge is widely presented and measures are being envisaged in the strategic agendas of both EU and Japan.

Recommendation: A process of policy exchange and cooperation on a joint agenda of concrete projects on ICT human resources (education, vocational training, mobility) development would be highly opportune and feasible. EU initiatives like the "Grand Coalition of Digital Skills and Jobs" or "Digital Leadership Actions" could be proposed as benchmarks. The EU-Japan Centre for Industrial cooperation could support the cooperation in this area by scaling up and re-calibrating its Vulcanus training and mobility program (in Japan and in Europe), considering large number of participants are already in the ICT domain.

3.2.11. "Technology diplomacy"- cooperation on developing international standards

Japan aims to promote "technology diplomacy" in order to link Science and Technology (S&T)

Note: Cooperation possibilities in paragraphs 2.2.10 through 2.2.13 are based on the Smart Growth Strategy II international competitiveness and expansion initiative and share the same goal, which is "Improving overseas sales by 5 times the current value (5 trillion yen) by 2020"[36]

[94] To be made available on April 2015 at the following location - http://www.eu-japan.eu/publications

[95] http://www.oecd.org/internet/broadband/1.10-PctFibreToTotalBroadband-2014-06.xls

[96] http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=5133

with foreign policy so as to further their mutual development"[97]. In the 2014 Smart Japan Growth Strategy II the main goals of "technology diplomacy" are in the area of ICT international standards development. Cooperation on regulatory harmonisation and development of international standards is similarly listed as a priority in all EU Digital Economy strategic documents.

Recommendation: In the context of their regulatory cooperation, the EU and Japan should focus on developing standards in particular for smart grid, digital signage, next-generation browser areas; new generation networks (including new-generation wireless networks).

[97] http://www.sciencediplomacy.org/article/2013/rise-science-and-technology-diplomacy-in-japan

IV. THE EU-JAPAN REGULATORY COOPERATION POTENTIAL

An adequate regulatory framework is essential for the development of the digital economy in the EU and Japan as well as for better investment in each other's markets and improved global competitiveness. Regulatory cooperation and the necessity of developing international standards on Digital Economy/ICT have been identified as both a common challenge as well as a matching priority existing in the strategic agenda of both the EU and Japan. Addressing this issue by cooperation could be beneficial (business development, competitiveness, economic growth) for both sides. In this respect, encouraging steps towards the establishment of structured regulatory cooperation between the EU and Japan have already been taken at the industry level as well as at the official level over the last couple of years.[98]

Therefore, now that a general framework for regulatory dialogue and cooperation has been set up at both corporate and official policy level, the next desirable move would be to build up a structured dialogue and cooperation specifically on Digital Economy/ICT sectors/sub-sectors, with a list of priority issues, concrete actions and implementation roadmaps.

4.1. Recommendations by the EU-Japan Business Round Table

When searching for the most appropriate areas for regulatory cooperation, the most suitable source would be the stakeholders, namely the EU and Japanese Digital Economy/ICT related businesses and consumers. Fortunately this is an area which is extensively addressed by the EU-Japan Business Roundtable (BRT), from whose joint recommendations we can extract meaningful ideas to be prioritised in the EU-Japan regulatory cooperation agenda.

Below is a list of relevant BRT Recommendations, most of which are yet to be addressed by the EU and Japanese authorities:

1. **EU-Japan cooperation for Information and Technology Agreement expansion[99]:** its objective is to reclassify convergence technologies as duty free and to add them to the already existing list within the boundaries of the agreement. Although several meetings were held in 2013 and serious efforts were made to finalise the expansion of ITA, negotiators were unable to reach a conclusion before the WTO Ministers meeting in Bali in Dec. 2013 due to certain objections.[100] More attention on this topic is highly recommended.

2. **The private copying levy system reform**. The reform should consider, in a comprehensive manner, alternative methods – including new content distribution practices – available to secure compensation for right-holders and creators from private copying as well as the development of licensed cloud-based content streaming models. Increasing the availability of lawful digital content will require a reform of the existing copyright regime in the EU as well as in Japan. The aim of the reform should be to promote open and competitive markets in licensed digital content, and increase availability of more legitimate digital content, at prices which appeal to consumers and hereby promote innovation and growth of the digital

[98] At industry to industry level, the EU-Japan Business Roundtable has released in the last years a number of joint recommendations on regulatory cooperation, including on the Digital Economy/ICT. The forthcoming BRT Annual Meeting in April 2015 will have an exclusive session dedicated to regulatory cooperation, in support of the endeavors undertaken by the authorities. Furthermore, in November 2014 BusinessEurope and Keidanren have issued a Joint Statement on Regulatory Coherence. The DigitalEurope and JEITA are were also holding regular meetings on the ICT regulatory aspects. In the framework of the industrial dialogue between METI and the EC services the regulatory cooperation has been approached in 2014 and the discussions will be scaled up in 2015 with the proposal of a Joint Action Plan on selected sectors including digital/ICT.

[99] In the framework of WTO, the Ministerial Declaration on Trade in Information Technology Products (ITA) was concluded by 29 participants at the Singapore Ministerial Conference in December 1996. The number of participants has grown to 80, representing about 97 per cent of world trade in information technology products. The ITA provides for participants to completely eliminate duties on IT products covered by the Agreement.

[100] http://www.eu-japan-brt.eu/system/files/wpc_recommendations_joint_april14.pdf

creative market. The goal should be to enable the establishment of a system which is transparent and fair to consumers, rights holders, service and equipment providers, etc.
Current compensation is based on private copying levies and sometimes dates back to the analogue era. Private copying levies regulations do not address piracy. New emerging and expanding business models may be hindered by the current levy system. Furthermore the rules vary greatly across Europe.

3. **Maintaining an open transparent internet**. Japan and Europe have both released policy updates, both can gain much through working together. The internet has played a big role as a driver of innovation for economic growth. It is not governed by a single state or body, because in this case the multi-stakeholder approach works effectively and several innovative services using the internet have emerged under the multi-stakeholders governance mechanism. Continuous cooperation maintaining an open and transparent internet is highly encouraged.

4. **Work on an ambitious and comprehensive trade liberalisation policy** of services over the internet with the purpose of facilitating cross-border business and data flows is highly recommended. Global rules on digital services need modernisation which reflect current technological development and emerging business models.

5. **Cooperating on building a trusted, safe and robust online environment**. A common framework of best practices related to protection from and adequate response to cyber-attacks should be established by both Japan and Europe. Cooperation between critical infrastructure operators and ICT service providers is indispensable for addressing cyber threats. Security notification reporting should be applied only to critical infrastructure operators and such a requirement should not be applied to enablers of internet services. Finally, due to the sometimes crucial role played by ICT in supporting and developing key lifelines (energy, transportation, etc.), a robust ICT sector is especially important. Japan and Europe should both encourage the private sector to construct resilient and safe ICT infrastructures in order to both promote the development of new technologies and guarantee an adequate level of protection for critical infrastructures.[101]

6. **Policies addressing the need to balance personal data protection and innovation** are very ripe areas for cooperation. Both Europe and Japan should set up clear rules for the use of each category of data, thus enabling data transfers and creating an environment that facilitates the utilisation of "big data" in a responsible way that also protects privacy. Laws and regulations on data protection should be compatible with each other, so that there is no gap in data protection and enterprises can conduct business without concern about different data protection regimes. The new law in the EU and Japan should consolidate the currently fragmented authorities over personal data protection to one independent data protection authority and ensure transparency and foreseeability for both domestic and foreign-based companies.

   The EU should balance privacy protection and innovation, and recommends an active use of recognised certification schemes in international data transfers, a clearer definition of extraterritorial applicability, a flexible notification period in case of a breach, the transfer of employee data to an internationally integrated personnel system abroad, and the maximum fines to be proportionate and equitable. Furthermore, both sides' authorities should launch a dialogue to seek an international framework by enhancing cooperation with third countries and international organisations.[102]

[101] Ibidem.
[102] http://www.eu-japan-brt.eu/system/files/wpc_recommendations_joint_april14.pdf

4.2. Recommendations by the European Business Council in Japan

-Establishment of common technical standards and certification procedures. Having standards that are not substantially different in detail but which maintain separate outlines slows the introduction of European products in Japan and vice versa. The doubling of standards leads to the necessity of possessing multiple testing certificates which effectively limits the possibility of overseas expansion for SMEs, who do not possess in-house testing capabilities. The current EU-Japan Mutual Recognition Agreement provides only for recognised certification organisations to test for both markets. The Japanese certification process is also different from that of Europe.[103]

-Cooperation options concerning this topic should include the mutually acceptance of each other's technical standards and certifications for telecommunications equipment.

-Harmonisation of the spectrum for IMT (IMT-2000 and IMT-Advanced) is an issue that, when successfully addressed, will bring immense benefits to the industry and consumers by eliminating the need to develop local variations of new telecommunications equipment.

Japan could work jointly with other partners, such as the EU, to achieve a globally harmonised spectrum allocation for IMT systems, in line with the findings of the World Radio Communication Conference in 2007.[104]

[103] https://www.ebc-jp.com/images/stories/2014_EBC_White_E.pdf
[104] Ibid.

Summary

EU-Japan Business Roundtable joint Recommendations

1. Expansion of the Information and Technology Agreement (ITA)
2. Private copying levy system reform
3. Maintenance of an open, transparent internet
4. Trade liberalisation of Digital/ ICT services
5. Creation of a trusted safe and robust online environment
6. Balancing personal data protection and innovation development

European Business Council in Japan Recommendations (selected)

-Establishment of common technical standards and certification procedures

-Harmonization of the spectrum for telecommunications equipment (IMT)

These recommendations, when successfully implemented, will enable Japan and the EU to establish themselves as leaders in the global digital economy ecosystem. As long standing recommendations, special attention, should be paid to cooperation in the expansion of the ITA and the private copying levy system reform.

V. SUMMARY AND MAIN RECOMMENDATIONS

Digital Economy is a priority for both the EU and Japan. There is fertile ground for EU-Japan policy exchange, R&D and regulatory cooperation, as well as mutual investment and business development in this field. Based on the analysis of common challenges, matching policy strategies, as well as the recent EU-Japan Business Round Table recommendations, bellow is a summary of the priority topics for policydrop exchange and cooperation:

General recommendation:

- The EU and Japan should work together towards establishing a common definition of digital economy which encompasses digital trade, production processes and manufacturing.

Policy Exchange and benchmarking on:

- ICT training; E-Skills; Digital Business Knowledge and entrepreneurship
- ICT enabled advanced manufacturing-digital technologies integration into production processes (SMEs focus)
- ICT enabled Smart City Solutions
- e-Government; e-Participation, Open Data Governance
- Cyber-security, building trust and confidence in digital solutions
- ICT R&D& Innovation development and market uptake/Public-Private Partnership solutions and projects
- Digital Content IPR
- Digitally Active and Healthy Society
- ICT infrastructure development-fibre optics
- Broadcasting policy-adoption of 4K and 8K technology
- GNSS: development of ICT enabled services and downstream industries
- "Technology diplomacy" – cooperation on developing international standards

R&D Cooperation under Horizon2020 Framework

- Big Data driven by IoT and Cloud
- Cyber-security
- Future Internet Experimentation
- Social ICT
- "Silver/Platinum" Digital Society (Digitally Active and Healthy Society)
- ICT enabled energy efficiency solutions
- 5G Radio Access / Network Management

Regulatory Cooperation focusing on:

- Reducing the regulatory red tape for digital business development (with due consideration for the "think small" principle – SME focus)
- Modernization of IPR rules specific to Digital Economy/ICT-fundamental reform of the private copying levy system
- Setting clear rules for Big Data usage
- Cybersecurity- Creation of a trusted, safe and robust online environment
- Balancing Personal Data Protection and innovation development
- Expansion of the Information and Technology Agreement (ITA)
- Trade Liberalization of Digital/ICT services through mutual recognition of overlapping certificates and establishment of common technical standards and certification procedures
- Harmonization and development of ICT international standards particularly in the areas of smart grid, digital signage, next generation browsers
- Harmonization of spectrum for International Mobile Telecommunications

ANNEXES

Table 1 List of identified problems and barriers for Europe and Japan

Europe	Japan
EU businesses invest less in ICT than Japanese and US businesses	
Insufficient business investments in ICT	
	Quality standards unique to Japan – mainly in hardware, less so in software
Only 1.7% of EU enterprises take full potential of big data, cloud computing, mobile and social solutions	Only 16% of corporations are using ICT to raise profits.
Digital transformation is still in its infancy	Slow acceptance rate of new ICT solutions
Stagnant eGovernance spread rate	Limited society interest in active use of eGovernance procedures
Shortcomings in the performance of the Internal Market	Concentration on the home market with little outlook on expansion
Technical barriers and lack of interoperability	Legacy technologies, lack of interoperability, major role of System Integration companies (SI)
Lower innovation in advanced ICT technologies	Low marketability of R&D advances and innovation
Fragmented business environment	
Risk averse business practices	
Lack of ICT-trained human resources	
High level of urbanisation slows down the implementation of smart solutions	
Problems with scaling up the smart city solutions	
Lack of business knowledge and skills and entrepreneurial culture	
Regulatory environment not fit for purpose in the digital age	
Lack of trust and confidence in digital solutions	
Small size of companies: even Midcaps may be too small for some smart solutions	
Access to capital	
Rigidities in labour and product markets	

Explanation:

	Japan only issues		Shared issues
	Europe only issues		Partially Shared issues

Table 2: Examples of Japanese ICT/Electronics investments in Europe

Company Names	Field/Country	Summary
Rakuten Group	IT / Software (France)	Rakuten acquired French e-commerce giant Price Minister SA for €200m (2010)
	IT / Software (Germany)	Rakuten acquired an 80% stake in Tradoria GmbH, one of Germany's leading online e-commerce platforms and thus entered the German online shopping market (2011)
	IT / Software (UK)	Rakuten acquired Play.com, a UK-based e-commerce business, for £25m (2011)
	IT / Software (France)	Rakuten acquired French digital publishing tool company Aquafadas through e-reader company Kobo (2012)
	IT / Media (Spain)	Rakuten acquired Spanish online streaming video-on-demand (VOD) provider Wuaki.tv, which is Rakuten's first foray into the Spanish market (2012)
	IT / Software (Cyprus)	Rakuten acquired Viber Media (incorporated in Cyprus, with development based in Israel) for a reported US$ 900 million (2014)
Konica Minolta Business Technologies, Inc.	IT / Software (France)	In 2012, Konica Minolta Business Technologies purchased the IT service provider Serians through a French sales company
Ricoh Company, Ltd	IT / Software (Germany)	Ricoh acquired Aqua Design Amano Deutschland GmbH, expanding its IT solutions business (2012)
Elecom Co, Ltd	IT / Software (Germany)	Elecom established a wholly-owned subsidiary to sell computers and products related to computers and digital devices in Germany (2012)
Marvelous AQL, Inc.	IT / Software (UK)	Marvelous AQL established a wholly-owned subsidiary in the UK engaged in the management of online games (2012)

Company Names	Field/Country	Summary
Pole to Win Co, Ltd	IT / Software (UK)	Pole to Win established a European branch for its game software translation business in the UK (2012)
Sony Computer Entertainment (SCE)	IT / Software (UK)	Sony Computer Entertainment (SCE) acquired Media Molecule, the British company that developed the Little Big Planet software title exclusively for the PlayStation 3 (2010)
NTT DoCoMo, Inc.	Communications (Italy)	NTT DoCoMo acquired an Italy-based European mobile services giant, Buorngiorno SpA, that provides access to some two billion people across 57 countries (2012)
	e-commerce (Austria)	NTT DoCoMo acquired Austrian company fine trade gmbh, which offers payment solutions to e-commerce and m-commerce companies. The acquisition had a price tag of "several tens of millions of EUROs" (2013)
NTT Communications Corp	Communications (UK)	NTT Communications acquired Gyron Internet Limited, a UK-based provider of data centre services (2012)
Sony Corporation	Communications (UK)	Sony bought out Ericsson's 50% stake in UK-based Sony Ericsson (2011)
NTT Data Corporation	IT Consulting (Italy)	NTT acquired 100% ownership of Value Team SpA through its subsidiary NTT Data EUROPE GmbH (2011)
	IT / Software (Germany)	NTT Data acquired itelligence AG, the largest global SAP reseller and one of the largest SAP solution providers. The company became a 100% owned subsidiary of NTT DATA Europe GmbH & Co KG (2013)
DISCO Corporation	Semicon (Germany)	Semiconductor fabrication service provider Disco built a facility in Germany, provided prototype manufacturing services, and aims to get business in the manufacturing of devices (2012)
Sharp Corporation	Electronics (UK)	Sharp established a European headquarters in London (2012)
Eizo Nanao Corp	Electronics (Germany)	Eizo Nanao established a wholly-owned subsidiary to sell electronic equipment in Germany and the UK (2011)

Company Names	Field/Country	Summary
Softbank	ICT / Mobile games (Finland)	SoftBank and GungHo announced strategic investment of USD $1.5 billion in Finnish mobile game company Supercell (2013)
ClassNK	ICT / Software (Finland)	ClassNK acquires NAPA, maritime software house in Finland (2014)
Canon	IT / Software (Belgium)	Canon acquired I.R.I.S. S.A. – a developer of technologies and products for Intelligent Document Recognition (2012)
Panasonic	IT / Automotive (Germany)	Panasonic Automotive acquired AUPEO!, a German company specialised in streaming music into internet connected cars (2013)
Dentsu Aegis Network	Software / Social media (Poland)	Dentsu Aegis acquired Socializer Group: a Polish company active in social media services, apps and media development. The company will be integrated into Dentsu Aegis' Isobar brand (2014)

(Source): Eurotechnology.com