The Software Alliance

BSA

Software: A €910 Billion Catalyst for the EU Economy

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WITH DATA FROM

The Economist Intelligence Unit

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This report was written by BSA | The Software Alliance, incorporating the analysis done by The Economist Intelligence Unit (EIU). The EIU compiled these data and economic impact assessments using publicly available government data, maintaining full editorial control of the process and using industry standard approaches. Any views or opinions expressed in this document are not necessarily those of The Economist Intelligence Unit.

The Findings: At a Glance

EUROPEAN UNION[1]

Software is ubiquitous. It is at the heart of every aspect of modern life. We depend on software at the office, at school, at home, in our leisure time, when we travel, and when we communicate. Software helps us be more effective, more creative, and more efficient. BSA | The Software Alliance has commissioned this expert analysis by The Economist Intelligence Unit (EIU) on the economic contributions of the software industry in both the EU28 and its five biggest Member States: France, Germany, Italy, Spain, and the United Kingdom. The research findings provide important insights on how the European Union (EU) can take advantage of software's potential.

Software delivers a total value-added (direct, indirect, and induced)[2] GDP of €910 billion — over 7 percent of the EU28 total GDP. This contribution comes from all sectors and all levels of the economy: farming, manufacturing, services, education, and health care.

Total* Value-Added GDP:

€910 billion

7.4% of GDP

Direct Value-Added GDP:

€249 billion

2% of GDP

EMPLOYMENT

Direct:

3.1 million jobs

1.4% of total EU jobs

Total:*

11.6 million jobs

5.3% of total EU jobs

From software developers and web designers to futurists, project coordinators, administrative assistants, and accountants, software creates jobs for a wide variety of professionals in today's workplaces. These numbers capture jobs created directly by the software industry, as well as jobs the software industry supports through indirect and induced impacts.

WAGES

Average Annual Wage for Software Industry:

€45,333

by comparison...

All industries: €33,790[3]

Service sector: €25,214[4]

The EU average wage for the software industry is 34 percent higher than the EU average wage and 80 percent higher than the EU average wage for the services sector.

Total annual wages paid by the software industry:

€139.2 billion

R&D

€12.7 billion

Software R&D expenditures[5]

7.3% of R&D expenditures by business enterprise[6]

Software companies in the EU invest strongly in software R&D — almost €12.7 billion in 2013.

* direct, indirect, induced

1 All data are from 2014 and were provided by EIU unless otherwise indicated.

2 EU GDP data from Eurostat.

3 Eurostat: Mean annual earnings, Structure of earnings survey 2014.

4 Eurostat: Annual detailed enterprise statistics for services 2014.

5 Software R&D expenditures by business enterprise in 2013.

6 Software R&D expenditures by business enterprise in 2013, compared to total R&D expenditures by business enterprise.

Executive Summary

The software industry's headline contribution to the EU economy is immense; close to €1 trillion in total value-added GDP and almost 12 million high-quality, well-paying jobs. This study sets out to quantify this economic impact of software in three channels: The industry's direct impact; its indirect impact through inputs of goods and services from their EU supply chain; and the induced impact, from increased general demand due to higher total wages paid to people in the software industry and to people in industries that supply to the software industry.

1. **Direct impact**

- In 2014, the software industry in the EU directly contributed €249 billion to EU GDP, employed more than 3 million people, and paid over €139.2 billion in wages.

2. **Indirect and induced impacts**

- When indirect impacts are considered, the software industry supported an additional estimated €228 billion to EU GDP and supported almost 2.5 million additional jobs.
- The software industry helped drive an additional €432 billion to European GDP and over 6 million jobs.

3. **Total economic impact**

- Combining all impacts — direct, indirect, and induced — the software industry added €910 billion to total EU GDP in 2014.
- Every €1 million the software industry contributed to GDP supported a further €2.65 million in the EU economy.[1]
- The industry supported over 11.6 million jobs in the EU.
- The EU software industry spent almost €12.7 billion on R&D in 2013.

Software's Impact Is So Much Greater Than Its Direct Economic Footprint

The economic impact is indisputable; however, software's true impact is even broader than the direct economic indicators suggest.

This study captures the breadth of the software industry in the EU and the sweeping economic impact it is making within member states and across the union. The examples in this study explore how individuals, industries, and governments use software to improve what they do, use resources more efficiently, uncover new value, make better decisions, and extract insights from the myriad data generated daily.

It is this impact of software, the momentum it provides, and its potential to sustain the EU economy far into the 21st century that this study seeks to capture.

Software's Impact in the EU

Software's positive impact spreads throughout the EU economy. It contributes substantially to the GDP, it creates well-paid jobs, it funds a vital portion of European R&D, and it is instrumental in making Europe globally competitive.

BSA | The Software Alliance commissioned The Economic Intelligence Unit (EIU) to quantify software's impact and to assess how the EU and certain Member States gain from software's burgeoning influence. The study provides insights into the direct and indirect economic value generated by the software industry in the EU.

The research also shows how software generates further benefits that spread across the EU.

KEY FINDINGS

The results confirm software's pivotal importance to Europe and that its economic influence far outweighs its size.

- **Economic contribution:** Software delivers a total value-added (direct, indirect, and induced) GDP of €910 billion — 7.4 percent of the EU28 total.[2] This is greater than the GDP of 23 of the 28 EU Member States. Only the EU's 'big five' countries — France, Germany, Italy, Spain, and the United Kingdom — can lay claim to larger GDPs.
- **Job creation:** The software industry in Europe supports the employment of 11.6 million people — more than the entire population of Belgium. This is equivalent to 5.3 percent of all jobs in EU28.[3] The software industry directly employs over 3 million people, and this research shows the industry supports a further 8.5 million when including indirect and induced effects. In addition to programmers and coders, the industry creates demand for other experienced professions, including lawyers, designers, consultants, accountants, and marketing specialists.
- **Salaries:** The software sector attracts talented, highly skilled workers that command above-average salaries. The average annual wage for someone employed in the software industry is €45,333 — almost 35 percent higher than the estimated EU average, and nearly 80 percent higher than the service sector average.
- **R&D Investment:** Software companies invest strongly in R&D — almost €12.7 billion in 2013. This is more than 7.3 percent of total business enterprise research expenditure in the EU.[4]

  However, software means more than these bare economic statistics. Software brings broader benefits, improving our daily lives by letting us work better, smarter, and faster.

  By putting the right rules, policies, and incentives in place, Europe can harness its full potential and reap the rewards.

Software is at the heart of the digital revolution, providing us with the tools that can turn data into ideas, ideas into inspiration, and inspiration into execution.

What Is Software?

Software is at the heart of the digital revolution, providing us with the tools that can turn data into ideas, ideas into inspiration, and inspiration into execution. It helps us deliver what was previously unimaginable, and enhances life in the process. Software is:

- Improving medical imaging techniques, helping doctors diagnose diseases earlier and improving outcomes;
- Reducing pollution by developing engine management systems that reduce fuel consumption and minimise exhaust fumes;
- Helping farmers keep crops adequately watered and free of pests, maximising yields and minimising waste;
- Building smarter, more energy-efficient homes, reducing greenhouse gas emissions;
- Delivering greater security for businesses of all sizes, as well as for critical industries such as online banking, reducing the risk of cyberattacks;
- Controlling smart energy grids, improving reliability, security, and efficiency;
- Helping local authorities deliver more efficient public transport systems, tailoring responses to meet demand and relieving congestion; and
- Connecting families and friends in new and novel ways.

Software helps us to achieve much more, including:

- Providing faster, easier, and cheaper access to technology. The unprecedented connectivity, productivity, and competitiveness of cloud computing is dramatically improving efficiency in businesses of all sizes. Large and small companies, as well as governments, benefit from massive computing power by scaling operations to their individual needs;
- Making sense of the ever-increasing amounts of data, allowing individuals, enterprises, and governments to make smarter, better-informed decisions;
- Providing traditional industries with a passport to the Fourth Industrial Revolution and the benefits of technological breakthroughs including artificial intelligence, smart manufacturing, and the Internet of Things (IoT).
- Contributing to the development of innovations we haven't even imagined yet. Already, software is enabling new, cheaper manufacturing methods through 3D printing, as well as faster and more transparent transactions through blockchain technologies.

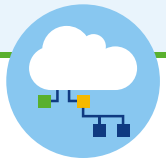
A hospital in the Netherlands is using SAS software to visualize diverse data sets and improve decision-making as well as resource allocation.

Autodesk 3D design software has provided a German Paralympian silver medal cyclist with a lighter, better, and cheaper prosthesis.

Software is central to everything we do. For example:

Delivering data-driven insights.

Using software, scientists interpret data to give new insights into complex topics. Detailed economic modelling, accurate weather forecasting, and screening for genetic diseases all use data-processing software.



Delivering technology on the move.

Cloud computing is revolutionising how and where we work and use data. It frees us from our desks and offices and lets us collaborate wherever we are. Software makes this possible.

Making our world greener, cleaner, and leaner.

Every manufacturing and service sector, from the complex to the routine, depends on software to design, refine, produce, test, and optimise what they do. Software is making our world greener, cleaner, and more efficient.

Powering personal technology.

The apps on our tablets and smartphones use software to provide messaging, banking, shopping, and travel at our fingertips.

This just scratches the surface of software's contribution. Every facet of our lives or work can offer similar examples, and every day sees further advances.

Airbus is collaborating with Autodesk to reduce unnecessary weight in planes, improving fuel consumption and range.

Software-Enabled Data Tools Are Bringing Benefits

Software's 'big picture' benefits to Europe are obvious. Yet the details also provide dramatic insights into the transformative effects of software in both Europe's traditional industries and its most advanced.

Software: Revolutionising Manufacturing

The advent of smart factories has shifted manufacturing into the Fourth Industrial Revolution. Software can now simulate the entire lifecycle of products — even highly complex, multiple-component products — before any manufacturing begins. Software lets manufacturers run simultaneous, rather than sequential, analyses and scenarios during the design and development phases, reducing lead times. Design changes can be made before production begins, avoiding costly retooling.

This allows manufacturers to build products that are better performing and more reliable than ever before while streamlining production and keeping costs under control. For example:

- Italian luxury car manufacturer Maserati uses Siemens PLM software to design, develop, and build the Ghibli, its new executive saloon.[5] The entire product lifecycle was modelled using software, as was the design, the process definition, and the production modelling. Maserati also relies on software to manage ongoing production and quality control for the Ghibli.

- Airbus is collaborating with Autodesk to lighten the partition walls that separate passenger seating from cabin crews, without compromising its strength or safety.[6] Making these walls thinner and lighter maximises space and reduces unnecessary weight, improving fuel consumption and range.

  Airbus turned to Autodesk's data analytics to define the best solution. They relied on an approach called generative design, which uses algorithms to design to a specific goal — in this case making a significantly lighter structure that could still meet air safety performance requirements. It then 3D-printed the various components and assembled them into the final product, which weighed 45 percent less than the traditional partition design.

Swedish-Swiss group ABB uses Microsoft software to help keep electric vehicle charging stations available at all times.

- Software is not only changing business; it is improving lives. An advanced cloud-based software design tool has provided Denise Schindler, a German Paralympian silver medal cyclist, with a new prosthesis that is better, more comfortable, and cheaper to produce.

  Previously, Denise's prosthetic took weeks to make, with technicians working from plaster casts. She has now partnered with Autodesk to use 3D design and printing techniques to produce an improved and more affordable prosthesis.[7]

Software: Making Travel More Dependable, Efficient, and Affordable

Europe views easy mobility as a given, with air travel increasingly priced akin to a commodity. However, this makes it tough to be competitive in a business sector such as long haul air travel, where margins are narrow. High-quality data analysis can make the difference between success and failure. For example:

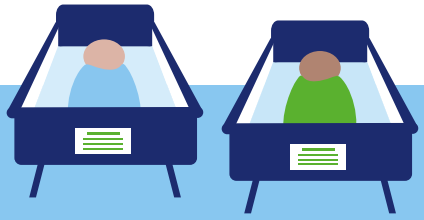
- When Finnair sought to double revenue from Europe – Asia flights within ten years, it knew high-quality data analysis would be vital. Margins on passenger travel are tight, so pricing competitively while gaining market share demands precision. However, 1,600 potential flight combinations generate fragmented market information, and places complex demands on any analytical approach.

  Finnair turned to the SAS Institute Demand-Driven Planning and Optimization[8] software for a solution. This allows them to combine and rapidly analyse data from multiple sources. It allowed them to take account of various parameters, including capacity, flight frequency, timetables, and available aircraft when estimating likely customers per flight. The company could then use this to assess the sales, marketing, or pricing strategy most likely to grow passenger numbers and increase profitability.

  This investment in analytic software has changed the corporate culture at Finnair. It is now merging its existing data warehouses to support a wider use of analytics across the organisation, encompassing everything from decision-making to fleet operations.

- Zero-emission electric cars are growing in popularity as the public becomes more environmentally aware. Although the range of these cars is constantly improving, they still require frequent recharging.

  Swedish-Swiss group ABB provides many of Europe's charging stations. It uses Microsoft software to calculate the likelihood of failure at the charging stations and immediately informs ABB of any damage.[9] This allows ABB to take rapid remedial action, ensuring the maximum available charging points at all times and keeping Europe's growing number of emission-free cars on the road.



IBM is helping an Irish research group build a cloud-based monitoring system to detect neurological problems in newborns.

Software: Delivering More Effective, Efficient, and Affordable Health Care

The growing problem of chronic conditions such as diabetes is placing health care systems under increasing pressure. Health care providers are turning to software to help make the best use of available resources and provide better care to patients. For example:

- Type 1 diabetes is a genetic condition, usually first affecting people in their teens. This means they have to manage and control their blood glucose, diet, and insulin for as many as 70 years. Someone with type 1 diabetes may need to make as many as 200 decisions a day to control their symptoms.

  A major Dutch technology company worked with Salesforce to find a way to simplify life for type 1 patients.[10] They created a mobile app that collects and connects data from electronic medical records, patient self-reported data, and personal health devices including wireless glucose meters and activity monitors. The app can analyse and report vital information on blood glucose levels and insulin use, and provide advice on management.

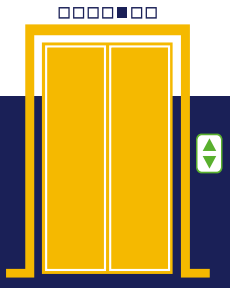
- Newborn babies have highly specialised needs, particularly where they have neurological problems. However, recognising these problems can be challenging and requires the use of electroencephalograms (EEGs) to monitor brain activity. By interpreting EEG data, neurophysiologists can identify previously undetected problems in newborns and take any action necessary. However, these specialists are not always available.

  The Irish Centre for Foetal and Neonatal Translational Research (INFANT) is working with IBM to develop a cloud-based monitoring system called Babylink.[11] This system can analyse real-time EEG data on a large scale, comparing the data with hundreds of other similar cases and automating detection of neurological problems in newborns. It can run 24/7, reducing the demands on specialists for routine analysis.

Software is also improving performance and efficiency in hospitals.

- Gelderse Vallei Hospital in the Netherlands chose SAS Institute Visual Analytics to allow its staff to call up custom reports and analyses to visualise diverse data sets and help them make decisions that improve patient care and reduce costs.[12] As a result, the hospital now uses its resources more efficiently, minimising patient waiting times and improving outcomes.

  Respiratory specialists also realised that adding weather data could let them predict when allergies and asthma attacks would spike, letting them ready the necessary resources to deal with more patients.



IBM is helping a Finnish engineering company use data from sensors to improve reliability of millions of escalators and elevators.

Software: Ensuring Seamless End-to-End Reliability

There is more to transport and transport infrastructure than airplanes, buses, and cars. At one end of the scale, we expect aircraft to take us around the world safely and reliably. At the same time, we expect the elevators and escalators in our airports, hotels, shopping centers, and offices to move us around seamlessly. For example:

Irrespective of the area of operations, one thing is universal: downtime and disruption cost money, so reliability is essential. This is why leading manufacturers increasingly rely on data analytics to help them predict and prevent problems.

- Finnish engineering company KONE is a global leader in elevator and escalator manufacturing. It recently chose the IBM Watson IoT cloud platform to connect, remotely monitor, and optimise the way it manages its millions of elevators, escalators, doors, and turnstiles installed around the world.[13]

  Using data from sensors embedded in their equipment, KONE can predict issues and potential failures in advance, helping minimise out-of-service times. Rather than immediately calling in a service engineer, they can now use the IoT to run remote diagnostics and issue commands, saving time, money, and disruption.

- Europe is a pioneer of using software in aviation. In 1984, an Airbus was the first aircraft manufacturer to install an all-digital autopilot,[14] now an industry standard.

  The latest Airbus, the A350 XWB, is powered exclusively by giant Rolls-Royce turbofan engines. Rolls-Royce is partnering with Microsoft to use advanced analytics to revolutionise its operations and management, reducing costs and improving on-time performance for customers.

  Rolls-Royce will use Microsoft's Azure platform to collect and aggregate data. Analysing this data will help reduce fuel costs and emissions, allowing operators to fly routes more efficiently. In addition, it ensures maintenance teams and equipment are where they need to be, when they need to be, keeping out-of-service times — and lost revenue — to a minimum.

The city of Breda in the Netherlands is using software to improve the quality of its water management and lower the risk of flooding.

Software: Enhancing Government Ability to Provide Remote, Fast, and Secure Services

Increasingly, governments at all levels are recognising and embracing the immense benefits of online data services. E-government offers a pragmatic method of delivering fast, efficient, and secure services at maximum speed with a minimum of red tape. For example:

- Europe is the world's largest single market, with goods moving freely between Member States. However, individual countries are responsible for customs controls on goods entering the EU. Manually identifying potentially illegal shipments is time-consuming, and long delays can make ports uncompetitive.

  To accelerate the process, the Lithuanian government, along with local IT company Affecto, partnered with IBM to develop a system to accurately risk-profile cargo according to specific criteria.[15] This system processes huge volumes of data in seconds, allowing the Lithuanian authorities to concentrate on strengthening their controls, seizing millions of Euros worth of contraband with minimum disruption to incoming goods.

- The humanitarian crisis in Syria led to more than a million people seeking asylum in Germany. The German Federal Office of Migration and Refugees (BAMF) recognised that a surge in applications would strain their existing systems, which were currently capable of processing only 50,000 applications per year.

  To overcome this challenge, BAMF worked with Oracle Germany to create a digital management system — called ASYL Online — to quickly and effectively process crucial proof of arrival and application data. Within only two months, the new system was available to the authorities.

  Running from two computer centers in Nuremberg, ASYL Online integrated smoothly with existing systems, easing its introduction and adoption. By connecting with other federal authorities such as the Federal Criminal Police Office and the Central Register of Foreign Nationals, it ensures all bodies are working with identical up-to-date records, underpinned by secure biometric data.[16]

- The City of Breda in the Netherlands is sited at the confluence of two rivers. The high annual rainfall, combined with the famously flat landscape, puts the city at high risk of flooding. This means that the city's water management system needs to be continuously observed and monitored.

  To improve the quality of their water management, local authorities decided to work with the Microsoft Azure platform.[17] By allowing them to visualise the vast amount of data generated by the system of sensors and pumps, the city can now benefit from predictive maintenance, minimising downtime. The system is easily scalable, letting the city add further sensors as required. As a result, Breda can now enjoy a lower risk of flooding, better asset management, and lower maintenance costs.

Winemakers in Italy are embracing software that controls virtually every aspect of production and cellaring.

Software: Bringing New Techniques to Classic Industries

Europe has a rightful reputation for artisanal food and drink. Adding to the benefits of long-standing traditions and centuries of expertise, innovative software is helping European winemakers, brewers, dairy producers, farmers, and many others improve the quality of their offerings. For example:

- Winemaking retains an image of an industry built on established approaches; however, modern wine production has long relied on automatic temperature control to ensure optimum fermentation.

  In Italy, one of the world's largest wine producing nations, a number of winemakers are embracing software that controls virtually every aspect of production and cellaring.[18]

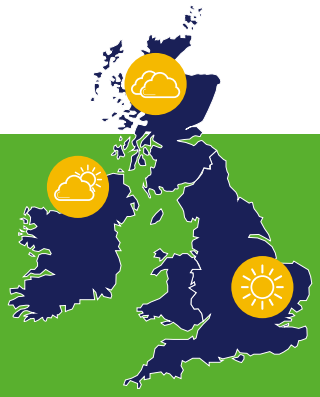
  The system uses historical winemaking data to 'learn' how to optimise production and sustain the highest standards for the product. It can automatically adjust various parameters of fermentation to maintain quality and where necessary call for assistance. This delivers a high quality, consistent product with minimum spoilage.

Software: Preventing Online Fraud

For many people, online credit card payments are routine. However, for some businesses, stolen cards remain a major problem. Indeed, for organisations with a high volume of card payments, the risk can be substantial. Increasingly, companies are using data to minimise their exposure. For example:

- Addison Lee, the UK's leading taxi company, gathers around 10 percent of its revenue from credit cards. Many of these transactions are time sensitive and booked via the internet or telephone, making it difficult to verify the payment in advance.

  The company discovered that between 5–10 percent of their transactions were fraudulent — a major cost. The company worked with IBM's Analyst's Notebook and iBase to help reduce the rate of fraud to less than 1 percent, saving the company almost €1,800 per month.[19]



The UK top weather forecasters use software from CA Technologies to provide the public with more accurate weather forecasts.

Software: Making More Accurate and Reliable Weather Forecasts

Weather data have been gathered for centuries. Today however software allows us to better understand the terabytes of data collected on a daily basis by weather satellites, weather observatories, radar, and other sensors, allowing us to make more accurate and timely predictions. For example:

- The UK's Met Office is recognised as one of the world's most accurate weather forecasters. It combines cutting edge science, technological advances, and local insight to deliver value for users, creating up to 3,000 tailored forecasts and briefings each day.

  The Met Office recently turned to CA Technologies to develop an API, an interface that would allow it to securely share the vast amounts of data it collects and produces.[20] This partnership will let the Met Office launch new mobile app services, which will give the public more accurate weather forecasts, assist the armed forces in planning exercises globally, and help protect technology against the impact of severe weather.

Software touches every aspect of the public and private sector, delivering efficiencies and allowing us to glean fresh insights that improve what we do and how we do it.

Software Is at the Heart of a Competitive European Economy

Europe already benefits greatly from software. It touches every aspect of the public and private sector, delivering efficiencies and allowing us to glean fresh insights that improve what we do and how we do it.

We now create and store more information than ever before. In 2012, this stood at 2.5 trillion gigabytes of data each day globally — equivalent to the data contained in nearly 60 billion 32Gb iPads[21] — and growing rapidly. Between 2014 and 2020, the digital universe will have grown by a factor of ten — from 4.4 trillion gigabytes to 44 trillion, more than doubling every two years. This means that if the digital universe were represented by the memory in a stack of tablets, that stack would have stretched 66 percent of the way to the Moon in 2013. By 2020, that stack would equal 6.6 times the distance between the Earth and the Moon.[22] Importantly, we have the sophisticated software to interpret it.

Data analysis lets companies and governments alike make better-informed decisions. A *Harvard Business Review* study shows that companies in the top third of their industry sector and that use software for data-driven decision-making are, on average, 5 percent more efficient, and 6 percent more profitable, than their competitors.[23] In 2012, General Electric estimated that a 1 percent increase in productivity — easily achievable with data analysis — would add $10 to 15 trillion to global GDP.[24]

The Internet of Things is only adding to the growing importance of data analysis. By 2020, an estimated 50 billion devices, packed with powerful sensors, will be connected to the internet globally,[25] generating even more raw data. Properly prepared, Europe stands to gain massively from this revolution

Yet we must remember that software is not simply about identifying efficiencies; it is also about seizing opportunities. Software opens up limitless potential. By helping everybody work better and smarter, software makes European companies of all sizes more competitive. It allows governments to engage with their citizens and meet their needs faster, better, and in new ways. It empowers employees and individuals to be more efficient and more creative, lets products reach markets more quickly, and allows research teams to meet customer demands more quickly. In the right hands and with the right encouragement, software improves every aspect of life.

The findings of this BSA study are unequivocal: Software is already a major contributor to the EU economy, and it has massive potential for growth, both directly and indirectly.

Fostering an Environment for Economic Growth

The findings of this BSA study are unequivocal: Software is already a major contributor to the EU economy, and it has massive potential for growth, both directly and indirectly. Already, it supports close to €1 trillion of the EU28 GDP and nearly 12 million jobs. With the right incentives, this contribution will only increase; the software industry is continuously innovating, delivering both incremental and genuinely transformative advances for the benefit of all Europeans.

Unlike more traditional sectors of the economy, software does not need an external catalyst to bring about change — it is the catalyst. Software will revolutionise how we work, communicate, plan, and create, in ways that we can only now begin to fathom.

It is challenging to craft a regulatory framework that will allow such promising technology to thrive. Today's rules could limit or enhance the potential of tomorrow's software. It is important to devise legislation that is ready for the future to avoid stifling innovation or delaying the uptake of new technologies. Countries choosing policies that encourage technological developments and support a digital economy boost their competitiveness and guarantee their role as hubs in the globalised economy.

To keep pace with growing global competition, the EU must embrace software's potential. The regulatory landscape needs to acknowledge the inherently global nature of the software industry while leaving room for digital innovation. Championing the free flow of data across borders without unnecessary restrictions would send a strong signal, as would embracing fully the development of the next generation of digital standards in international fora and opposing mandates on the localisation of servers and other computing infrastructure. Regulators should also give ample space for IoT technology applications to thrive in and not preemptively regulate this booming sector as this could prevent the EU from riding the wave of this impending revolution.

Our health, our wealth, our work, our social lives, our leisure, and our security are all improved by software, and the potential for further benefits is limited only by our imagination. Software is the key to the benefits of the 21st century and beyond; the EU should seize the opportunity.

METHODOLOGY

In 2016, BSA | The Software Alliance commissioned The Economist Intelligence Unit (EIU) to assess the economic impact of the software industry. The EIU collected and analysed the most recent data available from several recognised and reputable sources. These sources included the EIU itself as well as Eurostat.

To estimate the total contributions of the software industry to the EU, French, German, Italian, Spanish, and UK economies, the EIU analysed the direct contributions and estimated indirect and induced impacts using various economic multipliers. The economic contribution analysis presented in this paper uses input-output models, which describe the full inter-industry transactions between producers and intermediate and final consumers, to compute multipliers. Multipliers allow for the estimation and isolation of the direct, indirect, and induced contributions of an industry to economic outcomes (e.g., value-added GDP, employment, and wages). Direct and indirect contributions are estimated using different multipliers:

1. **Direct contributions:** The levels of output or employment from the software industry itself.
2. **Indirect impacts:** The indirect impacts estimate the inter-industry economic activity resulting from the direct contributions (e.g., purchases of inputs). These indirect impacts look backward at the linkages of the software industry in the economy, and the demands inputs from other sectors, like real estate and other professional services. This demand generates additional output (and jobs) from those sectors that wouldn't exist if it weren't for that software industry demand. As a result, the indirect multipliers estimate this additional output from other industries that is attributable to the software industry.
3. **Induced impacts:** Induced impacts take the next step — identifying the additional economic activity supported by spending on goods and services by households whose income was affected by the direct contributions and indirect impacts. The software industry pays its employees but also supports incomes in other sectors, like real estate. These jobs come with additional wage payments, which increase total earnings to people working in these upstream sectors. These people then buy more goods and services, which generate additional demand (and output) across the broader economy. Induced multipliers estimate this additional output from increased general demand due to higher total wages paid to people in the software industry and people in industries that supply to the software industry. The modern definition of the software industry used in the study reflects recent technological advancements in the software industry — from one that focused on tangible and packaged software products to one that includes software-related services like the cloud-based software as a service (SaaS), cloud storage and computing, mobile app development, and hosting. As a result, the EIU analysis has defined the EU software industry to include the following software sub-industries:

NACE 582: Software Publishing

NACE 620: Computer programming, consultancy, and related activities

NACE 631: Data processing, hosting, and related activities; web portals

The EIU compiled these data and economic impact assessments using publicly available government data, maintaining full editorial control of the process and using industry standard approaches. Any views or opinions expressed in this document are not necessarily those of The Economist Intelligence Unit.

ENDNOTES

[1] Calculated by dividing software's total contribution to EU GDP by the amount GDP software directly adds to the EU economy.

[2] Total EU28 GDP figures from Eurostat. "GDP at Current Market Prices, 2003–04 and 2012–14," Eurostat Statistics Explained, 2 June 2015, available at http://ec.europa.eu/eurostat/statistics-explained/index.php/File:GDP_at_current_market_prices,_2003%E2%80%9304_and_2012%E2%80%9314_YB15.png.

[3] "Labour Market and Labour Force Survey Statistics," Eurostat Statistics Explained, June 2016, available at http://ec.europa.eu/eurostat/statistics-explained/index.php/Labour_market_and_Labour_force_survey_(LFS)_statistics.

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