ECONOMIST IMPACT

The future of Europe's data economy

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Part one: Making data work for Europe

5G connectivity, sensors everywhere, connected devices, and the shift to cloud and edge computing are just a few forces that are seeing the volume of data produced globally increase fivefold between 2018 and 2025, from 33 zettabytes to 175, according to the International Data Corporation (IDC).[1] The penetration of artificial intelligence (AI) into everyday life, and the maturing of frontier innovations like quantum computing, will further deepen data's power to shape our world.

From an innovation point of view, access to data can lead to ground-breaking discoveries.

The "data economy" is a catch-all term covering the generation, collection, storage, processing, distribution, analysis, delivery and exploitation of data enabled by digital technologies.[2] Far from a by-product of economic activity, data is itself now a target of government policy and corporate intention. The likes of the UK, Estonia and France have national data strategies and chief data officers (CDOs) in place, while in corporate settings, data expertise is increasingly in demand, from the workforce to the boardroom.[3,4,5]

When conveying the value of data in the modern world, commentators often liken it to other resources and commodities – including oil, light and water. Each analogy captures a facet of data's economic and social importance, but none entirely covers it. Data is, for instance, a non-rival good; it can be re-used and recombined to generate positive spillovers, lending strength to arguments for breaking down barriers and restrictions more than might be the case for natural resources. Similarly, data gains value in the aggregate – especially through tools like machine-learning-based pattern recognition – rather than in isolation.

From an innovation point of view, access to data can lead to groundbreaking discoveries. Take, for example, data modelling for the property comparison of molecules in drug discovery; the gathering of data from smart metres to balance power supply; or the collection of data for measuring and reducing carbon emissions. Opportunities are vast and, as a result, there is an economic as well as social incentive to widen access to data. But an entirely open and free-flowing data ecosystem can lead to headaches and catastrophes, like privacy breaches, cyber security threats, or simply data overload.

How can Europe best harness data's potential, and address risks?

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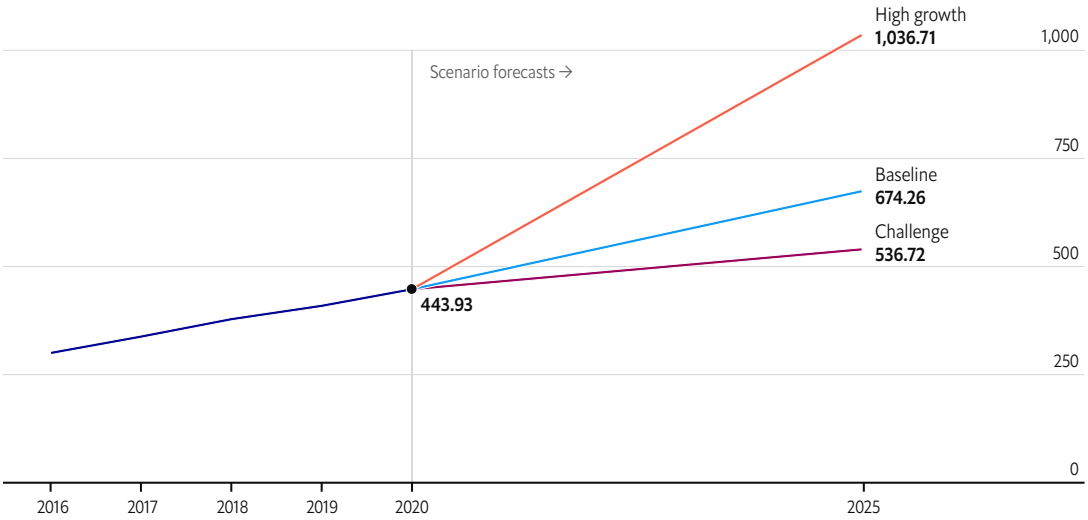
Europe's data ambitions

The European Union (EU) has been among the most active regions in the world in regulating the data economy and assembling rules and regulations to govern it. It envisions the share of the data economy – data stored, processed and put to valuable use in Europe – to correspond to its economic weight by 2030.[6] The European Commission estimates that the EU's data economy will be worth €829 billion in 2025, from 2% to 6% of regional GDP.[7] The European Commission's aim is to create a "single European data space" – a single market for data.

To support these efforts, the European Commission has published a sequence of directives, strategies and regulatory acts to set direction for member states. Critical moments include the General Data Protection Regulation (GDPR) (2018), a gold standard for data privacy globally, the European Data Strategy (2020),[8] the Data Governance Act (2021) and the Data Act (2022).[9] The EU is working with international partners to bring consistency and order to international data exchange, as with the Trans-Atlantic Data Privacy Framework.[10] The Annex to this report lists the most relevant EU projects and programmes to ease and encourage data exchange across borders and commercial sectors.

Figure 1: Value of the data economy in the EU and the UK, 2020-25, under three scenarios
Euro, billions



Source: Statista

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Data spaces are central to the architecture of Europe's data economy, with nine sectors outlined in the 2020 data strategy, but now expanding to others. The goal is for data spaces to provide a platform on which to see which use cases thrive and to incentivise market participants by lowering the complexity of data exchange.

"The objective of data spaces is to stabilise data partnerships around use cases, which are currently being developed ad hoc, so you have to have agreements, standards, decisions like which server will run the joint data processing," says Malte Beyer-Katzenberger, data policy officer at the European Commission. "We want to stabilise and lower transaction costs for coming to all of these agreements, in a set of rules with low transaction costs and high trust so we can stimulate more and more use cases to happen within a data space."

Put simply, the European Commission is seeking to remodel the current way in which data is governed across the continent. But while the policy initiatives indicate a clear policy momentum, it should be noted that a number of the proposed initiatives still lack a precedent and practical use cases – at least on the scale the Commission intends. Take data intermediaries, for example, as proposed in the Data Governance Act. The European Commission envisions these as third parties that will collect data from various organisations and make data available to third parties through a trustworthy mechanism.[11] Large amounts of literature from innovation think-tanks proposes them as an alternative model for governing data at scale.[12,13] In theory their establishment makes sense, but aside from a few initiatives more evidence is needed with regard to the specific impact that large-scale data intermediaries would have on stimulating the digital economy.

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Part two: How can Europe's data economy support the continent's social and economic goals?

The attention devoted to legislating Europe's data economy reflects an appreciation of its contribution to the continent's industrial ambitions, and of the frictions and glitches that currently prevent its full exploitation. Take healthcare, for example. Nearly a third of the world's data is produced by healthcare systems, making this a treasure trove for research and development into new therapies and improved service provision.[14] The European Health Data Space (EHDS) will connect national health systems. The first data space for which a draft regulation has been developed is in **healthcare** – an interesting choice according to Dipak Kalra, President of the European Institute for Innovation through Health Data, given that it is one of the most complex and difficult areas.

Patients benefit from such open data – think of an Italian being able to access a prescription from a local pharmacy on holiday in Spain, or an emergency room doctor in France having access to health information for a patient from Finland.[15] This infrastructure already exists at MyHealth@EU initiative; the data space would expand it to include laboratory results and MRI scans, for instance, and give patients easy and free access to their own health data. The EU believes this will add up to €11 billion in economic benefits over the next ten years, with half coming from improved data exchanges within healthcare itself and the rest from the use of health data in research and policy.[16]

Clinical research benefits from a well-governed data ecosystem that allows responsible re-use of data for research purposes. Professor Kalra recalls an influential project a decade ago, the Innovative Medicines Initiative, as providing the wake-up call for the impact of data re-use on clinical research.

The project focused on re-using hospital electronic health records to fine-tune the design of clinical trials by showing how many patients were likely to match clinical trial eligibility criteria in different regions. Given the cost and risk involved in conducting multi-site trials, and patient enrolment being a major cost and risk factor for clinical trials, such insights can significantly improve trial efficiency. The project also showed how data re-use can be conducted responsibly in a sensitive sector. "This was about re-using data without consent but in a very strictly controlled way, where only aggregate frequency distributions, not actual patient data, would be shared," says Professor Kalra.

"You don't pull patient-level data out of healthcare settings and create a big brother database without permission, but rather that you look at frequency distributions." Professor Kalra identifies other clinical benefits such as gathering information on diseases in small patient populations within individual countries, including rare diseases, or understanding risks to subpopulations, such as how certain drugs affect pregnancy.

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Manufacturing, a jugular vein for economies like Germany, is another sector well-placed to benefit from an integrated and efficient European data economy. The digitisation of industry and manufacturing was a major catalyst for the European Commission's decision to focus on a Europe-wide data strategy, led by former Industry Commissioner Günther H. Oettinger.

The potential value of sharing manufacturing data has been estimated at €83 billion in process optimisation alone, and the efficient use of data can lead to up to 20% improvements in material resource efficiency.[17] European manufacturing giants are world leaders in gathering data and putting it to use. Volkswagen is building an industrial cloud for over 120 factories.[18] BMW and Bosch have unveiled technology allowing independent workshops to access connected car data to deliver after-sales services.[19,20]

Daimler, BMW and Volkswagen have been pooling data into a common data lake to support autonomous vehicle research, a data-heavy field that requires reams of data about every landscape, every day of the year, and every hour of the day. "By putting their data together, they are gaining a lot of traction and getting benefit by volume. If they do it separately it will take years, but if they work together they can significantly reduce the time," says Hubert Tardieu, chairman of the board of Gaia-X, a European cloud initiative.

Airlines are using Airbus's **Skywise**, an open data analytics platform which improves efficiency, prevents delays and reduces risks of aircraft being grounded. **Launched** in 2017, the platform supports enhanced aircraft and equipment designs, improving service and support based on in-service data insights.[21] **Catena-X** is a first for the automotive industry, an open data ecosystem that provides an environment for the creation, operation and collaborative use of data along the entire automotive value chain.[22] The network addresses current issues facing the automotive industry, from topics such as sustainability to traceability.

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Europe is also a global leader in **finance** and the EU and national governments have taken steps to open up banking data, notably through the Payment Service Directive which allows customers to share data about transactions with multiple providers via secure, structured IT interfaces as well as application programming interfaces (APIs). This is unlocking new business models and improving competitiveness in financial services by enabling a fintech revolution on the continent, as start-ups emerge to enable more personalised banking services such as savings and investments projections and budget-tracking, and new segments, such as low-cost "robo-advisory" platforms, giving retail

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investors opportunities to build wealth in capital markets.[23] As Europe moves further towards being cashless and cardless, digital payments require safe and efficient data flows. But data is not just a commodity to be shuttled around to ease transactions: it is a resource that can deliver insight. Studies show that data analytics can reduce payment fraud by up to 30%, and credit scoring can be fairer and more accurate through careful use of alternative data.[24]

In **agriculture**, robots, drones and digital technologies help farmers make well-informed decisions on everything from irrigation to sowing, improving the quality and quantity of production, with lower costs and a lighter environmental footprint.[25] The European data strategy envisions data-sharing benefits within the objectives of the Green New Deal, from digital "product passports" to next-generation analysis of environmental legislation compliance.[26]

Figure 2: Big Data success stories: main use cases and business impacts, 2019

Agriculture	Crops monitoring: Costs = -10%	Equipment optimization	Precision agriculture
Automotive	Predictive maintenance	Self driving	Smart services: Costs = -80%
Financial Services	Fraud detection: Operational Ex. = -80%	Risk assessment	Targeting: Marketing costs = -35% TCO costs = -80% Conversion rate = 10x
Healthcare	Diagnostic	Patient monitoring	Preventive systems
Manufacturing	Predictive maintenance: Maintenance costs = -30%	Smart manufacturing: Utilities costs = -20% Cust. retention = +110%	R&D optimization/ Smart design
Retail	Assortment optimization/ Intelligent fulfilment	Price optimization/ Promotions: Conversion rate = 50% Cust. retention = +14%	Targeting: Conversion rate = +85% TCO costs = -15%
Telecommunication	Churn prediction/ Promotions	Network capacity optimization	Targeting: Conversion rate = +130%
Transport & logistics	Churn prediction/ Promotions	Fleet management	Network capacity optimization: TCO costs = -90%
Utilities	Churn prediction/ Promotions	Network capacity optimization: Costs = -20% Cust. Expenses = -30%	Personalized fares: Marketing costs = -50% TCO costs = -50%

Source: DataBench.EU

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Part three: Challenges and considerations for the EU's data economy

The approach pursued by the EU can bring drawbacks as well as advantages. On the one hand it allows the EU to create a legislative framework influenced by its own vision and identity. One of the central arguments of experts who we spoke to is that Europe is trying to frame its focus on trust and safety as a competitive edge. Indeed, the amount of proposed legislative initiatives is evidence of a region that has put facilitating data access at the top of its policy agenda. The intention, at least, is clearly in the minds of policymakers.

But while Europe's market size places it alongside the US and China as a "data economy", it is far from a single market in terms of data flows and exchange. Indeed, commentators, executives and policymakers have expressed concerns that, when it comes to data and related technology leadership like AI, the continent is lagging.[27] Given a lack of precedents for large-scale initiatives akin to, for example, the data spaces, it is also unclear to what extent Europe will be able to successfully implement the proposed initiatives – both in terms of achieving the desired economic results, but also from a purely operational point of view.

The reality is nuanced; it makes little sense to compare the amount of data produced in Europe with that of a country like China, much of which is of lesser use outside of the country.[28] But there are arguments in favour of building a data economy with fewer artificial barriers or unproductive obstacles. This will require a) innovation; b) imagination and investment in capacity; and c) interoperability and governance.

Start with **capacity**. By 2030, the European Commission is targeting 20 million ICT specialists – more than double the 8.4 million counted in 2020 – and aims to ensure basic digital skills for 80% of the population.[29,30] The Data Market Monitoring initiative, a European Commission project which has analysed the supply and demand of data professionals since 2014, forecasts a data skills gap reaching 759,000 unfilled positions in 2025 in a baseline scenario, and over 1.1 million in a high-growth scenario.[31]

Europe's broader workforce population shows an unequal level of digital skills, data literacy and internet access in the overall population, which in turn limits the degree to which companies can fully profit from data. Economist Impact's Inclusive Internet Index, for instance, finds high levels of heterogeneity across the continent, with Sweden, Spain, France and Denmark in the global top ten, but Croatia ranking below Thailand and Greece below Brazil.[32]

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European firms need to increase cloud adoption in order to fully enable data exchange initiatives. Currently, averages vary but are lagging international leaders. Only 41% of European firms currently use cloud computing.[33] Cloud adoption "is not an end in itself," says Mr Tardieu of Gaia-X. "It is a means to an end: to facilitate the existence of data spaces absolutely requires that companies belonging to the same ecosystem, whatever their cloud service provider, can communicate data without any restriction." Others, however, have argued that Gaia-X risks becoming overly bureaucratic and particularly hard to navigate for start-ups. As Gaia-X has attracted increasing membership (over 300 organisations at the time of writing), procedures determining the shape and future of the project have increasingly slowed down and been steered less by start-ups than by larger players.[35,36]

Then comes **interoperability** in the data economy in terms of standards and governance, and with countries taking different regulatory and policy approaches, and companies and institutions at vastly different levels of capacity. Inconsistent data was one factor limiting the coordination and effectiveness of Europe's response to covid-19 in the first wave of 2020, and interoperability of data systems will be critical in the green transition.[37] Lack of consistent real-time data on electric-vehicle charging, availability and billing, for instance, is obstructing EU-wide data analysis, and can hinder consumers travelling across borders and wishing to charge vehicles and pay bills in other markets.[38]

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Malte Beyer-Katzenberger claims that interoperability is "the hardest and most work-intensive issue" in building a Europe-wide data economy given the range of technical challenges, from encoding data access permissions in machine-readable language to authentication protocols for all the devices and machines coming onto networks. "It's easy to say we need interoperability. Making it happen is really hard."

All of this can be subsumed under the broader question of how data governance can keep up with data innovation. In healthcare, Professor Kalra believes that the tools of data-sharing are moving much faster than the governance decision-making. "The technology has enabled more sophisticated, secure ways of scaling up big data research, but the governance and decision-making landscape has not really cohered around that. We are seeing heterogeneous decision-making and mixed messages given to the public or to patients about what's being done." Professor Kalra hopes that the EHDS could help to drive consistency and alignment across data-openness initiatives.

Privacy and security are considerations for any data-sharing endeavours. Europe's GDPR has become a gold standard for data privacy worldwide, but the framework will need to – and has been designed to – evolve in step with technological changes. For instance, European healthcare scientists have argued that GDPR's threshold for anonymity is limiting their ability to share and analyse health data with research institutes in other geographies like the US and with global bodies such as the World Health Organization.[39,40]

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Professor Kalra says worries about data ethics are making the pharmaceutical industry reluctant to share data that could be useful for clinical research. "I've spoken to companies who are sitting on millions and millions of records and who say: 'we would love to make this available, we know it's useful, but we just don't know how to do it in an ethically acceptable way.'"

To be sure, every time a silo or data barrier is torn down, the risks of privacy breaches or cyber-threats can increase. Attacks against public utilities like energy are already growing in frequency and complexity around the world, including Europe, adding another layer of risk which might inhibit investments in connectivity and data exchange.[41]

Data sharing needs to be appropriately incentivised, and cannot be assumed to be in the interests of all participants in the value chain. Risks might outweigh rewards. Any time an institution shares data or data infrastructure, it could lay itself open to a cyber-attack in the supply chain. A study by the EU Agency for Cybersecurity Mapping, which analysed 24 supply chain attacks, found that 62% of attacks exploited the trust that customers have in suppliers, and 58% aimed to access data.[42] Companies might worry that increased data openness as set out in the EU's data policy creates intolerable risks related to business secrets or intellectual property. "Privacy for companies will become more of an issue, as they worry about know-how and assets flowing away," says Mr Beyer-Katzenberger.

Some smaller market participants fear what larger players will do with their data. Farming data, for instance, could be used to create yield-prediction models, leading to predatory, exploitative or opportunistic pricing practices and food price speculation, such as offering lower prices when there is an expected abundance, according to Mr Beyer-Katzenberger. Evidence in Europe, Australia and North America shows that farmers have been reluctant to share data with agribusinesses for fear that it will be used to build competitively threatening businesses.[43]

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Organising innovation

The good news is that European stakeholders – companies, governments and associations and data advocacy groups – are fleshing out a range of solutions. Data spaces are trying to lower transaction costs such as interoperability, but are currently open to only a select few players. Industry codes of conduct can help institutionalise best practices, but often lack regulatory endorsement. Recognising significant concerns among farmers, for instance, the EU is developing one in agriculture.[44] Pricing models can be adapted in ways that build trust and secure public support. In healthcare, Professor Kalra claims that buying and selling data is unpopular with the public. However, a mechanism through which companies pay for a data-sharing infrastructure which gathers, maps, cleans, anonymises and makes the data available would be a win–win, as would protocols requiring any participation in data-sharing platforms to contribute and not just extract data.

Innovative institutions are also emerging to bring order to the data universe, like data trusts, data stewards, data cooperatives and data safe havens. While legal and technical models vary, these are all, in essence, ways of designing data infrastructures to achieve pre-specified objectives related to control, openness and transparency.

None of the obstacles is impossible to surmount. But delivering on Europe's data economy vision will require agile regulation, investment, and strategies built on consensus and backed by evidence – all of which are fundamental to the ongoing project of the EU itself. Mr Tardieu believes that Europe's covid-19 recovery spending could be a much-needed booster, and European countries are each leading the initiative in ways that reflect their diverse economic interests and competitive advantages.

"There is a new way to think about cooperative projects. Not bureaucratic [but rather] initiated by private companies mixed with governments to have data spaces – with health being driven by the likes of Philips and the Netherlands, a tourism data space driven by Spain, an energy space driven by France and EDF, and mobility driven in Germany. You'll see a complex network of companies and countries building data spaces."

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Annex: Relevant EU data policy initiatives

Digital Single Market Strategy (2015) – Aims to **tackle market fragmentation** and provide the necessary digital infrastructure to facilitate cross-border e-commerce. This will ensure that consumers and businesses have better access to goods and services across Europe, thereby promoting inclusive growth in all EU regions and boosting the bloc's competitiveness.

General Data Protection Regulation (GDPR) (2018) – Aims to protect consumer data through implementation of requirements for organisations worldwide that collect personal data of EU citizens and residents. GDPR ensures that data processing is fair, lawful and transparent; only that data which is absolutely necessary can be collected; and data must be stored confidentially only for as long as is necessary.

Regulation on the Free Flow of Non-personal Data (2018) – This was implemented to remove barriers to the free flow of non-personal data between EU countries; to prohibit data localisation restrictions; and to allow every organisation to store and process this data anywhere in the EU.

The Data Act (2022) sets rules for use of data generated by Internet of Things (IoT)-enabled devices. **The proposal** includes measures that will allow users of such devices to gain access to data generated by them and to share it with third parties. Small and medium-sized enterprises (SMEs) will be protected from abuse of contractual imbalances in data-sharing contracts, and public sector bodies will be permitted to access and use data held by the private sector. Analysis/critique available here).

EU Data Governance Act (2022) – Promotes the availability of data by allowing re-use of some categories of protected public sector data to facilitate its use for research and creation of new products and services.

EU Cybersecurity Act (2019) – Offers an EU-wide cyber-security certification framework for ICT products, services and processes. **The Act** sets parameters for the rules, technical requirements, standards and procedures that should apply to risk-based certification schemes for ICT products, processes and services.

Open Data Directive (2019) – Provides common rules for government-held data through addressing barriers to the re-use of publicly funded information. This should contribute to the development of the **information society** in the EU, while allowing SMEs and start-ups to enter new markets providing data-based products and services.

The European Strategy for Data (COM (2020) 66 final, 02/19/20) aims to make Europe a global leader in the data-agile economy by creating a favourable policy environment and a genuine single market for data. A pillar of this strategy will be the creation of common European data spaces in strategic economic sectors and domains of public interest, where data-driven innovation will have system impact on the entire ecosystem and on citizens.

EU AI Strategy (2021)) – Focussing on two areas – excellence in AI and trustworthy AI – the Strategy aims to turn Europe into a global hub for trustworthy AI, guaranteeing the safety and fundamental rights of people and businesses while strengthening AI uptake, investment and innovation across Europe.

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Digital Services Act (2022) – Forms a single set of rules, along with the Digital Markets Act, to create a safer digital space where users are protected, and to level the playing field in order to build growth and competitiveness and foster innovation in Europe and globally.

Nine "data spaces" (p. 129) in strategic sectors, including health and mobility – Created to ensure that more data becomes available through a free flow of data across sectors and countries through provision of technical tools such as interoperability for data sharing. The nine data spaces are: Industrial, Green Deal, Mobility, Health, Financial, Energy, Agriculture, Public Administrations and Skills.

Sector-specific legislation:

Automotive – vehicle owners will have **greater control** over their service providers as companies will be required to share data generated on vehicle performance if requested. The free flow of **data in the automotive industry** can result in new shared-mobility models, customised insurance contracts, remote diagnostics and repairs, and predictive maintenance services.

Payment service providers – The Single Euro Payments Area (**SEPA**) allows cashless euro payments anywhere in the EU and in some non-EU countries. Integration and harmonisation for card payments are lagging, prompting calls for a **SEPA for cards** which would abolish limitations on acceptance of some cards by merchants, lack of interoperability between cards and terminals, and confusion over different payment experiences across Europe.

Smart metering information (reference spans two directives) facilitates the transition from fossil fuels towards cleaner energy. This legislation was also set up to deliver on the EU's Paris Agreement commitments to reducing greenhouse gas emissions while providing sustainable energy for its citizens. **Data availability** will contribute to renewables integration, grid resilience and innovations such as smart mobility.

Electricity network data (reference spans two regulations) – This has an **underlying goal** of creating a clear, legal framework allowing easier electricity trade and higher levels of operational security. It allows for the gradual harmonisation of transmission system operation in the EU through the establishment of a **code on interoperability** and data exchange.

Intelligent transport systems – This aims to establish interoperable and **seamless intelligent transport operations** across the EU. This includes data-sharing obligations across the transport sector, with the provision of travel and traffic data, advance passenger information from air carriers, and vehicle emissions information.

Digital Content Directive – Ensures better access for consumers to digital content and services, **covering** computer programs, applications, video, audio and music files, digital games and e-publications.

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