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EUROPEAN COMMISSION DIGITAL STRATEGY
A digitally transformed, user-focused and data-driven Commission

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European Commission Digital Strategy
A digitally transformed, user-focused and data-driven Commission

1. INTRODUCTION

We are at a crossroads in the development of the European Union. The medium-term challenges facing Europe include globalisation, climate change, demographics and digitalisation. These challenges must be addressed at the same time as more immediate issues, including the need to prevent terrorism and cyberattacks, to foster faster growth, to create more jobs and to deliver better public services. Resolute political leadership and appropriate, EU-wide, interconnected policies are needed.

These policies will depend, more than ever, on data. As a recent United Nations report put it 'data are the lifeblood of decision making and the raw material for accountability'. The role digital technologies should play is clear.

'The right to quality information is a cornerstone of our democracies'

- Mariya Gabriel

Around the world, these same preoccupations are evident, and there is an emerging understanding that only those who convert data into previously unimaginable digital solutions will thrive. Member States are also facing these unprecedented societal challenges. They have recognised the need to update their public sector digital strategies to seize the opportunities offered by digital technologies. The Tallinn Digital Summit in September 2017 addressed these issues at European level. Leaders at the summit emphasised the need to accelerate the completion of the digital single market. They also underlined the importance of the public sector and articulated what they expect from the Commission. This confirms the need for the European Commission to adopt a new digital strategy, which should be focused on the post-2020 policies that will shape the future of Europe.

New, innovative digital solutions in support of the Commission's policies and activities are needed as a result of several factors: Member States' expectations, legal obligations, new user requirements, heightened security concerns and a corporate approach to information management, emphasising the sharing and reuse of data. Thus, the major IT challenges for the Commission are: (i) the design, development and deployment of the next generation of mission-critical digital solutions, and (ii) the modernisation of its legacy systems.

'*Without high-quality data effective policies become almost impossible*'

- United Nations

This digital strategy sets out a vision to meet this challenge — evolving towards a digitally transformed, user-focused and data-driven administration. It formulates the principles to underpin the development of digital solutions to support the effective and coherent use of data by the Commission in compliance with data-protection regulations. It identifies actions to deliver a digitalised Commission, including borderless digital public services that implement EU-wide policies, while simultaneously strengthening cybersecurity.

This strategy emphasises the fundamental role of a sound data ecosystem. It highlights a new delivery model promoting agility, innovation and co-creation by all Commission services. Crucially, it underlines the importance of enabling actions — on governance, resources and digital skills — without which it will be impossible to achieve the desired transformation.

This digital strategy is a unique opportunity to exploit the potential of digitalisation to create innovative solutions for a more trustworthy, effective, efficient, transparent and secure Commission. It focuses on internal, corporate, IT related actions to support the Commission's departments in their daily work and to develop the digital solutions that are legally indispensable for the EU-wide execution of the Commission's policies. The strategy also represents an opportunity to explore collaboration and synergies with other institutions and agencies. The outcome will be a Commission that makes the best use of digital technologies to work in harmony with Member States and one that is fit for purpose in today's global, digital information space with its real-time flow of data.

This corporate transformation depends on committed support at political and management level. Time is of the essence. The accelerating pace of global change accentuates the urgency with which this strategy must be implemented. Directors-General are responsible for and must lead this digital transformation of their departments. Failure would undermine the Commission's reputation as a world-class administration and diminish its potential to serve Europe in the digital era. Success will be a Commission renowned for its innovative use of digital technologies to deliver the best possible services for the Union's citizens.

The successful implementation of this strategy will result in data-driven, digital solutions for Commission policies and a secure digital environment for staff that is suited to their working methods. Finally, this digital strategy may be considered as the Commission's response to the European Council's call of 19 October 2017 for 'governments and the public sectors that are fully brought into the digital age and lead by example'.

2. VISION

By 2022, the Commission will be a digitally transformed, user-focused and data-driven administration — a truly digital Commission. It will be endowed with a new generation of trusted and personalised digital solutions supporting its digitalised policies, activities and administrative processes. These solutions will increase the Commission's efficiency, effectiveness, transparency and security and will deliver EU-wide, borderless, digital public services that are indispensable for the functioning of the European Union.

This vision goes beyond more traditional e-government and is aligned with the OECD's definition of digital government: 'the use of digital technologies, as an integrated part of governments' modernisation strategies, to create public value (…) supporting the production of and access to data, services and content through interactions with the government'. More simply stated, this means fundamentally changing the way the Commission works so that it makes full use of digital technologies. This strategy focuses on people and their needs, not just on data and technology. It is the means to give staff the tools that add value to what they are doing and delivering to (ultimately) the citizen.

Figure 1: Vision

The successful implementation of this vision will deliver a set of digital solutions that: (i) support the Commission's political priorities and activities in an 'open, efficient and

inclusive' manner, and (ii) provide 'borderless, interoperable, personalised, user-friendly, end-to-end digital public services'[1] (figure 1).

These solutions should enable the sharing of data and the collaborative working practices put forward by the Communication on Data, Information and Knowledge Management[2]. They should provide flexibility for staff in how, when and where they work, allied with more standardisation in the way IT tools and information are used. In line with an open government[3] culture, they should also allow citizens to engage with — and participate in — policy-making. The solutions should be designed to optimise the user experience in terms of functionality and user interface.

The following high-level objectives should drive the actions implementing the vision:

- to support the Commission's political priorities and activities with secure, state-of-the-art, digital solutions;
- to provide the Commission with high quality, trusted, borderless, digital public services, implementing its EU-wide policies, facilitating the free flow of data and boosting the digital single market;
- to enable the transformation of the Commission and maximise its role in policy-shaping by exploiting the potential of the Commission's data;
- to make the Commission a world-class 'open administration', a collaborative, innovative and agile institution in the service of the European Union;
- to ensure that the Commission's IT assets are secure, that unauthorised access or use of information is prevented and that the Institution is protected from cyberattacks;
- to guarantee the resilience of the Commission by ensuring the security, efficiency and effectiveness of its digital infrastructure and of its portfolio of digital services.

Achieving these objectives will make the Commission a world-class administration — open, trusted, secure, connected, digitalised and data-driven. It will be characterised by a culture of collaborative working practices, the sharing of data, and personalised digital solutions. This will support the uptake of interoperable, digital public services across the European public sector and help make the digital single market a reality.

3. PRINCIPLES

The following set of high-level principles, based on the EU eGovernment action plan, the European interoperability framework and the Tallinn Declaration, will enable the implementation of this vision. These principles are adapted to the specific requirements of the Commission and will be embedded in the Commission's IT design, development and delivery processes.

1 Ministerial declaration on e-government — Tallinn Declaration: https://ec.europa.eu/digital-single-market/en/news/ministerial-declaration-egovernment-tallinn-declaration

2 Communication C(2016)6626 - https://ec.europa.eu/transparency/regdoc/rep/3/2016/EN/C-2016-6626-F1-EN-MAIN.PDF

3 https://ec.europa.eu/digital-single-market/en/open-government

Digital by default and Once-Only

Digital by default means that the default choice of Directorates-General (DGs) will be to deliver services digitally via multiple channels. Digitalisation will create new simplified services based on data-centred processes instead of digitising existing 'silo' processes. Once-Only means that DGs will ensure that citizens, businesses and administrations supply the same information only once to the Commission, so that this information can be re-used internally in compliance with data-protection rules. Services will be designed to be inclusive by default, accessible for those with disabilities and to cater for different user needs. Users will be asked to provide only the information that is absolutely necessary to obtain a specific service.

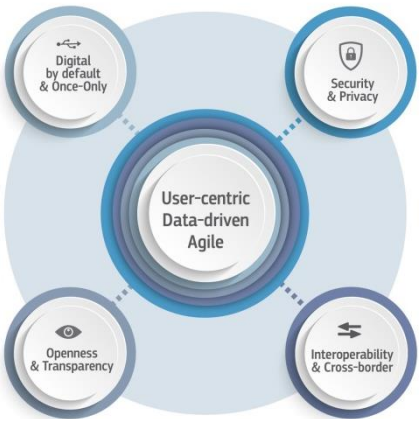

Figure 2: Principles

Security and privacy

The Commission's integrated approach to security covers citizens, physical assets and information. As part of this approach, DGs will ensure that their digital solutions are compliant with the Commission's IT-security and information-security policies and standards. DGs will safeguard the availability, confidentiality, authenticity, integrity and non-repudiation of data provided by staff, citizens, businesses and public administrations. In particular, the Commission will respect applicable cybersecurity rules and personal data-protection rules and policies.

Openness and transparency

DGs, in the context of their activities, will share data and information between themselves, and with other EU institutions and EU agencies. Where appropriate, they will also share data with Member States' administrations and third parties. Under the data protection rules, they will enable citizens to exercise their data protection rights (e.g. access, rectify and erase). DGs will allow other public administrations to view and understand their administrative rules, processes, data, services and decision making.

Interoperability and cross-border

DGs will design digital solutions to work seamlessly across organisations and respect interoperability and data exchange requirements. DGs responsible for implementing EU-wide policies will make digital public services available across borders, supporting the free flow of data.

User-centric, data-driven, agile

When developing digital solutions, DGs will focus on 'Business'/IT alignment, value for money, user requirements and the user experience. They will place innovation, data management, data sharing and data protection at the centre of the development process. They will favour the reuse of solutions, early delivery and continuous improvement. Particular attention will be given to user interfaces, accessibility and to data visualisation. Co-creation will be encouraged. Open-source solutions will be preferred when equivalent in functionalities, total cost and cybersecurity. The ultimate goal will be the delivery of

trusted services providing fast, reliable and secure access at the right time to high-quality, relevant and protected information.

Guidelines for the application of these principles will be prepared with the relevant DGs, emphasising the need for Commission-wide coordination and common technical approaches to their implementation. In particular, clear internal guidelines will be provided explaining how the Once-Only principle should respect data protection rules and other relevant legal rules, notably competition rules, depending on which information is concerned.

Taken together, this set of principles (figure 2) constitutes a holistic, user-centric, data-driven development paradigm. This paradigm will be the foundation for the provision of the Commission's next generation of digital solutions and will be progressively adopted by all Commission departments. All new developments must adhere to these principles.

4. THE DIGITAL COMMISSION

This chapter identifies current and future actions by the Commission to improve its set of digital solutions and digital infrastructure. These actions, with a timeline to 2022, will be guided by policies on digital affairs (data, interoperability, eGovernment) and based on the following existing detailed strategies for specific domains:

- the digital workplace strategy;
- the collaboration solution strategy;
- the digital infrastructure strategy;
- IT-security and information-security strategies;
- data, information and knowledge management at the European Commission;
- the Commission's data strategy;
- the European interoperability framework;
- the trans-European systems strategy.

These actions will also use, extend and develop the Commission's: (i) existing portfolio of policy and administrative information systems, (ii) digital services and (iii) current digital infrastructure.

As articulated in the vision, the focus will be to support the Commission's political priorities and activities and to satisfy user needs. Depending on the context and the specific digital solutions, users may be internal (staff of the Commission, agencies and other European institutions) or external (citizens, businesses or Member States' public administrations). Taking account of the specificities, backgrounds, handicaps and linguistic requirements of this broad spectrum of users requires specific attention to the design of the user interface.

The following actions will help achieve the strategy's high-level objectives (see chapter 2):

- review, align and develop the Commission's portfolio of information systems to support its political priorities and activities;
- prioritise the digitalisation of the processes supporting the post-2020 multiannual financial framework in the Commission and with Member States;
- optimise the quality, protection, preservation and openness of the Commission's data so that they are perceived as trustworthy by staff, citizens, businesses and public administrations;

- maximise the value of the Commission's information so that multidisciplinary teams can exploit their potential for evidence-based policy-making;
- ensure the operational effectiveness, efficiency and continuity of the Commission's IT services;
- implement security measures to protect the Commission's data and safeguard its IT services from threats such as cyberattacks and cybercrimes;
- integrate new technologies into the Commission's IT environment so that innovative digital solutions can be deployed for the Commission and Member States' public administrations;
- deploy trusted common digital solutions within and across European public administrations in support of EU-wide policies;
- facilitate the free flow of data related to EU-wide policies between European public administrations.

These actions will build on work underway in the Directorate-General for Informatics (DG DIGIT) and in the other DGs, and they will deliver innovative digital solutions. These solutions will allow the Commission to:

- adopt new working practices to improve its efficiency, effectiveness and transparency;
- be trusted by citizens and businesses;
- strengthen its cybersecurity;
- help modernise public administrations across Europe.

The implementation of these actions will be in accordance with the principles enshrined in the Financial Regulation[4]. They will also seek to generate synergies and efficiencies in the Commission's IT tools and infrastructure, as envisaged in the Synergies and Efficiencies Review Communication[5].

The design, development and deployment of these new digital solutions require a cultural change throughout the Commission. Managers, in particular, will have to adopt a 'digital first' mindset.

These digital solutions will be based on:

- a reusable solutions platform that will enable and foster the reuse of 'business-agnostic' solutions;
- a data ecosystem that will enable, facilitate and stimulate the sharing and reuse of data;
- a common digital infrastructure (including networks) that will ensure operational excellence.

Staff, citizens and businesses must be confident that this digital ecosystem of data, solutions, services and infrastructure is secure, trustworthy and resilient to cyberattacks. A 'security by design' and a 'privacy by design' approach must be adopted for all developments and cross-cutting actions must be implemented to enhance the Commission's cybersecurity and to protect its data assets.

4 Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002

5 Commission Synergies and Efficiencies in the Commission — New Ways of Working (SEC(2016) 170 final, 4.4.2016)

The conceptual model for the provision of these solutions is shown in figure 3.

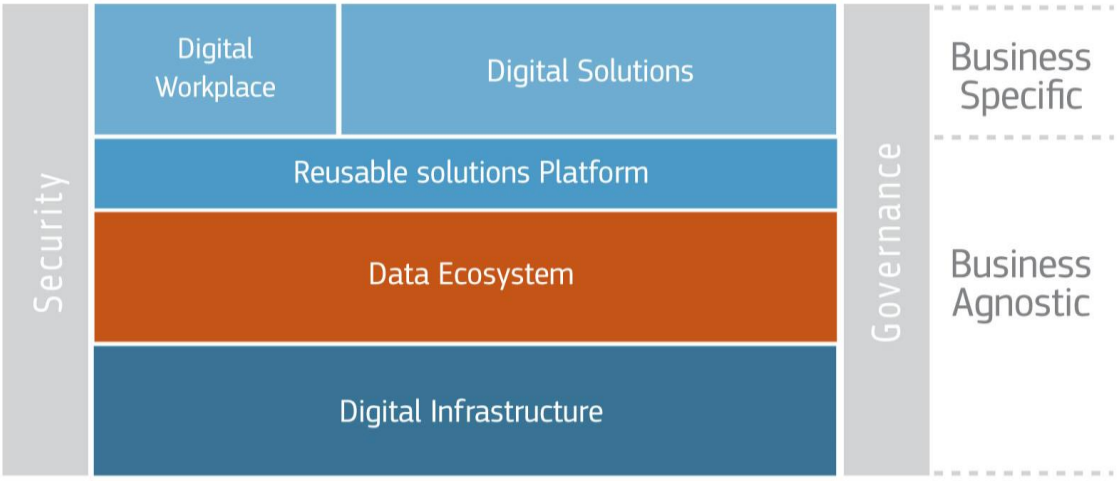

Figure 3: Digital Commission — Conceptual model

DGs will drive the development of these digital solutions to support their digitally transformed administrative and policy processes. The user experience should be central to the development of these digital solutions, focusing on two main aspects: (i) functions and data to support processes, and (ii) a friendly, personalised user interface. Solutions should be user-focused, user-friendly and offer a coherent experience.

A key element in implementing these digital solutions and the digital workplace is a corporate data ecosystem for information management that will enable the reusable solutions platform and be supported by the digital infrastructure. This will fundamentally change the Commission's working methods and its use of data in line with both the Communication on Data, Information and Knowledge Management and the associated data strategy. The data ecosystem consists of data standards and technologies supporting the full data lifecycle (i.e. storage, processing, analysis, visualisation, sharing, reuse, preservation of data, etc.). It can be thought of as the 'refinery' that makes the Commission's 'raw' data more valuable, useful, interoperable and reusable.

At the policy level, the corporate data ecosystem will allow the Commission to take better-informed decisions. This will result in evidence-based policy-making that promotes the drive for better regulation. By making the most use of data to support better policy-making, the Commission will be better able to 'predict' new policy needs by detecting trends earlier. The Commission will also be able to better assess the impact of new policies and monitor and evaluate existing policies. In other words, by exploiting the full potential of its data, the Commission will be able intelligently to design, implement and assess its policies. The Commission should also lead by example and promote the participation of citizens and businesses in policy-making through shared platforms and shared open-data solutions.

At the administrative level, the corporate data ecosystem will enable the Commission to move to collaborative working practices. Better collection, sharing, use and reuse of data and information in the Commission are essential to overcome 'silo' mentalities and deliver integrated policies. Teamwork within and across DGs will therefore become the norm.

Finally, the corporate data ecosystem will maximise the value of the Commission's data and ensure interoperability between the Commission's systems. It will gradually promote a new culture of data sharing and collaboration, which is necessary to address the many challenges facing the Commission.

4.1 An effective, efficient and transparent Commission

The digitalisation of the Commission aims to transform fundamentally the current processes (through simplification and streamlining) rather than just replicating these current processes electronically. This will make it possible to exploit fully the capabilities offered by digital technologies, while unlocking the potential of the Commission's data.

Doing this requires:

- cooperation at all levels (digital solutions, digital workplace, digital infrastructure);
- enhanced security mechanisms;
- a corporate IT architecture;
- the application of the European interoperability framework;
- the implementation of a reusable solutions platform;
- the introduction of a data ecosystem;
- end-to-end service management and operational excellence.

Digital solutions

The Commission has many, diverse IT systems for administration (human resources, finance, document management, decision making, etc.) and policy support. The DGs own these systems and they are crucial for the efficiency and effectiveness of the Commission as it automates its processes.

Managing these systems is a complex challenge. A standard business-fitness and technical-fitness check should be performed regularly on the systems to make sure that they are aligned with the Commission's priorities and activities, that they meet security requirements, that business continuity is ensured and that they are cost-effective. Particular attention should be paid to those information systems that are reaching the end of their lifecycle. Appropriate strategies to renew mission-critical legacy systems are essential.

Managing these systems in a decentralised organisation such as the Commission is even more challenging. This is because of constant changes to the systems, the current fragmentation of business processes and the lack of interoperability. In dealing with this complexity, the corporate IT architecture, business process reengineering and the European interoperability framework are crucial to ensure that systems are compatible and interoperable with each other, and that they support the current and future 'business' needs of users.

Early 'ex-ante' collaboration between the Commission's services, including its informatics staff, is essential to exploit the full potential of new technologies in the preparation of new legislation, the digitalisation of new processes and the transformation of services. This is especially important for the post-2020 multiannual financial framework, which will require many major systems to be upgraded to take into account new legal instruments. Guidelines for Commission policy makers should be prepared to address IT issues in new legislation, particularly regarding data management and the legal and semantic interoperability that is necessary to give legal certainty to the free flow of data and real-time data exchanges that characterise the data economy. Provision should be made in the legislative texts for the collection, (re)use, dissemination, protection and preservation of the data necessary for shaping the policy and executing the resulting daily operations.

The Commission's Information Technology and Cybersecurity Board will adopt a digital solutions modernisation plan, prepared by DG DIGIT in collaboration with all other DGs. This plan will identify and prioritise the corporate and policy-support digital solutions that need to be built, renewed, developed, maintained or phased out. It will support the Commission's political priorities and activities, and will be based on standard business-fitness and technical-fitness checks derived from the principles of the Commission's digital strategy. This plan will take into account the potential for interinstitutional synergies and savings through the wider provision of digital services by the Commission to other institutions and agencies.

This significant undertaking will require collaboration and input from all stakeholders, in particular the owners of corporate systems. It will be overseen by the new IT governance structures. The resulting set of solutions should:

- facilitate sharing of data;
- enhance security;
- ensure compliance with data-protection rules;
- apply the European interoperability framework;
- use corporate building blocks and Connecting Europe Facility (CEF) components.

All solutions should be adapted or developed in line with the principles of the Commission's digital strategy. Solutions should be designed with data sharing and reuse in mind so that they comply with the Commission Decision on reuse of Commission documents[6]. Solutions should be consistent with the Public Sector Information Directive[7], which encourages public-sector bodies to make data and relevant metadata publicly available in open and machine-readable formats that ensure interoperability. Similarly, for spatial data, solutions should be consistent with the Infrastructure for Spatial Information in Europe (INSPIRE) Directive[8]. Solutions should also be aligned with the Commission's communication policy.

The alignment of Regulation (EC) No 45/2001 to the EU General Data Protection Regulation (GDPR)[9] and the recognition by the Commission of electronic identification and trust services covered by the eIDAS Regulation[10] will need to be fully integrated into the management and development of the Commission's digital solutions and infrastructure. The Commission should reflect on the potential benefits of developing a single solution to manage users' consent for the use of their personal data for different EU public services. A centralised solution and single interface for managing user consent

6 Decision on the reuse of Commission documents: http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32011D0833. See more information at https://ec.europa.eu/digital-single-market/en/news/rules-re-use-commission-information

7 Directive 2013/37/EU on the re-use of public sector information: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32013L0037

8 Directive 2007/2/EC establishing an Infrastructure for Spatial Information in Europe: https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32007L0002. See more info at: http://inspire.ec.europa.eu/

9 COM Proposal 2017/002 (COD) - Proposal for a Regulation of the European Parliament and of the Council on the protection of individuals with regard to the processing of personal data by the Union institutions, bodies, offices and agencies and on the free movement of such data, and repealing Regulation (EC) No 45/2001 and Decision No 1247/2002/EC.

10 Regulation (EU) N° 910/2014 of the European Parliament and the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC, OJ L 257, 28.8.2014, p. 73.

would help different EU public services provided by the Commission to comply with data protection rules, while simultaneously applying the Once-Only principle.

DIGITAL SOLUTIONS	TIMELINE[11]
OUTCOME: A modernised and reliable set of mission-critical, interoperable digital solutions for administrative and policy support, delivering personalised digital services via multiple channels.	
▪ The Information Technology and Cybersecurity Board will approve a digital solutions modernisation plan, which will identify and prioritise the corporate and policy support digital solutions, including trans-European systems. This will help deliver state-of-the-art solutions, optimise the IT investments and maximise synergies.	2019
▪ DGs, in line with the digital solutions modernisation plan, will develop their new digital solutions based on the principles of the Commission's digital strategy.	2022
▪ DGs, in line with the digital solutions modernisation plan, will apply the principles of the Commission's digital strategy if and when they evolve existing systems.	2022

Digital workplace

The modernisation of the Commission goes hand in hand with the digitalisation of the working environment. DG DIGIT is committed to creating the digital workplace of the future. DG DIGIT will provide a new office-automation environment with state-of-the-art personalised functionalities for each staff member. This will be made easier by standardising and centralising the management of end-user IT equipment and support services. At the same time, the digital workplace will be developed to make the Commission more resilient to potential disruptions, either accidental or intentional. It will therefore include mechanisms to improve significantly the resilience, security and stability of the underlying infrastructure in order to ensure the continuity of service.

The digital workplace will be structured around the following main areas:

- devices, especially mobile devices;
- office automation;
- mail and calendars;
- unified communication with advanced video-conferencing;
- collaboration and social networking;
- integration and identity-and-access management.

Wi-Fi will be installed throughout the Commission's buildings to support access to the digital workplace from anywhere at any time.

Building on these elements, the digital workplace will become the customisable, integrated environment for the personal and collaborative work needs of all staff.

11 The timeline is to be understood as the final completion time for each action.

A smart digital dashboard - *MyWorkplace* - will be developed in collaboration with Directorate-General for Human Resources and Security (DG HR). It will give a consolidated presentation of actionable tasks, and provide seamless access to the information sources and digital solutions necessary to execute them. It will be integrated with MyIntracomm to provide a personalised information space for each staff member.

Staff engagement and staff productivity should increase by providing each staff member with a modern and effective digital workplace. In parallel, the definition and uptake of the associated new working methods should be facilitated by the "One-Stop-Shop" initiative[12]. As the digital workplace will be accessible remotely and by mobile devices, it will also support the balance between professional and private life by increasing the scope for teleworking and working-time flexibility. Guidelines and training should be provided to support staff and ensure that they make effective use of this technology and minimise the risk of technology aversion.

The implementation of the digital workplace will empower staff to work together from anywhere at any time. It will allow secure collaboration and sharing/transmission of information between Commission staff and third parties, including other EU institutions and agencies, public administrations, international organisations and citizens.

DIGITAL WORKPLACE	TIMELINE
OUTCOME: An individualised digital workplace for Commission staff with the right IT tools, platforms and services for secure personal and collaborative work from anywhere at any time.	
▪ DG DIGIT will provide a new user-centric digital workplace supporting mobile working methods and secure collaborative solutions.	2019
▪ DG DIGIT in collaboration with DG HR will provide a smart digital dashboard — *MyWorkplace* — with actionable tasks and seamless access to related information, MyIntracomm, and relevant digital solutions.	2021
▪ DGs will transform their working methods in cooperation with DG HR so that collaborative work (enabled by the digital workplace) becomes the de-facto standard in the Commission and with third parties.	2022

Reusable solutions platform

To drive efficiencies across the Commission when building digital solutions, DG DIGIT, in collaboration with the other DGs, will progressively deliver a reusable solutions platform. Reusable solutions are not restricted to a single use-case but can be used for a variety of different purposes and can be customised for the specific needs of the DGs. DGs will use reusable solutions that are already available and will help develop new solutions derived from their specific needs. The platform will be built around a catalogue containing: reusable building blocks and services, open-source solutions, a corporate architecture, standards, best practices, support and consultancy services, etc. Reusable building blocks

12 https://myintracomm.ec.europa.eu/sg/info-management/Pages/one-stop-shop-collaboration.aspx

can also be based on specific developments made by DGs so as to maximise synergies and leverage existing investments. This reusable solutions platform will: drive reuse, enable common user experiences, bring standardisation, reduce redundancy, increase interoperability, reinforce security and reduce development costs. The use of the reusable solutions platform should be enforced by the Information Technology and Cybersecurity Board, so as to reduce overall costs, increase efficiencies and encourage the use of standardised solutions across the Commission.

This will enable the Commission to make the transition toward a digital delivery model based on the principles set out in this strategy, the corporate IT architecture and the European interoperability framework. In particular, it will support business-agnostic, data-driven and user-centric solutions. It will also make the current delivery model more agile by reducing the 'time to market' of new solutions.

REUSABLE SOLUTIONS PLATFORM	TIMELINE
OUTCOME: A reusable solutions platform for the Commission's IT community to develop and operate cost-effective, interoperable and trustworthy digital solutions.	
▪ DG DIGIT, in collaboration with the other DGs, will establish, promote and support a sustainable delivery platform for a set of reusable building blocks and reusable services - the reusable solutions platform.	2020
▪ DGs will base their new IT projects on the reusable solutions platform to improve efficiency and effectiveness in delivering user-centric digital solutions.	2022

Data ecosystem

As outlined above, the provision of a corporate data ecosystem overseen by the Information Management Steering Board is a critical element in the transformation of the Commission to a data-driven administration. The corporate data ecosystem will underpin the move towards multidisciplinary, data-driven, evidence-based policy-making and support initiatives such as Data4Policy[13]. It will also ensure that data can be shared within and beyond the Commission unless there are legal constraints or clear justifications for access to be restricted, such as data protection rules, confidentiality needs or third-party intellectual property rights. A clear distinction will be made between personal data for internal administrative purposes and non-personal data for policy purposes. The data ecosystem will be business-agnostic while enabling DGs to create business-specific information. It should be built upon existing capabilities and responsibilities in data-related domains and foster close collaboration between DGs.

This ecosystem should be seen as a set of interconnected and interacting elements for the collection, acquisition, management, storage, curation, sharing, reuse, publication, protection, archiving and preservation of the Commission's data. In technical terms, this infrastructure will include: data sources (e.g. databases, systems), associated analytical tools, data standards, catalogues, metadata, ontologies, protocols, application programming interfaces (APIs), analytics and guidelines; all of which will address the issues of data fragmentation and data silos across the Commission. It will ensure the emergence of

13 https://www.data4policy.eu/

semantically interoperable (i) data repositories, (ii) master data and (iii) base registries. This will be achieved by adapting existing systems to allow seamless data sharing that is compliant with the Decision on the reuse of Commission documents, and consistent with the Public Sector Information Directive and the Infrastructure for Spatial Information in Europe Directive.

The definition of the data standards that are essential for the semantic interoperability of existing and new digital solutions will be a collaborative effort undertaken by DG DIGIT in cooperation with all other DGs, particularly those who are members of the Data4Policy group.

Creating a corporate data ecosystem is more than just a technical endeavour. This requires a 'common information culture' among senior managers and staff so that data sharing becomes the norm, i.e. a substantive change from the current situation, which is characterised by data silos. It necessitates addressing challenges including skills, legal and ethical frameworks, data governance, data quality, etc. Over time, a corporate data ecosystem should contribute to: (i) better collaborative, evidence-based policy-making, (ii) greater ease of information exchange, (iii) better data quality and (iv) reduced costs.

It is essential to raise awareness of the value of information and emphasise that data are the reusable raw material of the 21st century, and that the data ecosystem is the 'refinery' to process, analyse, share and reuse the Commission's data assets. To succeed, the data ecosystem will require strong sponsorship at the highest level and alignment with the data strategy of the Commission. It will also require data governance, including master-data management and compliance with common semantic standards. Accompanying measures will be essential to drive the change towards a data-sharing culture, including a dedicated training programme to ensure that staff acquire the necessary mindset and skills.

DATA ECOSYSTEM	TIMELINE
OUTCOME: A data ecosystem including a set of interoperable data repositories, corporate base registries, associated tools and frameworks for data sharing and reuse between DGs and external stakeholders.	
▪ DG DIGIT, under the supervision of the Information Management Steering Board and in collaboration with all other DGs, will establish the technical governance for master data and base registries, establish taxonomies for the Commission's data and develop semantic interoperability standards for the management of corporate data and metadata and the secure exchange of data.	2019
▪ DG DIGIT, under the supervision of the Information Management Steering Board and in collaboration will all other DGs, will establish a data management capability (covering standards, vocabularies, guidelines, analytical tools, visualisation, frameworks, catalogues, consultancy, and training) to: (i) support data-sharing initiatives, (ii) support the Data4Policy initiative, (iii) facilitate discoverability of public data sets and (iv) enable the evolution of existing systems.	2020
▪ DGs will ensure that existing systems are adapted and that new solutions are developed in compliance with these interoperability standards and data reusability principles.	2022

Digital infrastructure

The 'cloud' is already transforming IT in the Commission, in the other EU institutions and in Member States' administrations. This is making IT systems more agile, accessible and scalable, while keeping costs under control. DG DIGIT intends to make optimal use of cloud-computing technology by following two parallel sets of actions.

Firstly, DG DIGIT will continue to build a strong offering with external sourcing from the public cloud-computing market for those services that can be done better and more cheaply outside. This is especially the case for systems for which data confidentiality requirements are lower. Secondly, in parallel, DG DIGIT will modernise the operations of its on-premise data centres so that they follow a 'private cloud' model with high levels of security, resilience and data protection. This will cover the entire infrastructure stack from self-service request to middleware platforms and the underlying virtualised infrastructure (processing, storage and networks). Ultimately, the current traditional data centre will be transformed into a genuine, on-site private cloud. By combining the best of the public cloud market with a secure, on-site, private cloud, the data centre's delivery model will be transformed into a hybrid cloud to support the Commission, executive agencies and other European institutions.

In addition, DG DIGIT will continue to consolidate the Commission's local data centres so that there will be only two integrated sites in Luxembourg with fail-over facilities. This is in line with the action plan in the Synergies and Efficiencies Review. The consolidation of the local data centres will produce savings (manpower, rental cost and connectivity costs) while improving the overall operational effectiveness of the Commission's infrastructure services (better performance, reduced business continuity risks, increased security, improved resilience against cyberattacks, etc.).

DIGITAL INFRASTRUCTURE	TIMELINE
OUTCOME: Corporate, consolidated, secure, hybrid cloud services for the Commission, executive agencies and other European institutions.	
▪ DG DIGIT will deliver a resilient, secure and stable infrastructure to ensure continuity of service for the digital workplace and for digital solutions.	2020
▪ DG DIGIT will complete the consolidation of the local data centres as planned in the Synergies and Efficiencies Review.	2021
▪ DG DIGIT will build a hybrid cloud service offering secure, on-site private cloud services and public cloud services for the Commission.	2021
▪ DG DIGIT will use its experience with cloud technology to become the cloud broker for the European institutions and executive agencies.	2022

4.2. Borderless digital public services

The Commission promotes the digital transformation of public services through the use of innovative digital technologies. As underlined in the Tallinn Ministerial Declaration and the

EU eGovernment action plan 2016-2020, the Commission plays a significant role in facilitating the provision of borderless public services for the single market.

Concretely, the Commission runs several programmes and initiatives that aim at enabling cross-border digital interaction and the digital modernisation of European public administrations. The Directorate-General for Communications Networks, Content and Technology (DG CONNECT) leads this process in partnership with DG DIGIT.

Furthermore, the Commission is legally obliged to develop and operate a large number of pan-European systems in various policy areas. They are managed by their respective DGs in collaboration with the Member States. Pan-European systems are large-scale IT systems supporting the implementation of EU policies across borders. They can be considered as digital solutions for European public services. They play a critical role in the day-to-day functioning of the EU and the delivery of its policies. Future changes to these systems will be a major challenge for the Commission. Failure to modernise these systems would pose a reputational risk for the Commission.

These systems will have to change to meet the commitments of the Tallinn Declaration, where Members States explicitly called on the Commission to 'fully integrate digital considerations into existing and future policy and regulatory initiatives', and 'apply the Once-Only principle for the EU-level digital public services they own and coordinate, in all policy areas'. Actions to achieve these objectives form an integral part of this digital strategy.

Public administration modernisation

Between now and 2020, the modernisation of public administrations will continue to be supported by the following instruments and programmes:

- the interoperability solutions for public administrations, businesses and citizens (ISA²) programme;
- the Connecting Europe Facility (CEF) Digital;
- the eGovernment action plan 2016-2020;
- the European Structural and Investment Funds (ESIF), in particular the European Regional Development Fund, the European Social Fund and the Cohesion Fund, via two specific objectives as well as a specific structural reform programme;
- the Horizon 2020 programme;
- the Structural Reform Support programme (SRSP).

As indicated in the eGovernment action plan, several initiatives will drive the digitalisation of public administrations between now and 2020. The Commission will co-fund the implementation by Member States of ambitious digital solutions to modernise their administrations. For instance, the Commission will coordinate the implementation and monitoring of the European interoperability framework. The Commission will also continue to provide and maintain Connecting Europe Facility building blocks and fund their use in the Member States to facilitate the uptake of reusable and interoperable solutions in public administrations across the EU. In leading by example, the Commission will also use these e-government solutions as part of its portfolio of solutions for its own administration.

In 2020, most of the current programmes and instruments (ISA², CEF, ESIF, SRSP, Horizon 2020) will come to an end. There is a strong consensus that simpler and better-coordinated new programmes and instruments need to be put in place to ensure the sustainability of the current initiatives.

In addition, the Council has highlighted that 'coherence is necessary between the actions stemming from the eGovernment action plan and the concerned EU policies, financial instruments and programmes (including CEF, ISA², Horizon 2020 and ESIF)'[14].

After 2020, the Commission is proposing to establish a coherent set of programmes — the Digital Europe Programme and the Connecting Europe Facility — and an associated operational budget. The budget should include support for the modernisation of public administrations to guarantee a shared vision and goals. This should help to exploit synergies better, avoid duplication of effort and lead by example in innovative digital by default solutions. Actions implementing this strategy in the domain of both these programmes must comply with these programmes and their implementing rules.

Within the context of EU-wide digital public services, these programmes, as proposed by the Commission, have the following objectives:

- to support European public administrations' ability to embrace a convergent and interoperable digital transformation that will enable them to be more effective in implementing EU policies.

- to adopt a more ambitious and structured approach to ensuring the provision and sustainability of trusted, coherent, digital, cross-border service infrastructures of public interest in the EU.

- to foster a public and collaborative platform for European public administrations to share common, digital, operational challenges and solutions and to benefit mutually from cross-fertilisation of respective local strengths. This will nurture a holistic and coordinated, participative approach towards the modernisation of public administrations.

14 eGovernment action plan 2016-2020 — Council conclusions (20/09/16).

PUBLIC ADMINISTRATION MODERNISATION	TIMELINE
OUTCOME: A platform for European public administrations to fund, share and co-create trusted digital solutions for the transformation of their administrations.	
▪ The Commission will seek to ensure greater consistency between the different initiatives related to digital public administrations[15] by establishing a coherent set of programmes with an associated operational budget, which should include support for the modernisation of public administrations.	2020
▪ The Commission will provide an updated public and collaborative platform for EU public administrations, ensuring that digital elements and associated communities are networked and that systemic opportunities are publicised, explored and deployed at scale.	2021
▪ The Commission will support the modernisation of public administrations by progressively adapting its digital solutions in line with the Tallinn Declaration and the European Interoperability Framework.	2022

Digital solutions for EU-wide public services

The Commission is legally obliged to develop and operate a large number of systems to support different EU-wide policy areas, including the single market. These systems provide cross-border services between national administrations and for citizens and businesses. They support a very wide number of policy areas such as taxation and customs union, home affairs, the single market, mobility and transport, health and food safety, consumer protection, environment, employment, the production of European statistics, etc.

Although these systems support specific processes in their policy domains, they also share common technical requirements, including: identity and access management; electronic signatures; secure information exchange; data analytics; and the need for secure connectivity. In the future, these systems should therefore rely on a common set of reusable services provided by the reusable solutions platform. These common services will extend the services already provided by the building blocks of EU-wide programmes such as CEF and ISA² or the Commission's own building blocks (Trans European Services for Telematics between Administrations-New Generation, eID, eSignature, eTranslation, EU Login, etc.). This approach will allow optimal use of resources, convenient and seamless cross-border access, and improved resilience.

After 2020, new systems may be developed to support the above or other policy areas and to satisfy the growing number of requests from Member States for centralised, common, EU-wide solutions. This will be an opportunity to exploit the potential of these reusable solutions in the design, development and deployment of these systems. In particular, efforts should be made to reinforce the sharing of data, to optimise IT investments and to maximise synergies.

15 Successor of CEF, successor of ISA², successor of Horizon 2020 and ESIF.

The plan for the evolution of these pan-European systems will be an integral part of the digital solutions modernisation plan (cf. 4.1). The plan should identify the digital solutions for EU-wide public services that need to be built, renewed, modified, maintained or phased out. DGs should use the reusable solutions platform and the data ecosystem in the development of these solutions.

DIGITAL SOLUTIONS FOR EU-WIDE PUBLIC SERVICES	TIMELINE
OUTCOME: A modernised set of centralised Pan-European systems using new technologies to deliver user-centric, interoperable digital solutions that support EU policies.	
▪ DG DIGIT will consolidate and extend a common set of reusable services for pan-European systems as part of the reusable solutions platform.	2020
▪ DGs and executive agencies, in line with the digital solutions modernisation plan (cf. 4.1), will develop their new digital solutions for EU-wide services, based on the principles of the Commission's digital strategy.	2022
▪ DGs and executive agencies, in line with the digital solutions modernisation plan (cf. 4.1), will progressively apply the principles of the Commission's digital strategy if and when they evolve legacy trans-European systems.	2022

Greater collaboration for borderless digital public services

The Commission will reinforce collaboration with Member States, other stakeholders and the private sector to implement borderless, digital, public services supporting EU-wide policies, emphasising the reuse of digital solutions and the sharing and exchange of open data.

Now that Europe's data economy is growing rapidly, the Commission should enable the European Union to make the most of these data opportunities. The Commission should promote the implementation of an open data ecosystem for the European Union, by continuing to develop data standards, specifications, tools and systems, and inviting Member States to use them widely.

Inspired by the Tallinn Digital Summit, and in partnership with the chief information officers of the Member States, this could result in the implementation of a European information infrastructure for the public sector. This could be a cornerstone of Europe's future data economy. It could integrate high-performance computer facilities, cloud services, high-speed networks, open data, data analytics, blockchain, machine learning and artificial intelligence. It could provide a data platform for the reuse, aggregation and transformation of scientific, public sector and private sector data, based on a federated network of data hubs. This infrastructure would increase the Commission's capacity for evidence-based policy making and facilitate the development of new, borderless, digital, data-driven, public services. It would also accelerate the emergence of the data economy and support the free flow of data across the EU.

GREATER COLLABORATION FOR BORDERLESS DIGITAL PUBLIC SERVICES	TIMELINE
OUTCOME: A European information infrastructure supporting open data and the free movement of data. It would also facilitate the next generation of data-intensive, borderless, digital, public services underpinning the digital single market.	
▪ The Commission will work more closely with Member States' chief information officers on public sector transformation, in particular on the implementation of digital solutions for EU-wide policies. It will also encourage Member States to collaborate with each other in this task.	2019
▪ The Commission will deliver an open data ecosystem for Europe, increasing the value of open data.	2022
▪ The Commission will deliver a pilot solution for a European information infrastructure for the public sector in partnership with the chief information officers of the Member States.	2022

4.3. Cybersecurity at the Commission

Cyber threats

Cyber-attacks are becoming more sophisticated. Politically motivated cyber-attacks target the EU institutions, their staff and, in particular, their political leaders, in both their professional and private lives (e.g. targeting personal email accounts). The Commission's IT ecosystem is hard to defend with 50,000 devices, more than 1,000 corporate applications in a variety of locations with different business needs, in many datacentres and DGs. Maturity and resilience varies, some critical systems are well protected while others do not implement basic cybersecurity hygiene. Also, the increased use of mobile devices, cloud computing, social media and data-intensive collaborative tools means that there is a growing number of targets.

'Cybersecurity is essential for Europe and we start by being safe ourselves'

- Mariya Gabriel

A major cybersecurity failure could drastically harm the political and operational activities of the Commission and damage its reputation. IT security is therefore a top priority of the Commission and cybersecurity has a central role in the modernisation of the Commission and in the creation of borderless, digital, public services. In fact, an appropriate level of security, based on a sound risk management approach is a prerequisite for the success of this digital strategy. Thus, in addition to the specific security measures embedded in the actions in the preceding chapters, the Commission's overarching approach for cybersecurity addresses its cross-cutting nature with Commission wide actions.

Cyber defence

The Commission already has a "defence in depth" approach to cybersecurity, with multiple layers of defence to block and/or detect attacks. The majority of attacks are routinely detected and automatically blocked by the first lines of defence. The Commission has a

mature capacity to detect known malware and malicious sites and to respond to incidents. However, with the size and complexity of the Commission's IT systems, classical attacks patterns are still a danger: notably stealing credentials through a phishing campaign or compromising an unpatched system, escalating privileges to obtain administrator rights to install malware or exfiltrate data. Experience shows that very sophisticated attacks are hard, can take a long time to detect and need significant resources to eradicate.

The revamp of the Commission's IT security internal governance from 2015 with the establishment of a corporate information security steering board and the adoption of Commission decisions 443/2015[16] and 46/2017[17] was a first step towards the establishment of clear governance and management mechanisms.

In the short term, the Commission will reinforce the foundation for its IT security, based on four main objectives:

- Ensuring that fundamental IT security processes (i.e. risk management, the formulation and implementation of security plans, secure development, timely vulnerability management, penetration testing, routine vulnerability scanning, and secure system administration) are embedded in management practices across the board;
- Provision of a cost effective, consistent and balanced infrastructure offer based on i) appropriate and well governed use of public cloud services (integrated with in-house IT security services), ii) the consolidation of in-house information systems into on-premise cloud services and iii) the migration of more sensitive applications into secure hosting. At the same time, the resilience of the systems will be raised by segregating and securing IT environments by function;
- Widening the scope of incident detection and response to provide full visibility on more information systems (and as a priority all critical information systems) and to defend against increasingly targeted and sophisticated attacks. The aim is to detect earlier and respond more effectively. A 24/7 capability will be part of reinforcing this responsiveness.
- Reinforcing corporate governance by integrating IT and security governance and reinforcing corporate awareness by stepping up the campaign to build awareness, beyond end users, with a reinforced emphasis on the role of senior management and IT experts regarding IT security and the need for effective preventative measures.

Cybersecurity is a shared responsibility

DG DIGIT can provide leadership in achieving these goals alongside the other lead services in the Secretariat-General and DG HR. It is of concern to everyone in the Commission and in particular it is important that senior management understands and embraces its specific roles and responsibilities for risk assessment and mitigation.

The main thrust required is a general consolidation and streamlining of IT systems to reduce complexity and increase baseline security across the board (infrastructure, software, services and information) for all DGs, irrespective of their geographical location. The full take-up of the opportunities of data centre consolidation, secure and agile software development, the re-use of secure building blocks and effective updating

16 Commission Decision (EU, Euratom) 2015/443 of 13 March 2015 on Security in the Commission

17 Commission Decision (EU, Euratom) 2017/46 of 10 January 2017 on the security of communication and information systems in the European Commission

and security patching procedures cannot be achieved without all services playing their part. Supportive tooling will be introduced for all software projects (re-usable components, new solutions, major upgrades) and vulnerability scanning of digital solutions and services will made systematic. Security by design will be mandatory for IT development. Security must also be a key component of the procedures for IT operations and business continuity by the DGs. DG DIGIT will progressively put in place a 24/7 IT security capacity to respond to cyberattacks and to support DGs if their business continuity plans need to be activated.

As part of the digital modernisation plan, system owners responsible for legacy systems, some of which were designed before IT security was a priority, will be called upon to review and update their systems. A risk mitigation plan, supported by reinforced monitoring, will be proposed and resourced as part of maintenance or the phase out plans. Where agreed with DGs, DG DIGIT will support these efforts through a centralised, local information security officer service. The overall renewal of the digital infrastructure will integrate key security practices (e.g. patching, logging and forensics). Actions to reinforce the security of all systems will be included in the digital solutions modernisation plan (cf. 4.1).

A new governance model, integrating IT and security governance, is therefore necessary to ensure the implementation of the principles described above.

In order to assist this process, DG DIGIT will provide a regular risk report to the Information Technology and Cybersecurity Board in collaboration with all DGs, covering the risk profile of the Commission's existing information systems and new digital solutions. The report will include recommendations to the responsible DGs to mitigate these risks.

With these actions, DG DIGIT will increase the security level of the whole Commission in cooperation with DG HR, the computer emergency response team of the EU institutions[18], the EU Agency for Network and Information Security[19], Europol and other relevant authorities, where appropriate. This collaboration with relevant bodies at Member State and EU level will enhance the Commission's cybersecurity capabilities.

Finally, individual staff members are the frontline defenders of the institution. Education initiatives on cyber hygiene will be intensified to make sure that all staff adopt simple routines and behaviour to minimise the risks from cyber threats. Each individual has a role in guaranteeing the cybersecurity of the Commission.

CYBERSECURITY AT THE COMMISSION	TIMELINE
OUTCOME: Security mechanisms in place to safeguard the Commission's IT infrastructure and IT services and to protect and preserve its information assets.	
▪ DG DIGIT will progressively improve the security of its IT infrastructure offer through the provision of secured public cloud services and secure, segregated on-premise hosting services.	2019

18 https://cert.europa.eu/

19 https://www.enisa.europa.eu/

CYBERSECURITY AT THE COMMISSION	TIMELINE
▪ DG DIGIT, in collaboration with the DGs, will standardise secure development procedures in its software delivery model including source code review tools to support agile development and on-demand security assurance testing.	2019
▪ DG DIGIT will reinforce its cyber awareness-raising programme and tailor this programme for different staff categories with an emphasis on the roles and responsibilities of senior management and IT experts.	2019
▪ DG DIGIT, in collaboration with the DGs, will launch an annual IT security risk report on the IT security risk profile of Commission services. The report will propose priority mitigation measures.	2019
▪ DGs will ensure that both existing systems and new solutions are in line with the Commission's IT security and information security frameworks[20] and that legacy systems are subject to appropriate mitigation measures.	2020
▪ DG DIGIT will continue to develop its detection and response capacity with emphasis on having full visibility of critical information systems and early detection of sophisticated attacks.	2020
▪ DG DIGIT will progressively put in place structures and procedures to ensure 24/7 response to cyberattacks and to assist DGs if their business continuity is at risk.	2021

5. DIGITAL DELIVERY MODEL

The objectives and actions described in this strategy will be achieved only if the Commission's digital delivery model changes to integrate the principles outlined above (chapter 3). This implies adopting a paradigm for the development of the Commission's digital solutions and digital public services that takes into account the priority of the Commission to deliver a secure and trustworthy digital ecosystem that has the following features:

- security by design
- privacy by design
- interoperability by design
- digital by default
- cross-border by default
- open by default.

The digital delivery model should not be seen as a simple adaptation of the technological environment, but as a change management challenge for the Commission with a strong human dimension. It should lead to an internal simplification of IT in all its aspects.

20 Decision 2015/443, Decision 2015/444, Decision 2017/46 and their respective implementing rules, standards and security notices.

This delivery model will be based on an inclusive approach, incorporating contributions from all DGs to make IT development more consistent across the Commission. It should enable the delivery of user-friendly, digital solutions that meet the needs of each DG. The technology environment will need to be fully redesigned to make it responsive to fast-changing user needs. DG DIGIT should foster the emergence of this digital delivery model by providing, as a stable foundation, a set of shared capabilities (i.e. corporate IT architecture, the European interoperability framework, a reusable solutions platform, capabilities for the data ecosystem, agile software development methodologies, cloud services, etc.), while at the same time limiting technological lock-in. The delivery model should also include principles and guidelines for when to choose in-house software development and when to choose external software development, supported by the necessary contractual framework.

The roles of the corporate IT architecture and the European interoperability framework are critical as they will allow all the technical elements of the Commission's IT environment to work together in a consistent manner. The European interoperability framework will be adapted to the Commission's specific requirements and applied where appropriate. Connecting Europe Facility (CEF) and other corporate building blocks will be used where possible. This should guarantee the overall cohesion, effectiveness and security of the IT environment. It should also ensure that this environment can change swiftly and efficiently in order to meet the current and future needs of the Commission.

DG DIGIT will both establish and promote this digital delivery model and it will also lead by example, by applying this model when implementing digital solutions. Nevertheless, the application of the digital delivery model is the shared responsibility of all DGs (and IT staff) of the Commission. It is a collective and distributed delivery model inspired by a collaborative working ethos. The Information Technology and Cybersecurity Board will be instrumental in promoting actively this digital delivery model throughout the Commission.

Agility

The dynamic nature of the Commission's work means it is very important that the digital delivery model is agile and can quickly deliver truly user-centric solutions. This means reducing the 'time to market' and bringing flexibility to the development and deployment processes. Collaborative working methods will be the norm within the Commission's IT community to foster the sharing of code, data and solutions.

On software development, it is essential that IT professionals embrace agile methodologies, in particular the project management methodology Agile@EC. IT professionals should also adopt flexible delivery methods. The corporate IT architecture and European interoperability framework should support this objective. PM² [21] should also take into account the principles described in this strategy and ensure that these principles are applied. When possible, the Commission should not develop software itself, but instead make use of off-the-shelf products, whether commercial or open source. This should enable the Commission to respond faster to user needs, particularly for requirements that are not specific to the EU institutions.

On infrastructure, cloud computing has already started to enable greater agility and flexibility in the Commission. It is also improving accessibility and scalability, while driving down costs. Cloud computing has already shown considerable benefits, notably

21 https://ec.europa.eu/isa2/solutions/open-pm2_en

by reducing the time it takes to furnish hosting solutions. Cloud technologies should therefore be exploited further, for instance, by making more cloud services for IT professionals available (e.g. services for developers) and making these services easier to access.

Co-creation

The Commission is a decentralised organisation with multiple IT teams in many DGs. Thus, although DG DIGIT is the corporate solutions provider, it is not the only internal solutions provider. The digital delivery model should recognise and maintain this as a strength, and promote and encourage co-creation through collaboration among DGs. This approach should generalise solutions developed by local IT teams in domains of specific expertise of their DGs, thereby exploiting synergies and existing investments. This will ensure that all digital services are presented, used and reused in a coherent and harmonised manner.

Such an approach can take various forms. For example, corporate services should be built from existing proven local solutions, and DGs should use the capabilities of existing multi-DG solutions. The IT community should also tap into the growing potential of open-source software, and join forces with major commercial players and communities, where appropriate, and mobilise co-creation capacity to support DGs in pioneering new solutions.

Co-creation should not be limited to the implementation of digital solutions but should be applied more generally notably to business processes, data sharing, interoperability and enterprise architecture. Staff across the Commission who are skilled in these domains should be identified and called on for new initiatives. Lessons learnt and experience in managing co-creation should be shared between all DGs. DG DIGIT and the Information Technology and Cybersecurity Board have an important role in facilitating these actions.

The Commission should also examine the possibility of co-creating solutions in diverse policy domains with external stakeholders (Member State administrations, citizens and businesses) to implement state-of-the-art digital public services on shared platforms and promote e-participation in EU affairs. The Commission should, where appropriate, share its vision and tools across the EU, and with neighbourhood partners, other relevant regions and networks.

Innovation

The Commission should play an incubator role: to promote the adoption of emerging technologies; to modernise the Commission and European public administrations; and to make the Commission future-proof. The digital delivery model should therefore encourage innovation.

Administrative mechanisms should be created to facilitate the launch of carefully selected technological pilot projects. These will allow the Commission concretely to test and implement new technologies (e.g. artificial intelligence, machine learning, blockchain, internet of things, etc.) for well-identified use cases. Once a technology is validated and the return on investment is proven, the Information Technology and Cybersecurity Board may decide to extend the use of this technology across the Commission. The lessons learnt from the experience should then be shared with all DGs.

Such pilot projects could be implemented in a collaborative manner jointly between DG DIGIT and interested DGs, particularly those with experience and expertise in emerging

IT technologies. In addition, the Commission should further explore the possibility of partnerships with external organisations (private or public sector, European institutions, national organisations, universities, etc.) to use these organisations' expertise in a specific new technology, their funding capacities, etc.

The Commission should also recognise the fact that, by using its purchasing power effectively and imaginatively, it can stimulate innovation internally and externally. Using procurement to implement a new technology or to acquire an off-the-shelf technology can improve the internal efficiency and effectiveness of the Commission. This approach could also open a route to market and create international growth opportunities for all types of innovative companies, even the smallest start-ups. Over time, this could lead to a dynamic community of public and private players, both large and small, that could develop cutting-edge solutions for public administrations.

The Digital Pole[22], co-managed by DG CONNECT and DG DIGIT, is an organisational entity to promote IT innovation within the Commission and across the EU. Its mission is to act as an incubator for digital innovation with a foresight capacity to assess opportunities stemming from new use cases, new organisational models, new technologies, etc. It will focus on four priority areas: (i) European digital infrastructure, (ii) the European data economy, (iii) public service innovation and modernisation, and (iv) digital solutions[23]. It will also be instrumental in encouraging the adoption of innovative digital solutions for EU-wide policies.

DIGITAL DELIVERY MODEL	TIMELINE
OUTCOME: A new, Commission-wide, digital delivery model based on interoperability, reusability and data sharing. The digital delivery model prioritises agility, co-creation and innovation.	
▪ The Information Technology and Cybersecurity Board will promote co-created digital services among DGs, external stakeholders and Member State administrations.	2019
▪ DGs will progressively adapt their digital delivery model, in particular by adopting more agile development methodologies for their IT projects and by updating their sourcing strategy.	2021
▪ The Commission will adopt a policy for IT innovation in the institution, and launch pilot projects in partnership with the private sector to showcase its role in an innovation-driven, public-sector, digital ecosystem.	2022

22 https://ec.europa.eu/info/departments/informatics/digital-pole_en

23 Digital solutions will primarily look at (1) health, ageing and well-being, (2) learning, multi-lingualism and inclusion, and (3) culture and creativity.

6. ENABLERS

'When 'analog complements' to digital investments are absent the impact can be disappointing'

- World Bank

It is now recognised that the main obstacles to achieving the benefits of digitalisation are no longer technological. In addition to technology, the proper enabling environment and a change management philosophy must also be put in place to make the most of the transformational potential of digitalisation and its new working practices. Governance, resources and skills are all critical elements of this enabling environment.

6.1 Governance

In line with best practices for modern government, it is critical that this digital strategy benefits from strong political sponsorship. Given the transformative nature of the strategy, support at both political and administrative levels is needed on a continuing basis.

Given the need to reinforce the foundation for IT security by implementing principles such as security by design in all IT projects, and building on the initial work of the information security steering board, it is considered useful to integrate both IT and security governance bodies in a single Information Technology and Cybersecurity Board .

Governance should ensure that actions are taken to support the vision and objectives of this digital strategy. To do this, a digital strategy implementation plan will identify a hierarchy of priorities, measurable outcomes and progress indicators. The plan will be drawn up by DG DIGIT in collaboration with all DGs, and adopted by the Information Technology and Cybersecurity Board. It will include the digital solutions modernisation plan. The actions planned in this strategy and the associated implementation plan should be reviewed in 2020 to take account of: the rapidly changing digital landscape; the evolution of the existing digital solutions and digital infrastructure; the emergence of new technologies; the evolution of the security threat landscape; and the adoption of the post-2020 multiannual financial framework by co-legislators. This will ensure that the strategy remains aligned with the Commission's political priorities, while exploiting the potential of emerging technologies.

The digital strategy will be plugged into the Commission's corporate governance and will use the new IT governance structures, integrating security at the heart of the IT governance process. The Information Technology and Cybersecurity Board will oversee the implementation of the strategy and DG DIGIT will be responsible for the coordination of its implementation. Its composition will be enlarged so as to ensure a stronger representativity of the DGs and to strengthen the oversight of the implementation of the strategy. Given the importance of data management, the functions of the Information Management Steering Board should be reinforced under the chairmanship of the Secretariat-General. In particular, responsibility for data governance should be invested in the Information Management Steering Board. Similarly, the responsibilities of DG DIGIT for IT technical governance and the corporate IT architecture should be re-affirmed.

Governance structures for projects and development methodologies should be adapted to place data at the heart of the design process. In assessing the plans for new projects, the Information Technology and Cybersecurity Board should ensure that data management, data interoperability, data sharing and data protection are properly addressed. They should also ensure that the relevant data standards are rigorously adhered to so that data reuse becomes the norm within the Commission. The Information Technology and Cybersecurity Board

should also enforce the uptake of the reusable solutions platform to reduce costs and encourage the use of standardised solutions across the Commission services.

Finally, governance structures should be devised for co-creation developments and interinstitutional cooperation. DGs responsible for corporate solutions should have the right to veto proposed developments that would deviate from the corporate approach. If the responsible DG accepts a proposed development, it should then oversee its integration and release.

Since the digital strategy has the potential to benefit other institutions, the Commission should also take this opportunity to reinforce interinstitutional collaboration through the *Comité Informatique Inter-Institutionel* (CII). This will help create more synergies, based on joint actions.

GOVERNANCE	TIMELINE
OUTCOME: Corporate oversight, monitoring and review of the implementation of the digital strategy.	
▪ The Information Technology and Cybersecurity Board will oversee the implementation of the strategy within the new IT and security governance framework and DG DIGIT will coordinate its implementation.	2019
▪ DG DIGIT, through the *Comité Informatique Inter-Institutionel*, will invite the European institutions to collaborate with the Commission in implementing this digital strategy. DG DIGIT will also initiate interinstitutional actions that will allow for economies of scale (e.g. tenders for public cloud services, licences, and hardware), trusted data exchange and greater interoperability of digital solutions.	2019
▪ The Commission will conduct a mid-term review of progress towards the implementation of this strategy, taking into account the final multiannual financial framework decisions, in particular.	2020

6.2 Resources

Funding constraints and the push for efficiency mean that the total budget envelope for informatics (operational and administrative) under existing programmes is unlikely to expand in the coming years. This means that the successful implementation of the digital strategy depends on how the available IT budget is allocated by the budget authority and optimised by the Commission. There is therefore a clear need for more flexible mechanisms to allow for the transparent and optimal allocation of the budgets to fund IT solutions including, if appropriate, the redeployment of existing resources in terms of staff and appropriations.

The budget structure and funding mechanisms should allow for the implementation of the digital strategy, including co-financing. The budget will be executed in compliance with the budgetary process, the Financial Regulation and applicable rules and regulations. As domain leader for IT, DG DIGIT will present annually the budget request for the digital strategy implementation plan, to be reviewed and approved in the normal budgetary process.

In addition, existing instruments should be used to provide dedicated funding to evaluate emerging technologies and integrate them into the Commission's IT environment, if appropriate.

RESOURCES	TIMELINE
OUTCOME: A digital strategy implementation plan that is reviewed annually, and flexible funding mechanisms to ensure the optimal alignment of digital investments and political priorities.	
▪ DG DIGIT will present annually the budget request for the digital strategy implementation plan. This budget will be reviewed and approved in the normal budgetary process.	2019
▪ The Commission will propose new mechanisms applicable from 2021 to allow all legislative instruments to finance corporate IT from operational budgets.	2019
▪ The Commission should use existing instruments to provide dedicated funding for the integration of new emerging technologies into the Commission's IT environment.	2019

6.3 Digital skills

Creating a digitally transformed and data-driven Commission requires, inter-alia, changing the mindsets of staff and their working methods. This represents a major cultural change overseen by DG HR that will be achieved by equipping all staff (both IT professionals and non-IT staff) with the right skills through training, coaching, knowledge sharing, etc.

In line with the European digital skills initiative[24], the Commission should put in place an effective recruitment policy and ambitious accompanying measures to help its staff to make the most of the new ways of working and the new capabilities offered by digital technologies. The leadership role of management is also critical to the success of this transformation challenge. Managers must have the right skills to be able to digitalise processes with new technologies, manage information as an asset, and introduce new working practices and oversee the change management associated with this transformation.

Finally, the skill sets of DG DIGIT staff and of local IT teams should be aligned with the objectives of this strategy, with a particular emphasis on data-centricity for the delivery of new digital solutions.

DG HR and DG DIGIT, in collaboration with the other DGs, will:

- establish new targeted training programmes for staff, IT staff and management;
- identify new staff profiles;
- adapt the Commission's recruitment policies and the framework contracts to recruit IT specialists in new emerging technologies;

24 https://ec.europa.eu/digital-single-market/en/digital-skills-initiatives

- establish a community of practice to enable personalised learning experiences, etc.

This focus on digital transformation, digital skills and digital literacy also requires an internal awareness-raising campaign.

DIGITAL SKILLS	TIMELINE
OUTCOME: A corporate digital and data skills programme for staff, management and the IT community.	
▪ DG HR and DG DIGIT, supported by the DGs, will establish a digital and data training programme, which will cover digital leadership, digital literacy and data skills.	2019
▪ DG HR and DG DIGIT, supported by the DGs, will run an awareness-raising campaign emphasising the benefits of the digital strategy.	2019
▪ The Commission, supported by DG DIGIT, will identify new staff profiles for emerging digital technologies, security and data management. It will also launch competitions and new framework contracts for recruitment of these profiles.	2019

7. IMPLEMENTATION

The rapid implementation of this strategy, starting immediately, will be necessary to achieve its objectives. A sense of urgency and a shared determination by Directors-General is needed to achieve this transformation of the Commission. An ambitious timetable and the meticulous, coordinated execution of the planned actions will be supported by a set of key short-term deliverables to be adopted by the Commission's corporate governance structures by end 2018/early 2019.

The actions identified in this strategy, which should be completed by 2022, constitute a high-level action plan (see Annex 1). On this basis, DG DIGIT, in collaboration with all DGs, will prepare the Digital Strategy Implementation Plan. The Information Technology and Cybersecurity Board will adopt this implementation plan, which will identify in detail the deliverables for DG DIGIT and the other DGs.

Directors-General are responsible for the implementation of this strategy in their departments. They should collaborate with DG DIGIT in designing, developing and operating their digital solutions. They must signal to DG DIGIT, at senior management level, any challenges or issues arising from their use of IT that could have wider repercussions or could pose a reputational risk to the Commission, so that joint actions can be undertaken to address the problem.

In order to ensure the continuous monitoring and follow-up of the implementation, DG DIGIT, in collaboration with the other DGs, will present an annual progress report to the Information Technology and Cybersecurity Board, starting in 2019, and a mid-term review to the College in 2020. The mid-term review will be a pivotal milestone. It will prioritise ongoing actions and identify new actions, taking into account political priorities, the adoption of the post-2020 multiannual financial framework and emerging technologies, so as to continue the transformation of the Commission.

Given the urgency of this digital transformation, corporate governance structures will adopt the following key short-term deliverables so as to launch the implementation successfully.

KEY SHORT-TERM DELIVERABLES	TIMELINE
▪ Digital Strategy Implementation Plan	Q4 2018
▪ Cybersecurity action plan	Q4 2018
▪ Data ecosystem action plan	Q4 2018
▪ Digital Strategy: Governance	Q4 2018
▪ Digital Strategy: Financial resources	Q4 2018
▪ Digital solutions for EU-wide public services action plan	Q1 2019
▪ Digital Solutions Modernisation Plan	Q1 2019

These key deliverables define the framework for proactive data sharing; co-financing for the development of corporate solutions; use of common solutions; strengthened security. In addition, the reporting mechanisms outlined above will permit the necessary oversight by the Commission's corporate governance structures to ensure the successful completion of the digital Commission.

8. CONCLUSION

'Data is the foundation of our digital future'
- Andrus Ansip

The European Union is at a crossroads. It needs creative policies and innovative digital public services to deliver the quality of life aspired to by its citizens. This Communication defines a digital strategy for the Commission to facilitate the preparation of these policies and the rollout of these digital solutions. It envisages a digitally transformed, user-focused and data-driven Commission with a common culture of data sharing and collaborative working practices. It proposes principles, actions and enablers to achieve this vision.

This corporate transformation will depend on committed sponsorship at political level, consistent support from senior and middle management, and the active participation of all DGs. Its success will also be critically dependent on managers becoming aware of the value of the data for which they are responsible. They must take the lead in the digitalisation of their services.

Overseen by the Commission's Secretariat-General and implemented by DG DIGIT together with all the DGs, this digital strategy, with data as its leitmotif, will transform the Commission, contribute to the modernisation of public administrations across Europe and strengthen the digital single market.

The Commission is invited to:

- endorse the European Commission digital strategy proposed in this Communication;

- mandate the Secretariat-General to oversee its implementation within the new governance framework;
- instruct DG DIGIT to coordinate its implementation in collaboration with all DGs;
- require all DGs to contribute actively to its implementation.

The College will be kept regularly informed of ongoing work and progress achieved.