

Digital Government Benchmark

Annex to the Final Contract Management Report (1.3.2)

Executive Summary of the Final Report

This study provides an analysis of digital transformation of government, analysed in conjunction with the role of data and of technological areas, specifically APIs and blockchain. While digital transformation of government is much wider than the technologies which can potentially support it, an analysis of the role of APIs and blockchain in the public sector is highly relevant to illustrate how technology can enable the transformation of government.

This Digital Government Benchmark report is a compilation of three related, but largely independent, work packages:

1. **Digital Government Transformation** - The aim of this work package has been to better understand components of the Digital Transformation of Government, and to propose a method to help the public sector better shape its Digital Government Transformation activities.
2. **The API landscape in the Public Sector** - The aim of this work package has been to identify areas of further research for the Joint Research Centre, including the ability of APIs to assist Member States with enabling their digital transformation. Areas of specific focus include cross-border interoperability between Member States and the opportunity for the EU to become involved in developing or advocating API standards.
3. **Blockchain and Distributed Ledger Technologies and their relevance for Digital Governments** – The aim of this work package has been to identify the relevance of this technology for Digital Government and investigate key pilot deployments of this technology for governments within Europe. The study focusses on the functionalities, governance, usage, technical architecture, costs and benefits of the pilot deployments and explores their potential to be scaled across borders.

Digital Government Transformation

The work package has analysed existing frameworks and definitions of Digital Government and the Digital Transformation of Government, in the light of a proposed Framework for Transformation and a related definition for 'Digital Government'. This Framework consists in five levels of transformation, from e-government to a fully transformed and 'smart government'. Each level is qualified by characteristics following seven themes, which include, for example, drivers for transformation and the types of ecosystems.

The mapping of the different analysed frameworks (e.g., from OECD, UN and EC sources) against the proposed Transformation Framework shows that examples mostly relate to its levels one (e-government) and two (open-government), with some elements of level three (data-centric). The gaps identified relate to the notion of capacity building (in project management and procurement) to accompany digital transformation, which we propose to add to the definition of Digital Government. Another set of gaps relates to the enablers of transformation measured by the different frameworks: human capital, technical infrastructure or digital skills and the uptake of technologies. Enablers relating to technology and skills are also referred to in the EU definition of e-government, together with organisational change to "strengthen support to public policies".

The study illustrated Digital Transformation of Government with a series of case studies in several domains, where we learned: (1) the importance of the context of a Digital

Transformation Initiative: the outcomes of an initiative are influenced by the political, organisational and technical opportunities and threats; (2) the drivers and the link with the key motivations of Digital Transformation; (3) the relation between the different themes – and their levels of maturity - used in the proposed Framework to qualify this transformation.

An expert workshop was held towards the end of the study, during which the main findings were shared and ideas for further research were discussed. As well as acknowledging the potential focus on data that this work has initiated, and the technology related aspects that it has mapped, experts have advised further work to explore the nature of government and how it can change in light of technological developments, covering a range of research opportunities of policy and service-delivery relevance.

Leveraging the lessons learned, the study drew four sets of conclusions and proposed areas for further research. The first one, the challenges of change, relate to managing change and setting the right path for transformation. This included, capacity building for change and adequate access to skills are key. The second one, the reasons and means of transformation, considers drivers, where key motivations and leadership of digital transformation initiatives and the service model are related to digital systems and a technology focus. Key research points relate to researching the benefits of digital transformation and what is the role of the ecosystem, also from a social or policy perspective. The third one, the roles of policy and interoperability in transformation initiatives, highlights the driving force of policies in transformation, and research points address how policy opportunities can support the higher levels of transformation. The fourth set of conclusions leveraged the insight from the experts and key points focused on how transformation can be made to policy and how technology can support this transformation in a broader view to consider the nature of European government and governance in the coming years.

The API landscape in the Public Sector

This work package set out to explore the API landscape in the EU public sector. API is the acronym for Application Programming Interface and it refers to a set of clearly defined methods of communication between a service and any other software or components¹, essentially, a software intermediary that allows two applications to interact with each other. The purpose of the study has been to identify areas of further research for the Joint Research Centre in the ability of APIs to assist Member States with enabling their digital transformation. Areas of specific focus include aspects such as cross-border interoperability between Member States, and the opportunity for the EU to become involved in developing or advocating API standards. To deliver the insight required, both desk-based research and structured interviews with public sector organisations that have developed successful APIs were carried out.

The report provides a useful baseline overview of APIs, considering what they are used for, the different types of API that can be leveraged, and the API standards that exist. A glossary of terms and API types in the appendices provide further resources from this work. The work considers how APIs are used in the public sector, where the findings showed that their role includes helping organisations to achieve their goals in four main ways:

1. Enabling ecosystems
2. Overcoming complex integration of large systems
3. Supporting Open Government initiatives
4. Enabling innovation

¹ <https://www.definition.net/define>

The use of APIs is not without its challenges, however. This study highlighted IT security and enhanced EU regulation around privacy as important issues for API owners to take into account. An API is another gateway into a computer network and requires the security features and ongoing maintenance that such an interface deserves.

The lack of standards (except in the geospatial/mapping space where the OGC has many) was also considered, both in the desk-based research and the interviews conducted. In summary, the lack of standards does in some way hinder interoperability both internally and externally to government agencies. It is forcing organisations to develop their own set of guidelines to ensure alignment, and this is something that the UK Government have recently released to all API developers. However, the use of API gateways, and the predominance of RESTful architectures is, in some ways, diluting the pressure for a standard.

Differences with the private sector were also considered. The report found that to date, government has (in the main) harnessed the power of the API to make data more open and available to their citizens, and between government organisations, themselves. The benefits range from increasing transparency, to enhanced efficiency of the existing service models. The private sector has harnessed APIs for a more transformative and disruptive end, giving rise to completely different business models, such as those which have made Netflix and Amazon leaders in their field. For public sector organisations, APIs can similarly be leveraged to self-disrupt itself in the face of increasing citizen demand and cost pressures.

Our research also considered the future of government, which will be to some extent built on the API as a key enabler. As the demands of government move forward, it appears that APIs are well-positioned to keep apace. They provide the access points needed to enable fast and secure data-sharing to support government's needs for integrating technologies across sectors, from law and order, to healthcare and the environment.

Finally, in line with its purpose, the study suggested that a number of further research topics be considered. The most significant relates to the possible development of an EU API standard. This is clearly an area that can deliver benefit, and has support (based on our limited study). However, there are some key design principles that would need to be explored with a wider audience as a next step – and this audience must include API consumers and providers, not be developed in isolation or overly academic. Other areas for consideration are regarding the economic stimulation provided by APIs, and the way in which APIs will play a role in the future of government, including enabling wider ecosystems incorporating the private sector and the exploitation of disruptive tools, such as 'Artificial Intelligence' and Robotics.

Blockchain and Distributed Ledger Technologies and their relevance for Digital Governments

The origins of blockchain technology date back to 2008 when it was proposed as a computer science design to enable secure direct trading of assets among peers who may not have sufficient confidence in each other. The Bitcoin protocol, the best known application of the blockchain concept, has proven that distributed ledger technologies (DLT) can effectively solve the double-spending problem on a mass scale and build trust among nodes of a peer-to-peer network without the need for a central authorization point. In recent years, the concept of decentralised ledgers, on which time-stamped messages are recorded in the append-only mode and safely stored, rapidly expanded beyond this original payment system application. Today, blockchain is recognized as a truly radical innovation being explored by a growing developer community and vibrant start-up ecosystem. It has many potential applications outside of the financial sector, in particular in the public sector for managing social transfers and public aid, voting, taxation or citizen records. This technology has the potential to be used as part of an infrastructure to exchange information between public

administrations. For example, to share criminal records information, grants and details of academic degrees across borders.

This study has examined the relevance of this technology for Digital Governments. It provides the definition, contextualisation and history of blockchain and distributed ledger technologies from a Digital Government perspective. Also, it analysed nine key pilot deployments in the public sector related to blockchain and distributed ledger technology. Based on the horizontal analysis of the pilot deployments (in terms of functionalities, governance, usage, technical architecture, costs and benefits) and the exploration of the potential for the pilots to be scaled cross-border, potential policy actions that the EU can take to fully utilize this developing technology have been proposed.

The nine key pilot deployments were analysed using a structured assessment framework, consisting of the following elements

- Case study characteristics – including the country or countries the blockchain pilot caters to and the level of government that is involved
- Functionalities, governance and usage – including the functionalities provided by the platform, the blockchain architecture type and the current amount of users and transactions
- Technical architecture – based on the elements of the hierarchical framework of ISO TC307 DLT Reference Architecture Outline (draft)
- Cost and benefits – including recurring and non-recurring costs, and qualitative and quantitative benefits

The analysis of the nine pilot deployments presented key insights in these elements. The Exonum Land Title Registry project in Georgia was able to move quickly into a production phase as blockchain technology is used as a separate, additional technology layer that provides safety and security for digital certificates stored in the National Agency of Public Registry's (NAPR) land title database. The land registry in the blockchain project in Sweden presented a number of key hurdles that inhibit the use of this technology for complex and high value transactions such as real estate transfers. These hurdles include the legality of digital signatures. The project of Zug (Switzerland) that allows citizens to create blockchain-based E-ID's that are official government ID's, provides a prime example of how blockchain can be used to empower citizens, yet needs a centralized, government-owned E-ID system to exist in parallel. The Stadjerspas in a smart-voucher system in Groningen, created to promote inclusion for low-income citizen. This pilot deployment highlights the potential of programmable money for social benefits, enabled by blockchain technology.

The study also explores the potential of these pilot deployments to be scaled cross-border, based on the potential benefits, costs, technical consequences and policy adherence for the EU to be scaled. Using the key insights in the analysis and the scaling exploration, the study draws five sets of conclusions and proposed areas of future research. The first is that blockchain is not a radical innovation for the public sector as it is often portrait to be, as they often do not present direct disintermediation for public organisations. The second is that blockchain the main benefits that public services realize from using blockchain technology is the enhancement of data integrity, immutability and data consistency between organisations. With this, blockchain technology can improve the trust in public institutions as the consensus mechanism allows for the shift of trusting the public authority towards trusting the technology for registering transactions. Also, blockchain technology enables new public service delivery models, as it allows for data consistency within an ecosystem of organisations and actors, beyond the traditional public organizational boundaries. This removes the need for endless copying of data and artificially connecting different back office systems, presenting the opportunity of leveraging this technology for spanning IT silos between governmental organizations. Based on these insights, the study proposes a framework for potential policy steps for the EU in order to exploitation of the full potential of blockchain technology.

Digital Transformation of Government

Using desk based research, and a limited number of case studies, this study provides an insight into the digital transformation of government in the EU. Furthermore, it suggests a possible framework that can be used to support Member States in their journey. The exploration of APIs and blockchain shows that they are enabling technologies which are being adopted by Member States to support transformational activities. There is potential for further research on the role and impact of these and other technologies in new studies from both socio-technical and policy perspectives in relation to digital transformation of government.