

**Preparation of a Long-Term National ICT Strategy**

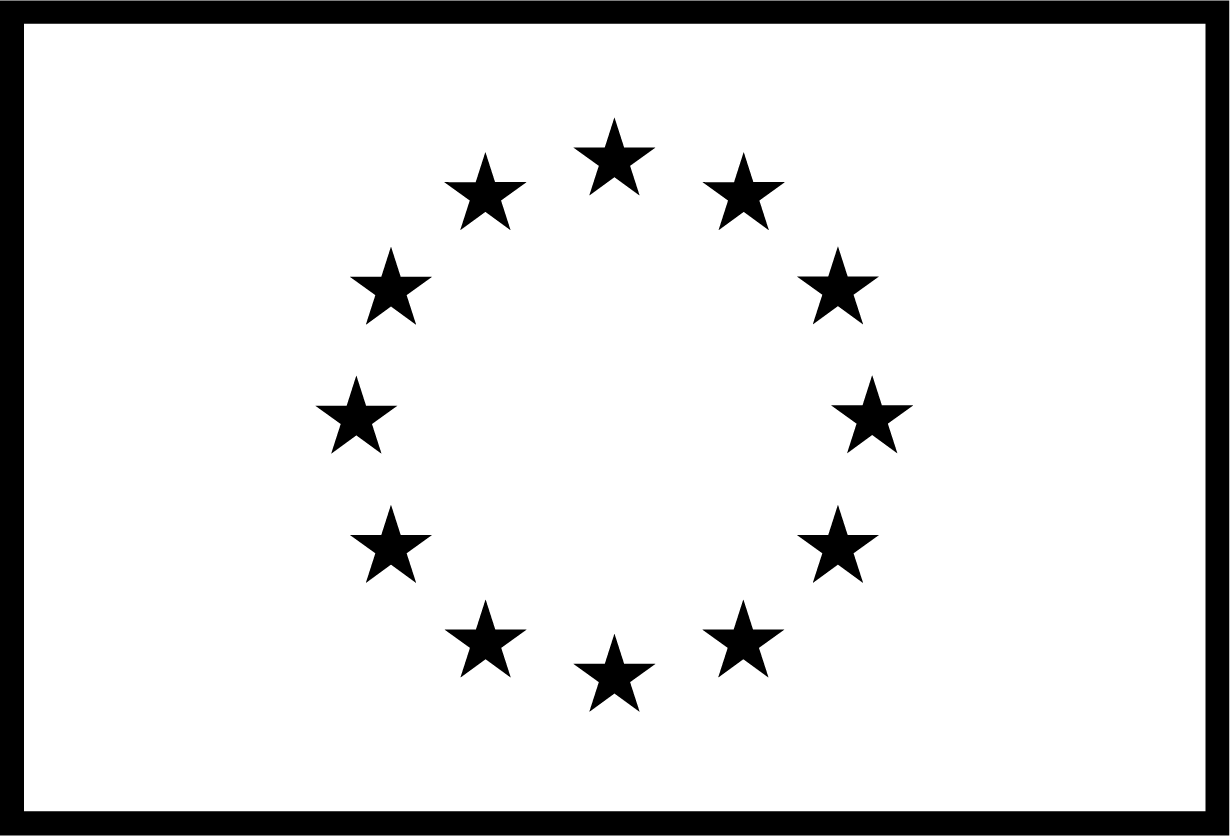
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**North Macedonia**

**National ICT Strategy**

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Versions

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| Changes | • The period for implementation of the strategy changed to 2021-2025 (instead of 2020-2025), due to the fact that the pandemic caused by the coronavirus postponed the implementation of the planned activities and caused a delay in the timely adoption of the Strategy by the Government of the Republic of North Macedonia .  • In Part 2, “Connectivity and Government Infrastructure”, “Promote national broadband targets, implement faster”, MISA is added as one of the institutions responsible for reviewing and proposing updated timelines and priorities stipulated in the ‘MK National Operational Broadband Plan’. |

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List of Acronyms

|  |  |
| --- | --- |
| 3GPP | 3rd Generation Partnership Project (3GPP) unites seven telecommunications standard development organizations (ARIB and TTC (Japan), ATIS (United States), CCSA (China PR), ETSI (Europe and rest of world), TSDSI (India), TTA (South Korea), defines the global standards for 5G and the roadmap.[[1]](#footnote-1) |
| 4IR | Fourth Industry Revolution, which builds on new technologies such as 5G, AI, IoT, advanced data analytics, robotic process automation, blockchain, robotics, cloud computing, virtual and augmented reality, 3D printing, drones, smart grids, smart cities, smart home, e-health, etc. There are a number of cross-cutting themes such as security, standardisation and digital skills development. |
| 5G | Fifth generation wireless technology for digital cellular networks |
| AEK | Agency for Electronic Communications of Republic of North Macedonia |
| AI | Artificial Intelligence |
| App | Application |
| BCO | North Macedonia National Broadband Competence Office[[2]](#footnote-2) |
| CAPEX | Capital Expenditure |
| CEO | Chief Executive Officer |
| CIO | Chief Information Officer |
| DAMK | Digital Agency of North Macedonia, an organization to be established by the Government of North Macedonia |
| DESI | EU Digital Economy and Society Index[[3]](#footnote-3) |
| DG | Directorate General |
| eID | Electronic Identification, a digital solution for proof of identity of citizens |
| eIDAS | Electronic Identification, Authentication and Trust Services EU regulation[[4]](#footnote-4) |
| ETSI | European Telecommunications Standards Institute[[5]](#footnote-5) |
| EU | European Union |
| EUR | Euro |
| EuroHPC | European High-Performance Computing Joint Undertaking (EuroHPC)[[6]](#footnote-6) |
| GDP | Gross Domestic Product |
| GDPR | General Data Protection Regulation of the European Union |
| GÉANT | Collaboration on e-infrastructure and services for research and education[[7]](#footnote-7) |
| ICT | Information and Telecommunications Technology |
| IoT | Internet of Things |
| IPR | Intellectual Property Rights |
| ISO | International Standards Organization[[8]](#footnote-8) |
| IT | Information Technology |
| ITU | International Telecommunications Union[[9]](#footnote-9) |
| JP MRD | JP Makedonska Radiodifuzuja – Public Enterprise Macedonian Broadcasting |
| KPI | Key Performance Indicator |
| MISA | North Macedonia Ministry of Information Society and Administration |
| MK | Republic of North Macedonia (ISO Code) |
| MKD | Macedonian Denar |
| MKD-CIRT | National Center for Computer Incident Response of Republic of North Macedonia[[10]](#footnote-10) |
| NGO | Non-Government Organisation |
| NIS | EU Network and Information Security Directive[[11]](#footnote-11) |
| NRI | Network Readiness Index[[12]](#footnote-12) |
| O&M | Operations and Maintenance |
| OECD | Organisation for Economic Co-operation and Development |
| OPEX | Operating Expenditure |
| OSCE | Organization for Security and Co-operation in Europe |
| PAR | Public Administration Reform |
| PM | Project Management |
| PPP | Public Private Partnership |
| R&D | Research and Development |
| SLA | Service Level Agreement |
| SME | Small and Medium Enterprise |

# **1. Introduction**

ICT is today’s key for inclusive growth and a sustainable future. Be it at home, at work or on the move, people expect affordable, fast and reliable internet. Other key societal expectations include interoperability of services, cyber security, privacy and trust in stakeholders.

The ‘MK National ICT Strategy 2021-2025’ focuses on the identified priority areas in the ICT sector and aims to prepare MK for a manifold and agile digital future. It focuses on meeting the challenges of society’s growing connectivity needs, of boosting competitiveness and on making the daily life of citizens and businesses smarter. Digital technologies as enablers for transformation will provide society with a better quality of life.

A few examples of these include an improved health care system, easier access to public services and cultural interest sites, a cleaner environment, safer and more secure transport solutions, secure e-banking and e-payment as well as new business opportunities. Transformation goes hand in hand with cost efficiency and agility and needs to be publicly addressed through processes, technology and innovation.

The main pillars of this ‘MK National ICT Strategy 2021-2025’ correspond to the EU’s DESI dimensions, in order to ensure alignment of MK’s digital transformation with EU policies and directives, which in turn will lead to adapting the country’s statistical reporting mechanism to cater for the DESI-related sets of indicators. The aim is to interlock the outcomes of the strategy with the country’s measurable digitalization progress which can then be easily compared with other EU countries. Also, guidelines from several organizations[[13]](#footnote-13) have been taken into account in formulating parts of the recommendations, to make sure that the strategy adheres to international best practices.

Since March 2020, the Corona virus pandemic precipitated a lockdown of populations in a large part of the world, leading to the cessation of a number of activities and economic stress which had not been seen for decades. During the global pandemic the need for connectivity (mobile and fixed line networks) became greater than ever.

There was a sudden urgency to ensure the continuity of activities and services. In MK, as in all the countries affected by the Corona virus pandemic, numerous digital initiatives emerged, to inform the population, allow part of the workforce to work from home, offer online services to citizens and companies, provide access to digital training content by pupils and students as well as provide support to health, etc.

The crisis situation gave tremendous leverage to digital practices. Countless digital platform projects were developed globally by various stakeholders to meet the immediate lockdown related needs. But this dependence suddenly revealed the limitations of digital transitions, such as the pressure on the telecommunication infrastructures’ capacity (connectivity), the limits of digital equipment for people and households and the lack of digital skills that people have who could otherwise benefit from content and digital services, etc.

While the global health crisis is accelerating transition to digital (and especially its dissemination into certain social classes/strata of the population), paradoxically, it is generating very little revenue, due both to the surrounding economic context but also, and especially, to digital coverage rates that are often still too low, and the ongoing existence of vast dead zones. The Coronavirus pandemic crisis has underscored the need to scale up digital technology, a need which will likely entail massive costs. The need is also reflected in the Broadband Commission (ITU/UNESCO) ‘Covid-19 Crisis Agenda for Action for Faster and Better Recovery`[[14]](#footnote-14), which supports the following three pillars a) resilient connectivity, b) affordable access, and c) safe use of online services for informed and educated societies.

The long-term ‘MK National ICT Strategy 2021-2025’ which was prepared between March and May 2020 can be seen as an additional opportunity to speed up digital adoption in MK.

This ‘MK National ICT Strategy 2021-2025’ considers and builds on existing MK strategies overlapping with this period, such as:

* ‘Open Data Strategy 2018-2020’ including Annexes and Action Plan 2018-2022[[15]](#footnote-15)
* ‘National Cyber Security Strategy 2018-2022’ from July 2018 including Action Plan 2018-2022 from December 2018[[16]](#footnote-16)
* ‘Public Administration Reform Strategy 2018-2022’ including Action Plan 2018-2022 from February 2018[[17]](#footnote-17)
* ‘MK National Operational Broadband Plan’ from April 2019 including Measures for the period until end of 2029[[18]](#footnote-18)
* ‘Education Strategy 2018-2025’ and Action Plan[[19]](#footnote-19)

All related actions recommended will promote the following **cross-cutting principles and objectives**:

* Climate change mitigation
* Environment
* Gender equality
* Indigenous peoples
* Persons with disability
* Rights-based approach
* Security incl. data security, privacy, data sovereignty
* Transparency, fairness and non-discriminatory

# **2. Connectivity and Government Infrastructure**

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| Main strategic objectives and goals for Connectivity and Infrastructure:Speed up the implementation of the ‘MK National Operational Broadband Plan’, promote standardisation and consider the EU toolbox for secure 5G deployment.  1. Enable further harmonization towards stable legislative and regulatory environment. 2. Establish a trusted Government of MK data centre, a disaster recovery data centre, and a network operations centre. 3. Establish a secure Government of MK cloud service and connect Government of MK entities through a government optical network. |

## National Connectivity

High-speed telecommunications networks have the same revolutionary impact today, as developments in the field of electricity and transport had a decade ago. Digital services are becoming universally accessible on any device be it a smart phone, personal computer or notebook, a tablet, a digital radio or high-definition television, or any other smart device.

Enhanced mobile broadband 5G is seen as a game changer. It is enabling industrial transformations through wireless broadband services provided at gigabit speeds that are ultra-reliable. Low latency communications and the support of new types of applications, connecting devices and objects (IoT) coupled with the versatility by way of software virtualization, allows for innovative business models across multiple sectors (transport, health, agriculture, education, manufacturing, logistics, energy, finance, media and entertainment, etc.).

However, with 5G and IoT applications and different technologies in parallel (2G, 3G, 4G/LTE, 5G, wireless, fibre, etc.), running telecommunications network operations will become more challenging than it has ever been before. Telecommunications network infrastructure needs to be treated as a critical infrastructure of national interest, and protected accordingly through physical and data security, and respective policies, laws and regulations.

Invest in connectivity- connectivity objectives can only be achieved with massive investments, that require forward-looking and simplified rules that make it more attractive for companies to invest in new top-quality infrastructures and make it affordable for the population. Optical network deployment according to the ‘MK National Operational Broadband Plan’[[20]](#footnote-20) is key to meet the overall connectivity objectives for MK. It underlines the importance of broadband deployment to promote social inclusion and competitiveness, reflected in the DESI digitalisation performance indicators for connectivity (monitored by BCO) which are: human capital/digital skills, use of Internet services by citizens, integration of digital technology by businesses, digital public services and R&D ICT. Fast and reliable connectivity can be achieved through fibre fixed line or wireless networks, or a combination of both. Wireless networks require a resilient redundant fibre fixed line backbone.

Promote standardization- complying with international accepted standards (e.g. ETSI, 3GPP, ITU, ISO) for hardware, software, and services guarantees national and international interoperability, minimum Quality of Service (QoS) and better utilization of skills. Furthermore, it promotes competition and efficiency, and reduces investment and O&M costs. The development of standardization efforts especially for 5G mobile networks in the 3GPP group will be monitored[[21]](#footnote-21), new developments will bring new features including opportunities for a substantial reduction of infrastructure roll-out costs especially in rural areas.

Promote national broadband targets, implement faster - the ‘MK National Operational Broadband Plan’[[22]](#footnote-22) gives a detailed description of the national broadband targets for MK up until 2029. For the period of this ‘MK National ICT Strategy 2021-2025’ the following targets have been set:

* By the end of 2023, at least one larger city to be covered by 5G signal.
* By the end of 2025, the main corridors in accordance with the Treaty establishing the Transport Community on the basic and comprehensive road network in the country should be covered with an uninterrupted 5G signal.

Already from the early stages of the Corona virus pandemic we have witnessed how ICT contributed globally to mitigate the impact of the economy (e.g. home office work), supported health response, e-learning and several other areas of life.

The practical experience gained will remain for the future and its importance will be amplified. For all ICT, a robust and resilient infrastructure (connectivity) is required. MISA and JP MRD will review and propose updated timelines and priorities stipulated in the ‘MK National Operational Broadband Plan’ for a faster implementation. A special focus will be on prioritization of connections to critical government functions, vital services and strategic connectivity points, such as public buildings, educational institutions, hospitals, pharmacies, emergency centres, transportation hubs, financial sector, etc.

To avoid duplication of work and additional infrastructure costs, during broadband infrastructure planning and implementation requirements of specific virtual (closed) networks e.g. for the Government of MK (e.g. government optical network), academia and R&D (e.g. to participate EuroHPC and to interconnect with other international academia and R&D networks such as EU supported GEANT) will be considered.

2. Enable further harmonization towards stable legislative and regulatory environment - a stable regulatory and legislative environment will ensure investors long-term certainty in whichever sector they operate. Laws and regulations will be aligned to guarantee an easy, clear, unified, contemporary and predictable process for all planning and implementation related to permits and approvals, and related fees and taxes. This includes right-of-way and multi-sector infrastructure sharing for laying and maintenance of fibre optic cable infrastructure, facilities for equipment and locations incl. towers for base stations. The major source of costs in network deployment is civil engineering costs, accounting for up to 80 % of the total costs[[23]](#footnote-23). Costs for implementation and O&M of infrastructure play a major role for end-user communication costs.

Today, wireless broadband plays a key role in ensuring coverage of all areas including urban and rural regions. Affordable access to and efficient use of radio spectrum are the central criteria to develop wireless broadband networks. A forward-looking MK spectrum policy which also allows spectrum sharing, to be prepared by the MK telecommunications regulator AEK and harmonized with European countries, will promote efficient spectrum management supporting competition and innovation. The deployment of 5G networks requires the timely availability of a sufficient amount of harmonized spectrum. High spectrum costs will limit the telecom operators’ investment budget flexibility for infrastructure and services or have impact on end user telecommunications pricing. Higher floor prices will lead to 5G networks being unviable and therefore getting delayed. An equilibrium therefore needs to be established between government revenue and overall growth.

Consider EU toolbox for secure 5G deployment - in compliance with the EU toolbox for secure 5G deployment[[24]](#footnote-24), MK authorities will ensure that measures will be in place (including rights for national authorities) in order for them to respond appropriately and proportionately to possible risks that may arise. In particular actions will allow for the restriction, prohibition, and / or will impose specific parameters or conditions under which the 5G network equipment will be operated, supplied and deployed. These parameters and conditions will be applied to mitigate risk and will be based on security-related grounds. The conditions will aim to:

* Strengthen security requirements for mobile network operators (e.g. strict access controls, rules on secure operation and monitoring, limitations on outsourcing of specific functions, etc.).
* Assess the risk profile of suppliers; as a consequence, apply relevant restrictions for suppliers considered to be high risk - including necessary exclusions to effectively mitigate risks - for key assets defined as critical and sensitive in risk assessments; e.g. core network functions, network management and orchestration functions, and access network functions).
* Ensure that each operator has an appropriate multi-vendor strategy to avoid or limit any major dependency on a single supplier (or suppliers with a similar risk profile), ensure an adequate balance of suppliers at national level and avoid dependency on suppliers considered to be high risk; this also requires avoiding any situations of lock-in with a single supplier, including by promoting greater interoperability of equipment.

Consider EU green deal for broadband deployment - in compliance with the EU ‘Green Deal’[[25]](#footnote-25), MK authorities will ensure that respective measures will be in place.

## Government of the Republic of North Macedonia ICT Services

ICT in the Government of MK is not centralised. Nearly every ministry, institution, agency, university, government hospital, etc. runs their own ICT with separate rooms for server hosting, and their own ICT staff. An interoperability project has started, but there is no standardization for computer room infrastructure (air conditioning, uninterruptable power supplies, backup generators, etc.), software and hardware. There are no policies and guidelines for minimum security and Quality of Service (QoS). Wide frame agreements with suppliers for ICT support and maintenance do not exist with the Government of MK and there are no software volume agreements. Often infrastructure, hardware, software and operating systems are outdated, same as technical documentation, and maintenance and support agreements do not always exist.

There is a lack of annual budget for O&M, spare parts, replacement purchase, software licenses / upgrades, consumables, regular training for ICT staff, etc. Several server rooms do not meet basic international security standards. Some overheat in summer causing servers to collapse, others are used as storage which creates a high fire risk. Most are not insulated against possible water leakages from the floors above or on the same level, smoke in case of fire outside the computer room, and dust in case of construction work outside the computer room.

The Government of MK lacks several hundred ICT experts to cover positions such as system engineers, system administrators, software developers, programmers, project managers, support centre staff, critical skills staff (e.g. security). Several ICT staff will retire soon and due to the restricted government salary scheme the Government of MK cannot compete with the private sector for experienced ICT staff. Furthermore, due to the global demand for such experts many young people have left and continue to leave the country. There are no career and development opportunities in the Government of MK.

To summarize – the Government of MK ICT is running at a high risk and is very vulnerable. Several samples around the world show that weak ICT operations and security threaten the population, lead to their mistrust in the government and can even been seen as a threat for national security[[26]](#footnote-26).

It is expected that in the future, ICT will become much more critical for the Government and the Government’s dependency on IT will grow. With upcoming technologies and services like e-government, eID, e-health, digital agriculture and forestry, IoT for the mining industry, data analytics and 4IR which includes, for example AI, IoT, advanced data analytics, robotic process automation, blockchain, robotics, cloud computing, virtual and augmented reality, 3D printing, drones, smart grids, smart cities, smart home, etc. IT requirements for governments globally will become much more challenging. Trust, data security and privacy are the major objectives that the Government needs to address to guarantee sovereignty of its share of citizen and industry data.

Establish a ‘Digital Agency’ - To overcome its weaknesses and threats, the Government of MK will pool ICT experts and centralize its ICT services in a new ‘Digital Agency of North Macedonia (DAMK)’, whose setup and functions are described in detail in the following chapter.

Establish a trusted Government of MK data centre, a disaster recovery data centre and a network operations centre - under the new Digital Agency the Government of MK (as option with private sector participation) will plan, build and operate a state-of-the-art earthquake-proof and trusted Government of MK data centre, a disaster recovery data centre and a network operations centre which is manned 24 hours a day, 365 days a year. The data centres, will be located in a suitable secure location and will meet international standards and certifications such as the European standard EN 50600 ‘IT - data centre facilities and infrastructures’[[27]](#footnote-27), minimum ANSI/TIA 942 Tier 3 (Concurrent Maintainability) level[[28]](#footnote-28), and ISO/IEC 27000 (Information Security Management)[[29]](#footnote-29). For a total cost forecast, beside investment costs (CAPEX) O&M costs (OPEX) will also be considered for the expected lifespan of assets. The data centre specification will consider technically balanced and economically justifiable state-of-the-art ‘green’ technologies, such as those stemming from the EU ‘Green Deal’[[30]](#footnote-30). The data centre environment and connectivity will be handled as critical infrastructure of national interest.

As an option, the Government of MK will rent sufficient secure (caged, separate rooms) rack space in MK private sector data centres, which meet the above standards and certifications. For this option, the Digital Agency will carry out regular performance, security and O&M processes audits, will monitor SLAs and KPIs. The rental agreements with the private sector will be for 10 years with option for renewal for another 5 year or 10 years.

For the disaster recovery data centre, the newly established Business Continuity and Disaster Recovery Data Centre of the Ministry of Interior in Prilep, MK (about 80 km linear distance from MK capital Skopje) will be considered as an option[[31]](#footnote-31).

The central secure Government of MK data centre infrastructure will host the servers including all applications of all ministries, agencies, institutions, universities and government hospitals. After a pilot migration project, the servers of one entity after the other will be migrated to the new data centre and disaster recovery data centre environment.

Establish a secure Government of MK cloud service - a secure, high available and scalable Government of MK cloud service will be established where all government data will be stored in trusted locations. A public Government of MK central cloud service or a hybrid model consisting of a central public Government of MK cloud service for sensitive government data and a private cloud service will be considered.

Connect Government of MK entities through a government optical network - all the entities of the MK Government and the central data centre environment will be connected via a high availability, redundant and resilient secure government optical network. The government optical network will be planned and implemented together with competent stakeholders, utilizing the national transporting optical infrastructure / network. The government optical network will consolidate all existing ‘state’ optical networks with which the entities are currently connected.

# **3. Centralization and Streamlining of ICT and e-Government Services**

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| Main strategic objectives and goals for Centralisation and Streamlining of ICT and e-Government Services:Establish a centralised digital agency (DAMK) to consolidate all government ICT assets and resources in order to create a cost-effective government ICT service delivery mechanism.Empower DAMK with a horizontal Program Management Unit to ensure that all ICT related programmes and projects are managed efficiently across the government.Establish and apply a single ‘digital services reference framework’ which will include a common set of policies, guidelines, principles, standards, supporting measures and tools for the development, provisioning and utilization of digital services across the government.Deliver enabling initiatives to accelerate adoption of the ‘digital services reference framework’.Raise awareness and gain the trust of citizens and businesses in using state digital services by ensuring adherence to cyber security, privacy and data protection principles. |

***MK will become a service-oriented government adopting a centralized, user-centred approach that puts the needs of citizens and businesses at its primary focus.***

## Background – Principles and Priorities

The state of play of e-government services in MK is mainly characterized by the following:

* Central government ICT systems take too long to implement and as a consequence there are a lot of ‘ad-hoc’ solutions being developed independently, leading to the creation of ‘islands’ of information (fragmentation),
* There is a rather low compliance to standards and existing frameworks (such as interoperability),
* The process of procurement of IT is tedious and does not promote modern implementation trends,
* Services are designed around existing registries or IT systems, rather than around actual user requirements and are based mainly on existing processes with a high degree of complexity,
* There are several active ICT related strategies and action plans being managed by different stakeholders.

At the same time, MK faces several key challenges as regards the deployment of e-government services in the country:

* There is no strong digital culture from the side of the citizens, and consequently there is low demand for available electronic services,
* Public sector continues to show resistance to changes of long-standing bureaucratic processes,
* Highly skilled ICT personnel is hard to find and to retain in the public sector (salary packages, career chances), and ICT personnel are constantly looking for better opportunities elsewhere (private sector or abroad),
* Several institutions are characterized by a ‘no-sharing’ mentality which impedes quick realization of related initiatives.

As a consequence, MK government’s main strategic focus is **the centralisation of ICT and e-government service design and provision through the establishment of clear principles, priorities and organizational re-structuring initiatives**.

Taking into account the fact that efforts of the past few years have led to a series of major e-government building blocks being currently in production (or deployment), the primary objective of this strategic pillar is to steer focus away from system-oriented design towards a service oriented one. The goal is to establish a data-driven service culture across the government, and to achieve a wide deployment of secure, centralised e-services streamlined with simplified public processes. To this end, the present strategic pillar, which can be considered as the core of the country’s e-government strategy, is based on the following axes:

* The establishment of a central authority to drive the digital transformation of the country by consolidating resources and know-how that will be responsible for the execution of the strategy, the coordination of all ICT related initiatives and the deployment of e-services (the ‘vehicle’);
* The implementation of a central digital transformation framework which will act as the single obligatory source of reference for the design, development, deployment, maintenance and support of all ICT related projects, systems and services in the country, based upon modern EU policies, directives and guidelines (‘the guide’);
* The delivery of key enabling interventions to accelerate adoption of the reference framework, in full alignment with already approved national or domain sub-strategies and action plans such as PAR, or Open Data (refer to ‘Open Data Strategy 2018-2020’) (‘the fuel’).
* The guaranteeing of trust and security as an inherent part of the design and deployment of systems and services across the government and through to citizens and businesses.

This digital government vision recognizes that:

* Central co-ordination and optimum utilisation of available human and technical resources constitutes a key success factor for the high-level ICT strategy,
* Service delivery lies at the heart of government activities,
* Users and citizens want services to be as easy to access as possible, integrated and responsive to their needs throughout their lives and life events,
* Policy and programs should be inclusive (designed together with the users).

Key Principle - **Government services and ICT activities are to be designed and delivered via a top-level centralised Digital Agency of North Macedonia (DAMK). It will be progressively e-enabled and improved considering citizen and businesses needs and feedback and will be** consolidated. This principle and the policy’s requirements are a key driver **in increasing the availability of online services** for the next 5 years.

Main Challenges - Digital demands in services, data, innovation, and security are the main challenges that drive key government priorities for the Government of MK. More specifically:

* **Public services which mimic private sector best practices** – The government of MK will build an ecosystem of services and providers, with co-creation of an environment to help manage and increase employee value along with self-service offerings to help the public engage with agencies and improve their lives.
* **Continuous need to realize data value** - Government of MK will discover insights
  + Across services – payments, processes, constituents;
  + Across departments, public agencies;
  + On promoting public interest through better decisions and responses.
* **Importance of introducing innovation** - Government of MK will lay the groundwork for innovation by
  + Building collaborative and flexible platforms preferably based on open standards,
  + Reducing complexity and cost while increasing agility,
  + Creating better data integration solutions across internal and external information sources.
* **The need for more secure computing environment** – The Government of MK will integrate existing cyber security policy into all aspects of the centralized ICT service provision.

Specific Priorities - The Government of MK has identified the following key priorities to be able to meet its commitments:

* **Modernising ICT infrastructure** – The Government of MK will introduce **new cloud-based ICT operating models** and at the same time modernise ICT infrastructure through **centralised procurement**, based on a transparent and inclusive ICT assets policy.
* **Establishment of a service culture across the public sector** that is responsive to the needs and expectations of citizens and businesses. The citizen is considered to be a valuable client in the private sector enterprise.
* **Enhancement of central government capacity to design and innovate** - This will be achieved through the central digital agency which will develop internal capacity to design and deliver practical and achievable ICT solutions for everyday life.
* **Improved information sharing while implementing appropriate privacy and security measures** - Sharing information and avoiding silos, is a key success factor for shared and common government services.
* **Increased capacity to manage and leverage data** - Data has an increasing growth in complexity and size and therefore proper infrastructure, applications and human skills are required to get the best value out of the rich datasets that reside on government servers.
* **A cost effective and controllable approach to resource service improvements** - Each government intervention in e-service delivery will always be subject to a thorough cost-benefit analysis and linked to specific outcomes, to make sure there is a measurable, justified and quantified delivery of projects and services to MK citizens.
* **Ongoing engagement with users** - to ensure service delivery meets citizen needs through innovative methods like enterprise design thinking, impact mapping techniques etc.

## The Central Digital Agency of North Macedonia (DAMK)

Create DAMK as a non-profit government owned company - The Government of MK will establish - via an official legal procedure - a central Digital Agency following best practices from EU and other countries, directly reporting to the Government.

The main objective for the agency is to gradually consolidate assets and resources (infrastructure, software, ICT experts, ICT support, consulting and maintenance contracts, ICT trainings, ICT security measures, etc.) from the various ministries and organizations into a single entity in order to create a cost-effective and efficient delivery mechanism. The agency will **pool highly skilled resources** from both private and public sectors and offer a modern, **attractive work experience** which will motivate employees to focus on delivering the 5-year ICT vision of the government. The Agency’s core staff will constitute a ‘leading by example’ team which will consequently attract other government ICT talents in the country by demonstrating high quality and engaging work. DAMK will also co-operate with 3rd party trusted partners to enhance delivery quality and achieve economies of scale.

Through centralisation of ICT activities under one agency – the DAMK - it is expected that within a reasonable timeframe that:

* Government ICT will be more efficient while CAPEX and OPEX will be significantly reduced,
* Knowledge and experience will be shared between the agency’s personnel, leading into more efficient and secure service provision,
* More skilled personnel will be attracted to join the agency’s workforce.

DAMK will be responsible for:

* Funding, coordinating, designing, delivering and evaluating all government and donor ICT projects and services in full alignment with the national ICT strategy.
* Procuring, operating, managing and supporting government ICT assets and infrastructures.
* Migrating existing data centre infrastructures (hardware, networks, data centres, telecommunication, etc.), and applications from autonomous data centres to a central government infrastructure.
* Creating, implementing, monitoring and assessing national ICT related guidelines based on legislation and policy documents issued by MISA.
* Delivering horizontal ICT shared services for all Government of MK ministries and institutions.
* Providing capacity building and enhancing ICT skills for the public sector.
* Coordinating and promoting MK R&D ICT initiatives.

DAMK will be realized as a legal entity in the form of a **non-profit ‘Société Anonyme (S.A.)**” company, with the Government of MK owning all company shares[[32]](#footnote-32). DAMK will be established on the same hierarchical administrative level as the ministries and will operate following the principles of an independent authority, such as AEK, in the sense that the company will implement ICT related legislation and policies introduced by MISA and liaise with the private ICT sector to maintain connections with the market.

The general assembly of shareholders will appoint the Board of Directors (BoD), while the Minister of Information Society and Administration will have the power to name the president of the BoD and the Chief Executive Officer (CEO) of the company. Furthermore, the DAMK CEO will also hold the role of CIO of the Government of MK, being responsible to drive delivery of the ICT strategy across the Government of MK. The CIO will be in charge of all ICT related agenda items of the Government of MK, exercising authority over peer ministers.

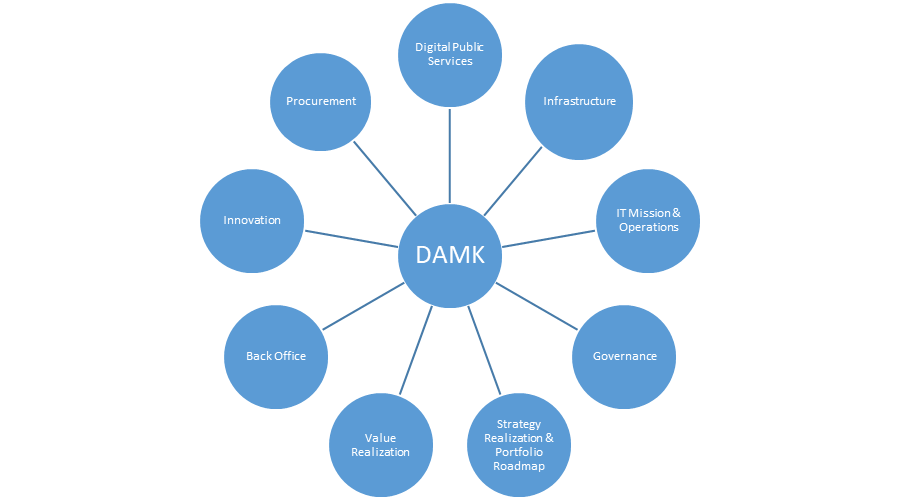
To ensure a transparent and inclusive governance, a Supervisory Board comprised of members of major stakeholders from the public sector and NGOs (and as option from the private sector) of the ICT ecosystem will be established. The Supervisory Board is regarded as a ‘control’ mechanism to safeguard adherence to good governance principles, alignment with Government of MK policy, successful execution of annual DAMK strategic and operational engagement plan and protection of the interest of involved institutions. The Supervisory Board will convene regularly and will provide a publicly available annual report on DAMK operations.

In accordance with MK legislation, DAMK will be audited by the State Audit Office.

The company will operate following private law legal entity principles in order for it to be able to:

* Autonomously **manage funds** to finance:
  + Implementation of all Government of MK ICT related project contracts (horizontal and domain specific);
  + Centralised procurement of ICT assets and services.
  + ICT research and innovation grants.
  + Own budget execution (salaries, assets, utilities, travel, etc.).
* Easily (based on labour law) **recruit personnel** from the private sector, under fixed-term contracts, with competitive salary packages.
* **Facilitate transfers** of highly skilled civil servants (ICT, public procurement, finance, administrative law) to its workforce, under a higher allowance payment scheme.
* Hire **external consulting** services and experts to support its operations.
* Customize and **facilitate procurement** processes in line with public procurement legislation.
* Create a **modern working environment**, providing attractive workspace and tools.
* Be able to **receive and manage funding** from donors and other financing sources (structural funds, grants, loans, etc.).

### Ensure essential Functional Domains in DAMK – The following functional domains are introduced within DAMK to ensure compliance of its operation to the principles and priorities identified in the strategy:



* **Digital Public Services** - This function concerns the transactional services that drive citizen engagement with the state and are in compliance with the supporting documents by Directorate General 3 (DG3 – refer to the following). This function also includes the value stream capabilities for end-to-end citizen experience[[33]](#footnote-33) (business and information flow, interaction points, business process management, user experience design, accessibility etc.), also known as ‘the digital face’ of the government to citizens.
* **IT Mission and Operations** - This function develops and operates the individual internal information systems or applications of DAMK departments (and also other government agencies). These are often specific to their business functions and many can be defined as 'special', although they draw upon underlying commodity components. These applications will follow interoperability and integration standards and the ‘Once-Only Principle’[[34]](#footnote-34). This function is also accountable for any integration and data exchange services with 3rd party trusted providers (private sector, other EU and international authorities).
* **Infrastructure** - The common connectivity, hosting, monitoring and asset management services that enable organizations to have the tools they need in the hands of officials and government employees. This function is accountable for the government data centre infrastructure and government cloud operations including the physical security of the computing environment. Other ministries or government agencies remain accountable for their own infrastructure in cooperation with DAMK. There is a separate unit accountable for the security policies and controls at infrastructure and data layers.
* **Value Realization** - Value Realization[[35]](#footnote-35) is the most important function and a special office will be accountable for the whole life cycle of programs and projects (planning, management, monitoring, execution, evaluation). The name emphasises the commitment by the Government of MK to offer valuable services to citizens and organizations. The ICT contracts ‘ready to run’ as signed by the Procurement Office will be executed and monitored by this function, based on guidelines provided by the DG3 Programme Management Unit (as described in the following section). Additionally, the Value Realisation Office will also be accountable for setting-up, executing and coordinating all the communication and collaboration action plans with other ministries – agencies as a joint task force team compromising of representatives from line ministries and other agencies, and the Value Realisation Office members.
* **Strategy Realisation – Portfolio Roadmap** - This function is accountable for implementing the ICT government strategy (developed and owned by MISA), designing the enterprise security architectures, providing the roadmap of project portfolio planning and IT investments, preparing and revising all the high-level artefacts, designing digital and shared services, technology framework, and reference guidelines. This function implements the guiding principles for digital transformation, is the high-level advisor for ICT matters to the Government of MK and an influencer for ICT matters in ministries and agencies. This function will ensure compatibility of existing or future ICT related domain ‘sub-strategies’ with this MK National ICT Strategy 2021-2025 as an umbrella strategy.
* **Governance** - This function will be responsible for audit and corporate governance, including organizational policy management, risk management, and compliance. It will develop governance models (ISO 38500 compliant) with enabling aspects on culture and ethics, organizational structure, administration principles, personnel skills and competencies and data governance.
* **Procurement** - This function is accountable for modernizing, accelerating and optimizing ICT procurement processes, preparing documentation and executing the full procurement lifecycle for IT assets and services, and promoting modern procurement tools such as PPP contracts, shared services contracts etc. - aiming to shift the IT culture from purchasing goods towards using services (taking into account the decision of the Government of MK to migrate into cloud services). The Procurement Office will take into consideration procurement risks and propose the most suitable procedure for efficient and cost-effective performance (fixed-price, time-and-material, framework agreements, etc.)
* **Innovation -Knowledge Management- Best Practices** - This function is accountable
  + to act as knowledge management gate, collecting experience, practices, methods and ideas across the government landscape;
  + to contribute towards the development of a skills enhancement ICT framework for public sector officials; and
  + to liaise with higher level education institutions, experts and other members of the scientific community in order to promote research and innovation in the field of ICT and establish strong links with the market.
* **Back office** - This function is accountable for supporting day to day operations of DAMK.

Implement a solid governance model- The DAMK organisational structure and governance model will be defined in such a way that it covers all main government ICT-related activities at **strategic, operational and technical levels and that they comply with the aforementioned functional domains**. The proposed structure consists of five Directorates General (DG), coordinated by the Board of Directors and a General Manager of the agency as follows:

**DG1 Strategic and Operational Planning**. DG1 will be responsible for executing, the national ICT strategy according to Government of MK ICT policies and legislation (owned and issued by MISA), enhancing internal capacity of the agency, streamlining and simplifying e-government processes and driving ICT innovation. More specifically, DG1 will be responsible for:

* Contributing to the formulation of the national ICT strategy,
* Ensuring compliance of existing ICT-related strategies with the national high-level ICT strategy,
* Developing the DAMK’s annual strategic and operational engagement plan by collaborating with other government bodies and ministries in order to identify and prioritize their needs, including:
  + Documentation of business needs and analysis of requirements,
  + Consolidation and prioritization of project proposals,
  + Development of a Digital Tactical Plan,
  + Preparation and development of a Benefits Realization Plan.
* Providing guidelines on new horizontal government ICT priorities and their high-level design, using an enterprise architecture approach:
  + set-up a long-term roadmap for technology, data and infrastructure layers (foundational building blocks for future solutions architecture).
  + develop the high-level security architecture across the government (with the exception of national security) following modern practices like ‘security by design’, ‘zero trust’ and ‘data once principle’
  + Ensure that the agency architecture patterns are aligned with the standard architectural practices with the other EU countries, especially in integration and data exchange.
* Designing, promoting and evaluating digital skills enhancement programs for the agency and other government bodies, in collaboration with competent agencies and the private sector.
* Establishing project selection criteria, evaluating and prioritizing projects for implementation (both internal and external).
* Assessing government demands for ICT assets and services, consolidating requirements, negotiating with vendors and designing centralized procurement tools (such as framework agreements) for software licenses, end-user hardware and other commodities.
* Designing, monitoring and evaluating horizontal ICT sub-policies (e.g. interoperability, accessibility, asset management, security, migration) both at national and cross-border levels, adhering to well established frameworks and standards, such as the European Interoperability Framework[[36]](#footnote-36), ensuring compliance with the MK National ICT Strategy 2021-2025 as an ‘umbrella’ strategy.
* Adopting, updating and applying ICT standards, best practices and methodologies in all ICT projects and services delivered by DAMK, including software costing models, procurement and contract templates, technical specifications, benchmarks, etc.
* Monitoring European and international trends, policies, guidelines and initiatives in the ICT domain, as well as cutting edge technologies (IoT, blockchain, AI, etc.) and proposing a roadmap for convergence.
* Identifying complex public processes, prioritizing them and proposing simplification initiatives along the priorities and objectives identified in the ‘Public Administration Reform Strategy 2018-2022’, through a formal simplification framework.
* Identifying financing sources for flagship projects and preparing relevant proposals for obtaining funding from donors and other sources.
* Monitoring implementation of strategic and operational plans of the agency.
* Coordinating and assessing digital innovation and research activities providing strategic guidelines and policies for the design of relevant grants and other financing tools in collaboration with competent ministries.
* Establishing and operating a digital observatory function to monitor progress, adherence to objectives, realization of expected outputs, outcomes and impact of the ICT strategy
  + Establish a formal systematic data collection process (qualitative and quantitative) by identifying sources, tools and methodologies to gather relevant information, in collaboration with State Statistical Office,
  + Process, analyse and visualize data for reporting,
  + Prepare management reports regarding progress of strategic priorities, initiatives, actions and main projects,
  + Undertake systematic evaluation of project outputs and outcomes,
  + Deploy a performance metrics dashboard for government bodies regarding delivery capability of the agency’s projects/actions,
  + Maintain and continuously improve a knowledge base, upon which national digital strategies will be further developed or improved,
  + Present results according to well established global and EU indexes, such as DESI.

**DG2 Design and Delivery**: DG2 will be responsible for designing, implementing, operating and supporting government ICT projects, executing ICT policies and delivering streamlined shared services across the public sector. More specifically, the responsibilities of DG2 include:

* Managing engagements between DAMK and other ministries or public sector bodies (policy owners) through programme agreements (project portfolio scope, roles and responsibilities of each party, monitoring and reporting, formal approval of results, financing),
* Ensuring alliance of project portfolio results with government ICT related strategies via effective planning and implementation of programmes and projects,
* Designing (business analysis, specifications, technical / functional requirements, standardization, system architecture, network architecture, usability), developing (software development, system and network engineering, development and ICT operations), testing (quality assurance, pilot tests), deploying, securing (system integrity, data protection privacy, certification (ISO), technical and security audits), operating, maintaining and supporting:
  + common ICT infrastructures (government cloud, public sector network, consolidated data centres)
  + shared services (eID, e-payments, e-invoicing, document management, etc.)
  + e-government building blocks (interoperability hub, base registries, trust services based on EU eIDAS regulation, etc.)
  + horizontal flagship ICT projects
  + domain-specific ICT systems
* Ensure service delivery compliance with EU standards and policies (e.g. eIDAS, European Interoperability Framework, ‘Once Only Principle’, cross-border data exchange).
* Design and implement system migration actions for existing (legacy or modern) systems from their current data centre infrastructure to government cloud,
* Procuring and managing ICT contracts (selection of procurement tools, design and publication of Request for Proposals (RfP), vendor selection, deliverable control and acceptance),
* Drafting, applying, monitoring and updating contracts including SLAs and KPIs with vendors or other public sector agencies,
* Modelling, assessing and re-engineering of business processes that lead to better e-government services,
* Ensuring compliance with security and privacy legislation and policies (Government to Citizens (G2C) services, social media, government information systems, telecoms, EU guidelines, GDPR, etc.),
* Managing the central registration and administration for the Internet country code top-level domain ‘.mk’,
* Planning, implementation, operation and performance monitoring for all virtual and closed user group Government of MK networks (e.g. government digital network) and other public networks (e.g. academia and R&D network), supported by competent stakeholders.

**DG3 Programme Management Unit**: The purpose of DG3 is to ensure that all ICT related programmes and projects are managed efficiently and under well-established principles by DAMK and other Government Agencies of MK (some also with private sector participation) until their full migration. DG3 will be responsible to:

* Organise a formal proposal submission process, assess and prioritize received proposals from their conceptual phase, in order to confirm feasibility and alignment with the ICT strategy (‘business case’).
* Identify synergies, gaps and overlaps between submitted proposals and provide opinions on consolidation or intervene to apply remedial actions.
* Maintain an ‘umbrella view’ of all related Government of MK strategies, actions and projects and operate a global project registry providing relevant reports and data to DG1.
* Compose ‘task-force’ teams comprising of domain experts from various line ministries or Government of MK agencies to support project implementation.
* Monitor the implementation of ICT-related action plans, set priorities on resource allocation, provide recommendations, and impose corrective actions. The Program Management Unit will, among others, monitor projects:
  + to implement or modernise programme delivery to the public,
  + to implement internal administrative systems and processes, such as for finance or human resources management,
  + to implement information systems and applications used for a variety of purposes, ranging from policy development to financial reporting,
  + to implement information systems and applications used for a variety of purposes, ranging from policy development to financial reporting,
* Develop, expand and improve the ICT project management practice across the DAMK, ministries and other Government of MK organizations in the context of project governance structure, process guidelines, artefacts and templates, as well as an effective project management mindset and culture, including:
  + Applying a formal methodology for managing the agency’s project portfolio, as well as individual projects (see section on Open PM2 below for a proposed methodology),
  + Establishing a Project Support Office for the agency’s staff, to help with project implementation throughout its lifecycle,
  + Monitoring project progress (milestones, deliverables, risks, issues) and continuously provide relevant information to project owners,
  + Training DAMK personnel in modern project management practices,
  + Establishing a knowledge repository with templates, artefacts, lessons learnt, etc.,
  + Supporting project managers form other ministries in applying the approved methodology.

The Programme Management Unit will be staffed with highly skilled project managers (preferably possessing a certification for a formal methodology such as PRINCE-2, PMI, Open PM2) who will undertake the responsibility to:

* Collaborate with all Government of MK entities and donors for ICT related strategies and projects,
* Identify and document action plans, initiatives and projects to be monitored,
* Register all such entities into a programme management software solution,
* Request or produce business case and project charters,
* Establish ranking criteria for prioritizing projects based on expected outcomes in terms of adherence to relevant strategy or policy documentation,
* Create, maintain and disseminate detailed project management plans,
* Coordinate activities, identify gaps or overlaps and propose corrective actions,
* Plan, execute and monitor resource management for DAMK, other Government of MK entities and private sector involved,
* Monitor progress, expenditure, quality assessment results,
* Maintain issues and risk registers and monitor their resolution,
* Perform regular or ad-hoc audits and report on results,
* Ensure project execution is according to requirements, set standards and vendor engagements,
* Issue periodic progress reports,
* Provide recommendations for projects that are lagging behind schedule, over budget or divergent from original scope,
* Impose corrective actions on non-compliant projects,
* Align templates, artefacts and methodologies with best practices,
* Identify common mistakes or best practices and disseminate across DAMK and other public sector bodies.

The Programme Management Unit will use **project gating** and **independent project reviews** to strengthen owner accountability over their projects.

* The implementation of a formalised project gating structure and process will subject a project to senior management scrutiny at predetermined points in its life cycle to ensure the project's readiness to continue to the next gate. Central to this process is the discipline of the gate decision meeting.
* Formalised independent project reviews performed at predetermined points during the project's life cycle to allow for review of results and recommendations to support decision making at relevant gate decision points.

Gating and independent reviews provide key input for making important decisions about Government of MK investment management and resource allocation. Gate decision meetings, as an instrument of departmental governance, ensure that project decisions are prudent and taken in the full context of the overall investment portfolio. They also ensure that resources are appropriately allocated in accordance with the informed participation of senior executives.

This gating strategy sets out a series of checkpoints throughout the project's life cycle, as a result of progressive implementation, at which the following is expected:

* A greater degree of detail for project definition and planning,
* Fewer uncertainties and unknowns,
* An increased number of mitigated risks,
* More precise estimates; and
* A greater understanding of the specific business outcomes (e.g. cost optimization, new features, better processes) including how they will be assessed and realized to the public.

Independent project reviews are intended to uncover issues that may not be evident or effectively managed at the project level or are not being advanced sufficiently by the project and its stakeholders. Review deliverables, such as presentations, are structured so as to provide timely, constructive, action-oriented recommendations and advice as input to the gate decision process. Independent review findings are normally dealt with at gate decision meetings.

The seven-gate model and its variations[[37]](#footnote-37) will be considered as the most suitable methodology for the Programme Management Unit. Furthermore, the Open PM2 methodology[[38]](#footnote-38) by EU will be considered for Government of MK ICT projects. Open PM2 aims to enhance project management competency within EU member countries, leading to increased project efficiency and success by:

* Rationalising project management approaches across EU institutions and beyond,
* Establishing a common language and processes, resulting in effective project communication,
* Providing a common set of productive mindsets,
* Enabling transparency and visibility for cross-organizational project collaborations,
* Enabling better project management, leading to improved cost/effort efficiency,
* Enabling the improved monitor and control of EU-funded projects and grants,
* applying the EU decision of 12 December 2011 (2011/833/EU) on the ‘reuse of Commission documents to promote accessibility and reuse’.

**DG4 Cyber Security**: DG4 will be responsible for the execution of the National Cyber Security Strategy and Action Plan, as well as operations related to management of cyber security risks in critical infrastructures.

This Directorate General in essence:

* Will undertake the roles and responsibilities described in the forthcoming law on the transposition of EU NIS directive for the foreseen “Digital Agency”, for example:
  + All cyber security coordination and strategy execution responsibilities,
  + Conducting IT audits for all public sector systems,
  + Supervising the government optical network,
* Will formally incorporate MKD-CIRT including its function for incident response, government internal and public cyber security awareness programs and engaging with the private sector regarding risk management for critical infrastructures,
* Will provide principles, specifications, requirements and best practices to other DGs in order to implement ‘security by default’ principles into system and service developments.

**DG5 Administration and Support**: DG5 will be responsible for ensuring timely and cost-effective operations of the agency and promoting its vision. Its responsibilities include:

* Effective management of Human Resources (recruitment, transfers, payroll, training, etc.),
* Financial management (budgeting, cash flow, accounting, expenses, business plan, reporting, etc.),
* Procurement and contract management,
* Corporate governance,
* Internal Audit,
* Legal support (e.g. ICT frame agreements and contracts, disputes with suppliers, staff disputes),
* Communications and public relations.

## Centralizing e-government service delivery - The digital services reference framework and its key enablers

Formulate a Policy on Digital and Service for DAMK - The Policy on Digital and Service will serve as an integrated set of rules that articulate how DAMK and other Government of MK agencies manage service delivery, information and data, technology and cyber security in the digital era. The ‘Policy on Digital and Service’ focuses on the citizen and the company, ensuring proactive consideration at the design stage of key requirements of these functions in the development of operations and services. It establishes a government-wide, integrated approach to governance, planning and management.

Overall, the policy advances the delivery of services and the effectiveness of government operations through the strategic management of government information and data and leveraging of information technology. The management of these functions is guided by a commitment to the guiding principles and best practices of the Government of MK digital standards. These principles include: design with users; iterate and improve frequently; work in the open by default; use open standards and solutions; address security and privacy risks; build in accessibility from the start; empower staff to deliver better services; be good data stewards; design ethical services; collaborate widely.

The objective of this policy is to ensure that the citizen service experience and government operations are improved through digital transformation approaches. The expected government-results of this policy are as follows:

* Integrated decision-making is supported by enterprise governance, planning and reporting,
* Service delivery, business and programme innovation are enabled by technology and data,
* Service design and delivery is client-centric by design and
* Workforce capacity and capability development is supported.

The digital services reference framework provides the principles for developing the county’s e-government action plan, and constitutes an authoritative source of policies, tools, methodologies, templates, standards and guidelines according to which e-government actions will be implemented, to ensure homogeneity, cohesion and coordination[[39]](#footnote-39).

Key objectives - The Government of MK identifies three main objectives:

* To **design and deliver user-centric services across all channels** - Services will be designed and delivered in a way that put citizen and business needs first. Citizen efforts will be minimised and the user experience will be consistent through all channels. Services will be accessible to everyone and available in all official languages and at least in English.
* To provide an online experience accessible enough that **users will choose the digital channel** for delivery. Services will be secure, simple, and convenient, and offer assistance to online users when needed, promoting a ‘one-stop shop’ service approach to access all government services, anytime.
* **Services are interconnected to offer a ‘data once experience’** - Citizens will receive high quality services regardless of the channel used and have their concerns resolved at first point of contact, partnering with jurisdictions to offer bundled service offerings and integrated service channels.

Establish a set of Digital Government Guidelines – The Government of MK will announce a set of digital government guidelines for the way the government will operate in the next 5 years and guide the development of policy, programmes and services accordingly. These guidelines will be respected by all responsible entities designing and implementing policy, programmes, services and action plans and will be adopted by the central DAMK. They are intended to guide how the government and public service work on a day-to-day basis:

* **Design with users** - Research with users to understand their needs and the problems that the Government of MK intends to solve. Conduct ongoing testing with users to guide design and development. Take into account easy access by all user categories, to the services provided, including the elderly population and the disabled, and continuously ensure public website design is fully compliant with Web Accessibility Initiative[[40]](#footnote-40) guidelines and adaptive technologies.
* **Iterate and improve frequently** - Develop services using agile, iterative and user-centred methods. Continuously improve in response to user needs. Start small and scale up.
* **Adopt an open policy by default** - Share evidence, research and conduct decision-making openly. Make all non-sensitive data, information, and new code developed in delivery of services open to the outside world for sharing and reuse under an open licence.
* **Use open standards and solutions** - Leverage open standards wherever feasible and embrace leading practices, including the use of open source software where appropriate. Design for services and platforms that are seamless for MK to use, no matter what device or channel they are using.
* **Address security and privacy risks** - Take a balanced approach to managing risk by implementing appropriate privacy and security measures. Make security measures frictionless so that they do not place a burden on users.
* **Built-in accessibility from the start** - Services should meet or exceed accessibility standards. Users with distinct needs should be engaged from the outset to ensure what is delivered will work for everyone.
* **Empower staff to deliver better services** - Make sure that staff have access to the tools, training and technologies they need. Empower the teams (government with assistance of subject matter experts) to make decisions throughout the design, building and operation of the service.
* **Be good data stewards** - Collect data from users only once and reuse wherever possible. Ensure that data is collected and held in a secure way so that it can easily be reused by others to provide services.
* **Collaborate widely** - Create multidisciplinary teams with the range of skills needed to deliver a common goal. Share and collaborate in the open. Identify and create partnerships that help deliver value to users.
* **Mobile enabled** - All e-services to be deployed will be fully available and compatible with modern mobile technologies and devices in order to be accessible anywhere.

Adopt a user-focused design process - Departments and agencies, under the guidance of the central DAMK will apply user research and user-focused service design, also known as user experience design, to deliver services that consider client needs and feedback. This ensures that operations, programmes and policies are designed with users’ needs in mind and that services are tested in practice and not just in theory.

To promote the digital standard of design with users, the DAMK will work with skilled external consultants (user experience design practitioners) to identify and address administrative barriers to user research, provide guidance on user research practices, and encourage departments to adopt user research methods and activities as a key component of designing and building services, programs and operations.

Enforce meaningful service standards - Service standards allow the government to make a commitment to users and citizens on the **quality** and **timeliness** of service they can reasonably expect in the majority of cases. This provides consistency for users, who can plan around these service standards, and makes departments and programs more accountable for the services they provide. Every major deployed service will include meaningful standards and real-time performance reporting as a prerequisite for its deployment. Furthermore, the use of such standards facilitates cross-border compatibility with similar services deployed in the EU.

Accelerate implementation and deployment of flagship e-government building blocks and projects - A portfolio of high-priority key-enabling projects will form the core part of the e-government action plan as the expected outcomes are essential to provide the ground for the emergence of digital public services. A characteristic example is the implementation of a national eID solution, fully compliant with EU eIDAS regulation to secure digital identity and digital signatures, by consolidating existing core authentication services into a single integrated solution.

Promote Service integration across the public sector - Integrated, ‘data once’ approaches and end-to-end service delivery provide better services by:

* Understanding that citizens view government and sometimes even many government agencies, as a single service provider rather than a collection of silos or separate service providers,
* Focusing on the overall needs of the citizen rather than their relationship to a specific department or programme,
* Applying real-time service application status to allow users to check the status of their government applications without needing to call a helpdesk, visit a service provider or wait to receive an update by mail.

DAMK will gradually deploy end-to-end services **for major life events** by integrating service delivery between different data owners using the existing Interoperability Framework. By the end of 2025 at least 5 such services will be fully operational.

Deploy a centralised platform for shared services across the public sector - A centralised platform to develop and deploy common government services will be implemented by the end of 2025. The platform will provide shared services such as email, authentication, identity management, document management and other cross-department services for the public sector entities. The utilisation of a common platform will ensure compliance with the digital principles and incur significant cost savings.

Build awareness oφ e-government portal and e-services - In order to increase utilisation of government provided e-services, a coherent communication strategy and action plan will be in effect by 2022 in order to increase visibility of the deployed services to all citizens.

Ensure mobile access to all services - E-services offered by the central platform will be accessible via mobile devices offering the same secure functionality and user experience as in desktop computers. This will ensure higher user engagement and utilization of public services leading to constant improvement.

Link e-government services to simplified processes - A major pitfall in successfully deploying e-government services is trying to create online services on top of heavy, complex, bureaucratic processes involving many stakeholders and different systems. The Government of MK will implement a systematic Government Process Simplification Framework (GPSF) in order to ensure a more efficient and effective e-service delivery. The GPSF will identify and prioritize areas in which citizens encounter most problems in dealing with public administration that have a high impact on the quality of life. Following this, a formal mechanism for simplifying the implementation process in order to cut red tape, reduce delivery costs and maximize compliance of business processes to e-service delivery will be established.

GPSF will include Business Process Optimization, reduction or elimination of unnecessary certificates, legislative actions to enforce online service delivery and utilisation. The GPSF well be fully aligned with the objectives and actions identified in the ‘Public Administration Reform Strategy 2018-2022’ under the ‘service delivery and ICT support to the administration’ pillar. The objective is to establish a strong link between e-service development and the process optimisation framework, as well as the creation of a horizontal mechanism to enforce the program implementation.

## Security by design

Ensure Secure and Trusted Services - Citizens and businesses rely on the government to provide secure digital services in a way that protects the information they provide to the government. People who use government services must be confident that:

* any personal information they provide is stored and handled appropriately,
* they are informed about how their information will be used by the government,
* they can access the personal information they provide,
* their privacy is protected while they use the service and afterward,
* the system they are using is safe and secure.

The Government of MK will therefore establish a secure and resilient enterprise digital security ecosystem in which government services are delivered safely and securely, following the recommendations of the ‘National Cyber Security Strategy 2018-2022’. Building in privacy and security from the outset and using an information-centric approach will enable the delivery of reliable services that grant access to protected assets to trusted and verified users only. Taking a pragmatic approach to implementing security measures will help manage cyber and IT security risks and costs as well as help provide a seamless and frictionless experience to the public.

Enforce Trusted access - A trusted digital identity system is fundamental and is a key enabler of seamless and frictionless security in digital systems. This includes enhancing ‘Sign-in North Macedonia’, the authentication service for external, public-facing services, so that it can accept trusted digital identities from provincial and other agencies. When developing digital services that require digital identity authentication, departments will make use of these common enterprise solutions to enable access to government services for authorized parties.

Maintain a system to monitor protected assets - With the increasing sophistication and frequency of cyber-attacks, the Government of MK will continue to be vigilant and strengthen its cyber defences. By using an information-centric security model supported by a trusted digital identity, the government will have the means to protect assets (**including devices and information) throughout their life cycle. The Government of MK** will establish a real-time, enterprise view of the current status and configuration of government end-point devices that are authorized to use secure end-point profiles and thus will be able to identify end-point devices that pose a risk to the enterprise and respond to threats and attacks more effectively.

As the government adopts alternate service delivery models such as public cloud and hybrid clouds, it will continue to provide a secure, reliable and interoperable service delivery environment for internal services and business applications that are hosted in cloud‑based environments. By applying a defence-in-depth, layered security approach, the government can continue to keep pace with evolving technology and practices and implement adequate safeguards to protect government information and assets. This includes establishing additional trusted interconnection points to act as a gateway to access cloud services and to protect cloud-based workloads from direct attacks from the Internet.

Provide resilient services - Delivering secure and trusted digital services requires systems and applications to be built with resiliency against cyber-attacks from the outset, as part of its design, implementation, operation and management. As the government adopts more agile and iterative processes for development, it will focus on security and privacy from the beginning.

# **4. Digital Skills**

|  |
| --- |
| Main strategic objectives and goals for Digital Skills:1) Provide a national framework for digital skills empowerment consistent with EU and international initiatives.2) Ensure public and private stakeholders’ involvement under a common structure such as a national coalition.3) Engage actions focused on the four main target groups – educators and trainers, citizens, labour force, ICT professionals.4) Develop digital skills empowerment in public spaces as a means to guarantee inclusiveness especially for underrepresented groups.5) Support dedicated ICT training programs to upskill labour force and unemployed people.6) Link digital upskilling of civil servants to e-government development in public administrations.7) Support networking activities of ICT professionals as a mean to raise digital skills of this sector and retain ICT professionals in the country. |

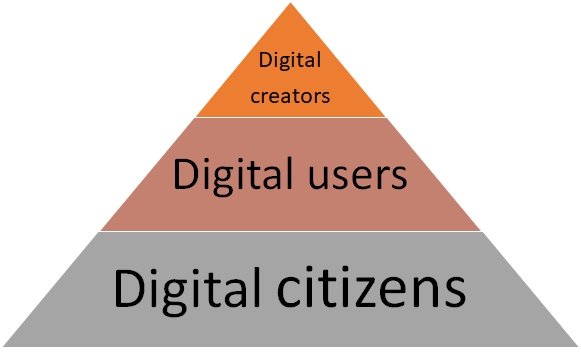
MK acknowledges the fact that digitalisation:

* Changes the structure of employment, leading to the automation of ‘routine’ tasks and to the creation of new and different types of jobs;
* Requires more skilled ICT professionals in all sectors of the economy and public administration;
* Calls for digital skills for nearly all jobs where ICT complements existing tasks;
* Reshapes the way we learn by fostering online communities, by enabling personalised learning experiences, by supporting the development of soft skills such as problem solving, collaboration and creativity, and by making learning fun;
* Expects every citizen to have at least basic digital skills in order to live, work, learn and participate in the modern society.

Digital skills are a prerequisite for the development of the digital economy and society in MK but the country is still suffering from a growing professional ICT skills shortage and a digital literacy deficit. This excludes many citizens from digital society and holds back productivity growth.

## Digital Citizenship Model

Digital citizenship involves all vertical groups such as ICT professionals, unemployed persons, educators and instructors, public servants and vulnerable categories. Digital citizenship is closely related to digital inclusion.



* 1. **Digital citizens**: are citizens who have the knowledge and skills for efficient use of digital technologies in order to communicate with other citizens, engage in society, and create and use digital content. Digital citizens use digital devices (usually a personal / laptop computer or mobile / smart phone) to exchange digital content (messages, text, spreadsheets, presentations, images, etc.) on local networks and / or over the Internet. They know how to protect their private information, manage their digital footprint and use the Internet safely, respect copyright, balance their time on the Internet and social networks, recognize cyber bullying and respect other digital citizens.

Digital citizens have the following skillset: work with keyboard and touch screen; work with folders, files and web browsers, basics of working with word processing tools and spreadsheets; basics of working with tools for making presentations, create professional profiles (user accounts) on the Internet; use of email for communication; managing basic settings for securing privacy and data protection; work on the Internet for access to digital resources and information exchange; safely make online financial transactions.

* 1. **Digital users:** are digital citizens who have the knowledge and skills for efficient use of digital technologies in everyday life, professional life, learning or socializing. They know how to recognize the potential for bullying and how to protect themselves properly, which means they are safe in the digital world. They know how to use software as a service and understand working in the cloud. In addition to data security, they also take care of data storage and management. They know how to work with corporate tools for appointments, video conferencing, managing tasks and projects, customer relationships and communicating with other users. They know how to use social networks for private and business purposes and can create creative digital content for marketing purposes. They are able to solve problems by applying digital skills and understand the processes that are based on digital technologies. They know how to use the Internet effectively for research and learning new things, recognizing the real and verified sources of information. They are open to learning new technologies and easily adapt to the latest innovations in the digital world**.**

Digital users have all the skills for digital citizens, and additionally the following skillset: work with software as a service and work in the cloud; ability to use corporate tools to work with users, lead projects, hold meetings and correspondence between users and clients; organizing video conferences; ability to use content management systems; advanced skills in working with word processing tools and spreadsheets; advanced skills for working with presentation tools, managing advanced settings to ensure privacy and data protection; techniques for achieving digital security and recognizing cyber bullying; advanced skills for efficient use of the Internet in accessing digital resources in research and learning; optimized Internet search; achieving digital marketing through social networks, web content and blogs; creativity in solving problems from the digital world; readiness to embrace innovative digital tools and technologies.

* 1. **Digital creators:** are digital citizens who create hardware and software digital content, in the form of new digital tools, technologies and resources, while taking care of their implementation, management and maintenance, guided by ethical principles. Digital creators must have prior knowledge and education to perform tasks in a particular recognizable field of the IT industry. Digital authors work in areas such as: programming, administration of computer systems and networks, development and administration of databases, data warehouses and big data, cloud computing, web content development and e-commerce, network and systems security, network monitoring, IoT, machine learning, AI, etc. Digital creators play an important role in transforming existing businesses through the development of new digital technologies and / or the use of such new technologies in digital entrepreneurship. They offer technical support to businesses and can provide on-the-job training to their employees. Digital authors create security policies and solutions and protect systems, networks and data from cyber-attacks.

In addition to skills for digital users, digital creators are advanced in one or more skills among the following: analysis and design of IT systems, design of IT systems architecture; programming, mobile technologies, web content development, virtual reality; operating systems, administration of computer systems and networks, cloud computing; modelling databases, data warehouses, big data; computer networks, IoT, Internet application services; machine learning, AI, data mining; creating security solutions and policies for computer communication systems and networks; implementing these innovative digital tools and technologies in digital entrepreneurship; testing and providing the desired level of service quality; support for management and maintenance of IT systems; training and education of non-technical persons; creativity for research and development of new digital content and resources.

The Government of MK 5-year ambitions for digital citizenship are:

* Increase the number of confident and secure digital citizens,
* Build up digital users ready to embrace innovative digital tools and technologies,
* Foster digital creativity,
* Partnerships for future jobs.

## Digital Empowerment of Communities

Empowerment of individuals and communities means increased control over life and coping skills. With information technology people gain new abilities and ways to participate and express themselves in a networked society. This can be called digital empowerment, which is not a direct consequence of having and using the technical facilities, but a multi-phased process to gain better networking, communication and cooperation opportunities, and to increase the competence of individuals and communities to act as influential participants in the information society[[41]](#footnote-41).

Nowadays digital empowerment, the reduction of digital exclusion, the improvement of digital skills among the population are recognized by all public authorities around the world as a key to ensure prosperity. In this way, the European Commission adopted the New Skills Agenda for Europe in 2016[[42]](#footnote-42) with the aim of boosting human capital, employability and competitiveness. Most EU countries have elaborated national strategies according to the EU framework that set priorities in enhancing digital skills and promoting e-inclusion. In the Western Balkans region, a Digital Agenda for the region was launched in June 2018[[43]](#footnote-43). It recognizes the necessity to increase digital skills among citizens and among its priorities.

Furthermore, digital empowerment of communities implies a 360° view covering ICT infrastructure, equipment, software tools but also accompanying measures such as training and digital transition among public-private service providers. The purpose of including digital empowerment of communities as one pillar of the long-term ‘MK National ICT Strategy 2021-2025’ is to secure links between all the necessary components of digital transition.

In the past years, several initiatives were taken in MK to cope with the challenge of increasing digital skills among the population and society. However, there is no comprehensive national digital skills strategy. Initiatives are too sporadic and lack the necessary coordination to lead to significant results, despite the fact that digital skills are mentioned in some ministerial policies (e.g. Ministry of Education and Science, Ministry of Information Society and Administration, Ministry of Labour and Social Policy).

According the State Statistical Office of MK in 2019:

* 18.2% of households do not have access to the Internet at home and 16.6% of the population aged 15-74 had not used the Internet in the last 3 months[[44]](#footnote-44);
* 13.7% of enterprises employed an ICT specialist and 14.1% have provided training to develop ICT skills of personnel.

The ‘MK National ICT Strategy 2021-2025’ is a key opportunity for the country to prioritise the improvement of digital skills. This means that the Government of MK will engage in bridging the digital divide between the part of the population and society that already live in the digital world, and those that are not equipped. Moreover, MK will consider the digital divide from the competence point of view to prepare citizens to work in an environment directly impacted by digital technology (most jobs will require in the near future, some digital skills along with the digital transformation of the economy) and to live in a digitized society (online administrative formalities, online banking, etc.). Furthermore, especially given the adoption of new technologies, the economy will in future require more skilled ICT professionals in all sectors. There are already hundreds of thousands of unfilled vacancies for ICT professionals in Europe. It is of upmost importance that MK increases and retains ICT specialists in the country to secure the positive transformation of the economy and society. Lastly, digital skills empowerment will benefit everyone irrespective of age, gender, physical ability, ethnicity, health conditions, socio-economic status, ensuring equal access to digital opportunities.

Digital skills are a prerequisite for the development of the digital economy and society in MK but the country is still suffering from a growing professional ICT skills shortage and a digital literacy deficit. This excludes many citizens from digital society and holds back productivity growth.

MK will increase digital skills empowerment consistent with the framework established by the EU (EU Digital Skills Agenda)[[45]](#footnote-45) and the Western Balkans Region (Western Balkans Digital Agenda, Stakeholders Regional Working Group on Digital Skills)[[46]](#footnote-46). It will support EU initiatives such as the participation in the Code Week[[47]](#footnote-47) as far as they offer opportunities for the country to participate in a common momentum towards digital upskilling and provide specific resources to the country either by accessing financial support or collaboration schemes.

Four main targets groups will be addressed and their associated challenges considered. It should be taken into account that each of these target groups aim to raise the level according to the digital citizenship pyramid.

| **Target Group** | **Challenges** |
| --- | --- |
| Educators and trainers | * Providing adequate ICT infrastructure in schools and training institutions. * Modernising and up-dating teaching content and pedagogical methods. * Up-grading trainers and teachers’ skills. * Strengthening cooperation between education and industry. |
| Citizens | * Developing a common definition and understanding of what digital skills and competences are. * Overcoming the obstacles and / or limitations some people face in obtaining digital skills. * Providing relevant digital skills training opportunities for all, giving specific attention to gender and disability. |
| Labour force | * Improving the understanding and definition of digital skills needs. * Upgrading digital skills of the labour force with a focus on professional-related digital skills. * Creating new opportunities and challenges. * Strengthening collaboration across relevant stakeholders. * Improving managers’ digital skills or so-called ‘e-Leadership’ skills. |
| ICT professionals | * Making the ICT profession more attainable as a career choice, with a focus on encouraging more women. * Increasing the number of young people trained for ICT professions (ICT graduates and conversions to ICT). * Ensuring certification and standardisation. * Upskilling of ICT professionals in a life-long-learning perspective. |

Three principles will be enforced:

* To provide affordable conditions to access to Internet connectivity and ICT equipment whether at individual level, at work or in a third place;
* To develop practical digital skills content and modules adapted to the uses of individuals, companies and public administration;
* To encourage collaboration between the public sector, the private sector and NGOs to reinforce coordination among initiatives and their efficiency.

The strategy for digital skills empowerment sets five priorities:

* To adopt a reference framework for governance of digital empowerment,
* To enable every citizen to digitally upskill,
* To provide solid digital knowledge in the education system,
* To reinforce the way the labour force has access to digital upskilling,
* To arrange a favourable environment for professionals in the ICT sector.

## Reference Framework for Governance of Digital Skills Empowerment

The ‘MK National ICT Strategy 2021-2025’ gives the opportunity to build a reference framework for organising the governance of how digital skills empowerment can be increased in all sectors of MK society and economy. Given the fact that until now MK has only addressed the issue of increasing digital skills in a sporadic way, the very first action to be taken by the Government of MK is to set the basis for a shared commitment of the different public and private stakeholders in meeting the challenges of digital skills empowerment in MK.

Two particular issues for this purpose will be considered:

* Build a common framework that draws the outline of digital skills,
* Propose to set up a national coalition for digital upskilling in MK.

Define a Digital Skills framework - despite MK commitment to tackling the matter in its policies, a clear framework of understanding is lacking, considerably slowing down the process of undertaking concrete resolutions in favour of digital upskilling. It is thus overwhelmingly important for MK to be able to define the digital needs of its society and to assess the impact of the digital gap within it, so that it can develop a framework where it becomes possible to undertake effective measures.

Digital upskilling framework settlement- Government of MK will implement a common framework upon which every stakeholder taking part in the process will rely, to elaborate their initiatives and actions. The framework will cover these questions:

* What does ‘Digital Skills Empowerment’ mean?
* Whom does it target?
* What are the categories of skills to address?
* What are the specificities in MK to consider?
* What kind of solutions are best suited to answer each challenge and to provide adequate solutions for the different target groups?

To answer these questions, the new framework will not only gather content of the former ‘National Strategy for Development of Electronic Communications’[[48]](#footnote-48) and the ‘National Strategy for Information Society Development’[[49]](#footnote-49), but will also largely draw inspiration from European frameworks. Indeed, experience of neighbouring countries in this field is already abundant and MK will benefit from their feedback. Since 2013, the EU’s **‘Digital Competence Framework’**[[50]](#footnote-50) established a list of 21 competences able to evaluate the digital skills fit of each citizen compared with the expected level required for a job based on five areas:

| **Areas** | **Details** |
| --- | --- |
| Information and data literacy | To articulate information needs, to locate and retrieve digital data, information and content. To judge the relevance of the source and its content. To store, manage, and organise digital data, information and content. |
| Communication and collaboration | To interact, communicate and collaborate through digital technologies while being aware of cultural and generational diversity. To participate in society through public and private digital services and participatory citizenship. To manage one’s digital identity and reputation. |
| Digital content creation | To create and edit digital content to improve and integrate information and content into an existing body of knowledge while understanding how copyright and licences are to be applied. To know how to give understandable instructions for a computer system. |
| Safety | To protect devices, content, personal data and privacy in digital environments. To protect physical and psychological health, and to be aware of digital technologies for social well-being and social inclusion. To be aware of the environmental impact of digital technologies and their use. |
| Problem solving | To identify needs and problems, and to resolve conceptual problems and problem situations in digital environments. To use digital tools to innovate processes and products. To keep up-to-date with digital evolution. |

Every EU member country used this framework as a reference for digital empowerment policies and carried out respective actions. Looking at the effectiveness of such policies, the generic European framework appears to be of significant influence, no matter how specific the context.

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| For instance, the French Digital Skills and Jobs Coalition has worked on defining recommendations on two specific paths - a path for basic digital skills, and a path for specialized digital skills. It has also worked on ensuring a shared recognition of different digital skills paths provided by different stakeholders, from education to high education and enterprises[[51]](#footnote-51). |

MK will take the initiative to elaborate the Digital Skills framework in close cooperation with both public and private stakeholders. This framework will serve as a reference to build courses.

The objective for MK is to get a framework that can ensure recognition of digital skills acquired throughout life.

Set up a national coalition for digital empowerment - precisely, no policy can be effective enough without considering the specificities of the situation it seeks to regulate. Looking at the best practices in terms of digital empowerment policies, it appears that one of the common denominators is the flexibility of implementation towards the local context. Considering the experience of EU countries, national coalition to boost digital empowerment is a valuable instrument for facilitating collaboration among business and education providers as well as public and private actors to tackle the lack of digital skills.

A national coalition is a multi-stakeholder partnership that ensures a commitment of all relevant actors around a common aim in this case improving digital skills in the country. The ‘MK National ICT Strategy 2021-2025’ and its digital skills pillar sets the ambition and priorities for digital skills empowerment, the national coalition by gathering the relevant stakeholders secures connection between public authorities, business, education, training and labour market actors to unite actions and develop concrete measures aligned with specific needs of MK, according to the reference framework presented hereabove.

Call for a digital empowerment coalition – the digital empowerment issue will concern national, regional and international partners that specialise in ICT or in transmitting knowledge. Therefore, MK will identify available forces and activate them so that the country can efficiently deal with digital skills empowerment. To these ends, the Government of MK will take the initiative of drawing a stakeholder’s map of the actors that are concerned with these topics and approach them in order to determine whether they can or cannot participate in the process.

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| Most of the successful examples of digital skills empowerment actions rely on collaborations between stakeholders. National coalitions bring all kinds of actors to the table, ranging from public administrations and NGOs to SMEs and large private companies. This format allows for greater coordination and engagement between members. For example, the French Coalition for Digital Skills and Jobs coordinated by Mouvement des Entreprises de France (MEDEF) brings together 200 members that combine their efforts to increase digital employability of French citizens. In the case of MEDEF, processes are very lightweight. The coalition works according to a yearly roadmap that identifies the issues to address. Recent work has focused on improving the pathway to basic skills, the path to expert skills and the impact of AI on skills and professions. For each topic, the coalition brings together a working group made up of members interested in the topic, identifies a financial partner (for example the Ministry of Labour on the issue of the impact of AI) and launches a study. The coalition otherwise meets twice a year in a plenary session open to all members. The role of the coalition is therefore to federate the actors and to establish partnerships. Operational costs are also quite cheap as the coalition only employs one person working half-time and simply pays for covering the logistical costs of the meetings. Other good practices can be observed in other European countries relying on different structures (light structure such as France or creation of a specific body like an association, which means earmarking a specific budget dedicated for running the operation and actions). The Belgian National Coalition established ‘BeCentral’, a digital hub located in Brussels and is now home to many training courses in digital skills and start-ups. In the Czech Republic, a permanent roundtable allows dialogue on innovation in education, the quality of digital content in the context of lifelong learning, the initiation of local coalitions and clusters. |

The Government of MK will also benefit from the regional dynamic set up in the Western Balkans on digital skills (e.g. the Stakeholders Regional Working Group on Digital Skills) to engage a mobilisation of key stakeholders around a national coalition.

Centrality of the Government of MK in the digital empowerment process- even if multi-stakeholder cooperation has proved to be of major importance in the implementation of successful initiatives and thoroughly supports government strategies, the Government of MK will still play a key role in coordinating the digital empowerment process. More specifically, the Government of MK will take the lead in setting the basis for the creation of the national coalition on digital skills. Different stakeholders will be involved, such as ICT Forum, ministries, faculties, telecom operators and ICT companies, training organisations, NGOs, etc.

Once created, the national coalition for digital skills will be the governance body and will keep an oversight on each action undertaken and therefore design a centralised governance mechanism. The structure of the national coalition will be discussed during the early stage of the creation process among the stakeholders in order to define the most relevant one for the MK context.

The MK State Statistical Office will provide support to the Government of MK and the national coalition by including a set of questions targeted on assessing digital skills in the country in its regular surveys, aligned with the EUROSTAT, DESI standards and the Digital Citizenship Model.

### Citizen’s Digital Upskill

The world is going online, and so is MK thanks to digitisation of its public services and economy. The ‘MK National ICT Strategy 2021-2025’ will set the objective to support digitalization in every economic sector and society. MK will therefore allow every citizen to get involved in the digital world. Part of the MK population still lacks basic digital knowledge and remains excluded from digital opportunities. Reasons for digital exclusion are well documented by research:

* Lack of access or connectivity.
* Lack of digital skills for using online services.
* Lack of confidence and trust in online services.
* Lack of motivation and understanding of the benefits of digital.

Allowing every citizen to digitally upskill requires that these different obstacles are considered, and that appropriate solutions are provided.

## Raise awareness about the importance of digital upskilling - to make the case for digital empowerment policies, it is better to have the citizens understand why the topic matters. Therefore, the Government of MK will engage in the promotion of digital empowerment through dedicated communication campaigns and organise or sponsor events that deal with digital empowerment. The Government of MK will also communicate largely on the policies it implements in favour of digital empowerment and will expressly indicate whom they target and how to benefit from it.

Ensure coordination between all facets of different strategies that impact accessibility to digital - the ‘MK National ICT Strategy 2021-2025’ and other actual MK strategies cover different facets related to broadband rollout and the fixed and mobile networks coverage of MK territory and population, development of e-government and online services to citizens.

The expected results will contribute to increase the capacity of accessing the Internet by the population in better and more affordable conditions, and to provide a wider range of online services useful in the daily life of every citizen.

Develop digital skills empowerment in public spaces - Providing access to ICT (connectivity, equipment but also human resources to support the population) in public infrastructures and spaces is necessary in order to tackle the digital divide[[52]](#footnote-52).

Government of MK will develop the role of public libraries in improving digital inclusion. To ensure the success in mobilizing libraries in becoming a ‘digital inclusion provider’, the Government of MK will qualify the network to identify a first set of libraries that have the capability to play this new role. In parallel, the Government of MK will assess the feasibility of enlarging the network of libraries able to get involved and their needs to provide digital inclusion resources for communities properly. The Government of MK will give specific attention to the geographic distribution in the country in order to set up a network that addresses all citizens.

In parallel, the Government of MK manages 18 Internet clubs nation-wide, which are public spaces in their essence. The Government of MK will explore the role that the future network of single point of services supported by MISA will play in assisting citizens who do not have the necessary skills/devices or have some other technical issues.

The Government of MK will put a strong focus on universal access to ICT tools by developing ICT services in public spaces, so that every MK citizen has the means to upskill. This implies that MK will have to increase spending in public digital equipment and enable civil servants to help their fellow citizens in their digital procedures. Such an engagement is costly but is an efficient way to show the Government of MK commitment to its will of empowering the society. In order to reach this goal, the Government of MK will seek partnerships either to provide hardware and / or training for the civil servants.

Provide digital devices for vulnerable people - Access to affordable digital devices and connectivity, especially for vulnerable people, is a prerequisite for accessing the digital world. Complementary to the action of providing access to digital resources in public spaces, the Government of MK will facilitate the reuse of digital devices and its distribution to vulnerable people. The action requires building a specific sector to ensure the collection of digital devices, their refurbishment and its distribution to eligible people.

Support digital upskilling programs to ensure every citizen has basic digital literacy - As a lack in digital knowledge is increasingly becoming a factor in social exclusion, the Government of MK will sponsor initiatives that promote digital literacy. In a world driven by technological changes and that always requires more digital skills, MK will promote activities that allow society to keep up with the pace of those rapid changes. Hence, the Government of MK will encourage the organisation of timely and responsive events to raise awareness and sensitise citizens about the digital shift. Such events will promote digital education, digital upskilling and digital jobs.

The Government of MK will also design more long-lasting programmes that will prioritise digital inclusion. Once again, flexibility is key to the success of such initiatives and it will address the specific needs of each targeted group of population. No true inclusion can happen if MK only implements a single generic programme. MK will therefore identify groups of citizens that are the most affected by digital exclusion and develop programmes that fit their needs, learning abilities and social conditions. Following these steps, several categories of the population will emerge with different needs towards digital inclusion. Specific programmes will hence address those specificities. For instance, Portugal identified different categories of its population such as citizens that have left the educational curriculum, unemployed, youths at risk, migrants, minorities, women, elderly, etc. In order to address efficiently the needs of each category, the Government of Portugal cooperates with different experts to jointly design adapted programmes.

The Government of MK will also work in compliance with the orientations that arise from the creation of the national coalition on digital skills. In between, the Government of MK will launch a call for interest on upskilling citizens in order to identify early actions to engage.

Support peer-mentoring initiative / involve citizens in the process -Another relevant way to support digital literacy with low spending is by encouraging peer-mentoring actions. Such initiatives have proved to be an efficient way of engaging citizens in the process of digital empowerment. It is moreover a great factor in social inclusion. An example of peer-mentoring format is pairing young skilled voluntary citizens with elderly people so that the first can provide the latter with a basic level of digital knowledge. Such programmes encourage face-to-face interactions to facilitate dialogue between generations and properly enhance interactions between community members. This has already proved to be efficient in other countries such as Sweden.

To attract young volunteers, the Government of MK will also collaborate with local high schools and universities, so that they propose this option to their students. Students engaging in the peer-mentoring programme will earn bonus credits as a counterpart of their civic actions.

Centre for safer Internet for children - as cyber security is one of the strategic priorities of the Government of MK, the Government of MK will establish a centre for safer Internet for children, following the footsteps of many EU member states, in coherence with EU decision No. 1351/2008/EC[[53]](#footnote-53).

A focus on underrepresented groups - Digital exclusion particularly affects underrepresented groups (women, disabled people, minorities). This is not only the case in MK, but also in many other developed countries. All of these social groups are underrepresented in the uptake of digital qualifications and also in digital jobs. As digital upskilling is set as a priority for MK, the Government of MK will specifically look for implementing actions that addresses such imbalance. Attention will be given to align the MK orientations with Directive (EU) 2016/2102 and decision (EU) 2018/1523[[54]](#footnote-54).

## Improving the education system’s provision of digital knowledge

## Reinforce ICT specific curricula in the education system - A healthy digital society does not only seek to reduce the digital gap, but it must also educate its youth. From that point of view, the Government of MK will make significant efforts in order to keep up the pace with its competitors and mitigate brain drain. To this end, the Government of MK will consistently commit to its ‘Education Strategy 2018-2025’[[55]](#footnote-55) and prioritize the digital aspects of this. The Government of MK will prioritize measures included in Priority III of the above strategy and achieve digital consistency in its education system. Programmes such as this will find a parallel at higher levels of the curriculum. As the digital market grows at a 5-10% rate per annum in the Western Balkan region, the Government of MK seeks to increase the number of ICT specific curricula at least at the same rate. On the other hand, the Government of MK will pursue its effort to develop ICT events and career orientations fairs to attract more high school students to the ICT sector.

## Encourage digital upskilling by bringing digital tools into the school – The Government of MK will increase spending in digital infrastructures and find new ways of bringing ICT related tools into the education curriculum. Similarly, MK Code Weeks and international cooperation programmes such as the 21st Century Education programme[[56]](#footnote-56) may serve the same purpose. The Government of MK will commit to finding new partnerships aimed to digitally upskill students and engage them in the ICT sector. The Government of MK will support innovative tools to disseminate ICT skills and knowledge such as Massive Open Online Courses (MOOCs) at high school and college level through the digital platform it is currently developing.

International cooperation (e.g. EU supported GÉANT) will be encouraged to get support in implementing smart education in the country.

MK will particularly look after cyber security issues. The strategy will consider providing workshops in schools as piloted in 2019, in cooperation with the Ministry of Education and Science, the OSCE Mission to MK, Metamorphosis Foundation[[57]](#footnote-57) and MISA. This initiative will become a nation-wide project that aims to cover every school in the country.

## Involvement of private sector players in promoting ICT in their sector - for collaboration in many ways, the Government of MK will also look for the support of private partners with a focus on promoting digital upskilling in the education system.

Educational program sponsoring – The Government of MK will open more programmes to sponsorships. This format has proved to be interesting to both public and private players. On the public side, this allows sharing the costs of education, broadens the number of ICT curricula offerings, and helps benefit from the company’s network, infrastructures and case studies, thus resulting in an all-encompassing qualitative program. On the private side, such programmes increase brand image, allow the sponsor to scout young talents, to engage in dialogue with them and to benefit from a cheaper R&D resource.

Company sponsored scholarships -in the same perspective, the Government of MK will financially incentivise private ICT companies to increase their participation in ICT scholarship programmes to attract young talents into the ICT branch.

Fast track programmes –The Government of MK will seek partners to develop fast track enabling programmes aimed at reorienting non-ICT university graduates into the ICT branch.

Have private partners signing a pledge to digitally upskill students -The EU greatly benefited from the National Skills and Jobs Coalition[[58]](#footnote-58) in leveraging private sector’s ability to upskill public communities.

## Ensuring upskilling of the labour force

Develop specific upskilling programmes for the employed workforce -Gartner predicts that AI alone will create 2.3 million jobs by 2020, that is 500,000 more jobs than those it will eliminate[[59]](#footnote-59). While MK has made significant efforts to cope with digital transformation in the education sector, the country still has to commit to upskill the existing labour force. For now, there is too little evidence for involvement in this field; that is a major source of concern. Only 2% of the actual MK active population is actually working in the ICT sector versus 3.1% in the EU zone[[60]](#footnote-60).

The Government of MK will therefore focus on upskilling its labour force to catch up with the competition. It will first commit to develop upskilling programmes targeting the employed workforce. These programmes, taking the form of fast tracks, will aim at upgrading workers’ digital knowledge so that they better fit the new business requirements of their companies and gain productivity. Training will cover digital marketing, e-commerce, use of typical office tools, cyber security. More advanced programmes will also be accessible in order to allow an upskilling of all workers that are willing to progress. Cooperation with representatives of the private sector will be foreseen in order to identify the priorities in terms of economic sector and workforce profile. This will lead to support digital transition programmes for enterprises with a specific focus on digital upskilling of the workforce.

#### *Strengthen skills training for the unemployed people –* The Government of MK will consider the results of initial actions taken to introduce IT skills training for unemployed people to plan their extension. These actions are part of the Operational Plan for active employment by the Ministry of Labour and the employment agency[[61]](#footnote-61).

To give a firm foundation for these actions, the Government of MK will reinforce the market assessment with the representatives of the private sector in order to get a better picture of the needs, ranging from basic skills to more advanced skills. The future national coalition on digital skills will offer a platform to assess market demands in line with the expected impacts of digital on jobs in MK. Once again the Government of MK will make efforts to activate a network of stakeholders (private ICT companies, NGOs, international partners) willing to engage in the process.

Self-assessing digital skills – the promotion of an online digital self-assessment tool is required, based on the digital skills framework. Many EU countries have developed such tools. MK will also use these tools by adapting them to the national context.

Digitally empower civil servants - In order to drive digital transformation effectively, the Government of MK will be a pioneer. Its commitment to e-government means consolidating the skills of civil servants and providing access to the necessary resources to successfully operationalize the digital transformation of public administration. Digital transformation of public administrations will considerably affect skills, processes, internal organisation and jobs profiles. To meet this major challenge, the Government of MK will support awareness raising among public decision makers, redefinition of job profiles to better include digital prerequisites, integration of new digital skills (designer, data scientist, etc.) among the administration and adaptation of training formats for civil servants.

The Government of MK will consider best practices in Europe that were implemented over the last years to support public digital transformation from the digital skills perspective, e.g. Public Innovation Labs in France[[62]](#footnote-62), to elaborate a national programme that will allow all civil servants to have access to a minimum customised training on ICT skills adapted to their current jobs and consider the evolution of jobs due to the increase of digitisation.

## Ensure Favourable Conditions for Professionals in the ICT Sector

Provide short specialized training courses for the skilled workforce - as MK lags behind in terms of ICT workforce, the country will not only do its best to requalify unemployed workers and prepare them for newly required jobs but it will also help its already skilled ICT workforce to reinforce their knowhow if needed. As digital technologies quickly evolve, MK will keep in mind that a skilled ICT worker will not possess the skills matching the job he is doing forever. It is then important that to consider activating a network of stakeholders able to train highly skilled workers and care about this highly important resource for the country and its process of digitisation.

Promote networking events for ICT specialists - to reduce the shortage in ICT specialists, the Government of MK will ease the development of networking events targeting ICT specialists. The Government of MK will encourage interactions between peers to create a vivid network of talents by encouraging get together events bringing together universities, start-ups, SMEs and large-scale companies in the ICT sector. Cooperation with the ICT Forum will be reinforced to ensure that the needs of the sector are addressed.

A focus on cyber security skills - as digital is spreading around the world, cyber security threats represent a real risk for all society. Addressing cyber security requires a specific expertise in terms of digital skills. Cyber security will become an essential skill to acquire at different stages of the educational curriculum:

* Include cyber security issues in digital curricula at schools in order to provide young people with the minimum skills,
* Develop certificate on cyber security at university with high-quality courses and diploma to provide the necessary workforce on that issue,
* Encourage apprenticeships with enterprises and public sector on cyber security to raise their awareness and internal capabilities to address the issue.

Cooperation with the MKD-CIRT will be promoted to that end.

# **5. Research, Development and Innovation**

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| Main strategic objectives and goals for Research, Development and Innovation:Gradually increase R&D spending of public funds and private investments.Deliver the technical infrastructure to institutions for improving the research and innovation base.Increase commercialisation of research in academia by developing instruments and services.Revise and adopt regulatory framework in line with needs of academia for research, development and innovation.Support adoption of new technological and scientific trends in ICT.Support digital innovation in projects and areas targeting the needs of the global, regional and domestic market.Foster and nurture collaboration and networking regionally as well with various EU institutions. |

### Research and Development (R&D)

Science, technology and innovation are being revolutionised through the rapid evolution of digital technologies. These technologies are changing the way in which scientists work, collaborate and publish; increasing the reliance on access to scientific data and publications. They are opening new possibilities for public engagement and participation in science and innovation; facilitating the development of research co-operation between businesses and the public sector; and contributing to the transformation of innovation.

Excellence in science, research and innovation is recognized by MK’s international competitors as an important source of future competitive advantage and many are taking significant steps to increase their own investment in this area. In times when basic survival does not depend on basic industries but on a disruptive approach to the whole concept of living, MK cannot continue to be passive using the reasoning that MK is small, has basic survival problems, and no strength to invest in R&D and innovation.

Increase of public budget for R&D – in the future, MK will take research into account as an investment in the digital economy. Within the period of this ‘MK National ICT Strategy 2021-2025’, the Government of MK will gradually increase the **public budget for** **R&D from currently 0.2% to at least 2% of the GDP[[63]](#footnote-63)**, despite having to make substantial savings, reallocations or loans to reduce the inherited deficit.

Business expenditure on R&D - the challenge of attracting business investments in R&D is substantially lower than in most countries competing with MK, not comparing the most developed ones. To keep pace with competing countries, within the period of this ‘MK National ICT Strategy 2021-2025’ MK will work towards increasing the Business Expenditure on R&D (BERD)[[64]](#footnote-64) investments from EUR 4.3 per citizen at least to the average of EU countries, which was about EUR 20 per citizen in 2019.

Commercialization of investments - through the establishment of the Fund for Innovation and Technological Development (FITR)[[65]](#footnote-65) MK has already taken action to address its weakness in commercialising investments. A more diverse approach with more focused instruments on various needs in research is required. The Government of MK will strengthen the support for universities to commercialize their research ideas. The Government of MK will secure spending on digital science, recognizing its central role in generating new knowledge and discoveries.

Support for start-ups and spin-offs - MK produces only a symbolic number of start-up and spin-off companies, as well as patents (more or less 200 patents over the last 20 years). One of the reasons is low funding, and low interest of the community to participate in research. The digital space(‘golden triangle’) between academia, businesses, and financial institutions / instruments, and the Government of MK as an integrator, is highly needed and will be built and facilitated to achieve higher levels of R&D in both businesses and academia. Besides integration, the Government of MK will also be a generator of demands for digital, disruptive solutions. This approach and strategy will also increase the confidence for international investors.

As an example, the ‘Deutschland - Land der Ideen’ (Germany - Land of Ideas)[[66]](#footnote-66) which was founded in 2006 by the German Federal Government and German businesses and industry, is a successful nation-branding initiative that promotes Germany internationally as a hub of ideas and innovation.

The initiative fosters an environment that transforms ideas into innovations through competitions, exhibitions, virtual platforms etc. both in Germany and abroad, such as:

* **‘Digital Catapult Global Challenge: UK and Germany’**[[67]](#footnote-67)**:** a transnational innovation competition with a focus on the industrial application of AI, machine learning and distributed ledger technologies, where the winning start-ups and scale-ups from both Germany and Great Britain can collaborate with Siemens and Commonwealth Handling Equipment Pool (CHEP) Europe to further develop and validate their ideas.
* **‘German Mobility Award’**[[68]](#footnote-68): a national competition fostered by the ‘Germany – Land of Ideas’ initiative and the German Federal Ministry of Transport and Digital Infrastructure, that awards the most promising digital innovations that can transform the future of mobility.

**‘Landmarks in the Land of Ideas’**[[69]](#footnote-69): an annual competition organized in collaboration with the Deutsche Bank honour initiative awards the 100 most future-oriented projects across Germany on topics from urbanization to digitization.

Considering the foresaid, the strategic objectives for MK’s R&D sector will be:

**Substantially increase investment in R&D** and ensure MK’s research achieves appropriate funding in order to catch world trends. There will be a roadmap of increasing the level of R&D spending of public funds, finding new instruments to increase funding, and for the tax environment for R&D to drive up the level of private investment in science and innovation across the economy.

**Strengthen MK strategic capacity** through the existing Fund for Innovation and Technological Development (FITR), and by adding new instruments, as exemplified below, for strategic and nonstrategic investments as well as a ‘Fund for Commercialization of Academia’ focused on spin-offs and start-ups. These activities will require a change of regulatory framework in order to make some rules for the management of the IPR of academia and implementation of instruments that will motivate and enable businesses to actively participate.

**Strategic Industries.** MK will define strategic industries and prepare instruments for facilitation and improvements in those sectors.

**Support the academic and research community.** MK will expand mechanisms such as the Fund for Higher Education Innovation Support (FHEIS) which will support the academic and research community to patent their developments and work with local businesses to expand knowledge transfer partnerships, which can facilitate the exposure of PhD students to companies on a temporary basis. This will allow academia to provide greater support for the local economy and small businesses. MK will also implement new intervention instruments to enable research and businesses to collaborate (such as development of digital skills, or financially supporting ‘time away’ from laboratory in businesses to help in research or disseminate know-how). Such an instrument will be, for example, to train 25,000 teachers who need digital skills enhancement.

**Support innovative procurement schemes.** The Government of MK will provide dedicated funding for innovative procurement schemes, considering the EU Small Business Research Initiative (SBRI)[[70]](#footnote-70). The SBRI aims to provide a lead customer for technological (product or service) innovation by means of a normally two-stage competitive process in which firms seek to demonstrate the scientific, technical and commercial feasibility of their product or service idea and, at the second stage, to develop a prototype. EU government departments are using SBRI to engage with industry to define and meet:

* the government’s operational requirements (challenges) and / or
* the need for more general innovations to address specific policy problems where the government will not itself be a purchaser of the innovation, but where the market, if left to itself, might not be expected to deliver solutions.

The funding initiative will be an effective support for innovation. At the end of the SBRI process, innovations will be developed to the point where volume production is the next step and market competition can take place.

**Fund for support of strategic industries.** The Government of MK will create a new fund for support of strategic industries to help MK facilitate, nurture and improve strategic industries with the help of digital research and innovation. This will be an additional funding opportunity not intended to decrease other funding instruments, focused to further help main pillars of the economy with support of digital R&D.

This fund will focus on challenges where:

* The global market is potentially large, or fast growing and sustainable,
* MK has potential or capabilities to meet market needs in terms of research strength and business capacity:

1. There are significant social and economic benefits, and
2. There is evidence and good practice worldwide that government support will make a difference.

**Increase the number of PhDs.** Demand for higher level digitally based qualifications is growing strongly, and today’s PhD students are often tomorrow’s scientific and industrial researchers, and entrepreneurs. Existing funding programmes for ICT based PhD and post-doctoral researchers do not meet the actual needs, which results in intensive brain drain from MK. To counteract, the Government of MK will implement instruments to substantially increase the number of PhDs and research fellowships in subjects like science, technology, engineering and mathematics.

**Attract MK talents to come back from abroad.** This requires building a whole ecosystem for R&D, and innovation to provide the necessary environment for their high-level research, and incentives for the institutions to build more supportive instruments. This is a long process but, nevertheless, it will start and set some long-term goals. This is actually already happening in many countries which have experienced brain drain (Turkey, Romania, India, etc.).

**Deliver the technical infrastructure to institutions** which is needed for improving the research and innovation base. This will provide modern infrastructure to support R&D.

**Increase the effectiveness of research investment**. As well as increasing overall funding for R&D, the Government of MK will continue to work with academia and research institutions in order to improve the economic impact of research investment.

**Spin-off creation and growth.** The Government of MK has to ensure that university spin-offs have the best chance to survive, attract investments and grow over the long term. The Government of MK will commission research that will explore the different institutions’ principles and practices and the impact these have on spin-off creation and growth. For example, the size of equity stakes taken in spin-offs varies considerably, with little consensus over what is appropriate. On the one hand too large a stake could diminish future investment prospects, while on the other hand some new companies will rely heavily on academic funds for initial support. By examining these dynamics, the Government of MK will use the findings to disseminate the best practice approaches.

MK will continuously monitor and evaluate the value for money and effectiveness of such approaches compared to other funding mechanisms. This includes examining the value of currently active innovation instruments, if their Return on Investment (ROI) is appropriate to the funding secured. Based on this analysis, the Government of MK will provide more focused financing and enhancement of digital skills and know-how to strategically relevant sectors that will benefit the entire country.

**Adapt to technological and scientific trends.** Considering emerging and attractive technologies such as 4IR, universities, particularly faculties for ICT, must adapt to these technological and scientific trends, redefine and / or refine their curriculum and fulfil the needs of the MK economy. These trends will intensify the development and nurturing of researchers in the digital sphere, that are crucial for the creation and securing of new jobs. As this is an expensive and long process the Government of MK will secure support from the international community and attract businesses to participate in the research and innovation process, as well as allocate budgetary funds.

**Commercialization of research in academia** in MK is happening in the form of private initiatives from professors and students without help and involvement of the institutions they are coming from (and the results of these activities have no, or minor impact on academia and the whole society and economy). Countries faced with such a shortage developed instruments and services to resolve the problem. It is important, that educational institutions act as a pipeline for talents into innovation. For example, California’s Stanford University runs 145 educational courses on entrepreneurship (‘There are 145 Entrepreneurship Courses at Stanford University’[[71]](#footnote-71)) which feed into Silicon Valley’s employment opportunities.

There is a long list of European institutions and collaboration instruments that could further connect the MK research and innovation community with the R&D ecosystem of theEU, such as:

**European Research Council (ERC****)**[[72]](#footnote-72) which aims to bring about a wide range of benefits in the following ways:

* By creating open and direct competition for funding between the very best researchers in Europe, the ERC will enhance aspirations and achievements.
* The ERC's competitive funding will be able to channel funds into the most promising new fields, with a degree of agility not always possible in national funding schemes.
* The ERC aims to stimulate research organizations to invest more in the support of promising new talents - the next generation of research leaders in Europe.
* On the economic side, the ERC will help nurture science-based industry and create a greater impetus for the establishment of research-based spin-offs.
* From a societal perspective, the ERC could provide a mechanism for investing rapidly in research targeted at new and emerging issues confronting society.

**European Research Area (ERA)**[[73]](#footnote-73) which is a unified research area open to the world and based on the internal market. The ERA enables free circulation of researchers, scientific knowledge and technology.

The priorities of ERA are:

* More effective national research systems,
* Optimal transnational cooperation and competition, including optimal transnational cooperation and competition and research infrastructures,
* An open labour market for researchers,
* Gender equality and gender mainstreaming in research,
* Optimal circulation, access to and transfer of scientific knowledge including knowledge circulation and open access,
* International cooperation.

**European Open Science Cloud (EOSC)**[[74]](#footnote-74)

Over the past years, numerous policy makers from around the world have articulated a clear and consistent vision of global Open Science as a driver for enabling a new paradigm of transparent, data-driven science as well as an accelerator of innovation.

In Europe, this vision is being realized through an ambitious programme under the heading of the EOSC.

The EOSC will offer 1.7 million European researchers and 70 million professionals in science, technology, the humanities and social sciences, a virtual environment with open and seamless services for storage, management, analysis and re-use of research data, across borders and scientific disciplines by federating existing scientific data infrastructures, currently dispersed across disciplines and the EU member states.

The EOSC Implementation Roadmap[[75]](#footnote-75) describes six action lines for the implementation of the European Open Science Cloud with specific examples and related milestones.

## Innovation

Investment in innovation - especially digital, correlates with faster growth and higher income levels, both locally within different areas of MK and internationally. R&D lead to the creation of new innovative products and services, more effective processes and better ways of doing business. These improvements are the essence of economic growth. The Government of MK has an important role to play in driving public investment in innovation. Action to foster investment and the introduction of tax and other incentives to encourage businesses to invest in innovation are suggested.

Innovation is not just about breakthrough technologies or scientific and engineering processes. Effective adoptionof technology throughout businesses and improvements in management and workforce skills are just as important, as are new ways of providing services, from financial and retail to professional advice. Innovation is, or can, sometimes bedisruptive, but ultimately, innovation must be embraced, disruptive or not, to keep pace with the competition, create and secure more jobs. At the time when the level of scientific discovery and innovation is rising across the globe, MK needs to strategically change its approach towards research and innovation in order to keep pace with the rest of the world.

The main actors in innovation and especially their roles in the process are:

#### The public sector

The public sector has a central role to play in promoting innovation. It creates the regulatory environment in which all other actors operate. It puts in place rules and tools that can incentivise circulation of knowledge and cooperation among different actors with the aim to develop and market innovative solutions. Furthermore, it offers better modes of coordination among the economic actors involved in order to enhance productivity and value. It can create a demand for innovation, both through the above-mentioned regulatory means and, for instance, through the procurement of innovative solutions.

#### The financial sector

Due to the risks involved, accessing funding and finance is not always easy for those who have innovative ideas. Building more innovation-friendly financial instruments and institutions and promoting the integration of existing funds and tools is essential to support innovation. It is important that investors of all kinds find their interest in investing in innovation. Banks are often conservative and keen to limit their exposure. The Government of MK will focus on providing an environment and incentives for welcoming venture capital funds, business angels, etc. Joint investments are also welcome, so that the risk of government funding is balanced with venture capital.

#### Private business sector

Private businesses play an important role in innovation. In order to be able to bring innovations to the market, they must be able to maximize their returns on the resources allocated to innovation. For that, it is important to foster a more aggressive and faster approach to EU and world markets. To survive, businesses have to learn to be globally competitive.

#### Academia

Universities, higher education institutions, and public and private research and technology organizations have a key role to play in the innovation ecosystem, not only as knowledge producers, but also as co-creators and generators of skilled human capital. Challenges in this component of the ecosystem include the co-creation capabilities of universities, the design of incentives for academics when working with users and the absorptive capacity of academic knowledge within firms.

#### Citizens

Citizens, users and civil society organisations have a central and cross-cutting roleto play in bringing innovation to the market. They create a demand for innovative products and services, they can fund and / or finance projects that are relevant to them, they can be at the source of innovative ideas worth spreading and scaling up, and they can have a say which research is meaningful to them and can improve their lives.

MK digital innovation will focus on projects and areas targeting:

* Strategic industries in MK,
* The needs of the global, regional and domestic market,
* Development of capabilities to meet market needs in terms of research strength and business capacity,
* Gaining significant social and economic benefits,
* Areas where it is evident that government support will make difference.

Innovation must foster and nurture collaboration with various EU institutions which are very active in the fields of innovation. Good practices will rise as well as various levels of collaboration and approach to funds at disposal for innovation.

The European Innovation Council (EIC)[[76]](#footnote-76) was introduced by the European Commission to support the commercialisation of high-risk, high-impact technologies in the EU. Europe needs to capitalise on its science, innovative SMEs and start-ups to compete in global markets. Currently in its pilot phase, the EIC Pilot will be fully implemented from 2021 under the Horizon Europe Programme[[77]](#footnote-77).

The European Fund for Strategic Investments (EFSI)[[78]](#footnote-78)aims to overcome the current investment gap in the EU by mobilizing private funding both for strategic investments in infrastructure and innovation and also for risk finance for small businesses.

EFSI has two parts: An infrastructure / innovation window implemented by the European Investment Bank (EIB), and a SME Window implemented by the European Investment Fund (EIF).

As of 5 February 2020, approved EFSI financing amounted to EUR 84 billion (of which EUR 60.6 billion have been EIB-approved and EUR 24 billion EIF-approved). More than half of the investment concerns two of the sectors supported by the EFSI: smaller companies or SMEs (31%) and research, development and innovation (26%)[[79]](#footnote-79). As stated in a 2019 group figures review, with a guarantee of the EU budget, EFSI aims to unlock additional investment of at least EUR 500 billion by 2020[[80]](#footnote-80).

Moreover, under Horizon 2020, the EU Research and Innovation programme for 2014-2020, ‘InnovFin – EU Finance for Innovators’, as a new type of financial instrument and advisory service[[81]](#footnote-81), has funded more than 24,500 grants amounting to the total of EUR 42.8 billion out of which more than EUR 7 billion went to SMEs[[82]](#footnote-82).

# **6. Data Protection**

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| Main strategic objectives and goals for Data Protection:Provide appropriate budget, and secure employed staff and future employment of experts in the fields of cyber security and personal data protection.Support implementation of the new law of Personal Data Protection, through facilitating negotiations between major stakeholders involved. |

The EU General Data Protection Regulation (GDPR) 2016/679[[83]](#footnote-83) is the newest and toughest law on data protection and privacy in the EU. It also addresses the transfer of personal data outside the EU.

The GDPR aims primarily to give control to individuals over their personal data and to simplify the regulatory environment for international business by unifying the regulation within the EU.

Controllers and processors of personal data must put in place appropriate technical and organizational measures to implement the data protection principles. Business processes that handle personal data must be designed and built with consideration of the principles and provide safeguards to protect data. Data controllers must design information systems with privacy in mind.

No personal data may be processed unless this processing is done under one of six lawful bases specified by the regulation (consent, contract, public task, vital interest, legitimate interest or legal requirement). When the processing is based on consent the data subject has the right to revoke it at any time.

Businesses must report data breaches to national supervisory authorities within 72 hours if they have an adverse effect on user privacy. In some cases, violators of the GDPR may be fined up to EUR 20 million or up to 4% of the annual worldwide turnover of the preceding financial year in case of an enterprise, whichever is greater.

The EU GDPR was adopted on 14 April 2016 and became enforceable beginning 25 May 2018. As the GDPR is a regulation, not a directive, it is directly binding and applicable, but does provide flexibility for certain aspects of the regulation to be adjusted by individual member states.

**The Law on Personal Data Protection (PDP) in MK** (the separate MK Law, based on the EU GDPR)was adopted on 18 February 2020[[84]](#footnote-84).

**The functioning of the Directorate for Personal Data Protection** is currently jeopardized, with a chance of potential termination, as no appropriate budget has been allocated. Staff have been gradually decreasing from a number of 30 employees down to 19. Additionally, if big enterprises are indulge in head-hunting experts employed in the Directorate, it could result in losing further key employees. Business continuity measures must be prepared and deployed. Besides these critical obstacles, the team of the Directorate is still trying to keep up with its plans and activities, and provide services to the country’s institutions, businesses and citizens. In the last six months of 2019, the Directorate was functioning without appointed management. Finally, on 25 December 2019[[85]](#footnote-85) a new director and deputy were appointed by the parliament of MK. Since the team of the Directorate for Personal Data Protection is now managed by its newly selected leadership, it will take appropriate measures to fulfil its obligations.

**The timeframe for the implementation** of the new Personal Data Protection Law is in negotiations between major stakeholders involved (major data controllers). Lack of approved and detailed plans for internal preparation of activities to be done during implementation additionally burdens the process of practical adoption and implementation.

The new Law on PDP of MK will require a substantially **increased number of cyber security and privacy data protection experts**. It will be addressed strategically, in order to provide continuity of the Directorate and personal data protection.

An incident reported in July 2019 (GDPR Violation Case Study: National Revenue Agency of Bulgaria[[86]](#footnote-86)) is a recent example from a neighbouring country about consequences of a security breach.

**7. Digital Services**

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| Main strategic objectives and goals for Digital Services:The Government of MK will initiate and drive the activities for new digital services, especially but not limited to ICT for environment and Coronavirus pandemic take-aways. |

With growing demand for digital services, the **Government of MK will stimulate content markets** e.g. by making public sector information available on transparent, effective, non-discriminatory terms**.**

The following is a list of all the essential digital services:

* a robust and resilient ICT infrastructure,
* trusted cloud services,
* standards for interoperability between devices, applications, data repositories, services and networks,
* security by design and
* privacy by design.

The Government of MK will:[[87]](#footnote-87)

* support safe use of digital services by all, especially children and vulnerable population,
* empower youth,
* ensure and promote child safety online,
* respect the right to privacy,
* promote trust and security in the use of data,
* enable safe digital content sharing to support e.g. e-education, e-health, digital agriculture, e-ﬁnancial services and mobile payments, and e-government platforms.

Special focus will be placed on:

#### ICT for environment

The ICT sector has a key role to play in the challenging mitigation towards Climate Change and cutting greenhouse gas emissions. ICT offers potential for a structural shift to less resource-intensive products and services, for more efficient and less energy consuming intelligent transport systems, for energy savings in buildings and electricity networks.

To accelerate development and wide-scale roll out of ICT-based solutions for smart grids and smart meters, near-zero energy buildings and intelligent transport systems, close cooperation between the ICT industry, academia, various sectors and public authorities is required. Individuals and organizations need to be empowered with information that will help them to reduce their own carbon footprint and monitor developments[[88]](#footnote-88). The ICT sector should deliver modelling, analysis, monitoring and visualization tools to evaluate the energy performance and emissions of buildings, vehicles, companies, cities and regions. Smart grids are essential for the move to a low carbon economy. They will enable active control of energy transmission and distribution via advanced ICT infrastructure communication and control platforms. For the different grids to work together efficiently and safely, open transmission-distribution interfaces will be needed. To achieve emissions reductions, a mix of awareness-raising, training and multi-stakeholder cooperation is required.

#### Coronavirus pandemic take-aways

During the Coronavirus pandemic from the first quarter 2020, global telecommunications operators experienced major capacity growths, especially caused by ICT services related to cloud services, audio / video conferencing, mobile gaming, video streaming, and downloads from app stores (e.g. e-learning apps).

Work from home (home office), e-learning and many applications for the health sector including remote diagnostic, autonomous health robots[[89]](#footnote-89), doctor’s decision and other health application support through AI, etc. saw a major increase.

1. <https://www.3gpp.org/> [↑](#footnote-ref-1)
2. <http://bco.mioa.gov.mk/?page_id=69&lang=en> [↑](#footnote-ref-2)
3. <https://ec.europa.eu/digital-single-market/en/desi> [↑](#footnote-ref-3)
4. <https://ec.europa.eu/digital-single-market/en/discover-eidas> [↑](#footnote-ref-4)
5. <https://www.etsi.org/> [↑](#footnote-ref-5)
6. <https://ec.europa.eu/digital-single-market/en/eurohpc-joint-undertaking> [↑](#footnote-ref-6)
7. <https://www.geant.org/> [↑](#footnote-ref-7)
8. <https://www.iso.org> [↑](#footnote-ref-8)
9. <https://www.itu.int/> [↑](#footnote-ref-9)
10. <https://mkd-cirt.mk/?lang=en> [↑](#footnote-ref-10)
11. <https://www.enisa.europa.eu/topics/nis-directive> [↑](#footnote-ref-11)
12. <https://networkreadinessindex.org/>

    Since 2000 Network Readiness Index (NRI) was prepared by the World Economic Forum, handed over to the Portulans Institute in 2019: <https://networkreadinessindex.org/nri-2019-analysis/#preface> [↑](#footnote-ref-12)
13. <https://www.oecd.org/gov/digital-government/recommendation-on-digital-government-strategies.htm> [↑](#footnote-ref-13)
14. <https://www.broadbandcommission.org/COVID19/Pages/default.aspx> [↑](#footnote-ref-14)
15. <http://mioa.gov.mk/?q=en/node/2378> [↑](#footnote-ref-15)
16. <http://mioa.gov.mk/?q=en/node/2379> [↑](#footnote-ref-16)
17. <http://mioa.gov.mk/?q=en/node/2381> [↑](#footnote-ref-17)
18. <http://mioa.gov.mk/?q=en/node/2459> [↑](#footnote-ref-18)
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21. <https://www.3gpp.org/dynareport/SpecList.htm?release=Rel-15&tech=4> [↑](#footnote-ref-21)
22. <http://www.mio.gov.mk/?q=en/node/2459> [↑](#footnote-ref-22)
23. <http://www.mio.gov.mk/sites/default/files/pbl_files/documents/strategies/Broadband%20market%20developments%20in%20the%20EU%202017.pdf> [↑](#footnote-ref-23)
24. <https://ec.europa.eu/digital-single-market/en/news/secure-5g-deployment-eu-implementing-eu-toolbox-communication-commission> [↑](#footnote-ref-24)
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26. <https://www.huffingtonpost.in/2018/09/11/uidai-s-aadhaar-software-hacked-id-database-compromised-experts-confirm_a_23522472/> [↑](#footnote-ref-26)
27. <https://www.cis-cert.com/Pages/com/System-Zertifizierung/Data-Centers/Certification/European-Standard-EN-50600.aspx> [↑](#footnote-ref-27)
28. <https://www.cis-cert.com/Pages/com/System-Zertifizierung/Data-Centers/ANSI-TIA-942/four-level-rating-system.aspx> [↑](#footnote-ref-28)
29. <https://www.iso.org/isoiec-27001-information-security.html> [↑](#footnote-ref-29)
30. <https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en> [↑](#footnote-ref-30)
31. <https://www.1x2studio.com/projects/20190503.htm> [↑](#footnote-ref-31)
32. As an option, the Government of MK could also examine the case where the public sector owns the majority of the shares while the remaining shares are owned by the private sector, to enhance synergies with the IT market and accelerate the digital transformation of the economy. [↑](#footnote-ref-32)
33. https://ec.europa.eu/commission/presscorner/detail/en/IP\_17\_702 [↑](#footnote-ref-33)
34. https://ec.europa.eu/growth/single-market/single-digital-gateway\_en [↑](#footnote-ref-34)
35. An idea based on https://www.strategyand.pwc.com/us/en/reports/2015/program-value-realization.html [↑](#footnote-ref-35)
36. <https://ec.europa.eu/isa2/eif_en> [↑](#footnote-ref-36)
37. <https://www.canada.ca/en/treasury-board-secretariat/services/information-technology-project-management/project-management/guide-project-gating-it-enabled-projects.html> [↑](#footnote-ref-37)
38. <https://ec.europa.eu/isa2/solutions/open-pm2_en> [↑](#footnote-ref-38)
39. The development of an e-government strategy and action plan forms part of the PAR Strategy and Action Plan (Priority Area 4) and remains the responsibility of MISA. Pillar 3 of the present ICT strategy provides the core principles and high-level contents of the e-government strategy, along with several proposed actions, which can subsequently be analysed and developed in more detail in a ‘sub-strategy’ document for e-government. [↑](#footnote-ref-39)
40. https://www.w3.org/WAI/ [↑](#footnote-ref-40)
41. Maarit Mäkinen, University of Tampere, Finland [↑](#footnote-ref-41)
42. <https://ec.europa.eu/social/main.jsp?catId=1223> [↑](#footnote-ref-42)
43. <https://ec.europa.eu/digital-single-market/en/news/european-commission-launches-digital-agenda-western-balkans> [↑](#footnote-ref-43)
44. <http://www.stat.gov.mk/OblastOpsto_en.aspx?id=27> [↑](#footnote-ref-44)
45. <https://ec.europa.eu/social/main.jsp?catId=1223> [↑](#footnote-ref-45)
46. <https://ec.europa.eu/digital-single-market/en/news/european-commission-launches-digital-agenda-western-balkans>

    Report under preparation by the Stakeholders Regional Working Group on Digital Skills on ‘Supporting Western Balkans (WB) economics for developing Digital Skills Strategies, including best practices from EU Multi Stakeholder (MS) and the region’

    [↑](#footnote-ref-46)
47. EU Code Week is a grass-root movement run by volunteers who promote coding in their countries as Code Week Ambassadors. Its aim is to mainstream programming skills and boost new ideas by bringing motivated people together: <https://ec.europa.eu/digital-single-market/en/eu-code-week> [↑](#footnote-ref-47)
48. <http://mioa.gov.mk/sites/default/files/pbl_files/documents/strategies/nsekit_english-parlament_2.pdf> [↑](#footnote-ref-48)
49. <http://portal.mioa.gov.mk/sites/default/files/pbl_files/documents/strategies/Strategija_i_akcionen_plan_en.pdf> [↑](#footnote-ref-49)
50. https://ec.europa.eu/social/main.jsp?catId=738&furtherPubs=yes&pubId=8203&langId=en [↑](#footnote-ref-50)
51. <https://www.french-digital-coalition.fr/> [↑](#footnote-ref-51)
52. The Covid-19 pandemic affects access of population to public spaces and areas. Nevertheless, the situation may positively evolve in future removing lockdown constraints for the population. [↑](#footnote-ref-52)
53. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\_.2008.348.01.0118.01.ENG&toc=OJ:L:2008:348:TOC [↑](#footnote-ref-53)
54. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.327.01.0001.01.ENG&toc=OJ:L:2016:327:TOC>

    https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\_.2018.256.01.0103.01.ENG&toc=OJ:L:2018:256:TOC [↑](#footnote-ref-54)
55. <http://mrk.mk/wp-content/uploads/2018/10/Strategija-za-obrazovanie-ENG-WEB-1.pdf> [↑](#footnote-ref-55)
56. <https://www.britishcouncil.mk/en/programmes/education/21st-century-schools/about> [↑](#footnote-ref-56)
57. <https://metamorphosis.org.mk/en/> [↑](#footnote-ref-57)
58. <https://nationalskillscoalition.org/> [↑](#footnote-ref-58)
59. <https://www.itpro.co.uk/automation/30463/gartner-by-2020-ai-will-create-more-jobs-than-it-eliminates> [↑](#footnote-ref-59)
60. <https://wb6digital.files.wordpress.com/2018/01/wb6-study.pdf> [↑](#footnote-ref-60)
61. <https://av.gov.mk/operational-plan.nspx> [↑](#footnote-ref-61)
62. <https://www.modernisation.gouv.fr/nos-actions/le-lieu-de-la-transformation-publique>

    <https://www.modernisation.gouv.fr/etudes-et-referentiels/etudes/les-laboratoires-dinnovation-publique-bilan-et-referentiel-devaluation> [↑](#footnote-ref-62)
63. <https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_e_gerdfund&lang=en> [↑](#footnote-ref-63)
64. <https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_e_berdsize&lang=en> [↑](#footnote-ref-64)
65. <https://fitr.mk/> [↑](#footnote-ref-65)
66. <https://land-der-ideen.de/en> [↑](#footnote-ref-66)
67. <https://land-der-ideen.de/en/dialogues/international-competition-uk-germany-global-challenge> [↑](#footnote-ref-67)
68. <https://land-der-ideen.de/en/dialogues/german-mobility-award> [↑](#footnote-ref-68)
69. <https://land-der-ideen.de/en/dialogues/landmarks-in-the-land-of-ideas> [↑](#footnote-ref-69)
70. <https://rio.jrc.ec.europa.eu/en/library/review-small-business-research-initiative> [↑](#footnote-ref-70)
71. <https://steveblank.com/2016/10/06/there-are-145-entrepreneurship-courses-at-stanford/> [↑](#footnote-ref-71)
72. <https://erc.europa.eu/> [↑](#footnote-ref-72)
73. <https://ec.europa.eu/info/research-and-innovation/strategy/era_en>

    [↑](#footnote-ref-73)
74. <https://www.eosc-portal.eu/> [↑](#footnote-ref-74)
75. <http://ec.europa.eu/research/openscience/pdf/swd_2018_83_f1_staff_working_paper_en.pdf> [↑](#footnote-ref-75)
76. <https://ec.europa.eu/commission/news/european-innovation-council-2019-mar-18_en>

    [↑](#footnote-ref-76)
77. <https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme_en>

    [↑](#footnote-ref-77)
78. <https://ec.europa.eu/commission/priorities/jobs-growth-and-investment/investment-plan-europe-juncker-plan/european-fund-strategic-investments-efsi_en> [↑](#footnote-ref-78)
79. <https://ec.europa.eu/commission/strategy/priorities-2019-2024/jobs-growth-and-investment/investment-plan-europe-juncker-plan/investment-plan-results_en#latest-results-infographic> [↑](#footnote-ref-79)
80. <https://www.eib.org/attachments/general/the_eib_group_facts_and_figures_2019_en.pdf> [↑](#footnote-ref-80)
81. <https://www.eib.org/attachments/thematic/innovfin_eu_finance_for_innovators_en.pdf> [↑](#footnote-ref-81)
82. <https://ec.europa.eu/info/news/commission-invest-eu11-billion-new-solutions-societal-challenges-and-drive-innovation-led-sustainable-growth-2019-jul-02_en> [↑](#footnote-ref-82)
83. <https://gdpr.eu> [↑](#footnote-ref-83)
84. <https://dzlp.mk/sites/default/files/u4/zakon_za_zastita_na_licnite_podatoci.pdf> [↑](#footnote-ref-84)
85. <https://dzlp.mk/mk> [↑](#footnote-ref-85)
86. <http://cs.brown.edu/courses/csci2390/assign/gdpr/ja43-nra.pdf> [↑](#footnote-ref-86)
87. <https://www.broadbandcommission.org/COVID19/Pages/default.aspx> [↑](#footnote-ref-87)
88. <https://getaircare.com/> [↑](#footnote-ref-88)
89. <https://www.telecomlead.com/5g/sk-telecom-develops-5g-powered-robot-to-handle-covid-19-95348> [↑](#footnote-ref-89)