

WORKING PAPER #185

# UKRAINE

## DIGITAL RESILIENCE IN A TIME OF WAR

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# **Ukraine: Digital resilience in a time of war**

George Ingram and Priya Vora

## **Acknowledgment**

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The authors want to acknowledge and thank individuals who shared information and perspectives on the state of digital government in Ukraine, especially those who are on the front line of developing and managing those digital capabilities, including Hannes Astok, Cora Bay, Maksym Darkin, David Eaves, Valerie Ionan, Jaclyn A. Kerr, John McArthur, Danylo Molchanov, Rob O'Donovan, Charlotte Rivard, Jay Totte, and Garth Willis.

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## Context

As of the end of 2023, some 14 million Ukrainians had fled their homes since the Russian invasion of Ukraine in February 2022—5.1 million internally and 6.2 million throughout Europe.<sup>1</sup> This represents the largest human displacement crisis in the world today. While there is no silver lining to a crisis of this scale and depth, this paper attempts to understand one factor that is contributing to Ukraine’s resilience in a time of war and supporting enormous numbers of displaced individuals in their efforts to resume normal life: citizens’ ability to easily access their identity certificates, education credentials, health care records, and financial support through the government’s online citizen portal.

To understand the role of digital capabilities in the ability of the Ukrainian government to meet the needs of its citizens in a time of war, the research for this paper involved accessing written documents and websites; interviews with Ukrainian ministry officials, representatives of donor organizations that have provided digital technical assistance to Ukraine, and staff of organizations implementing assistance; and email exchanges with some of those officials. We draw considerably on information—public documents and presentations, statistics, and comments on an early draft, provided by a key official within Ukraine’s Ministry of Digital Transformation.<sup>2</sup> We were unable to find data on citizen experiences using digital services beyond usage statistics. We would have hoped to gather more on the degree to which digital services are valued, accessible, trusted, and responsive to concerns, and the extent to which these experiences differ by gender, age, and geography. Citizen trust and experience is a critical success factor that we have yet to fully understand in the Ukrainian context.

The research reveals:

1. Ukraine’s journey of digitization was a decade in the making and involved support from the global community to overhaul policy, institutional, and technology constructs. By embracing change in all three areas and revising the analog systems on which they are based to make them compatible with digital solutions, today’s digital experience in Ukraine allows for near-seamless e-government services for citizens, businesses, and an array of government ministries.
2. Ukraine’s path to digitalization owes much to Estonia, which has been at the forefront of digital government and served as a model and early adviser to Ukrainian efforts. Even today there are more than 30 Estonian advisers embedded within the Ministry of Digital Transformation.<sup>3</sup>
3. Initial efforts to digitize government started in 2012; the first significant innovation was in 2015 with the e-procurement platform Prozorro, which increased transparency (thereby reducing corruption), intensified competition for government bids, and reduced costs.
4. President Zelensky’s ambitious reform agenda was built on an earlier e-government foundation to introduce the digital transformation of Ukrainian society.
5. The existing digital capacity and services within the Ukrainian government allowed the adaption and creation of new capabilities and services, which have made a major

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<sup>1</sup> UNICEF, "Ukraine Emergency," UNICEF, accessed December, 2023. <https://www.unrefugees.org/emergencies/ukraine/>.

<sup>2</sup> In particular, we conducted an extensive interview and received a range of electronic documentation from Deputy Minister Valerie Ionan.

<sup>3</sup> Astook, Hannes; interview October 2023.

contribution to the country's resilience amid the war initiated by Russia. Further advancing its digital capability and reaching the millions of Ukrainians who are still offline can be key elements in rebuilding Ukraine.

6. The war catalyzed extensive advancements, including cloud-based data storage, low-code development tools, improved cryptography standards, and European acceptance of Ukrainian digital credentials.
7. Launched in 2020, Ukraine's e-government services through the Diia application—built on the Trembita interoperable data exchange system—are characterized by low construction and maintenance costs, high resistance to corruption, and improved, faster services for citizens with mobile phone and computer access. These services align with international and [open contracting data standards](#) as well as statistical and risk-management tools and innovation.<sup>4</sup> Ukraine is now sharing aspects of the Diia application with other governments, including Estonia.

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<sup>4</sup> World Bank, "[YOUKkraine: Because Prozorro.](#)" slide 14.

## Creating the digital foundations (2012-2019)

After the November 2013-February 2014 Maidan Uprising in Ukraine, which led to the ousting of Russia-leaning President Yanukovich, the government of Petro Poroshenko developed action plans and the underlying architecture for e-government services.<sup>5</sup> The government was motivated to urgently counter threats from Russia and to build credibility with the citizenry by reducing corruption within more than 2000 national and local government services.<sup>6</sup> Ukraine ranked 144 out of 177 nations in the 2013 [Transparency International Corruption Perception Index](#), and losses from corruption and limited competition were estimated by the World Bank at 60 billion Ukraine hryvnia (UAH) or \$2.2 billion annually.<sup>7</sup>

Ukraine's path to digital development began in 2012 with assistance from the Organization for Security and Cooperation in Europe (OSCE) and the [eGovernment Academy](#) (eGA) of Estonia. This initial step in digital development was bolstered in 2014 with funding from SIDA for technical assistance to eGA, which assisted in the establishment of several [foundational components](#) of Ukraine's digital government.<sup>8</sup> The eGovernment Academy was staffed with (and continues today to be staffed with) a cadre of technical advisers with direct experience with digital transformation in Estonia. Perhaps as important as their assistance has been the post-Soviet solidarity, which has made eGA and the Estonian government natural collaborators on issues of cybersecurity, acceptance of digital documents, and much more. Together with programs and support from USAID, UKAID, GIZ, SDC, UNDP, and the EU, Ukraine was able to make notable progress at the institutional, policy, and technological levels. Together these early reforms laid the foundation for transformative change a decade later.

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<sup>5</sup> For example, [Action Plan for the Implementation of the eServices Development Concept for the Years 2019-2020; Action Plan for the Implementation of the eGovernment Development Concept for the Years 2018-2020](#).

<sup>6</sup> Government of Ukraine, accessed December, 2023, <https://www.kmu.gov.ua/en/reformi/efektivne-vryaduvannya/rozvitok-elektronnih-poslug>. The site has since been deactivated.

<sup>7</sup> World Bank, "[YOUkraine: Because Prozorro](#)," slide 6.

<sup>8</sup> [e-Governance Academy. "Path Towards E-Governance in Ukraine." e-Governance Academy, accessed December, 2023, https://ega.ee/success\\_story/path-towards-egovernance-ukraine/](#); Danylo Molchanov, email November 13, 2023.

### Box 1: Donor support for e-government in Ukraine

Ukrainian e-government has significantly progressed thanks to the support of key international donors. Below is a list of these major organizations, accompanied by their specific focus areas in this initiative:

#### **Largest donors**

**USAID and UKAID:** Initially funded by USAID, which was later joined by UKAID, the TAPAS project supports Prozorro (e-procurement platform), Diia (app and portal for government/private services), Trembita (national interoperability system), Open data initiatives

**Swiss Agency for Development and Cooperation:** Focuses on Digitalization of public services; E-Democracy tools (d-DEM for petitions, local budgets, consultations); Digitalization for municipalities; e-Education.

**EU:** Enhances administrative capacity for digital economy policy.

#### **Other donors**

**Global Affairs Canada:** Digital security; resilience of civil society and independent media.

**GIZ:** Cross-walking the Ukraine Platform of Registries with [GovStack](#) building blocks to see how the 30% that is not in sync can be brought into alignment with GovStack specifications.

**German Federal Foreign Office:** Municipal government capacity; platform for data-driven decision-making; youth digital literacy.

**OCHA pooled funds:** Digital tools for education for vulnerable children in combat areas.

**SIDA:** E-government citizen services at the regional, district, and local level; tax administration; government capacity in digital social services and citizens ability to access services.

**UNDP:** Generators to maintain power for telecommunications; digitalization of public services; policy compliance with international digital standards; digital services for vulnerable groups.

**UNICEF:** Digital education.

**WHO:** Digital health platforms and services.

Sources: Primary data accessed through d-portal.org; Molchanov and O'Donovan: Personal communication, December 12, 2023. Insights and information derived from discussions and materials provided by: USAID, GIZ, UNDP, Eurasia Foundation, and Swiss Agency for Development and Cooperation.

## Institutional reforms

The Center for E-government, which had been the initial locus for Ukraine's e-government development, in 2014 became an independent agency as the Agency for E-governance. It worked with individual ministries and had some success in ensuring certain agencies could digitalize but had no authority over their approach. In 2019, under President Zelensky, authority was migrated to the new Ministry of Digital Transformation with enhanced profile and authority.

## Policy reforms

In 2014 the Verkhovna Rada (parliament) enacted a [law on asset declaration](#) imposing an e-declaration requirement on all government employees to declare their assets.<sup>9</sup> In 2016 the Rada enacted the [Law on Public Procurement](#), the purpose of which is to ensure effective and transparent procedures for public procurement, create a competitive environment, and reduce corruption risks. The law was amended in 2018, and again in 2019, to make public procurement more efficient and to align the legislation with European directives.<sup>10</sup> In 2018 Cabinet Decree 357 on state electronic information resources established a single interoperable system of public registries (Trembita) to underpin seamless e-government services and prevent duplication of registries. In 2021 the Rada adopted the [Law on Public Electronic Registries](#) that regulates the functioning of registries.

## Architecture and technology solutions

Ukraine introduced two complementary instruments of e-government. The first to be established was the e-procurement platform Prozorro, designed to bring the efficiency and transparency of digitalization to government procurement. It was followed three years later with e-services for citizens and businesses built on the interoperable platform Trembita that links a series of independent registries (population, business, cadaster, etc.) and enables digital public services via the personal phone app Diia.

### Prozorro<sup>11</sup>

The first major step into digital government was an electronic procurement system launched in 2015. [Prozorro](#) (meaning "transparency," and an allusion to a well-known character protecting people from lawlessness) was designed to create efficiency, transparency, and

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<sup>9</sup> World Bank, "Reform of Assets and Interest Disclosure in Ukraine." It is worth noting that this law was met with considerable resistance, especially from government employees. To slow its implementation, the SSSCIP ([State Special Communications Services of Ukraine](#)) authority challenged the legality of the software facilitating asset declaration on the basis that the software was developed outside of Ukraine. (source: Willis, Garth, interview, February 23, 2023)

<sup>10</sup> Maksym Darkin, email, June 25, 2023

<sup>11</sup> Principal technical support for Prozorro is via the [TAPAS](#) program, commenced in 2016 by the Eurasia Foundation and funded initially by USAID and subsequently jointly with UKAID. Funding of TAPAS has totaled \$43.6 million. (Email from Eurasia Foundation, May 20, 2023)

competitiveness, initially in small procurements and subsequently for large procurements. It was created through public and private collaboration, at local and international levels, with engagement of up to 300 volunteers and support from the Ministry of Economy.<sup>12</sup> Prozorro has received significant technical support through the Eurasia Foundation, a non-governmental implementing organization, with funding initially from USAID and subsequently also UKAID. The goal was to streamline the procurement system and reduce corruption. Prozorro eliminates much of the human element in procurement, thereby removing certain opportunities for corrupt payments. Prozorro targets what the government reports as an annual loss in public procurement totaling \$2.2 billion annually, equally divided between limited competition and corruption.<sup>13</sup>

The system provides a central and standard platform for the entire procurement process, including tender notices, submitting and reviewing bids, and awarding contracts. Designed for openness, fairness, and equal treatment for all parties, it is based on three principles:

- Open source and open standards: the platform is built on open-source code using the [OpenProcurement toolkit](#) and data standard. In doing so, it leverages a best-in-class tool that follows the open data principle of publishing data to the maximum extent of the law.
- Transparency: Disclosure of all data—participants, tender notices, bids, contract awards, qualification documents; the openness allows for scrutiny by public agencies, civil society organizations, and media.
- Golden triangle of partnership: Collaboration between state, business, and civil society with functions split between the stakeholders to ensure independence and mutual control. The state establishes the rules and maintains the system, business supplies technology and bids for contracts, and civil society monitors.<sup>14</sup>

Transparency is key to Prozorro, through three unique features:

- All procurement information, including tender documents, bids, and contract awards, is open.
- A two-stage bid process where initial bids are public provides transparent information to any participant for the second, final stage of bidding.<sup>15</sup>
- A network of civil society organizations, [Dozorro](#), serves as the civic watchdog accountability mechanism through monitoring procurement, identifying high-risk tenders, and submitting analysis to responsible government bodies.

## Trembita

[Trembita](#) (an alpine horn played in the mountains as a signal for people to gather for village meetings) is an interoperable, decentralized platform launched in 2018.<sup>16</sup> While modeled on Estonia's [X-Road](#) solution, it differs in adapting global best practices to Ukraine's needs (such as the Diia app and Diia e-services) and using cryptography standards conforming to Ukrainian

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<sup>12</sup> World Bank; "[YOUkraine: Because Prozorro](#)"; slide 4.

<sup>13</sup> Ibid., slide 6.

<sup>14</sup> Ibid., slide 8.

<sup>15</sup> This open, two-phase bidding system has been suspended out of security concerns during the war.

<sup>16</sup> E-Estonia; posted April 22, 2021. <https://e-estonia.com/deployment-of-trembita-system-in-ukraine-a-milestone-for-estonian-digitisation-efforts/>.

regulation (as opposed to X-Road which conforms to European and American cryptography standards). Due to the need to conform to different standards, Ukraine could not easily adopt the open-source X road solution but, instead, licensed technology from the Estonia-based company Cybernetica using its [Unified Exchange Platform](#).

Like X-Road, key elements of Trembita's security are that:

- Officials do not have direct access to individual's data.
- Data is encrypted during transmission and storage.
- Data entered or modified is signed with a digital signature and registered.
- Logs and backups can be placed in separate secure storage.<sup>17</sup>

Collectively these institutional and technological reforms and policies contributed to meaningful improvements in transparency and efficiency and set the stage for wider transformation. Importantly:

- An independent [study](#) concluded that procurement outside of Prozorro was 5% more costly than using the Prozorro system, and the Ukrainian government estimates Prozorro has saved the government approximately \$1 billion per year and gave visibility into large government procurements where corruption was perceived to be high.<sup>18</sup>
- Trembita facilitated the exchange of information across hundreds of government registries.
- The country's ranking on [Transparency International's Corruption Perceptions Index](#) improved incrementally from 144 in 2013 to 116 in 2022.

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<sup>17</sup> "Platform of state registries and online services"; PowerPoint by the TAPAS program, managed by the Eurasia Foundation; April 24, 2023.

<sup>18</sup> O'Donovan, Rob; Eurasia Foundation; conversation March 13, 2023.

## Digital foundation to digital transformation (2019-2023)

After a decade of policy and institutional developments, President Zelensky was elected in April 2019, marking a period characterized by reforms in the areas of anti-corruption and digital government. Under his presidency, the e-government transformation has been underpinned by institutional, legal, and architectural reforms.

### Institutional reforms

President Zelensky appointed Mykhailo Fedorov as Minister of Digital Transformation and as Deputy Prime Minister. The Ministry, established in 2019, had a staff of over 300 people by 2023.<sup>19</sup> And it is the center of Ukraine's aspirations to establish the country as a modern digital economy. The ministry coordinates digital development across the government and maintains the platform Trembita and the service delivery app Diia. It does not institute specific digital changes and services for other ministries and agencies, but it exercises oversight to ensure they follow basic government digital transformation principles.<sup>20</sup> The parliament supports these activities through a Committee on Digital Transformation.<sup>21</sup>

The government has instituted the position of Chief Digital Transformation Officers (CDTOs). Every ministry now has a CDTO at the level of deputy minister. The key role of the CDTOs is to facilitate smooth and transparent communication between various levels of government bodies to evolve a new digital culture in the state. The responsibilities of the position include updating digital technology, introducing innovations, and ensuring that citizens receive services electronically.

CDTOs are also designated at the regional and community level. As of mid-2023, 15 were in place in the 24 oblasts (regions), and the plan is to have CDTOs in each of the more than 1400 municipalities.<sup>22</sup> The responsibilities of regional and community CDTOs are the integration and protection of critical infrastructure, the introduction of electronic services, increased internet coverage, and improved digital literacy. The focus is on the areas of health care, social care, education, environment, transportation, and government services.<sup>23</sup>

To monitor the process of informatization and digitalization at each level, the government has instituted two indexes. The [Regional Digital Transformation Index](#) is focused on tracking regional policy effectiveness and is divided into eight pillars—institutional capacity, development of administrative service centers, connectivity, digital education, paperless service provision, regional business, basic e-service, and sectoral digital transformation.

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<sup>19</sup> Ionan 2023f.

<sup>20</sup> Ionin 2023e.

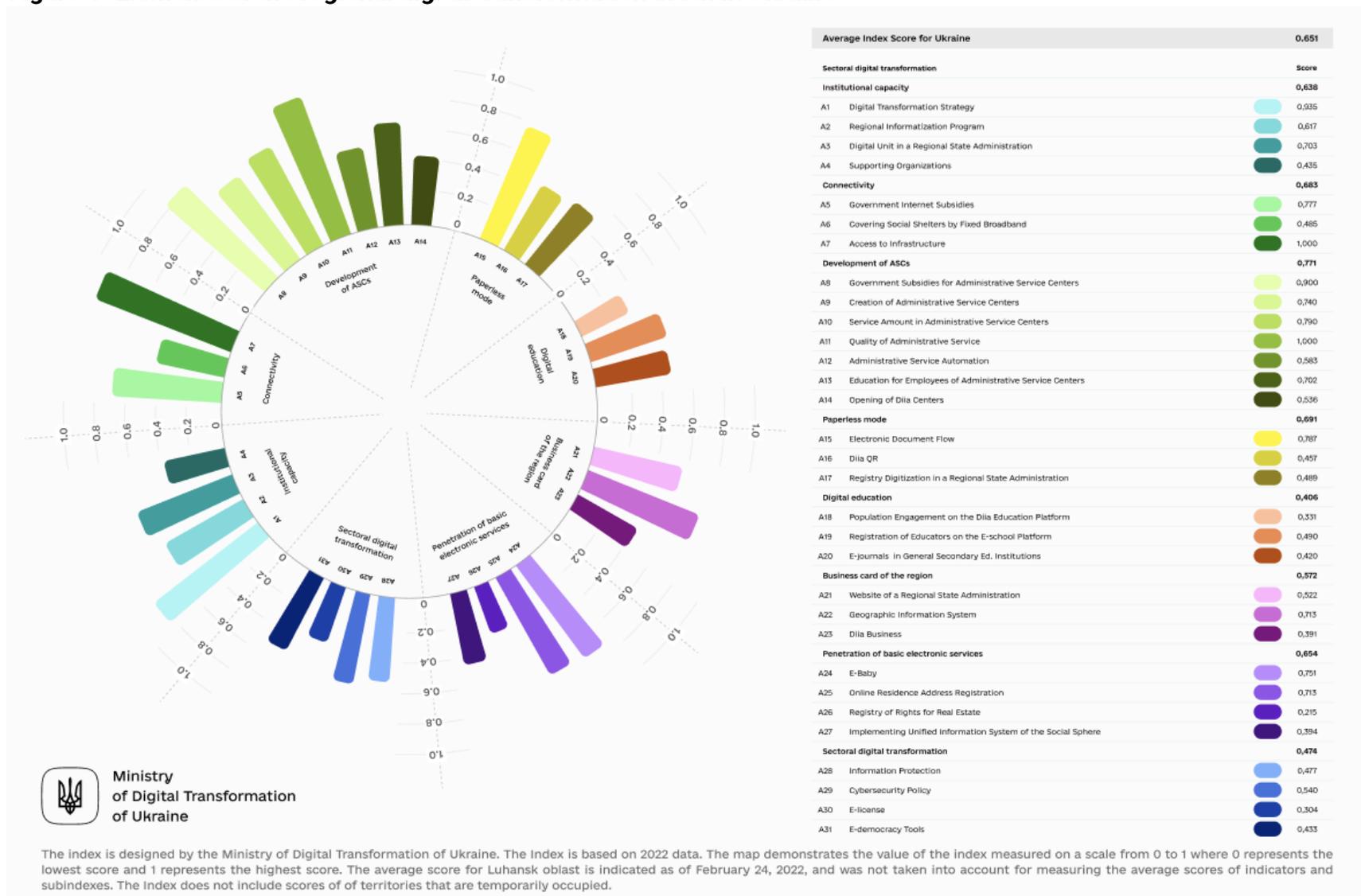
<sup>21</sup> Olivia Neal; interview with Gulsanna Mamedieva, Ministry of Digital Transformation; podcast.

<sup>22</sup> Ionan 2023e.

<sup>23</sup> Ibid.

The Territorial Communities Digital Transformation Index, focused on broader ecosystem changes within each region and comprised of five indicators—digital economy, skills, infrastructure, public service, and transformation of local government—is designed to provide

Figure 1. Elements of the regional digital transformation index in Ukraine



## Anti-corruption

In addition to strengthening institutional responsibilities and creating strategic coherence through the CDTOs, there were parallel efforts to strengthen anti-corruption institutions including the police force, the special anti-corruption prosecutor's office, and courts.<sup>24</sup> The National Agency for Prevention of Corruption was established, and a new prosecutor general was appointed. The USAID fund program, [ENGAGE](#), managed by PACT, supports local reform organizations to promote government transparency, accountability, and civic involvement.<sup>25</sup> These programs to extend anti-corruption efforts beyond the initial efforts in e-procurement (Prozorro) have been important in both bringing transparency and visibility to other elements of government and engaging civil society.<sup>26</sup>

The construction sector offers another example of how institutional digital reforms have advanced anti-corruption efforts by centering on transparent, automatic issuance of construction permits and data verification mechanisms. The Ministry of Digital Transformation prioritized urban planning as an area of targeted intervention given the scale of bribes in the construction industry, estimated at 2.7 to 3.5 billion UAH (\$75 to \$97 million) in 2019.<sup>27</sup> The Ministry created a [Unified State Electronic System in the Construction Sector \(EDESSB\)](#) to replace an opaque registry. In partnership with the Ministry of Urban Planning, data verification mechanisms were established to maximize the validity of data. Rules for transparency of data and processes were also instituted. The automation of construction permits has, by some estimates, helped the government save 1.5 billion hryvnias annually.<sup>28</sup>

## Policy reforms

With the data-sharing platform Trembita in place, a new requirement was established for all agencies and ministries to connect to Trembita. In 2021 the Rada enacted the [Law on Public Electronic Registries](#). Significant changes required under the law included: a prohibition of data duplication (an individual inputs personal data only once); a stipulation mandating that any new registries should be included in the Registry of Registries; common requirements for the development and functionality of registries; a requirement that data exchange between government registries must be through Trembita; and a right of citizens to be informed when their data is accessed. As of 2023, there were more than 430 public electronic registries hosted by more than seventy government bodies, the largest number being the Ministries of Economy (38) and Justice (33).<sup>29</sup> Legislative measures also were put in place to recognize the data privacy rights of citizens.

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<sup>24</sup> Anti-corruption efforts were supported by USAID [SACCI](#) program.

<sup>25</sup> <https://engage.org.ua/eng/about-engage/>.

<sup>26</sup> Additional information on donor anti-corruptions efforts can be found in USAID's September 2022 study, "[Dekleptification Guild: Seizing Windows of Opportunity to Dismantle Kleptocracy.](#)"

<sup>27</sup> Ionan, Ministry of Digital Transformation; September 25, 2023.

<sup>28</sup> Ionan 2023f.

<sup>29</sup> [Ministry of Digital Transformation, "Draft Law no. 2110 on Public Electronic Registries"](#); Valerie Ionan, email September 25, 2023.

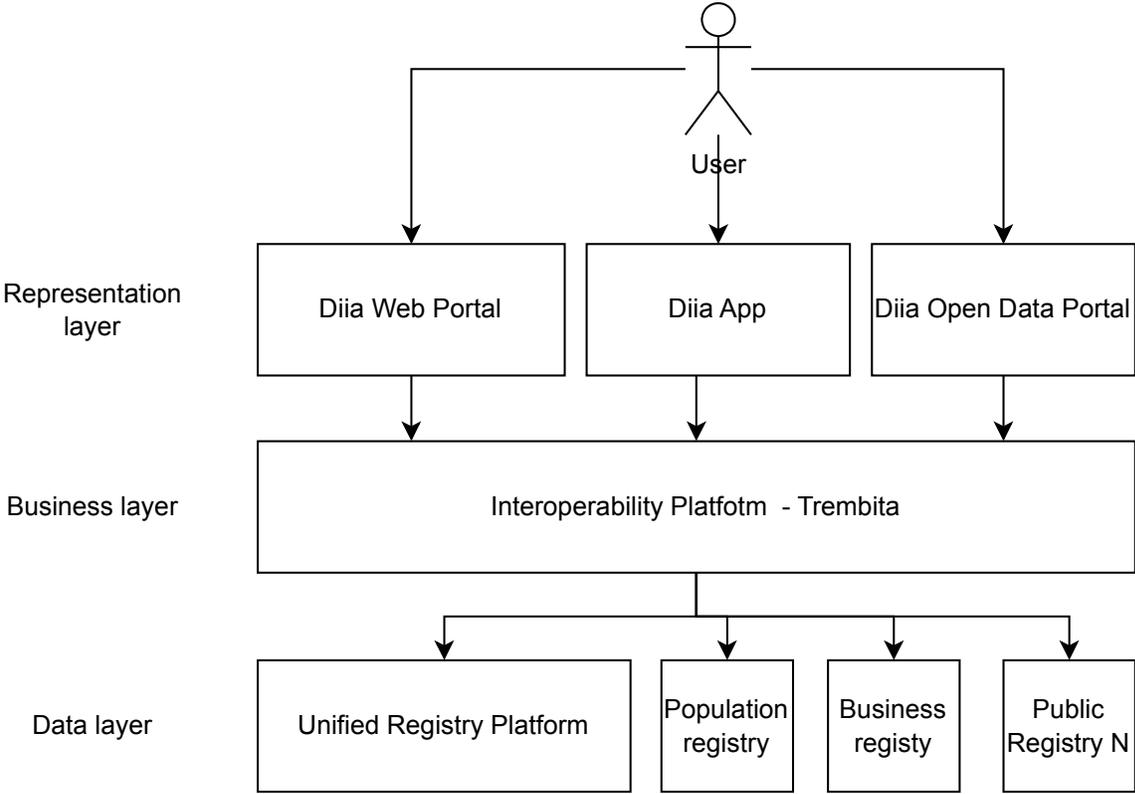
## Architecture and technology solutions

Perhaps the most visible achievement under President Zelensky has been the implementation of his concept of “state in a smartphone”—Diia. Meaning “action” in Ukrainian and also an acronym for “the state and me,” Diia, using the underlying Trembita system, is a phone application and web portal that easily facilitates citizen-government transactions. A few highlights include:

- **Digital ID:** Digital documents are legal (just as paper and plastic documents). They are stored in secure registers, and every operation that needs the usage of documents is related to verification and data actualization from the registry.
- **Credential Storage:** Diia works on the principle of “data in transition.” It stores only depersonalized data, which is required for operation needs, and does not store any personally identifiable information (PII) of users but displays information from various state registers and information systems. Users can access personal documents such as identification documents, driver’s license, passport, social security number, and student ID.
- **Communication:** Users can communicate with government offices, submit requests, and track the status of applications and inquiries.
- **Payment:** Diia can be integrated into various payment systems, enabling users to pay for government and private services and fees.
- **Document Management:** Digital creation, signing, storage, and sharing of documents; Diia allows the transfer of copies of documents.
- **E-Democracy:** Facilitates communications with citizens and surveys of public opinion.

Diia is both a digital brand and an ecosystem, the principal elements of which are [Diia portal](#), [Diia mobile app](#), [Diia Digital Education](#), [Diia Business](#), [Diia Engine](#), [Diia Open Data Portal](#), Diia Centers for Citizens, and [Diia City](#). It encompasses this online suite of digital solutions and physical service centers. The architecture of the Ukrainian digital structure is outlined in diagram X below. Details on the key Diia components and the services are presented in the appendix.

Figure 2. High-level architecture of e-Gov in Ukraine<sup>30</sup>



<sup>30</sup> Diagram provided by Danylo Molchanov, TAPAS program, Eurasia Foundation.

## Digital services in a time of war (present-day)

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*“War actually gives us—it’s a horrible thing itself, but, you know ... it gives us an opportunity to move even faster, because it’s easier to find a consensus inside the government and introduce really revolutionary things.”*

—Gulsanna Mamediieva, Ministry of Digital Transformation<sup>31</sup>

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The Ukrainian journey of digital transformation has led to an impressive 15.5 million users of the Diia app accessing the numerous benefits and capabilities described above.<sup>32</sup> As of December 2023—a mere 22 months after the war with Russia began, usage of Diia has increased 27% to 19.8 million users.<sup>33</sup> This rise can be explained by a series of policy pivots to secure the systems and modify Diia to be more responsive to wartime needs.

Immediately prior to the 2022 Russian invasion, Ukraine’s parliament enacted a measure allowing data to be stored in the cloud for the duration of the war and one year following. And in March the cabinet authorized the storing of state data in the cloud outside Ukraine.<sup>34</sup> This proved to be a prescient move as it provides added, but not complete, protection for sensitive data from cyber-attacks, ensures backups are available if data centers are destroyed, and facilitates data exchange for displaced Ukrainians across Europe.

As a result, Diia has been fully operational since the start of the war, enabling Ukrainians, no matter their location, to access government services and support the war effort. Ukraine’s e-government solution is no doubt easing the burden at a time of great upheaval.

The government has leveraged the Diia platform to respond to the unique needs of wartime life. Some of the new features available on Diia include digital passports for citizens (making Ukraine the first country where a digital passport is equivalent to a paper passport); the ability to purchase war bonds (raising over 2 billion UAH (around \$54 million) to support the economy); a means for citizens to report on enemy movements; consolidated and translated personal documents for quicker transit through border checkpoints and use abroad; targeted services and financial support from the state; access to TV and radio broadcasts.<sup>35</sup> A few examples of key elements follow, with a more complete list of capabilities and services presented in the box in the appendix.

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<sup>31</sup> Olivia Neal; podcast interview with Gulsanna Mamediieva, Ministry of Digital Transformation; <https://wwps.microsoft.com/episodes/ukraine-digital-government>.

<sup>32</sup> Danylo Molchanov, email, November 13, 2023.

<sup>33</sup> Ibid.; United Nations Development Programme, "63% of Ukrainians Use State E-Services, User Numbers Grow for Third Year in Row: Survey," UNDP Ukraine, accessed Jan, 2024, <https://www.undp.org/ukraine/press-releases/63-ukrainians-use-state-e-services-user-numbers-grow-third-year-row-survey>.

<sup>34</sup> Molchanov, email 2024; <https://www.kmu.gov.ua/npas/deyaki-pitannya-zabezpechennya-funkcionuvannya-informacijno-komunikacijnih-sistem-elektronnih-komunikacijnih-sistem-publichnih-elektronnih-reyestriv-v-umovah-voyennogo-stanu-263>

<sup>35</sup> Ionan 2023a and 2023f.

## Box 2. Services in Diia pre-war

- Taxation: file tax return, make payment, and access tax-related information.
- Health care: connects patients and doctors; appointment booking with doctors; electronic medical records; access medical information and prescriptions; COVID-certificates; location of health services.
- Banking: open a bank account (2.1 million opened online) using driver's license or digital ID; deposit savings; most banks in Ukraine offer online banking services, allowing customers to perform transactions, view account balances, pay bills, and access other banking services.
- Documents: obtain digital IDs; apply for passports, driver's licenses, etc.
- Education: student ID; apply to college; e-learning platforms offer a range of courses and programs (95 educational series).
- Vehicles: registration and driver's license renewal.
- E-baby: register births; includes a combination of nine services.
- Transportation: purchase train and bus tickets.
- Hotels: check in.
- Insurance: purchase life and automobile.
- Home: register residence; apply for mortgage.
- Courts: access enforcement proceedings.
- Business: registration (420,000 in a year); 70 free online consultancies; classes for entrepreneurs; connect partners; map of business support infrastructure; services and opportunities.

### Services launched during war

- eDocument provides citizens with a temporary document to show police and territorial defense soldiers at checkpoints to confirm identity.
- Donations to [United 24platform](#) and [Back Alive Fund](#);
- Financial assistance for business.
- Social assistance: 4,752, 911 citizens had received payments totaling 30.9 billion UAH (\$ 862 million) as of March 2023.
- eRecovery: registry to report damaged property.
- Services for IDPs that includes an IDP certificate and financial assistance.
- Military obligations.
- TV and radio broadcasting.
- Chatbot eVorog: used for citizens to report movement and coordinates of Russian troops and provide photographic evidence of damage.
- Purchase war bonds.
- Grants for veterans.
- eResidency allows foreigners to open a business and pay taxes without a physical presence in the country.
- eMortgage provides housing loans at 3% interest.

Sources: Olivia Neal; interview with Gulsanna Mamedieva, Ministry of Digital Transformation; podcast. "Diia"; PowerPoint from the TAPAS program. "State services online", website. "Diia in DC."

## Diia Engine

Recognizing the criticality of registries to facilitate e-government services, the Ministry of Digital Transformation launched a tool, [Diia.Engine](#). This is a low-code platform designed to simplify and speed up the creation of digital public services and digitalization of registries. It allows data exchange to be built easily and securely through Trembita. The government estimates that 80% of its 400 state registries and most back-ends of public services are technologically outdated—run in spreadsheets or paper format—making them impossible or unreliable to use for data exchange.<sup>36</sup> The Diia Engine facilitates easy digitalization of public services and a shift to secure, interoperable digital registries that all government authorities can use. It is low-code, does not require highly paid developers, and is open-source and easily adaptable by other governments.<sup>37</sup>

## eRecovery

In order to make the rebuilding process as transparent as possible, the Ministry of Digital Transformation and the Ministry of Territories, Communities and Infrastructure, with support from the USAID/UK Aid project TAPAS, launched the Register of Damaged/Destroyed Property, which allows citizens to add their property to the register by sending a report through the Diia app. This became the basis for eRecovery, launched in May 2023. Citizens can obtain funds for renovation or purchase of new property, depending on the level of damages from on-the-ground warfare or Russian missiles/drones. Misuse of eRecovery compensation is prevented through an anti-fraud mechanism. Upon verification of an application for damaged or destroyed property, citizens are authorized to open a digital [debit card](#) that can be used for purchasing construction goods and services from authorized vendors. Since the service was launched in May 2023, as of the end of 2023, over 37,000 households had been provided with compensation to repair damages and over 1900 people with digital vouchers to buy a new house.<sup>38</sup> The banking system identifies money operations with special codes that authorize payment for items such as construction materials, new windows, etc., so it is not possible to spend eRecovery money on items not related to property restoration. To date, over 3.3 billion UAH (around \$85 million) in recovery assistance has been transferred to people through this program.<sup>39</sup>

## IDP Status

Particularly important was the quick creation of the ability to register as an IDP (internally displaced person). For a person authorized on Diia, it is a quick process:

- Select under services “Obtaining IDP status.”
- On the subsequent screen, the button “Apply for status” becomes active if the place of registration of residency is located in a region identified as where hostilities are taking place, or the user’s taxpayer number indicates that. Clicking that button takes the user to a second screen to insert the user’s current location.

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<sup>36</sup> Ionan, 2023f.

<sup>37</sup> Ionan, email 2024.

<sup>38</sup> Ionan, September 25 email; Molchanov, email 2024.

<sup>39</sup> Ionan, 2023f; Molchanov, email 2024.

- That takes the user to a third screen for the selection of “eSupport” card for which the user wants to receive money.
- On a fourth screen the user specifies family members and needs from a list.
- From there, the application is reviewed and IDP status is obtained if the person meets all requirements.<sup>40</sup>
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Importantly for Ukrainians now living elsewhere in Europe, neighboring countries like Poland have taken measures to accept use of Diia. By recognizing Ukrainian digital credentials, the acceptance network in Europe expanded, allowing displaced Ukrainians to access and use their identity, driver’s license credentials, and Covid vaccination certifications.

The benefits have been essential to the government and citizens of Ukraine, with early reactions being overwhelmingly positive (2021 survey revealed 64.5% of citizens rated Diia “very positive” and 35.5% “positive,” and over 90% said it simplified various services).<sup>41</sup> At the request of other governments, Ukraine has shared its experience with developing Diia, including reengineering existing processes and how it can be adapted to a country’s specific needs. Notably, with Estonia—a digital leader with a solid foundation for e-government in its data-sharing system X-Road and a provider of technical support for Ukraine’s digital development—Ukraine is sharing its experience and expertise in the design and development of Diia. The Estonian version ([mRiik](#)) is currently being tested and legal issues are being addressed.<sup>42</sup>

## Telecom

Ukraine’s telecom sector, despite being a prime target of Putin’s war, has proved resilient. Telecommunications, postal services, and broadcasts have been adapted to war conditions, and basic services maintained.

Ukraine made great strides in building out telecommunications infrastructure before the war, though some of these have been set back by the destructiveness of the Russian invasion. As of February 24, 2022, 90% of Ukraine was covered by fiber-optic networks, meaning there was the technical ability to connect to fixed broadband internet.<sup>43</sup> 89% of citizens have access to LTE (mobile communication) from at least two operators.<sup>44</sup> The diversification of the market with numerous large and small providers promotes competitive prices (lowest in the ITU Europe region) and resilience. Access to the internet and quality of data transmission have decreased due to Russia’s destruction of digital infrastructure and attacks on energy facilities. As of August 2023, a quarter of internet networks and more than 4000 mobile base stations had been destroyed or damaged.<sup>45</sup> As of February 2023, the estimated loss to the Ukrainian telecommunications sector was more than \$2.2 billion.<sup>46</sup> The damage has been concentrated in the three oblasts, with Kyiv accounting for 37% of the damage, Kharkiv 19%, and Donetsk 17%.<sup>47</sup>

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<sup>40</sup> Ionan, 2023a and 2023b.

<sup>41</sup> e-Governance Academy; [Diia Mobile Application Evaluation Report: 2021](#)

<sup>42</sup> Ionan, email 2024; ERR News, "Digital Identity App 'M-RIIK' Delayed, Legal Amendments Necessary," ERR, accessed January, 2024, <https://news.err.ee/1609141054/digital-identity-app-mriik-delayed-legal-amendments-necessary>.

<sup>43</sup> Ionan 2023f.

<sup>44</sup> Ibid.

<sup>45</sup> Ibid.

<sup>46</sup> Ibid.

<sup>47</sup> Ibid.

## Trust

Ukraine and the EU have taken steps to bring Ukraine into the European telecommunications orbit. In 2020 the digital appendix to Ukraine's association agreement and [the roadmap of integration into the EU Digital Single Market](#) were updated. The European Commission has acknowledged that Ukraine is advanced in providing digital services, its digital legislative framework is broadly in line with the EU acquis (the body of common rights and obligations binding on all EU member states), and it has synchronized the sphere of electronic identification, authentication, and trust services with the EU. Ukrainian electronic signatures and seals fully comply with EU standards and are recognized by the EU, and Ukraine recognizes EU-qualified trust services so EU citizens can use electronic signatures and seals in Ukraine.

Ukraine is the first non-EU country on the [Third Countries Trusted List of the European Union](#).<sup>48</sup> In 2022 Ukraine joined the EU program "[Digital Europe](#)" and in 2023 the program "[Connecting Europe Facility](#)," both of which provide access to funds for the development of digitalization. Ukraine is adopting its digitalization to EU and international standards by conforming to the [EU Digital Single Market](#). This will lower costs and prices and expand choice and convenience for consumers while providing economy-of-scale effects for businesses.<sup>49</sup>

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<sup>48</sup> EU; eIDAS Dashboard

<sup>49</sup> Ionan 2023a; <https://t.me/mintsyfra/4037>

## Looking ahead for Ukraine

The years of investment by global partners and, more recently, under President Zelensky and Deputy Prime Minister Mykhailo Fedorov have contributed to building a valuable tool to help families and the country remain resilient in the face of displacement and war. But much remains to be done. Most obviously there needs to be continued vigilance to thwart cyber-attacks, most recently evidenced by the December 12, 2023 [attack](#) on Ukraine mobile network operator Kyivstar. In addition, ongoing priorities include rebuilding the physical infrastructure that was lost in the war, strengthening the stability of the electronic network, ensuring Ukraine independence from Russian internet traffic, and implementing 5G.<sup>50</sup> For the purposes of continuing the e-government journey, at least four categories of upgrades and reforms are needed.

*Closing the digital divide:* In 2020, less than half of the women of Ukraine were using public digital services.<sup>51</sup> Approximately 18% of households have no internet access at all.<sup>52</sup> As more investments are made in rebuilding roads, laying fiber, and reaching those not served will be a critical part of reconstruction.

*Upgrading the underlying platforms:* e-Government rests on high-quality data held within registries. In addition to ongoing efforts to clean and secure existing data and registries, new registries related to the consequences of the war need to be created and maintained. New cryptography standards that conform with American and European standards will enhance the performance of Trembita. Such a significant upgrade is critical for its scale and security.

*Financial sustainability:* The outpouring of support for the government and people of Ukraine, which has made it possible to achieve such progress and effectiveness of e-government services, must be sustained. A key postwar need will be the financing necessary to fulfill the billions of dollars of eRecovery applications, as well as the restoration of public infrastructure.

*Trust:* During the war, several trust-building measures were put on hold including the two-phase bidding on Prozorro. As elsewhere in the world, Ukraine has yet to have in place clear methods for responsive and transparent redressal and dispute resolution. These and other efforts will be critical to ensuring that the digital transformation is not only inclusive but strengthens trust and citizen empowerment in the years to come. Digital anti-corruption tools should be developed and enhanced to ensure a transparent recovery process and donors' trust in the reconstruction process.

*Innovation Vision:* In November 2023, Prime Minister Denys Shmyhal and Minister of Digital Transformation Mykhailo Federov launched a public conversation on [WinWin](#), a strategy for how Ukraine can build an economy based on innovation. The framework is founded on public-private partnerships to build an innovative high-tech private sector through government policy, regulation, and international cooperation. The design is to set priorities, engage business and academia to develop innovative ideas, and create an enabling environment for

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<sup>50</sup> Ionan 2023c

<sup>51</sup> OECD 2022; "OECD Policy Responses: Digitalisation for recovery in Ukraine" <https://www.oecd.org/ukraine-hub/policy-responses/digitalisation-for-recovery-in-ukraine-c5477864/>.

<sup>52</sup> Data Hub - <https://datahub.itu.int/data/?e=UKR&i=100001>; <https://www.oecd.org/ukraine-hub/policy-responses/digitalisation-for-recovery-in-ukraine-c5477864/>.

entrepreneurship.<sup>53</sup> The vision involves winning the peace and the concept of “fluid economies,” i.e., borderless digital economies. The [2023 WIPO Global Innovation Index ranks](#) Ukraine as 55th out of 132 nations, and the [WinWin strategy](#) envisions Ukraine moving from its current third place (India and Vietnam) among lower-middle-income countries to number one.<sup>54</sup>

## Lessons for all countries

Ukraine's journey over the past decades provides valuable insights for the global community.<sup>55</sup> The lessons listed below are particularly significant:

1. *Technology and policy go hand in hand:* The underlying foundations—notably the system of registries and the interoperable data exchange layer undergirded by policy and legislative directives—have been critical enablers of the citizen-to-government interface Diia. Without those underpinnings, the e-government services would not be seamless and robust. User-centric approach to developing digital public services has been a crucial component and a reason for Diia’s success.
2. *Cloud computing is an enabler and risk mitigator:* The shift to cloud computing not only ensured data integrity and mitigated the impact of attacks on data centers but also improved the ability to provide e-government services.
3. *Political leadership is key:* The leadership of President Zelensky and the Ministry of Digital Transformation drastically changed the direction from partial digitization to full transformation—the reengineering of government processes and practices to meet the age of technology.
4. *Crisis and urgency drive adoption:* Adoption of e-government services is facilitated when the value proposition and trust are high. The war created an urgent need to engage with the government digitally—for such services as unemployment registration, financial assistance, and damage recovery applications—and was a major factor in adoption rates. A combination of war making the offline option more essential for accessing government services and the greater efficiency and efficacy of e-government has contributed to its popularity and expanding use. Less known is the work to engage citizens through opinion surveys and consultations to ensure they were part of the design of the e-government solutions. Through such iterative processes, the government of Ukraine was able to create user-friendly solutions that are intuitive to citizens.
5. *Transparency can be embedded in code, but accountability requires a multi-faceted approach:* The underlying technology architecture of Ukraine’s e-government services adheres to good practices of data minimalization and transparency for users. But even the best-designed technologies can be implemented poorly. Ongoing efforts to strengthen oversight and accountability are needed to maintain trust and mitigate misuse.
6. *Reciprocal learning and sharing of solutions can accelerate digital transformation:* all countries are on a path toward digitization, and the opportunity to learn from one another is high. Importantly, there are opportunities to share underlying solutions to fast-

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<sup>53</sup> Current priorities are identified as defensetech, medtech, agritech, XR, AUV, biotech, Greentech, AI, semiconductors, secure cyberspace, fluid economy, edtech, and govtech.

<sup>54</sup> Victoria Gnizdytska, "About the Ministry," Google Drive folder, last modified Jan 16, 2024, <https://drive.google.com/drive/folders/1wHWMzwQ8LgX0F4i8kLMYBaSGALMzYSXT> .

<sup>55</sup> Olivia Neal; interview with Gulsanna Mamedieva, Ministry of Digital Transformation; podcast.

track progress. Ukraine benefitted from the example and assistance of the Estonians. Years later, Ukraine's entry into the GovStack consortium now offers the opportunity for others to learn from and reuse code from Ukraine.

## Appendix - Diia Ecosystem<sup>56</sup>

### Diia App

Diia mobile app, the most visible part of the ecosystem, is a one-stop-shop user interface. Ukrainian citizens and businesses can access 14 digital documents and 30 public services with the Diia app.<sup>57</sup> It leverages the underlying data exchange system, Trembita that links registries and facilitates interoperable exchange of information. The goal is to digitize all government services and have them accessible via the Diia app, the value and necessity of which has been demonstrated by the war. New services can be created within three days to three weeks.<sup>58</sup>

Diia is touted as “a single window of communication with the state” and brings to government services transparency, efficiency, flexibility, security, reduction in corruption, economic impact, and the fastest business registration in the world. As of September 2023, 19.5 million citizens of the total population of 44 million used the Diia app.<sup>59</sup> It is estimated to have had a cumulative economic and anti-corruption impact valued at 16.3 billion UAH (\$455 million) in 2021 and 48 billion UAH (\$1.34 billion) in 2022, and in 2021 to have saved 205,000 man-hours.<sup>60</sup>

Since the beginning of the war, the government has launched over 60 new services on Diia platforms. One example is that, with the digital platform in place, Ukraine was able to launch [eAID \(ePidtrymka\)](#) to promote vaccination and to support businesses that were impacted by the COVID-19 quarantine. Fully vaccinated citizens were able to use Diia to virtually open a bank account into which was placed 1000 UAH (\$27 at August 2023 exchange rate) that could be used for books, gyms, cinemas, and concerts—the dual goal of which was to encourage vaccination and support small businesses. Nine million Ukrainians used the service.<sup>61</sup>

Another example is that, by early March 2022, following the February 24th Russian invasion, the eDocument application was providing Ukrainians with temporary documentation of their identities. Other initiatives include eVorog to document Russian troop movements, the sale of war bonds, reporting damaged property, access to home mortgages, and other services presented in Box 2 of this paper.

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<sup>56</sup> Much of the information in this section comes from a virtual session with and memo from Valerie Ionan, deputy minister in the Ministry of Digital Transformation, August 14, 2023.

<sup>57</sup> Ionan 2023a & 2023d; Mykhailo Federov, Minister, Ministry of Digital Transformation; zedigital, Telegram post, accessed January 25, 2024, <https://t.me/zedigital/3158>.

<sup>58</sup> Iona 2023a.

<sup>59</sup> Ionan 2023a and 2023d.

<sup>60</sup> “Diia”; PowerPoint from the TAPAS program, managed by the Eurasia Foundation; April 24, 2023. “Diia in DC”; Ministry of Digital transformation. Olivia Neal; interview with Gulsanna Mamedieva.

<sup>61</sup> Ionan 2023a and 2023d.

## [Diia Web Portal](#)

The Diia web portal is a single portal of public services where 100+ services are available for citizens and businesses. Services on the Diia web portal are divided into categories and life events. Each of the categories has subcategories in which you can get an online service.

## [Diia City](#)

Launched February 8, 2022, Diia City, extending favorable tax and legal status for IT businesses, is designed to make Ukraine an IT hub for Europe. It extends to the IT sector taxes that are lower than the regular level in Ukraine, flexible employment forms, special treatment for investment, and protection of intellectual property. The special treatment applies to domestic and international companies. As of September 2023, over 760 companies had received the status of resident of Diia City. While designed for IT companies specializing in software and hardware development, games, esports, cybersecurity, and robotics, it also supports companies that develop drones and defense technology solutions and more general technology solutions.<sup>62</sup>

## [Diia.Education](#)

[Diia.Education](#) is designed to help Ukrainian citizens achieve the digital literacy and competencies required for a digital state. [Research in 2019](#) evidenced that half of Ukrainians had a low level of digital skills.<sup>63</sup> In 2020 Diia.Education was launched with free content that builds digital literacy for students, teachers, and employers. 1.5 million users were reached in the first year.<sup>64</sup> The [2023 ITU Global Skills Report](#) placed Ukraine ranking 15th out of 100 countries on digital skills achievement and third in Europe for technology skills.<sup>65</sup>

The education platform includes a national test for digital literacy—[Digigram](#)—based on the European framework of digital competencies ([DigComp 2.1](#)). Almost 900,000 users have accessed the test and almost 700,000 have received certificates certifying their level of digital literacy.<sup>66</sup>

Offline, Diia.Education supports a network of more than 6000 hubs of digital literacy—libraries, administrative service centers (ASCs), and private organizations around Ukraine.<sup>67</sup>

As increasing numbers of Ukrainians are working offline. In May 2023 the Ministry of Digital Transformation launched an updated Diia.Education for reskilling and digital literacy, supported by Google and East Europe Foundation. It supports the creation of personalized learning trajectories to allow users to develop specific skills to complete their own education courses. It houses more than [165 educational series](#) and [50 simulators](#). Included is a section on reskilling and upskilling to fit with specific work requirements, especially designed for professions in

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<sup>62</sup> Valerie Ionan 2023a & 2023d; <https://open4business.com.ua/en/number-of-diia-city-residents-has-increased-by-24-companies/>.

<sup>63</sup> Ministry of Digital Transformation; "Digital Literacy of the Population of Ukraine 2019" - [https://osvita.diia.gov.ua/uploads/1/8724-research\\_2019.pdf](https://osvita.diia.gov.ua/uploads/1/8724-research_2019.pdf)

<sup>64</sup> Ionan, "Ukraine upgrades digital education efforts," The Atlantic Council. <https://www.atlanticcouncil.org/blogs/ukrainealert/ukraine-upgrades-digital-education-efforts/>

<sup>65</sup> International Telecommunications Union; Coursera, "Coursera Global Skills Report 2023," 2023, [https://pages.coursera-for-business.org/rs/748-MIV-116/images/Coursera\\_Global\\_Skills\\_Report\\_2023.pdf](https://pages.coursera-for-business.org/rs/748-MIV-116/images/Coursera_Global_Skills_Report_2023.pdf). Valerie Ionan, email, September 25, 2023

<sup>66</sup> Ionan 2023f.

<sup>67</sup> Diia Education, "Hubs," Diia, accessed January 2024, <https://osvita.diia.gov.ua/en/hubs>.

demand in Ukraine. It also includes a job search where users can match their skills with available jobs—especially important for IDPs.

### [DiiBusiness](#)

[Dii.Business](#) is a large-scale Ukrainian national project for entrepreneurship and export promotion that was established in early 2020 to provide online and offline services for small and mid-sized enterprises (SMEs). Dii.Business portal is a one-stop shop for entrepreneurs with information on how to set up and promote a business. Services include more than 150 business ideas, consultations on 70 topics, business education, access to finance, and information on exporting.<sup>68</sup> Fourteen offline [Dii.Business support centers](#) for entrepreneurs (one in Poland), operated by local NGOs and supported by business partners, provide similar services plus space for events and testing products at pop-up locations.<sup>69</sup> As of August 2023, Dii.Business online had more than 6 million visits and the business support centers for entrepreneurs had provided more than 5000 consultations.<sup>70</sup> In 2022 Dii.Business won the [European Enterprise Promotion Award](#) in the nomination "Improving the business environment and supporting the digital transition" and the Go Global Award in "[Digital Innovation of the Year](#)."<sup>71</sup>

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<sup>68</sup> Ionan September 25 email.

<sup>69</sup> Dii Entrepreneur Support Centers; Ionan 2023f.

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