**Sector Review of Information Technology**

**in Official Statistics in Moldova**

**Report**

**18 August 2023**



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**Preface**

The Sector Review of Information Technology in Official Statistics in Moldova was undertaken in partnership between a group of international experts convened by the United Nations Economic Commission for Europe (UNECE), and the National Bureau of Statistics of the Republic of Moldova (NBS). The review responded to a request from the NBS in the context of the Strategy for the Development of the National Statistical System of Moldova, 2023-2030.

The Sector Review was conducted by a team consisting of Ms Francesca Kay (Central Statistics Office of Ireland), Ms Mira Nikic (Statistical Office of the Republic of Serbia), Mr Carlo Vaccari (Independent consultant, Italy), Mr Marlen Jigitekov (UNECE), and Mr Steven Vale (UNECE). The review was conducted in cooperation with the managers and staff of the NBS.

The agenda of the Mission "Sectoral evaluations of IT in Official Statistics and Organizational Structure for the National Bureau of Statistics of Moldova" is attached as an annex.

The Sector Review findings are based on discussions and presentations during a mission of the review team to the NBS office in Chisinau, which took place on 6-10 February 2023.

Prior to the mission, NBS staff completed a self-assessment questionnaire, which served as a starting point for the Sector Review, and a basis for the detailed discussions. The collaboration between the review team and the staff of the NBS was very positive and constructive throughout all phases of the work. The international experts would like to thank the NBS management and staff for this, particularly the staff of the General Division of Informational Technologies.

**Executive Summary**

In February 2023, an international team of experts convened by the United Nations Economic Commission for Europe (UNECE) conducted a Sector Review of Information Technology in Official Statistics in Moldova. This overview was undertaken at the request of, and in partnership with, the National Bureau of Statistics of the Republic of Moldova (NBS). This report contains the observations and recommendations of the international experts, and has been agreed with the management of the NBS.

The international experts were very impressed with the volume and quality of work carried out by the staff of the General Division of Informational Technologies of the NBS, and found many examples of good practices, and good ideas for future improvements. However, there are also several areas where the international experts can recommend improvements. These recommendations are set out in detail in this report, but five overarching themes can be identified:

* Human and financial resources for statistical IT are currently very limited, a situation made worse by the high rate of unfilled vacancies. A sustainable increase in funding for salaries, hardware and software is needed;
* Defining common standards and consolidating technology will be important to improve efficiency, and reduce the burden on IT staff associated with maintaining several solutions for similar tasks;
* The IAIS metadata-driven system is very promising, and should be developed in a modular way, integrating different reporting requirements, including Eurostat’s Single Integrated Metadata System (SIMS). Some further standardisation of code lists, e.g., for sex / gender would be beneficial;
* New data collection tools and methods are being introduced or planned, including CAPI for household surveys. This is a positive development, however the challenges of maintaining and integrating multiple data channels should not be under-estimated, particularly for the census;
* There are many conflicting demands on the time of the IT staff in the NBS. To better manage these demands, and to try to free some time for innovations to improve efficiency, an improved ticketing and prioritisation system is needed.

The international experts would like to commend the professionalism of the NBS staff, who make the best use of the very limited resources available to them. The experts would like to thank the management and staff of the NBS for their full and active collaboration in the conduct of this Sector Review.

**Chapter 1: Institutional Environment, Strategy and Resources**

**Institutional Environment**

The Government of the Republic of Moldova has recently approved Development Strategy of the National Statistical System (2023-2030) produced by the National Bureau of Statistics (NBS). The Strategy lays out the key priorities for NBS which are:

* Greater use of a standards and metadata approach to the production of relevant and accessible statistics;
* Increase public trust in and the use of data by strengthening governance, legal frameworks and privacy and data protection;
* Expand production of high-quality datasets (including the use of administrative data) to harmonize with EU requirements and improve timeliness, disaggregation and coherence;
* Increase understanding of the use of Statistics in the Republic of Moldova across Government and beyond.

NBS is the central administrative authority which, as the central statistical body, manages and coordinates the activity in the field of statistics from the country. NBS has a central office and 4 regional offices. The regional offices of NBS focus on data collection. NBS has 705 positions/posts, of which 242 (25%) are located in the head office and 463 (75%) in regional offices. The real number of staff members of the NBS as of 01 January 2023 was 574 people, of which 180 in the headquarters (74.4% of posts filled) and 394 in regional offices (85.1% of posts filled). 76 NBS posts were included in the temporary (but continuing for over 2 years) moratorium on the recruitment of staff from the budgetary sector. These data show that the pressure on NBS specialists, especially in the headquarters, is high, while the professional qualification requirements placed on them are high. In addition, the annual level of staff turnover in the years 2019-2022 was between 6% and 10.1%.

The reason is the very low salary level for statistician positions compared to opportunities of similar complexity and profile in the public and private sectors. This factor is even more important in the case of specialties traditionally considered "auxiliary", but which are clearly becoming more important, such as specialists in the fields such as IT. For these specialists, the difference in the level of entry salaries in other public institutions and in the private sector compared to the level offered by the NBS, is even higher than for statisticians. This resulted in vacancies at the end of 2022 ((113 posts), posts), even beyond the moratorium (51 posts).

According to Moldova’s legislation (Law no.467/2003 regarding computerization and state information resources), all the information systems of the public authorities should be developed and implemented only after a Technical Concept and Regulation for the System’s functioning are approved by the Government. Unfortunately, this is not the case for most of information systems and apps developed and used by NBS, in particular those developed in-house. The NBS activity in the field of IT is undertaken on the basis of the Technical Concept of the Automated Information System of the National Bureau of Statistics approved by Government decision no. 856 of 21.09.2010, which needs to be updated. The absence of such documentation represented an obstacle in recent years in NBS’ negotiations with the National Agency for Personal Data Protection and some holders of public registers and other administrative data sources, who used the lack of the corresponding documentation as a reason to refuse the NBS access to personal data from such sources for the purpose of official statistics.

To overcome this problem, in 2022, with the support of UNFPA, SDC and the India-UN Development Partnership Fund, the Concept for the Information System on Demographic and Social Statistics, has been developed and approved through a Government Decision and, at present, it serves as the basic legal framework to prove the right of NBS to process personal data collected through statistical surveys, but to also access and use personal data from administrative and even private data sources for statistical purposes. The development of the Concept for the whole Integrated Information System of NBS, together with the Regulation on its functioning, to be approved by the Government, is envisaged within the new Strategy for NSS Development 2023-2030.

In addition, some changes were made in the Law 93/2017 on official statistics in order to strengthen the legal basis to access and use personal data from administrative and privately held data sources.

Currently, there is no single document covering all areas of the IT strategy, such as IT training and technological standards. Each concept of the state information system has to be coordinated with the Central Electronic Governmental Agency and finally approved by the Government.

**Resources**

The General Division of Informational Technologies in NBS comprises 18 permanent posts (of which, 7 were vacant at the time of the review). All of these staff are based at the head office in Chisinau. Because of the lack of resources, specific projects/products, such as Genderpulse.md, the NBS official web-site statistica.gov.md, information systems for some specific statistical surveys (in particular for the household-based surveys, metadata integrated system, Business Register, Repository of financial statements, etc.) are developed by external suppliers and then passed to the Division to support and provide maintenance. Some of the unused salaries (from the vacant posts) are reallocated as bonuses to the IT Division employed staff as additional payment.

The ratio of IT staff to total staff (headquarters and regions), even if all the above posts are included, is around 2.5-3.0%, which is rather lower than the 8-20% average in Western European national statistical offices. There is a long-term aim to reduce the resources for data collection due to electronic collection and greater use of administrative data, which would result in a possible reallocation of some posts to other areas, including IT thus complementing the available human resources in such needy divisions.

The General Division of Informational Technologies is split into 2 divisions, with a Head and Deputy Head of IT, both as public servants, including:

* Design and development of IT Applications Division, comprising 8 posts (3 vacancies);
* IT System Administration and System Engineering Division, comprising 8 posts (4 vacancies).

The IT budget for salaries, software and hardware and maintenance services in 2022 was 9.5 million Lei (approx. 500,000 US Dollars). In addition, in the last three years, NBS has obtained 4 million lei per year to invest in the modernization of software and hardware licenses. It is important that this funding for the upgrading and maintenance of software and hardware is continued. Some investment in IT comes from technical cooperation projects, which has led to a proliferation of technologies, increasing the support burden on IT as well as making it difficult to have a systematic replacement strategy for outdated hardware and software.

NBS has a relatively modern data centre, hosted in their head office but is mandated by Government Decision no.414 of 08.05.2018 "On measures to strengthen data centers in the public sector and rationalize the administration of state information systems" and Government Decision no. 211/2019 of 03.04.2019 on the interoperability platform (MConnect) to use the Government MCloud and MConnect platforms (see Chapter 3).

There is no training strategy for IT staff, with staff having little spare time to carry out training despite the increasing diversification of technology being used. Staff participate in various webinars, conferences, seminars and trainings organized by IT companies, as well as a continuous process of self-training. The participation of IT specialists in the exchange of experience with other statistical offices abroad would be welcome.

**Working Practices**

IT staff receive many ad-hoc requests for support from other NBS staff. They are seen as responsive and helpful but dealing with and prioritising these requests represent a challenge, particularly at busy times, for both IT staff but also for statisticians whose IT-related requests are often delayed and postponed. This creates a vicious circle when there is little time left for improving efficiency. There is a need for an enhanced “ticketing” system to record these requests and set priorities. However, the “ticketing” system itself would only be a partial solution. Without additional measures to supplement the IT team with additional human resources, and a clear management vision, it would not solve the overall problem.

The IT System Administration and System Engineering Division has recently (for a year) started to use open source data science environments such as Jupyter Hub and Apache Superset. However, NBS staff have clearly defined IT and statistician job roles. The IT people have historically not routinely involved statisticians in IT-related work and the majority of statisticians, are used to IT staff doing all the IT-related work. There are certain exceptions, such as 1-2 persons in each of the divisions on demographic, labour force, living standards statistics and census who use SPSS and/or STATA for independent data processing, 4 persons in living standards division who can design statistical questionnaires in Survey Solutions software, and 2 persons in Statistical Methods Division using R for data linkage or sampling activities. Many IT development related activities were outsourced, with the support of development partners, because of insufficient internal software development capacities and insufficient capabilities in data/statistics-related issues of available IT staff. However, the modern-day job market in the field of official statistics demands new skills on a spectrum from purely IT to purely non-IT, from both IT specialists and statisticians. There is a growing demand at the NBS for statistical job roles with limited IT involvement that may include skill in data engineering, data analysis, data science, web design, UI/UX design, graphic design, digital publishing. Similarly, IT jobs are increasingly requiring some knowledge on data/statistics and international standards to be applied (e.g. GSIM, GSBPM). It will be necessary to build such skills and abilities to better understand the statistical processes and be able to provide IT coverage for NBS in line with the best international and European Union standards.

**Recommendations:**

* To meet the current and future challenges of official statistics, and particularly those associated with meeting EU standards, the government of Moldova and the NBS should discuss strategic funding to:
	+ increase the number of staff in the IT Department to align with international best practices;
	+ raise salaries for IT (and other) staff, to make them comparable with salaries for civil servants as a minimum, whilst also considering increases to address the significant salary difference with the private sector;
	+ secure a permanent increase in the IT hardware/software budget, similar to the additional 4 million Lei per year currently allocated, to ensure an ongoing ability to maintain and upgrade software and hardware;
* NBS should consider non-financial incentives to improve recruitment and retention of IT staff, such as encouraging IT staff to form networks with IT staff in other national statistical offices and participation in international projects/conferences to provide additional motivation for NBS staff;
* NBS should create an updated and consolidated IT strategy, looking to consolidate and reduce the number of technologies being used. The Strategy should be supported by a set of standards to be used internally and when using external suppliers for IT developments;
* The IT Department should further develop a ticketing system to keep track of requests from users and to help with prioritisation. This should:
* Be transparent to ensure the trust of statisticians;
* Be based on the current Redmine tool and/or ITIL standards;
* Include metrics to measure efficiency gains;
* Raise efficiency by implementing best practices and state-of-the-art technologies. Time saved from efficiency gains should be reinvested in raising efficiency further.
* NBS should consider how the recent approval of the Republic of Moldova as an EU candidate country can help strengthen the investment in IT needed to meet the required standards in the production of statistics as a member of the EU. This includes:
* Preparing for IPA and other funds by examining different approaches to using those funds for IT development by different NSOs (Montenegro, Serbia, Bosnia and Herzegovina etc.). Many multi-beneficiary country programmes have traineeships in various statistical and IT areas, which can help to make vacant IT posts in NBS more desirable;
* Developing technical cooperation networks with colleagues from other NSOs that are currently in the accession process (e.g., Georgia, Ukraine);
* Further developing the existing relationship and collaboration with Romanian NSO IT staff, where there are no language barriers;
* Seeking support on implementing EU standards such as SDMX.
* NBS should consider how to break down the barriers between IT and statistical staff by moving from rigid separate roles to one where statisticians have stronger technical skills for example by embracing data science and analytical skills. . These new job roles may need skills in data engineering, data analysis, data science, web design, UI/UX design, graphic design and digital publishing. This could include:
* Influencing university curriculums (both IT and statistics) to better meet the needs of the statistical and data ecosystem in Moldova;
* Adapting the recruitment policy to reflect the growing demand for the new job roles when recruiting statisticians;
* IT staff helping to identify statisticians who are willing to assume new job roles;
* Promoting new skills by organising training courses for statisticians;
* Setting up support groups comprising IT staff and statisticians to support the roll-out of tools such as those developed using R and Python languages.

**Chapter 2: The National Statistical System and Other Cross-Government Considerations**

The national statistical system in Moldova currently comprises the NBS and the National Bank of Moldova. Other government ministries and agencies are currently applying to be recognised as producers of official statistics (“Other National Authorities” is the term used by Eurostat). This process is set out in Government Decision No. 51 of 02-02-2022 “for the approval of the Regulation regarding the procedure for establishing the producers of official statistics” (<https://www.legis.md/cautare/getResults?doc_id=129869&lang=ro> – in Romanian).

This sector review of statistical information technology was not able to go into detail on the situation in these other ministries and agencies. Instead, it focused on the three main cross-government initiatives affecting information technology activities in the NBS:

* MConnect – This is an interoperability government platform for data exchange for public authorities, but also private entities, who have the legal right to process personal data (previously this right has been endorsed by the national Agency of Personal Data Protection, since a year ago this role stands with the Electronic Governance Agency). It is designed to improve efficiency of government information systems and reduce reporting burdens on citizens. It is administered by the E-Governance Agency. For more information see: <https://www.egov.md/en/content/government-interoperability-platform>;
* MCloud – This is a cloud storage solution for government bodies in Moldova. It is administered by the Centre for Information Technology and Cyber-Security (STISC). For more information, see: <https://www.egov.md/en/content/mcloud-platform>;
* Raportare Electronica – A “one-stop shop” for web-based electronic reporting (for tax and other administrative reports, as well as for statistical surveys) for legal entities, held by the State Tax Service and maintained by the public institution “The Centre for Information Technologies in Finance (CTIF)”. See: <https://raportare.gov.md/>.

The use of these platforms is mandated by the central government, although they do not fully meet the needs of NBS, for example, the MCloud platform does not provide Oracle license services. See chapter 3 for a more detailed consideration of the issues regarding the use by NBS of MCloud and MConnect.

**Recommendations**

* As the National Statistical System is developed in Moldova, NBS and partner institutions should consider whether the IT strategy proposed in Chapter 1 should be extended to cover the whole NSS, or whether specific agreements and protocols on statistical IT matters not already covered by cross-government initiatives are needed.

See recommendations on MCloud and MConnect in Chapter 3.

**Chapter 3: Hardware Infrastructure and IT Security**

**Hardware Infrastructure**

Currently, at NBS there is one server room located on the first floor of the main office. There are about 20 physical servers, 6 of which are used for virtualization. There are 80 virtual servers, 36 connection servers with the territorial statistical offices. HyperV is used as the main virtualization solution.

Oracle is the main DBMS in use at NBS. Oracle database is installed on a dedicated physical server and data is stored on a dedicated physical storage. Oracle is the main RDBMS in use at NBS.

NBS IT staff manage approximately 600 workstations, 60 laptops, approximately 150 printers.

The network infrastructure consists of 2 Next Generation Firewall appliances (FortiGate), 45 network switches, 10 Wi-Fi routers. All NBS employees have access to Internet.

Recent purchase activities on the infrastructure have been undertaken:

* 250 licensed computers;
* 50 3-in-1 printers;
* 3 switches for the central office of the NBS;
* Equipment for the unified Wi-Fi system for the central office of the NBS.

In addition, recent IT Security purchase and configuring activities that significantly improved the data protection and information security of the NBS were:

* The FortiGate (Firewall);
* The Symantec Endpoint Protection Manager antivirus system;
* The Veeam BackUp & Replication system;
* 4 security systems for access control, alarm management, video monitoring and fire protection in particular implemented in the areas of personal data processing or storage.

Backups of servers with the Linux operating system, the Windows 2012 operating system and higher, including the Database server, are performed using the recently purchased backup system Veeam BackUp & Replication. For servers with operating systems older than Windows 2008, the backup system cannot be used, on these server backups are performed manually. Backups of virtual servers in the XenCenter virtualization system are also performed manually. Veeam BackUp & Replication is not compatible with XenCenter. Database backup is done by saving SQL dumps every week. It should be noted that currently at NBS, disaster recovery and business continuity plans are missing.

In 2013 the Moldovan government launched the common government technology platform MCloud (<https://www.egov.md/en/content/mcloud-platform> ) to improve cost-effectiveness of government spending and consolidate data centres from the central public authorities in a form of shared management. The platform is managed by Information Technology and Cyber Security Service (ITCSS, STISC in Moldovan <https://stisc.gov.md/ro>): it provides services like IaaS, PaaS, SaaS for all public authorities, state institutions, real sector enterprises.

MCloud is a shared government information infrastructure that provides IT services, through the telecommunications system of public administration authorities, as well as public communications networks, exclusively through secure channels of access and data transport. The website allows access to configure virtualizable computing resources like networks, servers, storage devices, applications and services.

NBS requested IaaS (Infrastructure As A Service) services and is responsible for the administration of its IT systems. The virtual data centre provides systems with computing resources (processors, RAM and storage) managed remotely by NBS through self-service tools provided by MCloud.

NBS already migrated the following Information Systems to MCloud:

* Web server (the official website of the NBS <https://statistica.gov.md>);
* Data bank ([http://statbank.statistica.md](https://statbank.statistica.md/pxweb/pxweb/ro/?rxid=2345d98a-890b-4459-bb1f-9b565f99b3b9));
* Web application for interactive visualisation of Gender statistical data (<https://genderpulse.md>);
* The 2014 Population and Housing Census data visualisation system (<https://recensamant.statistica.md>);
* Training web application (instruire.statistica.md);
* Population and Migration Statistics Information System (PMS);
* Information System "The public depository of financial statements";
* WEB application for listing and georeferencing buildings and homes on the territory of the Republic of Moldova;
* "Assignment Management" WEB Application;
* WEB application „ Electronic Reporting Platform ";
* "ArcGis" WEB Application;
* Application for storing information collected through CAPI;
* The internal domain server (Active Directory);
* "Statistical Integrated Research" WEB application;
* ”InfoRSF” WEB application;
* Integrated Statistical Automated Information System "IAIS";
* ”Mobile Device Management” WEB application;
* Information Subsystem "Population and Housing Census 2024" (test environment).

NBS is planning to migrate:

* Systems using Oracle DBMS (7 systems);
* DB backup;
* The file server;
* The accounting server

NBS is also using MConnect (<https://mconnect.gov.md/#/>) - an interoperability platform that facilitates the exchange of data between the information systems owned by the ministries, other central administrative authorities subordinate to the Government and the organisational structures within their sphere of competence. In the case of NBS, MConnect is intended to be used mainly for consumption of data, in particular personal data, from public registers and other administrative data sources for statistical purposes, as well as to provide access to financial (bookkeeping) reports collected by NBS (the financial reports are collected not within the statistical law, but under the accounting/booking law, which foresees public access to financial reports). At the moment NBS has collaboration agreements with the Tax Authority (<https://servicii.fisc.md/>) and other public administrations and agreements are in preparation for 12 other providers of administrative data.

**Recommendations:**

* Cloud vs. Internal servers: NBS should reflect on the benefits that the use of the MCloud public cloud can bring: It could be positive to avoid dealing with issues unrelated to the statistics production process;
* Cloud vs. Internal servers: NBS should demand that the confidentiality of statistical data is fully protected in the governmental MCloud and MConnect platforms. This includes the data being properly secured and the service provider (ITCSS) being compliant with any relevant privacy regulations. NBS should also take into consideration existing and future platforms recommended by MCloud in defining its IT standards;
* Whilst MCloud and MConnect do not fully meet the needs of IT, NBS should look for opportunities to improve the platforms using their expertise in areas such as data management (as evidenced by the recent achievement of ISO standards ISO/IEC 27001:2013 on information security and ISO/IEC 27701:2019 on the protection of personal/confidential data) or through the encouragement of the creation by the managers of these two platforms (ITCSS and PSA) of a user/stakeholder group to influence the future direction of the platforms, discuss development plans, as well as exchange experiences, information and best practices among users;
* Strategy in choosing the software for infrastructure: Using too many different software packages can limit the ability of the IT staff to intervene, dispersing skills among different tools. Similar considerations are valid also for software tools used for statistical information systems. NBS should define its list of standard tools, which should be valid both for choices of institute technicians, for third-party developers, and for all experts proposing tools in different cooperation and collaboration projects.

**Chapter 4: Software Infrastructure**

NBS uses CIS and CIS2 metadata-based systems for data collection, data validation, batch logical control (batch data validation), and reporting. CIS and CIS2 are fully developed in house and currently include more than 80 **business statistical surveys**. The back end is an Oracle database, the front end (Interface) is a web application on .NET technology, C# language. Data validation on the spot and batch data validation are presented through metadata in the Oracle database. All data for surveys in CIS and CIS2 are in one Oracle database (relational databases), which ensures the corresponding data integration for surveys on businesses and other reporting entities (public authorities, public institutions such as education institutions, NGOs, etc.). Nevertheless, the development of unified catalogues of statistical variables and output indicators, with the correlated coding and interlinkage, to be generated from this two apps is still a challenge and an objective to be pursued. Data collection, for surveys is done in regional offices (PAPI part), who use CIS and CIS2 software for data entering and data validation. Data processing (reporting) is done by the central office.

Data collection (via PAPI) for **household surveys** has been undertaken since 2006 in an Oracle Apex database management system (outsourced), a commonly used and integrated app for the continuous surveys as Labour Force Survey (LFS), Household Budget Survey (HBS) and all other periodical (e.g., on access to health) or ad-hoc module-based surveys (e.g., Covid related). Data processing for HBS, LFS and additional household surveys is undertaken in SPSS and Stata by the survey management divisions.

Data collection for household surveys is in transition from PAPI to CAPI method. For CAPI, NBS uses CSPro software. For data transmission NBS uses CSWeb software. The Census and Survey Processing System (CSPro) is a public domain software package used by hundreds of organizations and tens of thousands of individuals for entering, editing, tabulating, and disseminating census and survey data. CSPro supports data collection on android devices (phones and tablets). The CSEntry Android App works in collaboration with the desktop version of CSPro. CSPro supports smart data transfer from Android or Windows devices to a server running CSWeb. CSPro and CSWeb are free software.

Currently, data collection for the Labour Force Survey (LFS) is partially done in CSPro, and data processing is done using procedures developed in Oracle database management system (the transition to the CAPI method is conducted gradually and to be completed by the end of 2023).

NBS is in the initial phase of introducing JupyterLab, the latest web-based interactive development environment for notebooks, code, and data. Jupyter notebooks will cover centralised data processing system with focus on:

* Governance;
* Standardisation of processes;
* Harmonisation of processes;
* Organisation of processes (i.e., according to GSBPM sub-phases);
* Support for all open-source statistical programming languages (R, Python, Julia, SQL, Spark… etc.);
* Server-side data processing;
* Security and data loss prevention.

Household budget survey (HBS) uses Oracle Apex, outsourced.

For the real time monitoring of CAPI data collection NBS uses Apache Superset, a data exploration and visualization platform.

**Price collection** (for CPI and HICP purposes) is done with the CAPI method. NBS uses tablets with Eclipse OS (previous), Android studio now (similar to java). On tablets, data are stored in a SQLite database. Data are exported from the application on tablets and sent, as a file, via email to the price statistics department. In the central office, data are imported to an Oracle DB. The front-end application for CPI is a desktop application on .NET technology, C# programming language.

Mobile device management is done via MDM Solution - Headwind MDM. Headwind MDM addresses the difficulties of managing mobile endpoints for CAPI surveys. Employing device detection and integration, policy adherence rules, application deployment, and a variety of other features, NSO manages the mobile devices and applications needed to run CAPI surveys.

The CAWI method for data collection is used for 33 with another 5 in the development phase. Web questionnaires are hosted on electronic service E-Reporting. The service E-reporting is a common platform for creation and transmission of electronic reports by private companies and organisations for various state agencies and public authorities. Use of this system is mandatory and imposed to NBS by the e-governance agency eGA (<https://www.egov.md/en/about-ega>), responsible for policies and regulations. The NBS IT department develops web questionnaires on this platform, puts them on GitLab and the Tax office deploys the web questionnaires (publishes them on the web server). Data are stored on Tax office servers and delivered to NBS after finished data collection. Confidentiality of the data is guaranteed by signed MoU between Tax authority and NBS.

For **Population and Migration Statistics**, a new software application has been developed - Information System on Population & Migration Statistics (IS PMS) (Front- end - in Java and back end - in Postgres database) and handed over to NBS (accompanied by the app’s documentation and training for NBS staff) for further development and improvement, maintenance from an outsourcing company to be finished in 2024. This application represents one of the 4 sub-systems, planned for development on the basis of the Concept for the Information System on Social and Demographic Statistics[[1]](#footnote-1). This System represents the common vision on integrated and process-based approach regarding the Social and Demographic Statistics envisaging another 3 sub-systems (on 2. Censuses, 3. Employment and standard of living statistics, 4. Social services and justice statistics), following the GSBPM and GSIM standards. Through this system the only (so far) data consumption via MConnect of personal data from the State Population Register is ensured and more personal datasets from public registers on population, migration and asylum, birth and death medical data and border crossings are to be integrated via MConnect (currently such data sets are integrated from available files obtained either vis dedicate web-services or other means).

For the 2014 Population Census, data collection was done on paper and later on introduced in the office in a CSPro app, as no other information system was not available. While for the 2024 Population and Housing Census, the planned information system will be comprised of modules on: data collection in the field via CSPro; data collection/usage from administrative data sources via MConnect with similar functionalities as in the case of a Population and Migration statistics Information System (for the census the consumption of data from 12 administrative and private data sources is envisaged according to Annex 6 to the Government Decision[[2]](#footnote-2) no. 951/2022 on organisation of the Census).

For the dissemination purposes NBS widely uses PXWEB. PXWEB is an API structure developed by Statistics Sweden and other national statistical offices to disseminate public statistics in a structured way. The latest version of PXWeb (mobile friendly) is used for stat bank, back end is not database, but file system.

A new **web site** was developed with the EU financial support with outsourcing. This web site will be maintained by the NBS.

Redmine is used across the NBS, by two divisions (IT department and Statistical Methods Division) for task management. It is a free and open source, web-based project management and issue tracking tool. It allows users to manage multiple projects and associated subprojects. It features per project wikis and forums, time tracking, and flexible, role-based access control.

IAIS – Integrated Automated (Statistical) Information System is to be developed following the national legal framework, on the basis of a Concept and a Regulation for functioning to be approved through a Government Decision (planned in the 2030 NSS development Strategy). IAIS is a metadata driven system with strong focus on processes and methods standardisation for all NBS statistical surveys. Individual and aggregated data will be on the same platform and all data processing will be described through metadata. IAIS goals are:

* Improving the metadata system;
* Integrating all Labour Force Survey (LFS) processes into IAIS;
* Implementing CAPI for all social surveys;
* Integrating all social surveys into IAIS;
* Improving the entire system.

**Recommendations**

* NBS should be careful when considering new software. Many different types of software can overwhelm any IT department;
* IT staff should lead and approve on all outsourced IT development. All external development must be aligned with the NBS IT strategy and based on IT standards.. Purchasing and using software as a service (SaaS) can be led by the statistical business areas, but IT of NBS must be consulted and approve all solutions before they are purchased and should not be expected to maintain applications that are outside the scope of NBS software standards;
* When outsourcing something NBS should have a coherent approach – for example, all outsourced applications must be on the same platform, with same front and back end, same CMS for different web sites;
* NBS should explore, in detail, the pros and cons for retaining Oracle DB or migrating to PostgreSQL. . The final decision must be made based on ease of migration (of data and data connection string changes or/and data processing procedures recoding), taking into account that IT staff have invested a lot in Oracle knowledge;
* NBS should continue developing the new metadata system in small steps. Develop, test and deploy module by module, even part of module by part of module, and expect that developing a metadata system can be very long (10+years) ;
* NBS should be careful not to overwhelm IT staff during the next population census with mixed mode (CAPI+CAWI) for permanent population. . Think of using CAWI only for special population groups (diplomats, resident of social institutions etc.).

**Chapter 5: Data Collection and Other Inward Data Flows**

Today the big part of the data collection in households is carried on by interviewers in NBS regional offices using the PAPI technique. Interviewers are coordinated by supervisors (1 supervisor every 3-6 interviewers). NBS reported issues in data collection processes due to the limited mobility of interviewers: they have problems in using cars and so they are “tied” to their territory, while NBS would need interviewers to be more mobile, covering wider areas.

80 surveys data are collected using CIS and CIS2 applications, web applications that use Oracle as DB, PL/SQL for checking the data and .Net as user interface. CIS and CIS2 have been developed by NBS and are used by supervisors in regional offices: they receive the paper questionnaires from economic agents and use CIS/CIS2 applications to load the data in the central servers.

NBS started implementing CAPI techniques for household surveys using CSPro. In the Labour Force Survey, from the end of 2022, data are collected using CSPro questionnaires, data are then stored in Oracle with the possibility to run Jupiter (Hub centralised processing system) code and using Apache Superset outputs for real time monitoring.

Also, Survey Solutions tool has been tested for HBS survey, but CSPro seems to fit better with NBS needs. The CSPro tool is going to be used also for 2024 Census.

NBS plans to start experimenting with CATI techniques.

NBS started using administrative data sources: using the MConnect platform NBS and receive data from the main producers of public data, like Tax Authority and Public Services Agency. NBS implemented the Business Register and wants to start designing the Population Statistical Register and Buildings and Dwellings Statistical Register on the basis of data from the current population and migration statistics and from the 2024 Population and Housing Census.

**Recommendations:**

* NBS should find a solution for interviewers’ mobility and productivity: the current workload is low and without interviewers’ mobility it is difficult to improve the data collection processes and to introduce new techniques;
* NBS should experiment with “matrix organisation” starting from regional offices: in this organisation, employees could report to both a functional manager (regional office) and a team leader in charge of some “central” functions, such as Methodology or IT. In this way NBS could leverage expertise from regional offices, increasing communication and collaboration across departments, and the ability to respond quickly to changing needs in workload. Matrix organisation has been tested in Italian regional offices;
* NBS should decide soon on the Census data collection modes: the remaining time is not enough to design, implement and test the “multi-channel” option. Multi-channel data acquisition implies a real-time monitoring dashboard and there is no time to put in production such a system;
* NBS should avoid experimenting too many techniques in parallel: define a plan for testing CATI and CAWI, with a strategy for tools and techniques that spans over the years. Test the different tools thoroughly, checking the advantages and disadvantages, and decide on a limited number of collection environments;
* NBS should start designing the the “System of Registers” defining the vision, priorities and connection. Verify the possibility of creating a unit responsible for all registers, in order to optimise data collection procedures and design the integration between registers more simply.

**Chapter 6: Dissemination**

**Overview of dissemination in the National Bureau of Statistics of Moldova**

The Dissemination and Communication Division has a small number of employees if compared to the complexity and volume of tasks assigned. It is important to emphasise that these employees are full of enthusiasm and try to achieve all goals, but this is very challenging and hard work. This Division consists of 9 posts, of which 6 are currently filled. Work in dissemination and communication is separated to different areas:

* Maintaining the release calendar according to the Statistical Program of Works;
* Creation, development and publishing of publications;
* Dissemination of data in the Databank;
* Maintaining the relationships with users;
* Managing the wide scope of users demands;
* Paper publishing is very limited (1-2 publications per year);
* Publishing of reference metadata (<https://statistica.gov.md/en/metadata>)
* **NBS Web sites**

Statistica.gov.md

* Is the official NBS web site;
* Holds a variety of documents, for example:
* Law on official statistics, article on dissemination;
* Policy of dissemination;
* Strategy of dissemination;
* Code of practice of EU;
* Quality policy;
* Statistical methodologies, including reference metadata, and classifications.
* NBS conducts annual user satisfaction surveys by sending a questionnaire via email to users;
* NBS conducts the annual user satisfaction surveys on the main website since 2021;
* The website is the CMS developed in-house by a third-party company;
* The Open Data Watch assessment - ODIN 2022, ranked [www.statistica.gov.md](http://www.statistica.gov.md) and [statbank.statistica.md](http://statbank.statistica.md) 15th in the World and 2nd in Eastern Europe.

Statbank.statistica.md

* Is the main dissemination database;
* The latest mobile-friendly version of PX-Web is implemented;
* PX-Web API is available for each table from Statbank for automized re-use of data by any app;
* Dissemination section prepares the PC-Axis files with the use of PX-Edit.

Statistica.gov.md/ro/infographics

* The webpage provides an extensive list of infographics on various subjects;

Genderpulse.md

* Is the interactive tool to view data on gender-sensitive statistical indicators;
* The user interface focuses on data visualisation;
* The visualisation elements are integrated with the PX-Web Stat Bank and provides API for automized re-use of data by any app (one of the open data principles) ;
* The name of NBS is not easy to discover on the website;
* The tool is not mobile-friendly.

Recensamant.statistica.md

* Is the 2014 Population and Housing Census website;
* Data is provided in various formats such as overview of the key indicators, tables, maps and infographics;
* The maps aren’t browsable;
* The name of NBS is not easy to discover on the website.

Web analytics

Web analytics are done using Google Analytics by the IT department. The Google Analytics statistics are monitored by the Dissemination and Communication Division.

Future plans

* Open SDG is to be released in 2023.

**Recommendations**

* NBS should consider moving to more automated ways of updating the PC-Axis database, including implementing the Nordic metadata model and the efficient way of populating Nordic metadata model data tables;
* NBS should investigate the use of dynamic mapping tools;
* NBS should broaden data dissemination by developing data visualisation. Moldovan figures publication can become the first data visualisation driven web product;
* NBS should consider how to develop capacity and infrastructure in storytelling;
* NBS should investigate the use of no-code and low-code web editors to make web publishing more efficient and involve statisticians in web publishing;
* NBS should consider the use of UI/UX web design best practices to improve quality of the web-based publications;
* NBS should release all its data under the common brand including the main website, PX-Web, Gender Pulse, 2014 Population and Housing Census and the Open SDG (to be released in 2023);
* NBS should make its infographics discoverable more easily. Showing the whole list and paging through it is the better option;
* NBS should take the Mobile First approach including the GenderPulse which isn’t mobile friendly for the moment;
* NBS should consider introducing a standards content management approach across the websites to reduce the burden of maintaining different platforms.

**Chapter 7: Non-Statistical IT**

The Financial Management Division uses 3 external software tools:

* FMIS (Financial Management Information System) administered by the Ministry of Finance - used for the development and planning of budget projects, financing plans, budget execution and for drafting, signing and systemizing financial reports (monthly, quarterly, annually);
* GAB (Budget allocations) administered by the Ministry of Finance – used for the disaggregation of the approved, modified, rectified budget and for redistribution of the approved budget;
* AIS “Accounting Software” administered by “Program-TEST” SRL (outsourced from 2018).

The FMIS and GAB systems are used for all public institutions. The Center for Information Technologies in Finance (CITF) provides access and creates user accounts only on request from the Director General of NBS. FMIS and GAB enable the NBS financial department to create, sign and transmit the set of monthly and quarterly reports. It is necessary to have a qualified advanced electronic signature. Implementation and maintenance support is provided by the public institution CITF. FMIS and GAB are provided without additional charge as free software. AIS “Accounting software” was purchased in 2018 at the price of 114.000 lei, including database development services. AIS "Accounting software" maintenance costs approximately 90.000 lei annually.

HR uses an IT system for human resources functions, developed by CTIF (Center for Information Technologies in Finance - https://ctif.gov.md/en/despre-ctif). This system is very difficult to use (electronic register of employees) and is designed based on the needs of the Ministry of finance (for development of wage policy), this is not proper HR software.

**Recommendations**

• NBS should be proactively involved in testing new cross-government applications to ensure these applications meet NBS’s needs;

• NBS IT should be engaged only in statistical production, not in non-statistical IT;

• NBS should implement an Intranet where all the documentation (statistical and non-statistical) can be collected, and information can be shared.

**Annex: Sector Review of IT in Official Statistics for the National Bureau of Statistics of Moldova – Agenda**

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| **Day 1, Monday 6 February**  |
| 09.30-10.30 | Meeting with the senior management of the NBSIntroductions, plans and priorities for the week | Lead: Steven ValeSenior managers |  |
| *10:30-11:00* | *Coffee break* |  |
| **Sector Review of IT in Official Statistics** |
| 11:00-12:30 | IT strategy, human / financial resources for IT, annual and multi-annual planningPresentation by NBS and discussion | Lead: Frankie Kay Directors of IT, human resources and finance, other staff involved in strategy and policy | Chapter 1 |
| *12:30-14:00*  | *Lunch break*  |  |
| 14:00-15:15 | Meeting with all IT staff – strengths, weaknesses, opportunities, threatsDiscussion | Lead: Frankie KayAll IT staff | Chapter 1 |
| *15:15-15:30* | *Coffee break* |  |
| 15:30-17:00 | Meeting with other producers of official statistics and other relevant government agencies (M-Connect?) assessment of any broader cross-government requirements and constraintsDiscussion | Lead: Steven ValeRepresentatives of other producers of official statistics / other government agencies  | Chapter 2 |

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| **Day 2, Tuesday 7 February** |
| 09:00-10:30 | Overview of hardware infrastructure and IT security policyPresentation by NBS and discussion | Lead: Carlo VaccariIT staff | Chapter 3 |
| *10:30-11:00* | *Coffee break* |  |
| 11:00-12:30 | Overview of software infrastructurePresentation by NBS and discussion | Lead: Mira NikicIT staff  | Chapter 4 |
| *12:30-14:00*  | *Lunch break*  |  |
| 14:00-15:00 | Overview of data architecture, storage and managementPresentation by NBS and discussion | Lead: Marlen JigitekovIT staff  | Chapter 5 |
| *15:00-15:30* | *Coffee break* |  |
| 15:30-17:00 | Overview of data collection and other flows into the statistical officePresentation by NBS and discussion | Lead: Carlo VaccariIT staff  | Chapter 6 |

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| **Day 3, Wednesday 8 February** |
| 09:00-10:30 | Overview of dissemination, communication and GIS toolsPresentation by NBS and discussion | Lead: Marlen JigitekovIT staff, dissemination and communication staff | Chapter 7 |
| *10:30-11:00* | *Coffee break* |  |
| 11:00-12:30 | Overview of IT systems for administrative functions (HR, accounting, etc)Presentation by NBS and discussion | Lead: Mira NikicIT staff, users of the systems | Chapter 8 |
| *12:30-14:00* | *Lunch break*  |  |
| 14:00-17:00 | Follow-up discussions on specific topics / recommendation drafting | Review team / IT staff | All chapters |

1. Approved by the Government Decision no.604/2022, <https://www.legis.md/cautare/getResults?doc_id=133411&lang=ro> [↑](#footnote-ref-1)
2. <https://www.legis.md/cautare/getResults?doc_id=135257&lang=ro> [↑](#footnote-ref-2)