United Nations
Economic Commission for Africa

African Union
African Union Commission

CRMC/6/EXP/2022/19*
Distr.: General
19 August 2022

Original: English

Conference of African Ministers Responsible for Civil Registration
Sixth session
Expert segment

Addis Ababa, 24–28 October 2022
Item 8 (a) of the provisional agenda for the expert segment**
Digitalization of civil registration and vital statistics systems

Digitalization of civil registration and vital statistics systems in Africa

I. Background

1. Civil registration is a core and essential function of governments. By recording vital events in a country, such as births and deaths, individuals are able to gain access to basic rights and the government is able to develop more effective public policies, implement and monitor government programmes and plan future activities based on vital statistics. Information technology (IT) systems are critical to the establishment of well-functioning civil registration and vital statistics systems. The use of IT to collect, transmit, store, protect and retrieve data is central to data management of a civil registration organization in any jurisdiction. At the same time, if an IT system is not well designed and aligned with key recommended principles and key features of operations (including those outlined by the United Nations), it can obstruct the performance of a civil registration and vital statistics system and may even have a detrimental impact on a country's governance processes.

2. The use of digital technology for civil registration and vital statistics and the strengthening of interoperability of relevant IT systems have been continuously highlighted in the declarations adopted at sessions of the Conference of African Ministers Responsible for Civil Registration. Key relevant resolutions from the various sessions include the following:

* Reissued for technical reasons on 21 October 2022; previously issued under the symbol CRMC/6/MIN/2022/19–CRMC/6/EXP/2022/19.
** CRMC/6/EXP/2022/1.

A.22-01145

(a) At the second session, held in Durban, South Africa, in September 2012, the ministers resolved to: "ensure the alignment of health information management system and the CRVS systems";[1]

(b) In the Yamoussoukro Declaration, adopted at the third session, in 2015, the ministers went further, recognizing "the pervasive nature of information technology in CRVS applications" and they resolved to: "adopt a sustainable development stance for civil registration and interrelated systems by using appropriate information and communication technology that meet the legal, administrative and statistical functions of civil registration";[2]

(c) As part of the Nouakchott Declaration, at the fourth session, in 2017, the African ministers more specifically addressed issues related to IT systems for civil registration and vital statistics by encouraging African Union member States to develop shared information and communication technology assets in support of effective civil registration and vital statistics systems for the continent, which were built to common standards and were interoperable with other governmental systems, such as health and identity management. The ministers further encouraged "the Economic Commission for Africa, as the secretariat of APAI-CRVS, to lead the development of common information communication technology assets to support effective CRVS systems across Africa, ensuring the highest standards of data protection and confidentiality of personal data, in order to promote interoperability among civil registration, health and identity management systems, and having the flexibility to meet the needs of all African countries";[3]

(d) Lastly, at the fifth session held in Lusaka in 2019, the African ministers recognized the broader context and the importance of digital transformation for the achievement of Agenda 2063 The Africa We Want, of the African Union and the 2030 Agenda for Sustainable Development. The ministers also highlighted the importance of using IT to ensure the connection between civil registration and identity management, by being cognizant of the fact "that civil registration is a foundation for identity management and that the digitalization of CRVS provides a unique ability to eliminate duplication and inefficiency, a cost-effective way to identify individuals while providing greater access to public and private services and better gender inclusion". The ministers welcomed "the opportunity for the modernization of the CRVS systems in Africa through technological solutions that aim to build centralized digital civil registries for all vital events to enable wide access, inclusive coverage, and reduced costs through automated systems."[4]

3. Building on the above commitments from the African ministers responsible for civil registration in Africa and recognizing the tremendous value and importance of digitalizing civil registration and vital statistics systems, the session is intended to highlight the principles and best practices, key functional requirements, different licensing and service options, hosting choices, and procurement possibilities for countries to implement sustainable, reliable, stable and secure IT systems for civil registration and vital statistics. Such systems should facilitate the establishment, verification and authentication of legal identity in compliance with national legislation and the production of timely and reliable vital statistics.

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[1] See https://archive.uneca.org/sites/default/files/uploaded-documents/Statistics/CRMC3/crvs-conference-ministerial-statements_en.pdf.
[2] See https://unstats.un.org/unsd/demographic/crvs/global_crvs_docs/news/thirdconf_resolutions.pdf.
[3] See http://citizenshiprightsafrica.org/wp-content/uploads/2017/12/Nouakchott-Declaration-CRVS-Dec2017-English.pdf.
[4] See https://au.int/sites/default/files/newsevents/workingdocuments/38223-wd-declaration_crvs_after_adoption_english.pdf.

4. While the focus is on the IT systems used to manage the operations of the civil registration organization and its functions, it is recognized that there are important linkages that civil registration and vital statistics systems should have with other IT platforms within the government, such as the population register, health information systems, voter registry, national identification (ID) system, and the vital statistics system, among others. It is therefore essential that the IT solution adopted, supports an integrated approach to civil registration, vital statistics and identity management.

II. Key issues

5. The present paper provides a summary of the principles and recommended best practices for the implementation of digital civil registration and vital statistics systems. It also provides an outline of key functional requirements for such digital systems, defining risks and benefits of different licensing options and service and hosting options for digital statistics systems, and highlighting considerations for the procurement of statistics IT systems. These key issues are modelled after the recently produced "Best practice guidelines for digital CRVS systems".[5] The guidelines have been issued in draft form for consultation and are currently under revision by partners. Further input from any interested stakeholder would be welcome.

III. Principles and recommended best practices for digital civil registration and vital statistics systems

6. The principles for the implementation of digital civil registration and vital statistics systems are the general rules and guidelines that inform and support the objectives of the system. They are designed to help countries develop and procure IT solutions to support universal registration of vital events (including the establishment of a legal identity for all persons) and the production of vital statistics. As such, these principles can also guide countries in their engagement with IT system vendors.

7. The following principles are proposed for consideration by countries:

(a) *Legal compliance*: the implementation of digital civil registration and vital statistics systems must comply with relevant national legislation or policy (e.g., civil registration and vital statistics, privacy, data-sharing, digital government). The development of statistics IT systems must explicitly discuss how to ensure compliance with existing legislation;

(b) *Sustainability*: civil registration and vital statistics IT systems are expected to be a long-term investment for a country and must therefore be sustainable over the long term with regard to the technical components (software and hardware), the maintenance of knowledge to manage the IT system, the relevant support contracts or service agreements, and the financial resources for the expected lifetime of the IT system;

(c) *Privacy and security by design*: civil registration and vital statistics IT systems include significant amounts of personal data and therefore, data security and privacy are important considerations in the selection and design of any system. To implement this recommendation, security requirements (including regular updating) should be identified at the

[5] Gloria Mathenge and others, "Best practice guidelines for digital CRVS systems". Noumea, New Caledonia, Pacific Community, 2021. Available at https://sdd.spc.int/digital_library/best-practice-guidelines-digital-civil-registration-and-vital-statistics-crvs.

same time as functional requirements, and they should be explicitly included in tender documentation;

(d) *Disaster mitigation*: civil registration and vital statistics IT systems should include measures to mitigate the risks of hazards (both natural and unnatural), such as the possibility to export data and metadata. The system should take into consideration the electricity supply to servers and data centres, the physical security for premises, and support for business continuity;

(e) *Person-centred nature*: the vital event record of every individual in the civil registration and vital statistics IT system should be connected and relationships between individuals should be captured. This will promote integrity and consistency of data, and will better support modern uses of civil registration data, for example, by developing a population register;

(f) *Interoperability and data-sharing*: civil registration and vital statistics IT systems should be able to share data with other government agencies based on the legal mandate of such sharing. Application programming interfaces are essential to providing secure interoperability with internal or external services for various clients;

(g) *Appropriateness to country context*: civil registration and vital statistics IT systems should not require a greater IT skillset or capability (for implementation or ongoing maintenance) than can be supplied within the national context. Implementation of a system should include measures to address knowledge gaps as needed;

(h) *Easy access to data*: civil registration and vital statistics IT systems should make it easy for people to gain access to data for reporting, discovery and analytical purposes, within applicable legal or personal data protection constraints. Modern data analysis and reporting methods, such as dashboards and visualizations, should be provided;

(i) *Country data ownership*: civil registration data are regarded as nationally significant and the data often have significant cultural, historical and or monetary value. Accordingly, such data should be owned by the country, and the IT system should adhere to the country's sovereignty. As applicable, contracts should state what access or use permissions a vendor may have;

(j) *Flexibility*: civil registration and vital statistics IT systems should be flexible in their design to handle changes in statistics processes and to respond to ongoing technological changes. Any IT system that is intended to support multiple countries must take into account the significant differences between countries;

(k) *Knowledge transfer to countries*: civil registration and vital statistics IT systems should be fully managed and supported by staff within the government. Procurement should therefore include the transfer of knowledge about the system along with adequate training of the teams that will be using and managing the system.

IV. Functional requirements

8. The following features provide the functional requirements of digital solutions for civil registration and vital statistics IT systems, which will enable the system to operate in line with the following United Nations principles and standards:

(a) *Capacity to register all vital events*: a civil registration and vital statistics IT system should have the capacity to register all vital events and collect cause of death information in accordance with international standards;

(b) *Inclusion of all steps in the end-to-end processes for civil registration and vital statistics*: the processing of vital events from notification to the production of vital statistics should be possible in the system;

(c) *Detection, merging, and removal of duplicate records*: the entry of more than one record for the same event should be automatically detected and the error resolved;

(d) *Querying and record searches*: users need to be able to search and retrieve records from the IT system, using a variety of parameters, for example, single names, geographical details and date ranges;

(e) *Correction and amendment of records*: authorized individuals should be able to modify civil registration records to reflect amendments to records;

(f) *Certificate management*: users should be able to print all required certificates, based on defined templates, and the system should keep records of all certificates printed;

(g) *Activity logging capabilities*: the system must log all user actions and any action taken by a user within the system, for example, to access, create, update or delete a record, must be recorded in a log;

(h) *Data importing and exporting*: the system should be able to receive and send data electronically to other, external platforms;

(i) *Role-based user permissions*: the system should define which users have access to the functions and categories of data, and what type of access should be assigned to specific roles within the civil registration and vital statistics system;

(j) *Storage and backup*: the system must include mechanisms to ensure the availability of data and the ability to restore data in an adverse event, such as a natural disaster, or system failure;

(k) *Consistency in monitoring of risks and improvement*: the system should regularly conduct system audits to facilitate constant monitoring of risks;

(l) *Online and offline access options*: the ability of the civil registration and vital statistics IT system to function in both online and offline modes is essential to facilitate civil registration;

(m) *Mobile device capabilities*: the system should be designed to work on mobile devices, including in offline mode on those devices;

(n) *Fraud detection capabilities*: the IT systems should incorporate mechanisms for fraud detection;

(o) *User alerts*: user alerts sent to clients, by SMS text messaging or email, can help to improve service delivery, for example, by notifying a client that a certificate requested is available for collection.

V. Non-functional criteria for IT solutions

9. In addition to the features and functional requirements described above, the following non-functional criteria should also be considered when developing or selecting an IT solution for civil registration and vital statistics systems:

(a) *Usability*: ease of use of the software should be considered, such as its configurability with a multitude of options, its ability to support local languages, and friendliness of the user interface;

(b) *Reliability*: the ability of an application to run consistently over time without failure. To meet this requirement, the software should allow for and implement regular system and data backups for use in case of failure;

(c) *Scalability*: the possibility of scaling up the solution to maintain consistent performance, such as available infrastructure and internet connectivity, without crashing or stalling as the number of users and data grow, needs to be considered;

(d) *Security information and event management capability and processes*: all systems should have out-of-the-box authentication, authorization and data encryption mechanisms;

(e) *Analytics*: understanding the analytical features of the system will be helpful in improving decision-making. For example, does the software provide online and offline functionality, visualizations and the ability to connect to third-party analytics platforms and data warehouses for natural language processing and predictive analytics?;

(f) *Telecommunications*: country telecommunications infrastructure needs to be taken into consideration when implementing and developing a civil registration and vital statistics system. Network capabilities, whether a wide area network or local area network, are a key requirement for data interoperability, data-sharing and data integration.

VI. Licensing options for digital civil registration and vital statistics systems

10. In addition to the principles and functional and non-functional requirements outlined above, it is important for countries to consider different licensing options for digital civil registration and vital statistics systems and their benefits and risks. Specifically, three main types of licensing options for digital civil registration and vital statistics systems are proposed and set out below:

(a) *Option one*: custom-developed software, whereby the software is built from scratch to suit the prescribed needs of the users. This solution is specifically designed for a particular setting and any interoperability needs for integration with other systems may be built into the system. This customized development experience can create ownership and improve sustainability. Such a custom-development, however, does not necessarily take advantage of the civil registration and vital statistics experience in other jurisdictions and may require more time and financial investment – especially at the initial stage, compared with commercial or community-supported solutions. In addition, it will be important to ensure that support from the developers is secured in the long run for the maintenance and possible modification of the system. Continuous innovation funding will also be required to update the system in order to keep up with the changing technology landscape, such as security updates;

(b) *Option two*: commercial off-the-shelf software, whereby the products are ready-made and are readily available for purchase from the commercial market. This option commonly requires less up-front investment in terms of human and financial capital and, depending on the contractual arrangement, offers the opportunity to tap into the experience of the company producing the software with regard to customization, installation, implementation and continuous upgrading – with all of these services likely coming with a cost. This option also has the advantage of the buyer being able to evaluate the solution before purchase and the commercial solutions would typically be designed to adapt to different infrastructure and environments and would have been tested by more users. This option, however, raises the risk of reliance on a specific vendor for ongoing support; in addition, the intellectual property of the system may not be available, thereby preventing independent modifications of the system. It will also be important to closely consider the fee structure of this software solution, comprising the periodic fee, fee for a set number of users and fee by usage, which may be unclear or complex;

(c) *Option three*: community-supported open-source software in which the source code and the software product are freely available and there is an active community of practice to support their continued development. This option involves no direct financial cost for the purchase of the software solution and it gives stakeholders the right to make changes to the software. The software will require a community to support it and this community, in turn, can support updates and enhancements of functionalities from all jurisdictions in which it is implemented. Stakeholders should consider that, even if the software is free, the configuration, implementation and system operations still require financial and human investment. Furthermore, a loosely knit community might not be able to provide the necessary business relationship, liability and accountability, and if the community is not sufficiently strong it may not be able to maintain the software.

11. Although the three options are presented as separate solutions, it is important to note that they potentially overlap: for example, open-source software can potentially be adapted and then sold commercially.

12. Modifications will be required to all systems in the course of their initial implementation and lifetime of use, regardless of the type of software chosen. Countries should endeavour to understand from the vendor or provider of the software the cost implications of any required changes to the standard system to enable it to meet the specific requirements of the country.

13. When adopting a digital solution for civil registry and vital statistics systems, countries need to select a service and hosting options (where the IT system and data will be hosted, maintained and accessed). A range of technical and human resource aspects will need to be considered before making a decision, including, server space, uninterrupted power supply, security and privacy protocols, anti-virus software, back-up servers, and skilled personnel to manage these systems.

14. The following paragraphs set out three main options that are available for services and hosting:

(a) *Option one*: software as a service where the database and application are hosted on remote servers and the software is sold (or offered freely) as a service that can be contracted based on use. The software is relatively easy to implement and its maintenance is managed by the service provider. This option requires only minimal hardware – for example, having no server – needed for access to the software over the Internet; as data are hosted on remote servers, however, high-quality Internet access may be required for access to the data, and jurisdiction

over the data may not be in the control of the customer using the service. The payment of regular fees may also become a challenge in the future. This solution, however, may have limited customization options and countries should bear in mind that the system is dependent on vendor support;

(b) *Option two*: outsourced system and data storage – when the organization customizes, buys or develops the software and then hosts the system and data at an external centre and pays for storage on a per user or per month or year basis. With this option, servers are safely located in a secure data centre and control is retained over the software and its functions and features. This option, however, requires continuous connectivity between the practitioner and data centre, the software and operating system licenses still need to be purchased, and the hardware and software may still need to be supplied or purchased with a monthly fee;

(c) *Option three*: self-hosted means that the software and data are hosted internally by the organization or ministry, with complete control of servers, data and all functions and features of the software. With this option, however, servers are subject to vagaries of the local environment, such as power outages, flooding, fires, earthquakes, among other eventualities. The system requires the owners to implement backups and procedures for disaster recovery, and it is the owner's responsibility to maintain the operating system and application, including software patches and upgrades. This places more demands on the local IT staff and there are potentially higher total costs associated with ownership.

15. Procurement of IT systems for civil registration and vital statistics refers to the series of activities and procedures followed to acquire all necessary hardware, software and networks needed to establish and make functional an IT solution for civil registration and vital statistics systems. The process entails determining the requirements for the system, communicating with suppliers, administering procuring contracts, managing IT assets and assuring quality of the products and services procured. Procurement of such IT systems is at the core of the civil registration organization's business as any changes effected can have significant impacts – both positive and negative – on the performance of the organization, including its relationship with other stakeholders with whom civil registration services and products could be linked, such as the population register and the health system. Procurement processes should therefore be managed carefully and under the leadership of an appropriate technical team that is well versed in the requirements of the project.

16. Within the civil registration organization, or as a part of the broader government ministry within which the civil registration agency sits, there should be an established model or protocol of IT procurement that provides guidance on managing procurement procedures and tasks, and makes possible the maintenance of collaboration between the people involved in the IT system procurement process. Such a model is important as it serves as a framework to be used by management teams to make the process of acquiring IT systems easier yet comprehensive. Following an established model will help ensure that the procurement process follows best practices and mitigates any possible risks.

17. A generic procurement process begins by defining the civil registration and vital statistics system process and requirements of the system and of the civil registration organization. The gathering of requirements entails establishing a business case for the IT procurement process in alignment with the country's vision and goals for the civil registration and vital statistics system and organization.

18. A request for expressions of interest should be launched to find out what vendors are offering, what contractual aspects are not negotiable (hosting, source code rights, among other things), from which a shortlist of providers to receive the request for proposals can be elaborated. This is followed by a process to define tender selection criteria. The request for proposals should be elaborated on through a consultative process involving relevant stakeholders based on objective requirements. Tighter criteria will receive targeted responses that can be compared. Vendor warranty, maintenance and local support services after implementation should be included in the procurement package.

19. As a next step, the request for proposals should be released with an option to respond to bidders' questions. Questions raised by bidders should be discussed and answered in writing. Following this, all aspects of the proposals received should be evaluated, including total cost of ownership (both initial implementation and operational costs of the IT system) and ensuring that the hardware proposed by the vendor is of good quality and fits the target IT environment. Prospective owners can also consider sending a list of questions or areas to be clarified to the bidder along with a timeline within which the responses should be provided. At this stage, it may also be valuable to gain insights by contacting other countries implementing the IT systems offered by the bidders, to collect feedback on the performance of the specific vendors' IT systems.

20. Lastly, the final contract needs to be awarded, negotiated and then signed. The contract is of critical importance as it legally defines the relationship with the vendor and what is expected from the vendor – warranty, maintenance and support services should be properly outlined within the contract – along with the delivery of a functional IT system with all relevant documentation, including manuals and passwords. The cost of developing new features for the IT system during its lifetime should also be included in the contract. Cases in which the software is licensed for a given timeframe, the contract should clarify how the vendor may charge fees for additional users or usage of the system. It should be made clear in the contract that all data are owned by the government (or its residents, depending on the legal framework), and the vendor can neither claim ownership over data nor withhold access to them. There should be a software escrow arrangement in place, so that the IT system source code is held by a third party and accessible to the government in case the vendor ceases to exist as a result of bankruptcy. Periodic reviews of vendor performance should be included in the contract, as well as provisions on how to handle the transition if the contract is terminated.

VII. Key messages

21. The following key messages are put forward for consideration by the Conference:

(a) The resolutions from previous sessions of the Conference of African Ministers Responsible for Civil Registration have highlighted the value and importance of the digitalization of civil registration and vital statistics systems. Such digitalization is also a priority of the Africa Programme on Accelerated Improvement of Civil Registration and Vital Statistics Systems secretariat;

(b) Digitalization is foundational to decentralization by enabling the connection between remote service points of civil registration and a central authority and database. Furthermore, it facilitates interoperability with other sectors and systems such as, for example, the health information system;

(c) The IT system is a critical enabler in realizing the full potential of an end-to-end civil registration and vital statistics system. The system will enable direct exchange with the ID

system to generate identities at birth and retire them at death, and interchange with other government systems for more equitable and effective provision of services;

(d) There is need for careful consideration when procuring an IT solution for an end-to-end civil registration and vital statistics system. These considerations should include key principles and best practices, key functional requirements, different licensing and service options, and hosting choices;

(e) Consideration should be given to conducting the transition to an end-to-end digital civil registration and vital statistics system in a phased process, to allow for learning, a change in practice, capacity-building and adaptation of the IT solutions.

VIII. Questions for group discussion and reflection

22. In the light of the above messages, the following questions are put forward for group consideration:

(a) What have been your greatest successes and challenges in digitalizing the civil registration and vital statistics IT system?

(b) Are the presented principles and best practices, key functional requirements, different licensing and service options, hosting choices and procurement possibilities the most significant ones? Or are there others that, based on country experience and expertise, should be considered?

(c) Given the guidance that is currently available, are there gaps in which more support may be useful?

(d) Which migration strategies from a paper-based IT system or a legacy IT system (or both), should be taken in the adoption of a new IT system?

IX. Key recommendation

23. Countries should actively pursue the digitalization of civil registration and vital statistics systems to reap the full potential of those systems for the benefit of all-of-government and civil society. Before doing so, countries need to take into consideration a broad range of principles and best practices, key functional requirements, different licensing and service options, hosting choices, and procurement possibilities.

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