Chapter 9 Auditing Public Debt Management Information Systems

This chapter helps SAIs to understand the main functions of a PDMIS and its importance in PDM. The chapter also provides an audit approach that incorporates INTOSAI standards and guidelines related to public debt audit, and the relevant audit types, criteria, sources of evidence, and sample audit questions and findings.

9.1 What Is a Public Debt Management Information System?

Typically, for government debt managers who manage large and risky debt portfolios that include foreign currency transactions, the following core functions are usually required:

- **Debt recording and analysis.** A general ledger capability is needed to account for transactions and to record debt servicing obligations. Information on the debt profile includes principal amortisation schedules, amount of outstanding debt and due dates for debt-servicing payments. This is essential for managing liquidity, preventing default and assisting with reporting needs (budget tables, reports to sovereign credit rating agencies, etc). If government debt managers are undertaking public debt issues, conducting hedging and buyback transactions or trading strategically with a goal of making risk-adjusted returns, they will need to capture market data through access to live prices such as spot and forward exchange and interest rates, as well as swap market spreads and secondary market spreads.

- **Risk and performance analysis.** This could include elements such as scenario analysis for assessing cost–risk trade-offs, information on costs at risk or budgets at risk, comparisons between the composition of the actual portfolio and the benchmark portfolio, tactical trading performance relative to position limits and loss limits, and an assessment of credit exposure against peer credit limits.

Therefore, the complex nature of public debt and its dependence on consistent and timely data for accurate analysis has encouraged many countries to develop or acquire debt management information systems. These systems ideally aid them in the recording, analysis, management, monitoring and reporting functions of public debt. The system is a combination of software, hardware, people and communication system that support data input, processing, storage and the production of outputs, such as management reports of both domestic and external debt portfolio.

For sound PDM, a PDMIS should support the following functions:

- **Recording function.** DeM staff should be able to record debt and debt-related information, including basic details and terms of contractual debt instruments, such as loans and debt securities, in addition to actual transactions of disbursements and debt service and forecast for debt service schedules.

- **Reporting function.** DeM staff should be able to generate reports that meet internal and external reporting requirements, such as debt reports for the World Bank's Debt Reporting System, Quarterly External Debt Statistics, General Data Dissemination System, Special Data Dissemination Standard, etc.

- **Analytical function.** DeM staff should be able to obtain debt indicators and develop 'what if' scenario analyses resulting from hypothetical changes in financial variables. This function, linked with up-to-date market information such as interest and foreign

exchange rates, as well as key macroeconomic information such as government revenues, GDP, international reserves and exports, will assist in analysing the public debt portfolio and the debt strategy. Interface with strategic modules should be also foreseen as, for example, with the MTDS module.

In addition, a PDMIS should be able to be integrated with other public financial management systems, such as treasury management and budget execution systems.

SAIs should be mindful that the computer software and hardware components will not be effective in accomplishing these functions without well-trained staff and well-designed procedures.

Characteristics of a good public debt management information system. A good PDMIS should do the following:

- Enable debt managers to record cash flow accurately for all transactions and to translate these flows into present values when necessary. The cash flow involved is associated with foreign currency and domestic currency borrowings, hedging and trading activities, and on-lending.

- Use a single database for best accuracy and efficiency. The system used should cover all or most of the flow of transactions between different parts of the organisation.

- Provide access to market information services. Wherever feasible, manual data processing should be minimised.

- Ensure integrity of the data produced and allow for further developments and system updates.

- Be user-friendly and easy to maintain, have adequate security features and be accompanied by good user documentation and online help.

- Provide complete coverage of all the financial instruments (loans and bonds) and their basic information (debtor, creditor, amount, currency, interest rate and schedule of repayment, etc.).

- Be able to produce reports on debt totals on an individual and aggregated basis with forecasting of debt service on existing and future borrowings.

- Identify standards related to information security.

- Have an emergency action plan in case of an information loss.

9.1.1 Commonly used public debt management information systems

UNCTAD's Debt Management and Financial Analysis System (DMFAS) and the Commonwealth Secretariat's Debt Recording and Management System (CS-DRMS) are the two major computer information systems that have been specially developed for use by government debt managers. Both systems are widely used and are designed to assist countries in capturing and storing information section by section in a computerised system. Both also include features that can analyse the stored information. These systems are used by different countries for management of the total debt portfolio or used in conjunction with other information systems that specialise in

specific debt instruments, such as auctions of domestic debt securities. Another option is the use of a country's own specific development or the adaptation of a commercial application to its own needs.

UNCTAD's Debt Management and Financial Analysis System (DMFAS). The DMFAS is a specialised debt management and financial analysis software. It enables the debt office to develop a debt database containing detailed and aggregated data on public and publicly guaranteed short- and long-term debt (external and domestic). It covers a large range of debt instruments (short- or long-term debt), including loans (bilateral, multilateral, private) and debt securities (bills, bonds with fixed or variable coupons, promissory notes, etc.), as well as Sukuk (Islamic securities). The system also allows for the recording and management of grants, on-lent loans, private non-guaranteed external debt and short-term external debt (aggregated or detailed basis) and real transactions (real drawings and debt service operations). The classification of instruments in DMFAS reflects the current international standards. Because the system can process large quantities of debt data, more time and energy can be deployed on analytical and management tasks. Its design allows for easy customisation and adaptation in accordance with the needs and preferences of each client institution. It is regularly enhanced so that it remains current with, and helps establish, best practices in DeM. In order to improve overall public financial management, the DMFAS software can be interfaced with other integrated financial management systems using web services.[27]

Commonwealth Secretariat's Debt Recording and Management System (CS-DRMS). The CS-DRMS assists countries in recording and managing debt by providing a comprehensive database for external and domestic debt data, both public and private, on a section-by-section basis as well as tools for analysing and managing the loan portfolios. It is regularly enhanced to reflect changes in internal operations, creditor practices, debt reporting standards and technology in order to reflect the best available options in DeM. The CS-DRMS is an integrated system that records various types of monetary flows within both external and domestic debt for everyday administration and management. The CS-DRMS is used mostly in Commonwealth countries. It has an external debt module that allows for the recording of a wide range of official and commercial needs, including short-term and private sector debt. It also provides a domestic debt module that allows for recording transactions during the issuance cycle of domestic debt instruments, such as treasury bills, bonds and notes. CS-DRMS is also used for planning debt issues, auctions and bid analysis. Actual and forecast transaction data as well as data on arrears are captured in a manner that meets the international debt data guidelines. The system is also capable of handling debt restructuring, including debt refinancing and Paris Club rescheduling.

The special management tools module assists debt managers in debt strategy formulation and analysis, such as portfolio analysis, sensitivity testing for risk management and monitoring of debt sustainability indicators. There are also various querying and reporting facilities, including standard reports and a custom-built report generator. Multilayer security features are provided to meet individual country requirements.[28]

Today the majority of developing countries use one of the above two systems, in combination with other information systems, for the management of public debt.

[27] For additional information please refer to http://vi.unctad.org/debt/debt/m2/documents/dmfas.pdf.

[28] For additional information please refer to https://thecommonwealth.org/about-cs-drms.

9.1.2 Controls for information systems

General controls provide the framework of overall controls for IT functions. In other words, they are like a foundation on which specific application controls are built. General controls relate to all parts of an IT system, and must therefore be evaluated early in an audit. General controls are needed to support the functions of application controls, and both are needed to ensure complete and accurate information processing.

The following are various categories of general controls.

- **Organisation and management controls** are aimed at ensuring operational efficiency, sound human resource policies and management practices, and adequate segregation of duties between the information processing area and the other organisational sections as well as within the IT system itself, and at providing methods for assessing effectiveness.

- **Segregation of duties** ensures that one person does not have complete control over a monetary transaction throughout its initiation, authorisation, recording, processing and reporting cycle. The following techniques are used to provide reasonable assurance in this regard:

  - User identification codes/IDs;
  - Passwords; and
  - Supervisor review at scheduled or random times.

- **Operational controls** refer to the day-to-day operations and usage of the hardware and software within the organisation. Operational controls ensure that IT processes are effective and efficient and that only authorised working practices are adopted. Operational controls include the following aspects:

  - Activity logging and reporting—error logs, transaction logs and access control logs;
  - Monitoring procedures;
  - Media management, including proper management of disks, tapes and CD-ROMs;
  - Support requirements, including backup, training, help desk and problem management;
  - Regular and proper data back-up to avert loss of important information in the event of system maintenance failure, both hardware and software;
  - Processing requirements, including batch and online processing; and
  - Effective monitoring and administration of the network.

- **Physical controls (access and environmental)** are aimed at preventing unauthorised access to and interference with IT services. They include administrative procedures; for example, staff identity badges and control of visitors. Physical measures such as mechanical key locks and electronic door locks are often used.

- **Logical access controls** use a computer system's built-in security to prevent unauthorised access to sensitive files and data. This control also ensures that access rights of all users are limited to the requirements of their job descriptions.

- **Security management controls** is a centralised application to monitor the security of all the applications in use.

- **Program change controls** are necessary to ensure that all changes to the system configuration are handled accurately, completely and in a timely manner. Poorly designed changes could alter relevant information and remove audit trails.

- **Business continuity planning** and emergency strategies are essential backups for any business, and government offices are no exception. It is important for debt management offices to fully develop comprehensive recovery strategies to ensure that government debt management operations can continue to operate in the event of natural disasters or other unforeseeable events.

The SAIs need to determine ahead of time the appropriate methods that should be applied during testing, because typically there are not enough time and resources to test all the controls. Four basic methods are followed in testing general controls:

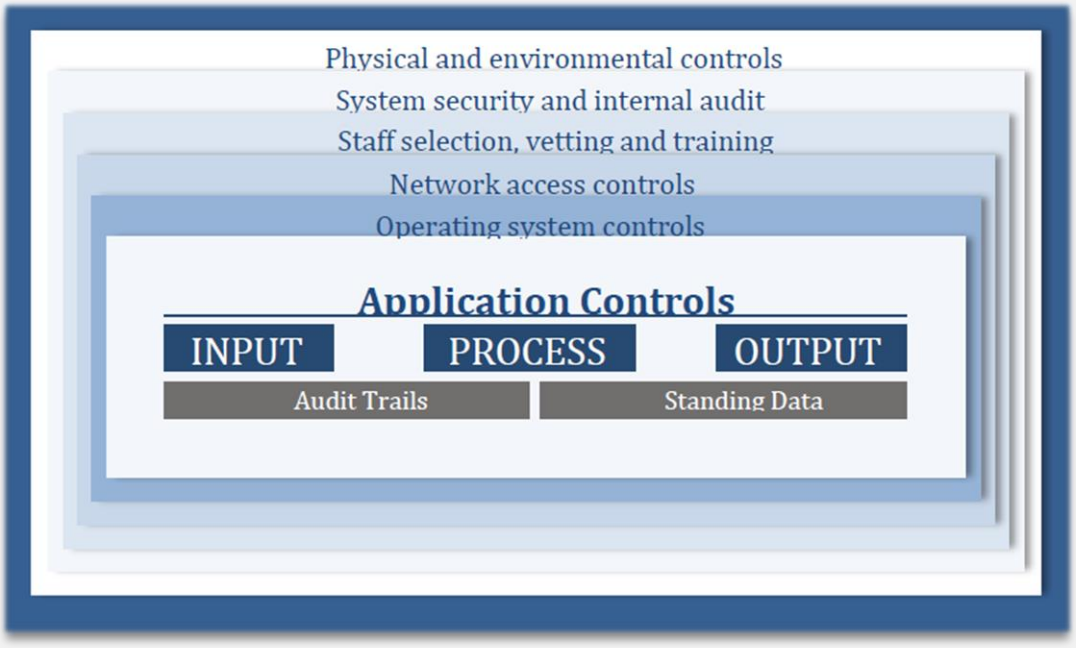
- Inquiry;
- Inspection;
- Observation; and
- Limited re-performance.

After testing, the SAIs document and evaluate the test results to arrive at a conclusion about the effectiveness of a system's general controls. If the general controls are found to be weak, the audit may not be able to proceed to testing of application controls and may have to rely on substantive testing. However, if there are few minor weaknesses, they can be reported to the public debt office during the exit conference or through an audit note.

After determining that the general controls operate effectively, the SAI is ready to test the application controls. Data are tested over accounting applications in order to assure that all transactions are authorised, recorded and processed accurately and on a timely basis. Application controls relate to the transactions and standing data pertaining to each computer-based system and are therefore specific to each such application. They may consist of manual procedures carried out by users (user controls), or automated procedures and controls performed by the computer software, as shown in *Figure 11*.

Figure 11. IT Controls Framework

Source: IDI – ISCITA e –Learning Course on Auditing IT Control



In a PDMIS, it is essential to perform data quality control or data validation and to ensure the reliability of debt data on a long-term basis. Debt data validation is defined as the process of ensuring that debt data are complete, accurate and consistent in order to produce reliable and timely information that meets the objectives and needs of domestic and external institutions.

An assessment of the quality of the database will reveal the weaknesses as well as the strengths of the DMO in being able to compile and record accurate, consistent and comprehensive data. In an audit, the SAI analyses the entire set-up of the debt office, its organisation and its procedures. Debt data validation has a narrower focus and concerns only the database and its surrounding procedures.

Data validation is important to check whether:

- Agreements and/or transactions may be missing from the database (data validation will check the completeness of the information). For instance, SAIs should check that all payment notifications (billing statements) have been received prior to the due date.

- Agreements and/or transactions may be miscoded (data validation will check the accuracy of information). For instance, billing statements should be checked against the debt office's projections and dates of payments.

- Different institutions may have conflicting information about the same debt (data validation will check the consistency of information). For example, SAIs should check the timeliness of payments and determine the cause of any late payment.

The debt data validation should be understood as an ongoing process of quality control by the DMO itself. It includes:

- Assessment of the reliability of the debt database;
- Measures for remedying errors found; and
- Implementation of regular measures of quality control in order to maintain the quality of the database over the long term.

9.1.3 Importance of a public debt management information system

Timely public debt reports help to prevent irregularities and safeguard assets. Because public debt operations involve large sums of cash, timely information on cash proceeds and payments associated with public debt transactions can discourage fraud. Consequently, a computer-based information system can help the country's debt managers to do the following:

- Produce timely, complete and reliable debt reports to policymakers and international monitoring institutions;
- Perform technical analyses of risks embedded in the country's debt structure, which are useful inputs in the development of a medium-term DeM strategic plan and the conduct of debt sustainability analysis; and
- Achieve the integration of debt and cash management with budgeting information into an IFMIS.

An effective and advanced informational system is characterised with several valuable features that trigger sound PDM. In particular, it:

- Enables debt managers to record accurately all cash flow transactions associated with foreign currency and domestic currency borrowings, hedging and trading activities, guarantees and on-lending, and to translate these flows into present values when necessary;

- Uses a single database for completeness, accuracy and efficiency and covers all or most of the flow of transactions between different parts of the organisation;

- Provides access to market information services and makes it available in the system, and minimises manual data processing wherever feasible;

- Ensures integrity of the data (valid, complete and accurate) produced and allows for further developments and for system updates, and is user friendly and easy to maintain, has adequate security features and is accompanied by good user documentation;

- Provides complete coverage of contractual debt instruments (loans and bonds) and their basic information (debtor, creditor, amount, currency, interest rate and schedule of repayment, etc.) and is able to produce reports on debt totals on an individual and aggregated basis with forecasting of debt service on existing and future borrowings;

- Enables all recorded transactions to be backed up, preferably automatically and in one repository, to ensure uniqueness of information regarding government accounts and revenues.

In many countries, one system is not able alone to provide all of the above functions of public DeM in an effective manner. If additional systems are used by the DMO, it is important that they share a common database and integrate it with any other specific module. Ideally, the integration of the PDMIS with the other public finance management systems should enable straight-through two-way electronic processing of debt operations such as payments.

9.2 Audit of Public Debt Management Information Systems

Before conducting an audit of PDMIS, SAIs need to acquire an understanding of the scope and characteristics of the country's PDMIS; how it is structured and managed; its applications; and how it is integrated with the DeM activities. Access to personnel and the computer systems is necessary to determine the audit approach. An audit of PDMIS calls for an independent assessment of how the risks are managed and mitigated to ensure the reliability of debt information. Two types of mitigating controls are commonly found: general controls and application controls.

When conducting the audit of public debt information, SAIs need to refer to the INTOSAI information system audit guidelines[29] and their respective SAI's information system audit manual. The INTOSAI guide includes high-level questions that are useful for SAIs, and a checklist is attached in its Annex D, focusing on the application control of DMFAS and CS-DRMS.

[29] GUID 5259, Public Debt Information System, provides auditors with descriptive guidance on auditing public debt management information systems. Because the INTOSAI already has some documents related to information technology (IT) audits developed by the Working Group on IT Audit, this GUID focuses on the application controls, which must be specific for the public debt management information system.

In carrying out an audit of PDMIS, SAIs need to check the following areas:

- Security features in the areas of debt data processing, and safeguards to secure access to and use of public debt data;
- Accidental and deliberate threats, and their impact on delivery of computer-related services;
- Effectiveness, integrity and completeness of controls within the system;
- Value for money in the procurement and development process; and
- Conformity with relevant standards.

9.2.1 Financial audit of public debt management information systems

If the audit of the PDMIS is conducted as part of a financial audit, the audit approach should be designed in a way that enables the SAI to check the design and implementation of controls for the purpose of ascertaining the extent of reliance that may be placed on the existing information system.

The objectives of a financial audit of PDMIS that cover general and application controls could be as follows:

To assess the design of the PDMIS (general and application controls) and test whether they are working effectively to enable the generation of complete, timely and accurate debt data.

9.2.2 Compliance audit of public debt management information systems

Under a compliance audit of the PDMIS, SAIs could evaluate the information systems' compliance with laws, regulations and directives related to its operations.

The objectives of a compliance audit of PDMIS that cover general and application controls could be as follows:

- To check the design and implementation of controls and compliance with laws, regulations and directives related to the operations of the information system.

9.2.3 Performance audit of public debt management information systems

The objectives of a performance audit of PDMIS that cover general and application controls could be as follows:

- To check whether the design and implementation of IT systems enhance the timeliness in the production of data, and the accuracy, completeness and integrity of the database to enable effective DeM operations; and

- To ascertain whether there are any gaps or deficiencies in information systems and IT controls and any effects on the DeM reporting performance.

9.3 Representative Audit Questions for Performance Audit of a Public Debt Management Information System

This section provides potential questions that SAIs may address in a performance audit of a PDMIS.

Audit objective: To check whether the design and implementation of IT systems enhance the timeliness in the production of data, and the accuracy, completeness and integrity of the database to enable effective DeM operations

- What DeM system is adopted, and where is it installed?
- Are there additional systems installed in different institutions? Do they share a common database?
- Are the debt programme and debt data secured and checked out only to authorised individuals by a custodian?
- Are passwords formally assigned, routinely changed and protected from use by unauthorised people?
- Does the computer system have embedded rules, such as credit checks, to verify the accuracy of debt information as it is entered into the computer?
- Are backup copies of debt files, programs and documentation maintained?
- Is there adequate documentation of the programs, applications and debt processing procedures?

Questions related to general controls

- Has a comprehensive strategy been developed and formally approved and is up to date?
- What are the bases on which the decision was taken to acquire or develop *vis-à-vis* competing systems?
- Are user guides easily available to the users, and are the users sufficiently trained for effective use of the system?
- Is there a helpdesk system to provide efficient trouble-shooting assistance, and how cost effective is that support?
- Is there adequate documentation of the debt management processes used by the system?
- Are responsibilities for controlling access to and use of files clearly defined?
- Are passwords formally assigned, routinely changed and protected from use by unauthorised persons?
- Is access to files and IT equipment through physical means well controlled?
- Have connections and access to the network been approved and secured? Is access to files and databases through software and networks well controlled using, e.g., virus controls and firewalls?
- Has effective risk assessment been carried out to identify the business and IT systems critical to the organisation?
- Have a business continuity plan and supporting detail procedures been prepared that allow recovery of the system in a controlled manner from a partial or total loss of IT or data and business services?
- Are back-up arrangements for files well controlled?
- When the system is integrated with the payment system, does it provide for a workflow process to control payments?
- If the debt system is integrated, are there sufficient firewalls to prevent wrong information flowing into the debt system through the integration?
- Are the different categories of users of the system satisfied that the system efficiently meets their needs? If not, what challenges do they face?

- Is the system being continuously improved?
- Are changes introduced to locally developed systems authorised and disseminated in a controlled environment?
- Are debt management system procurements consistent with the DMO's business process and IT strategy and do they adhere to procurement regulations?

Questions related to application controls

- Are all transactions entered in the system authorised, complete, accurate, timely and recorded once only?
- Are there appropriate processing controls in place to ensure completeness and accuracy of data?
- Does the system have adequate controls to ensure the accuracy, completeness, confidentiality and timeliness of reports?
- Is a complete audit trail maintained in the system to allow data and transactions to be traced from input through output?
- Does the system have necessary arrangements for creating back-up copies of data and programmes, storing and retaining them securely, and recovering applications in the event of non-availability of system and data?
- Are standing data in the system properly controlled and maintained to ensure reliability of data?
- Are the information systems used by different DMOs effectively interfaced?

9.4 Audit Criteria for Public Debt Management Information Systems

DeMPA tools articulate the importance of debt administration and data security.

DPI-12 concentrates on four crucial characteristics of debt administration: (1) availability and quality of documented procedures for processing debt-related payments; (2) availability and quality of documented procedures for debt and transaction data recording and validation, as well as storage of agreements and debt administration records; (3) availability and quality of documented procedures for controlling access to the central government's debt data recording and management system and audit trail; and (4) frequency of off-site, secure storage of debt recording and management system backups.

DPI-13 articulates the importance of segregation of duties for some key functions, as well as the presence of a risk monitoring and compliance function; staff capacity and human resource management; and presence of an operational risk management plan, including business continuity and disaster recovery arrangements.

DPI-14 is concentrated on completeness and timeliness of central government records on its debt, loan guarantees and debt-related transactions, and complete and up-to-date records of all holders of government securities in a secure registry system, if applicable.

9.5 Sources of Evidence in Auditing Public Debt Management Information Systems

The SAIs should obtain the following evidence as support documentation:

- Procedures manual for processing of debt-related payments and receivables, for debt data recording and validation, and for storage of agreements and debt administration records;
- Documents of the physical storage of original, signed copies of loan and derivative agreements in a secure location, of the scanning and maintenance of such agreements in

electronic form in a secure location, or of both;

- Evidence of validation procedures against payment notifications;
- Documents on the independent confirmation of all data with external creditors and major domestic investors;
- Evidence of a two-person authorisation process;
- System access permissions and evidence of system security and access controls;
- Evidence that audit trails are monitored; and
- Evidence of the storage location of debt recording and management system backups (the location verified by the assessors).

9.6 Illustrations of Audit Findings on Public Debt Management Information Systems

SAIs conducting audits of the PDMIS found (1) certain inadequacies in the recording and record-keeping; (2) deficiencies in the functioning of the PDMIS; and (3) deficiencies in financial reporting.

1) Inadequacies in recording and record-keeping

SAIs found that record-keeping was not accurate and complete. The information disclosed in the reports for the year under review could not be verified. Similarly, no records of guarantees and on lending that have been given by the government could be provided by the entity. In other cases where Excel was used to record details of debt agreements, SAIs noted the efficiencies and effectiveness a DeM and analysis system will add in the recording and analysis of the debt agreements.

2) Deficiencies in the PDMIS functions

The countries involved with the programme have different information systems for recording. In some cases, because the functions of recording are split across departments, different software is used. For example, to keep track of cash flow and to manage the public debt information, in many cases the software duplicates others and does not reconcile with the other, which created doubts regarding the integrity of the information provided by the different modules. Another important finding is that in a lot of cases the information systems are isolated or not integrated with the rest of the public administration components, causing a lot of duplication of efforts and increasing the risk of manual errors.

The difference between debt management systems and budget and accountable systems is that the latter do not allow keeping a record on adequately articulated public indebtedness. There is also a lack of a sub-index of the IFMIS that identifies, within each accounting account, the balance of each financial instrument component of the public debt.