



INTERNAL AUDIT DIVISION

REPORT 2022/008

Audit of business intelligence and data warehouse systems in the United Nations Secretariat

Governance and oversight need to be strengthened to facilitate a seamless user experience, availability of timely and accurate reports, and to ensure the security of the related data and infrastructure

06 April 2022
Assignment No. AT2020-517-03

Audit of business intelligence and data warehouse systems in the United Nations Secretariat

EXECUTIVE SUMMARY

The Office of Internal Oversight Services (OIOS) conducted an audit of business intelligence (BI) and data warehouse systems in the United Nations Secretariat. The objective of the audit was to assess the adequacy and effectiveness of the Secretariat's governance, risk management and control processes in ensuring effective implementation and management of BI and data warehouse systems. The audit covered the period from January 2019 to October 2021 and included a review of: (a) data governance and management; (b) project management; (c) data models; and (d) information and communications technology (ICT) operations and support.

The audit indicated that governance and oversight need to be strengthened to facilitate a seamless user experience, availability of timely and accurate reports, and to ensure the security of the related data and infrastructure.

OIOS made 10 recommendations. To address issues identified in the audit, the Department of Management Strategy, Policy and Compliance (DMSPC) needed to:

- Develop a roadmap and implementation strategy for BI in alignment with the Secretary-General's Data Strategy; assign responsibilities for functional and technical policy development; and define the governance structure to guide the use of self-service analytics in the Secretariat for the administrative management functions.
- Establish and publish a global inventory of BI and data warehouse systems; and establish a mechanism to guide the management of master data and metadata for enterprise applications that feed corporate business intelligence across the Secretariat.
- Finalize the terms of reference of the United Nations Business Intelligence (UNBI) Project Board and the standard operating procedure for data model development and certification; and ensure that the UNBI Project Board regularly meet and issues or areas for guidance are escalated to the ICT Steering Committee when needed.
- Develop a coordinated training strategy and catalogue for self-analytics capabilities amongst the user community.
- Enhance and standardize the UNBI data model creation and certification process with test plans, user access procedures and support modality; standardize and strengthen the change management process and testing environment for UNBI certified data models, exploring the feasibility of the use of automated tools; coordinate the development of a data dictionary for all UNBI certified data models, specifying the purpose for which they will be used; and reconcile the discrepancy in the number of UNBI certified data models.
- Strengthen the provisioning and deprovisioning process of management dashboards by establishing a mechanism to protect data security.

The Enterprise Resource Planning Solution Division (ERPSD) needed to:

- Implement access control mechanisms based on data sensitivity; conduct a vulnerability assessment of SAP Hana in collaboration with OICT; and strengthen the cybersecurity resilience of the SAP Hana data warehouse by addressing the cybersecurity risks identified in the early watch alert reports and strengthening the security configurations for SAP Hana.

- Leverage the existing Umoja tiered support model to manage BI related requests to support administrative management functions; and facilitate the identification of responsible stakeholders for implementation.

The Office of Information and Communications Technology (OICT) needed to:

- Facilitate a high-level assessment of the data architecture requirements; define and establish an enterprise data architecture to facilitate effective BI; and define the standards for the use and oversight of visualization platforms for enterprise systems.
- Conduct a security assessment on the third-party platform including data residency requirements.

DMSPC, ERPSD and OICT accepted the recommendations and action still needs to be taken to initiate their implementation.

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Audit of business intelligence and data warehouse systems in the United Nations Secretariat

I. BACKGROUND

1. The Office of Internal Oversight Services (OIOS) conducted an audit of business intelligence (BI) and data warehouse systems in the United Nations Secretariat.
2. Business intelligence refers to a type of data analysis aimed at understanding organizational activities and opportunities for decision making and includes a set of technologies that enables the analysis including query, reporting, and visualizations for operational reporting, tactical planning, and decision-support. Data warehouses act as a central feed of relevant data sourced from different systems as an integrated decision support database to facilitate business intelligence.
3. BI is critical to the Secretariat's ability to view and use information. In this regard, the Secretary General's data strategy also describes the envisaged data landscape for the Organization and the need for BI and data management. The data landscape of the Secretariat shows the descriptive, diagnostic, predictive and prescriptive BI requirements for entities/offices (including pillars such as sustainable development and humanitarian action, peace and security, human rights) for policy/programme, operations and management.
4. Enterprise systems such as Umoja (the Enterprise Resource Planning system), Customer Relationship Management (iNeed) and Inspira, amongst many, are the main data sources of the enterprise data warehouse system (e.g., SAP Hana) for administrative data. One key enterprise data visualization system is called the management dashboard, which is built on a third-party business analytics platform and is interfaced with the SAP Hana data warehouse.
5. The Business Transformation and Accountability Division (BTAD) of the Department of Management Strategy, Policy and Compliance (DMSPC) is the project executive lead for the United Nations Business Intelligence (UNBI) project with a focus on administrative and management data; it coordinates the project in collaboration with process owners (functional subgroups) in the areas of Supply Chain, Finance, and Human Resources. BTAD also provides implementation support on the Secretary-General's Data Strategy. The Enterprise Resource Planning Solution Division (ERPSD) is the technical service provider for both access to Umoja data and technical management of the SAP Hana platform. The Office of Information and Communications Technology (OICT) is also a technical service provider and enables access to data from non-SAP systems, such as Inspira. In addition, OICT maintains the consolidated Integrated Management Information System (IMIS) database and other legacy systems used in field missions for management of data prior to Umoja.
6. Data on the Secretariat's expenditure on BI and data warehousing was not readily available. In the absence of this information, it will not be possible to evaluate the return on investment, if any, on BI systems and data warehouses to ensure the cost of the desired end state does not outweigh the benefits realized.
7. Comments provided by DMSPC, the Department of Operational Support (DOS), ERPSD, and OICT are incorporated in italics.

II. AUDIT OBJECTIVE, SCOPE AND METHODOLOGY

8. The objective of the audit was to assess the adequacy and effectiveness of the Secretariat's governance, risk management and control processes in ensuring effective implementation and management of BI and data warehouse systems.

9. This audit was included in the 2020 risk-based work plan of OIOS due to the high risks associated with BI and data warehouse systems in the Secretariat.

10. OIOS conducted this audit from July to October 2021. The audit covered the period from January 2019 to October 2021. Based on an activity-level risk assessment, the audit covered risk areas which included: (a) data governance and management; (b) project management; (c) data models; and (d) Information and Communications Technology (ICT) operations and support.

11. The audit methodology included: (a) interviews with key personnel; (b) review of relevant documentation; (c) analytical review of data; (d) walkthroughs; (e) sample testing; and (f) surveys.

12. The audit was conducted in accordance with the International Standards for the Professional Practice of Internal Auditing.

III. AUDIT RESULTS

A. Data governance and management

Need to establish governance mechanisms and implementation strategy for BI and data warehouse

13. The BI governance mechanism should define the organizational model, stakeholder alignment and adoption mechanisms, and mode of data access and sharing that also protects and secures data. It should define a clear BI roadmap and implementation strategy across the Secretariat. Without a global data architecture for the Secretariat that clearly identifies data, data use cases, and how the data will be transformed and distributed as management information, the value of data as an Organizational asset may not be realized. For instance, effective and efficient BI and data warehouse is an essential part of the implementation of the Secretary-General's data strategy which proposes a hybrid organizational model of governance, where centres of excellence will collaborate with decentralized teams for optimal results.

14. OIOS found that there is need for a unified governance mechanism, a well-defined roadmap and an implementation strategy, as explained below:

(a) While the UNBI project was establishing a process to improve the governance mechanism for administrative data managed in Umoja and Inspira, no formally defined cross-cutting BI governance mechanisms existed at the time of the audit. In particular, the Secretariat had not established a governing body with oversight and coordination responsibilities to ensure an integrated approach to BI implementation and control.

(b) Data was often stored and used for a single purpose within pillars or entities/offices in databases, data hubs or data warehouses and was not readily available for consumption across the Secretariat. Also, the technical limitation of the Umoja BI platform created a situation that led to the development of local BI solutions which may or may not go through the standard approval and certification process.

(c) The Secretariat is encouraging data self-service analytics. Without a properly defined architecture and governance structure, there was a risk of inappropriate access, unauthorized use and lack of oversight in the use of sensitive data by the user community. For example, a Secretariat entity created an unapproved interface where data was extracted from Umoja and used in an internally developed application to map travel requests to mission reports, which was not adequately protected and led to cybersecurity attacks exposing personal data.

(d) There was no documented enterprise-wide strategy and standards for the use of data and oversight of visualization platforms (i.e., dashboards) to ensure consistency, accuracy and uniformity, and mitigate the risk that developed platforms may fail to support strategic objectives.

(e) There was no enterprise data architecture to guide data models and set the policies and standards on data collection, storage and use for BI and informed decision making. For instance, there was no standardized approach to BI, and standards to ensure interoperability between data sources had not been established.

(1) DMSPC, in coordination with DOS, OICT and ERPSD, should, for the administrative management functions: (a) develop a roadmap and implementation strategy for business intelligence in alignment with the Secretary-General's Data Strategy; (b) assign responsibilities for functional and technical policy development; and (c) define the governance structure to guide the use of self-service analytics in the Secretariat.

DMSPC accepted recommendation 1.

(2) OICT should: (a) facilitate a high-level assessment of the data architecture requirements; (b) define and establish an enterprise data architecture to facilitate effective business intelligence; and (c) define the standards for the use and oversight of visualization platforms for enterprise systems.

OICT accepted recommendation 2 and stated that the scope of the establishment of the data architecture will cover only the definition of a logical architecture, and not the actual implementation due to multi-year effort and availability of resources.

Need to strengthen the data management process

15. Data management is a process that ensures BI outputs are accurate, complete and relevant. An inventory of data source systems and data warehouses should be maintained with mechanisms to ensure data quality, data exchange and master and metadata management. OIOS noted the following:

(a) There was no inventory of available BI and data warehouse systems across the Secretariat to prevent duplication of effort, reduce the proliferation of decision support systems, improve the consistency of information and enable the Organization to better leverage data for informed decision making.

(b) Data quality mechanisms and the responsibilities for assuring the accuracy and completeness of the underlying data in the source systems and data warehouses was not adequately defined. OIOS was unable to obtain clarification as to who was responsible for data quality in systems. BTAD explained that data quality management was under the purview of each application and its business owner(s) and was of the view that an additional mechanism to improve the quality of administrative data in source systems and data warehouses was not feasible or necessary, as processes were already in place. However, how this modality is applied to enterprise systems such as Umoja and Inspira was not provided, which is a significant risk to the reliability of the data contained in these systems and their use as data sources for BI purposes. For

example, OIOS noted significant data quality issues with transportation management data within the Umoja supply chain management module whereby freight order information was not seen or updated by vendors in the absences of assigned carriers, and therefore, completed shipment information and data for statistical use were not available. In another instance, data quality issues were noted in the data within the Organizational management module in Umoja where there were differences in HR issues related to the management dashboard when compared to the entity dashboard.

(c) Master data and metadata management is required for uniform interpretation, standard nomenclature and semantic information. OIOS noted that there was decentralization of accountability (e.g., HR data), and no common definition of master data in the Secretariat (which was often synonymized with reference data). Further, operational data was subjected to varying interpretations due to lack of standardized definition of terms. Similarly, for metadata, there was no uniformity in what profiles of the metadata needed to be captured, e.g., sensitivity levels.

(3) DMSPC, in coordination with functional subgroups, ERPSD and OICT, should, for the administrative management functions: (a) establish and publish a global inventory of business intelligence and data warehouse systems; and (b) establish a mechanism to guide the management of master data and metadata for enterprise applications that feed corporate business intelligence across the Secretariat.

DMSPC accepted recommendation 3.

B. Project management

Need to strengthen UNBI project governance and processes

16. According to the project management framework of the Secretariat, ICT initiatives should be supported by adequate governance mechanisms with clear identification of roles, responsibilities, authorities, reporting, and quantification of costs and benefits.

17. The UNBI project is a corporate data programme to develop and make available certified data models on functional areas of corporate priority and business need. The project currently focused on corporate management and administration data, with the initial priority given to Umoja and Inspira data, as well as the BI requirements of the four pillars (i.e., Sustainable Development and Human Action; Peace and Security; Human Rights; and Rule of Law). It did not include substantive or programmatic BI requirements beyond what was available in Umoja Extension 2 (UE2). Following a Project Board review in 2021, revised and updated terms of reference (TOR) and standard operating procedures (SOP) were being finalized for the UNBI project.

18. Access to data is critical for decision-making. As such, the UNBI project was established to have a common certified layer of data to support consistent and timely reporting. It was envisaged that the establishment of a central data warehouse by sourcing data from enterprise systems (e.g., Umoja and Inspira) and selected data sources will increase uniformity, consistency, ease of retrieval of data and information, and avoidance of duplication of work through a “single source of truth”.

19. OIOS noted that the project management methodology and governance could be strengthened by addressing the following:

(a) The revised TOR of the Project Board and SOP for the UNBI data model development and certification needed to be finalized as there was a lack of clarity on roles and responsibilities of the various

stakeholders in regard to project deliverables. Further, the SOP developed in 2021 acknowledged the need to put the project on a sound footing but neither all the stakeholders nor the UNBI Project Board has endorsed these documents (as of November 2021).

(b) The TOR of the UNBI project specifies an observer role for the quality assurance function within the Project Board. However, OIOS noted that the mechanism for identifying, managing and monitoring quality assurance issues and specified qualifications in terms of technical expertise, knowledge, understanding and purpose of the products being delivered, could be enhanced.

(c) The UNBI project had oversight mechanisms (i.e., the ICT Steering Committee and the Project Board). The UNBI Project Board reports to the ICT Steering Committee. However, the ICT Steering Committee had not considered the issues related to UNBI project at its meetings since 2019 and the UNBI Project Board which was supposed to meet quarterly to oversee the progress in project implementation had only met twice in 2021. Therefore, the oversight mechanism and forum to facilitate a common approach to project delivery and address significant issues that impact project functionality and progress needed to be strengthened.

(d) OIOS was informed that the UNBI project deliverables (i.e., certified data models and management dashboard) will be available in SAP Analytics Cloud (SAC). At the time of audit, the project had not yet conducted a fit-gap analysis to ensure that existing data models and the management dashboard will effectively transition to, and perform in, the SAC environment. ERPSD stated that the SAP Analytics Cloud project is addressing the issues relating to fit-gap analysis and provided supporting documentation (i.e., migration from business objects to SAC and Umoja BI to Umoja Analytics Migration) indicating that this was considered in the transition planning phase. In view of the actions underway, OIOS did not make a recommendation on this aspect.

(e) There was no standardized and holistic approach for BI training targeted at the user community. Training on BI and related topics were provided separately by DOS, OICT, BTAD and ERPSD. The project could benefit from a coordinated training modality, together with a centralized training catalogue in building self-analytics capabilities amongst the user community.

(4) DMSPC should: (a) finalize the terms of reference of the United Nations Business Intelligence (UNBI) Project Board and the standard operating procedure for data model development and certification; and (b) ensure that the UNBI Project Board meets regularly; and (c) issues or areas requiring guidance are escalated to the ICT Steering Committee when needed.

DMSPC accepted recommendation 4.

(5) DMSPC, in coordination with DOS, ERPSD and OICT, should develop a coordinated training strategy and catalogue for self-analytics capabilities among the user community.

DMSPC accepted recommendation 5 and stated that the Capacity Development Operational Training Service and Organizational Development Section of the Office of Human Resources will work together in leveraging existing systems and platforms.

C. Data models

Need to strengthen the creation and maintenance of data models

20. A data model describes the rules for using data for analysis and visualization. The functional subgroup provides necessary input and clarification to define a business requirement that will drive the data models to be developed and certified. Reports for decision-making purposes are developed using data models.

21. Many data models built into SAP BW and SAP Hana had not gone through the functional subgroup and UNBI governance processes which were only established in 2020. There were hundreds of data models created prior to 2020 that were being used but had not been certified. OIOS noted the following:

(a) The data modelling for SAP BW was based on SAP Business Objects. With the implementation of SAP Hana, the data models based on Business Objects were repopulated in SAP Hana without any cleansing or reformatting which created replication of the old data models in SAP Hana. This resulted in clustering of multiple data models for the same data use cases which created confusion amongst the user community as to which data model to select.

(b) Concerning the conversion of uncleaned data models into SAP Hana, there was no plan for clean-up of data models and related reports derived from them. This led to the selection and use of reports no longer fit for purpose (e.g., the HR reports in Umoja BI public folders developed by different entities without adequate supporting documents).

(c) Certified data models are required to support the implementation of the Umoja UE2 processes for meeting the global reporting requirements for UE2 across the Secretariat. At the time of the audit, only 13 data models (out of a total of 182 certified data models) related to the 133 UE2 processes in Umoja were in the certified list of the UNBI project. Considering that 41 per cent of the total 321 Umoja processes were UE2 processes, this gap could leave the users without the business information required for management decision making.

(d) Many data models only facilitated a single objective. There were only a few combinations of data models which could be used for obtaining reports based on two or more business processes, which limited the user's ability to generate reports for complex reporting requirements. Users therefore had to perform a manual workaround with extracted data to get the required result. For example, in Finance, the data models relating to Accounts Payable, Accounts Receivable or General Ledger were available. But the data model integrating Accounts Payable with Accounts Receivable (or other such combinations) was not available.

22. ERPSD stated that the data model migration plan has been developed, which will cover the review/cleanup of outdated data models and reports based on it. Further, additional data models will be developed based on business demand. In view of the actions underway, OIOS did not make a recommendation on this aspect.

Need to strengthen the process for certification of data models

23. Data models define the structure and order in which data communicates and connects across the data ecosystem for ensuring consistent, reliable outputs using BI tools. The lack of data models may create data integrity issues, duplication and inefficiencies.

24. To ensure that data models fit into the overall data architecture, data oversight mechanisms are required to certify that the data models align with established data use cases and are fit for purpose. In this regard, the functional subgroups develop documentation that describes the purpose for which the data model was created. BTAD was in the process of finalizing the SOP on data model development and certification. OIOS noted the following:

(a) The data model certification process, including the process of requirement gathering, needed to be enhanced and standardized. For example, the request for data model creation and certification should include documented requirements, test plans, user access, and support. No guidance was provided to functional subgroups on the data model certification process. Consequently, the certification process depended on the experience and domain knowledge of the concerned focal point. Further, quality control had not been embedded into the process of developing data models to assure that the deliverables were meeting the intended quality objective/standard.

(b) Data dictionaries (describing the content, format and relationships between data fields) are required for ensuring quality outputs. Since data dictionaries were not consistently available, the certifier of the data model had difficulty in understanding the profile of the data fields.

(c) Changes to data models were not subjected to defined and standardized criteria which caused inconsistencies in approach. For example, some functional subgroups used Excel sheets for change management while some used an automated tool. A consistent approach is essential to mitigate the risk that different criteria may be applied to the same type of change.

(d) There was no control and oversight of testing procedures. The current testing processes were mostly manual, using Excel sheets because no automated tools were available. There was need to standardize and strengthen the change management process and testing environment for data models, exploring the feasibility of using automated tools. Also, testing was conducted in the production environment which could impact data integrity.

(e) The expertise required for converting business requirements into technical requirements for the development of data models was lacking. This gap could be addressed through knowledge transfer by ERPSD to the functional subgroups, or the use of other internal resources. The lack of such expertise caused delays in the data model certification process (e.g., the development of the Member State portal was delayed for four months).

(f) The process for managing the certification of data models was not clearly defined, as there was no mechanism to record and track data models. There were inconsistencies in the number of certified data models provided by the UNBI project (as the central record keeper), and the functional subgroups (as the certifiers), as shown in Table 1.

Table 1: Difference in number of certified data models reported by UNBI project and functional subgroups

Sl. no.	*Certified Data Model Category	No. of certified data models reported as of September 2021		
		UNBI	Functional subgroups	Difference
1	Finance	37	0	37
2	Human Capital Management	27	2	25
3	Supply-Chain	101	101	0
4	Travel Management	10	8	2
Total		175	111	64

(6) DMSPC, in coordination with the functional subgroups, OICT and ERPSD, should: (a) enhance and standardize the UNBI data model creation and certification process with test plans, user access procedures and support modality; (b) standardize and strengthen the change management process and testing environment for UNBI certified data models, exploring the feasibility of the use of automated tools; (c) coordinate the development of a data dictionary for all data models, specifying the purpose for which they will be used; and (d) reconcile the discrepancy in the number of UNBI certified data models.

DMSPC accepted recommendation 6.

Need to strengthen data protection and data integrity of the management dashboard

25. The Office of Legal Affairs is leading the Secretariat-wide effort on data protection and privacy policies and procedures. In the meantime, data privacy and confidentiality could be strengthened in the process of designing, developing and testing data models (i.e., classification, tagging, retention and protection) to prevent unauthorized disclosure of sensitive data. Further, data privacy and confidentiality requirements are important for data sharing internally and externally. For instance, the SAP Hana data warehouse connects to a few external data sources (such as the United Nations Development Programme).

26. The “Accountability Indicator Monitoring” section of the management dashboard has a functionality (entity alternative view dimension) that can be used to modify parameters and reconcile figures such as providing a budget viewpoint, a delegation of authority viewpoint, and career management/HR viewpoint. Since the management dashboard contains sensitive data, appropriate data protection measures are required to prevent unauthorized access and disclosure. The user access provisioning and deprovisioning mechanism for the management dashboard could be improved. BTAD explained that provisioning and deprovisioning of user access was based on information received from the concerned entity’s focal points. The results of OIOS’ review of the list of 1,350 users to whom access had been provisioned by BTAD are summarized in Table 2.

Table 2: Access review of management dashboards

	Issues	Counts
1	No email, no focal point, no index number	2
2	Entities with no focal point	44
3	Users with active access status that are deprovisioned in Umoja	230

27. Umoja is the source system of data for the management dashboard. Therefore, the same security standards should be applied to data in the management dashboard to prevent the dashboard from being used as a backdoor to access Umoja data.

(7) DMSPC should strengthen the provisioning and deprovisioning process of the management dashboard by establishing a mechanism to protect data security.

DMSPC accepted recommendation 7.

D. ICT operations and support

Need to strengthen information security enterprise dashboards and data warehouse

28.

[Redacted]

[Redacted]

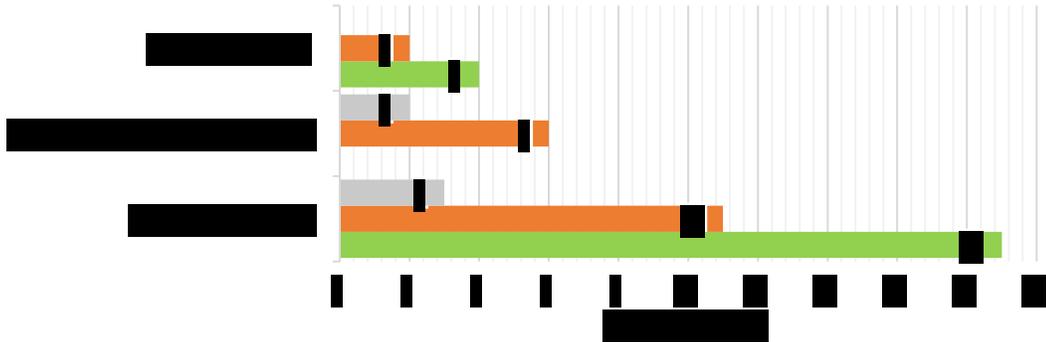
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[Redacted]

(8) OICT should conduct a security assessment on the third-party platform including data residency requirements.

OICT accepted recommendation 8.

(9)



ERPSD accepted recommendation 9.

Need to strengthen production support mechanism

30. BI production support was assigned in tiers. Tier-1 was not identified, Tier-2 was with OICT, and Tier-3 was with ERPSD and the Analytics and Performance Management Unit for management dashboard related issues. OIOS' assessment of the effectiveness of production support indicated that processes and criteria for measuring the performance of BI production support were not well defined, and production support mechanisms had not been realigned and embedded into existing ICT production support procedures. The following were noted:

(a) There was no consistent approach for raising service requests related to production support issues encountered by the user community. Some users raised requests via iNeed, while others sent a request to the Analytics and Performance Management Unit by email. The lack of a standard reporting and escalation process caused delays and inconsistencies in responding to user requests. For instance, service requests reviewed for the period 1 July 2020 to 30 June 2021 indicated that service performance could not be reliably evaluated due to the lack of standardized criteria describing the types of service requests and incidents. BTAD explained that it was in the process of setting up a service request structure in iNeed.

(b) Ageing analysis of open and pending service requests and incidents indicated that there was no mechanism for review and resolution of delayed BI requests which ranged from 5 to 387 days.

(10) ERPSD in coordination with DMSPC, DOS and OICT, should: (a) leverage the existing Umoja tiered support model to manage business intelligence related requests to support administrative management functions; and (b) facilitate the identification of responsible stakeholders for implementation.

DMSPC and DOS accepted recommendation 10 and stated that ERPSD will lead implementation of this recommendation, in coordination with the other stakeholders.

IV. ACKNOWLEDGEMENT

31. OIOS wishes to express its appreciation to the Management and staff of DMSPC, DOS, ERPSD and OICT for the assistance and cooperation extended to the auditors during this assignment.

(Signed) Eleanor T. Burns
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Office of Internal Oversight Services

STATUS OF AUDIT RECOMMENDATIONS

Audit of business intelligence and data warehouse systems in the United Nations Secretariat

Rec. no.	Recommendation	Critical ¹ / Important ²	C/ O ³	Actions needed to close recommendation	Implementation date ⁴
1	DMSPC, in coordination with DOS, OICT and ERPSD, should, for the administrative management functions: (a) develop a roadmap and implementation strategy for business intelligence in alignment with the Secretary-General's Data Strategy; (b) assign responsibilities for functional and technical policy development; and (c) define the governance structure to guide the use of self-service analytics in the Secretariat.	Important	O	Receipt of evidence that: (a) a roadmap and implementation strategy for business intelligence in alignment with the Secretary-General's Data Strategy has been developed; (b) responsibilities for functional and technical policy development have been assigned; and (c) the governance structure to guide the use of self-service analytics in the Secretariat for the administrative management functions have been defined.	31 December 2023
2	OICT should: (a) facilitate a high-level assessment of the data architecture requirements; (b) define and establish an enterprise data architecture to facilitate effective business intelligence; and (c) define the standards for the use and oversight of visualization platforms for enterprise systems.	Important	O	Receipt of evidence that: (a) a high-level assessment of data architecture requirements is conducted; (b) an enterprise data architecture is defined and established; and (c) standards are defined for the use and oversight of visualization platforms for enterprise systems.	31 March 2023
3	DMSPC, in coordination with functional subgroups, ERPSD and OICT, should, for the administrative management functions: (a) establish and publish a global inventory of business intelligence and data warehouse systems; and (b) establish a mechanism to guide the management of master data and metadata for enterprise applications that feed corporate business intelligence across the Secretariat.	Important	O	Receipt of evidence that: (a) a global inventory of business intelligence and data warehouse systems has been established and published; and (b) a mechanism has been established to guide the management of master data and metadata for enterprise applications that feed corporate business intelligence across the Secretariat.	31 December 2023
4	DMSPC should: (a) finalize the terms of reference of the United Nations Business Intelligence (UNBI)	Important	O	Receipt of evidence that: (a) the TOR of the UNBI Project Board and the SOP for data model	31 December 2023

¹ Critical recommendations address those risk issues that require immediate management attention. Failure to take action could have a critical or significant adverse impact on the Organization.

² Important recommendations address those risk issues that require timely management attention. Failure to take action could have a high or moderate adverse impact on the Organization.

³ Please note the value C denotes closed recommendations whereas O refers to open recommendations.

⁴ Date provided by DMSPC, ERPSD and OICT in response to recommendations.

STATUS OF AUDIT RECOMMENDATIONS

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	Project Board and the standard operating procedure for data model development and certification; and (b) ensure that the UNBI Project Board meets regularly; and (c) issues or areas requiring guidance are escalated to the ICT Steering Committee when needed.			development and certification are finalized; (b) the UNBI Project Board meets regularly; and (c) issues or areas requiring guidance are escalated to the ICT Steering Committee when needed.	
5	DMSPC, in coordination with DOS, ERPSD and OICT, should develop a coordinated training strategy and catalogue for self-analytics capabilities among the user community.	Important	O	Receipt of evidence that a coordinated training strategy and catalogue for self-analytics have been developed.	31 January 2024
6	DMSPC, in coordination with the functional subgroups, OICT and ERPSD, should: (a) enhance and standardize the UNBI data model creation and certification process with test plans, user access procedures and support modality; (b) standardize and strengthen the change management process and testing environment for UNBI certified data models, exploring the feasibility of the use of automated tools; (c) coordinate the development of a data dictionary for all data models, specifying the purpose for which they will be used; and (d) reconcile the discrepancy in the number of UNBI certified data models.	Important	O	Receipt of evidence that: (a) the UNBI data model creation and certification process with test plans, user access procedures and support modality have been enhanced and standardized; (b) the change management process and testing environment for UNBI certified data models have been standardized and strengthened; (c) a data dictionary has been developed for all data models, specifying the purpose for which they will be used; and (d) the discrepancy in the number of UNBI certified data models has been reconciled.	31 December 2023
7	DMSPC should strengthen the provisioning and deprovisioning process of the management dashboard by establishing a mechanism to protect data security.	Important	O	Receipt of evidence that a mechanism has been established to protect data security of the management dashboard	30 June 2023
8	OICT should conduct a security assessment on the third-party platform including data residency requirements.	Important	O	Receipt of evidence receipt of evidence that OICT has conducted a security assessment on the third-party platform including data residency requirements.	31 December 2023
9		Important	O		31 December 2023

STATUS OF AUDIT RECOMMENDATIONS

Audit of business intelligence and data warehouse systems in the United Nations Secretariat

10	ERPSD in coordination with DMSPC, DOS and OICT, should: (a) leverage the existing Umoja tiered support model to manage business intelligence related requests to support administrative management functions; and (b) facilitate the identification of responsible stakeholders for implementation.	Important	O	Receipt of evidence that: (a) the existing Umoja tiered support model has been leveraged to manage BI related requests for support for administrative management functions; and (b) responsible stakeholders for implementation have been identified.	31 December 2023

APPENDIX I

Management Response

United Nations  Nations Unies

INTEROFFICE MEMORANDUM

MEMORANDUM INTERIEUR

TO: Ms. Eleanor T. Burns, Director
A: Internal Audit Division
Office of Internal Oversight Services

DATE: 29 March 2022

THROUGH: *C. Monier*
Christophe Monier, Director
S/C DE: Business Transformation and Accountability Division
Department of Management Strategy, Policy and Compliance

FROM: *Mario Baez*
Mario Baez, Chief, Accountability Service
DE: Business Transformation and Accountability Division
Department of Management Strategy, Policy and Compliance

SUBJECT: **Draft report on an audit of business intelligence and data warehouse systems in the United Nations Secretariat (AT2020-517-03)**
OBJET:

1. With reference to your memorandum dated 7 March 2022 regarding the above-subject, please find attached Appendix I with comments provided by the Department of Management Strategy, Policy and Compliance (DMSPC), the Department of Operational Support (DOS), the Enterprise Resource Planning Solution Division (ERPSD) and the Office of Information and Communications Technology (OICT).
2. Thank you for giving the Administration an opportunity to provide comments on the draft audit report.

Management Response

Audit of business intelligence and data warehouse systems in the United Nations Secretariat

Rec. no.	Recommendation	Critical ¹ / Important ²	Accepted? (Yes/No)	Title of responsible individual	Implementation date	Client comments
1	<p>DMSPC, in coordination with DOS, OICT and ERPSD, should: (a) develop a roadmap and implementation strategy for business intelligence in alignment with the Secretary-General's Data Strategy;</p> <p>(b) assign responsibilities for functional and technical policy development; and</p> <p>(c) define the governance structure to guide the use of self-service analytics in the Secretariat for the administrative management functions.</p>	Important	Yes <i>(with the suggested amendments to the text of the recommendation - please see comments)</i>	Director, BTAD / DMSPC	31 December 2023	<p>The recommendation is accepted with the understanding that a) b) and c) are all for the administrative management functions. For clarity, the following rephrasing is suggested:</p> <p>DMSPC, in coordination with DOS, OICT and ERPSD should, for the administrative management functions: (a) develop a roadmap and implementation strategy for business intelligence in alignment with the Secretary-General's Data Strategy; (b) assign responsibilities for functional and technical policy development; and (c) define the governance structure to guide the use of self-service analytics in the Secretariat for the administrative management functions.</p> <p>Within this scope, BTAD/DMSPC will coordinate with other stakeholders in DMSPC, DOS, OICT and ERPSD.</p>
2	OICT should: (a) facilitate a high-level assessment of the data architecture requirements; (b) define and establish an enterprise	Important	Yes	Director, PSGD / OICT	31 March 2023	The scope of the establishment of the data architecture will cover the definition of a logical architecture. The actual implementation of this architecture will be outside of the scope of this

¹ Critical recommendations address those risk issues that require immediate management attention. Failure to take action could have a critical or significant adverse impact on the Organization.

² Important recommendations address those risk issues that require timely management attention. Failure to take action could have a high or moderate adverse impact on the Organization.

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	data architecture to facilitate effective business intelligence; and (c) define the standards for the use and oversight of visualization platforms for enterprise systems.					recommendation as this would be a multi-year effort depending on dedicated resource availability.
3	DMSPC, in coordination with functional subgroups, ERPSD and OICT, should: (a) establish and publish a global inventory of business intelligence and data warehouse systems; (b) implement a mechanism to improve the quality of the underlying administrative data in the source systems and data warehouses; and (c) establish a mechanism to guide the management of master data and metadata for business intelligence across the Secretariat for the administrative management functions.	Important	Partially <i>(with the suggested amendments to the text of the recommendation - please see comments)</i> a) Yes b) No c) Yes <i>(with the suggested amendments to text of the recommendation - please see comments)</i>	a) Chief, Enterprise Solutions Service, OICT b) N/A c) Chief, Policy and Compliance Service, OICT	31 December 2023	b) A single mechanism to address quality of data in the source systems and data warehouse does not seem feasible, nor necessary. Processes are already in place specific to each source system and data warehouse that address data quality issues identified through either preventative procedures or as they are reported by users. c) For clarity, slightly rephrased language is suggested, please see below. As in recommendation #1, and taking into consideration other comments for this recommendation, for clarity, the following rephrasing is suggested: DMSPC, in coordination with functional subgroups, ERPSD and OICT should, for the administrative management functions: (a) establish and publish a global inventory of business intelligence and data warehouse systems; (b) implement a

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						mechanism to improve the quality of the underlying administrative data in the source systems and data warehouses; and (c) establish a mechanism to guide the management of master data and metadata for enterprise applications that feed corporate business intelligence across the Secretariat for the administrative management functions;
4	DMSPC should: (a) finalize the terms of reference of the United Nations Business Intelligence (UNBI) Project Board and the standard operating procedure for data model development and certification; and (b) ensure that the UNBI Project Board meets regularly; and (c) issues or areas requiring guidance are escalated to the ICT Steering Committee when needed.	Important	Yes	Director, BTAD / DMSPC	31 December 2023	Within this scope, BTAD/DMSPC will coordinate with other stakeholders in DMSPC, DOS, OICT and ERPSD.
5	ERPSD should prepare transition plans and conduct a fit-gap analysis for effective transition to	Important	No	N/A	N/A	Documentation has been provided to OIOS as evidence of the plan and analysis for effective transition to the SAP Analytics Cloud environment. The Administration requests OIOS to exclude

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	the SAP Analytics Cloud environment.					this recommendation from the final audit report.
6	DMSPC, in coordination with DOS, ERPSD and OICT, should develop a coordinated training strategy and catalogue for self-analytics capabilities among the user community.	Important	Yes	Director, CDOTS / DOS & Chief, Organization Development Section, OHR / DMSPC	31 January 2024	CDOTS and Organizational Development Section of OHR will work together on this recommendation, leveraging existing systems and platforms.
7	DMSPC, in coordination with the functional subgroups, OICT and ERPSD, should: (a) enhance and standardize the data model creation and certification process with test plans, user access procedures and support modality; (b) standardize and strengthen the change management process and testing environment for data models, exploring the feasibility of the use of automated tools; (c) coordinate the development of a data dictionary for all data models, specifying the purpose for which they will	Important	Yes <i>(with the suggested amendments to text of the recommendation - please see comments)</i>	a) Director, BTAD / DMSPC	31 December 2023	This recommendation can be accepted if the scope is defined as being with regard to UNBI certified data models. For clarity, the following rephrasing is suggested: For UNBI data model certification, DMSPC, in coordination with the functional subgroups, OICT and ERPSD, should: (a) enhance and standardize the UNBI data model creation and certification process with test plans, user access procedures and support modality; (b) standardize and strengthen the change management process and testing environment for UNBI certified data models, exploring the feasibility of the use of automated tools; (c) coordinate the development of a data dictionary for all UNBI certified data models, specifying the purpose for which they will be used;

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	be used; and (d) reconcile the discrepancy in the number of certified data models.					and (d) reconcile the discrepancy in the number of UNBI certified data models.
8	DMSPC should strengthen the provisioning and deprovisioning process of the management dashboard by establishing a mechanism to protect data security and preserve data integrity.	Important	Yes <i>(with the suggested amendments to the text of the recommendation - please see comments)</i>	Director, BTAD / DMSPC	30 June 2023	Data integrity is the overall accuracy, completeness, and consistency of data and since the scope of this recommendation is security, it is suggested to remove reference to data integrity. The following rephrasing is proposed: DMSPC should strengthen the provisioning and deprovisioning process of the management dashboard by establishing a mechanism to protect data security and preserve data integrity.
9	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

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	[REDACTED]					[REDACTED]
10	DMSPC and DOS, in coordination with ERPSD and OICT, should: (a) leverage the existing Umoja tiered support model to manage business intelligence related requests to support administrative management functions; and (b) facilitate the identification of responsible stakeholders for implementation.	Important	Yes	Director, ERPSD	31 December 2023	ERPSD will lead the implementation of this recommendation, in coordination with the other mentioned groups.