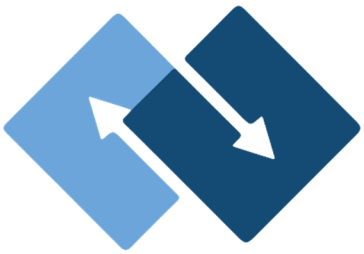

SDMx

The standard for Statistical Data & Metadata

BUSINESS CASE

Published June 2026

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1. Executive Summary

Purpose of document

The purpose of this document is to present the business case for the Standard for Data and Metadata (SDMx) and explain how it addresses challenges faced by statistical agencies worldwide through modernising the data lifecycle, improving efficiency and reducing costs. It is intended primarily for statistical and technical leadership in national statistical agencies[1], providing insights into how the SDMx framework can help improve operations across the statistical data lifecycle.

Statistical organisations face rising demands for timely, granular, trustworthy data amid tightening resources and rapid technological changes. □gencies must maintain impartiality and trust while competing with alternative data providers and platforms that increasingly shape public narratives. □t the same time, they are expected to adopt emerging technologies such as □rtificial Intelligence, which offer great potential but raise concerns about ethics, transparency, and methodological soundness. These pressures require statistical organisations to modernise processes, strengthen governance, and innovate continuously to remain relevant and resilient.

In this environment, there is strong demand for practical solutions that do not require high upfront investment but can gradually scale up to enterprise-level operations. International statistical and technical standards enable organisations to take advantage of industry best practices, automate business processes, and increase overall efficiency while improving data quality and facilitating international comparability. In addition, reliance on standards rather than proprietary products helps avoid vendor lock-in and improve the sustainability of investment in statistical information systems. In this context, SDMx offers a mature, standards-based ecosystem – complete with technical specifications, guidelines, interoperable tools, and a global community – that modernises the statistical value chain while containing cost and risk.

SDMx is an international standard for statistical data and metadata supported by eight international organisations (SDMx Sponsor □gencies[2]). It is endorsed by the UN Statistical Commission and approved as an official standard by the International Organisation for Standardisation (ISO). Originally developed to reduce the reporting burden on Member

[1] In this document, statistical organization or agency refers to any producer of official statistics including the National Statistical Office, Central Bank, and ministries and departments that produce statistical data.
[2] Bank for International Settlements (BIS), European Central Bank (ECB), Eurostat, International Labour Organisation (ILO), International Monetary Fund (IMF), Organisation for Economic Cooperation and Development (OECD), United Nations (UN), and the World Bank.

States, SDMx has evolved into a key enabler of modernisation for statistical agencies. Its application now extends far beyond its initial purpose, demonstrating its versatility and effectiveness in diverse contexts.

This document outlines how the SDMx framework can address the needs of statistical agencies to respond to the pressures, meet the demands of statistical data users, and ultimately lead to better-informed decision-making. It focuses on five core areas: modernisation of business processes; dissemination and sharing of statistical data and metadata; data and metadata governance; data integration and strategic interoperability; and exchange and reporting[3]. □s shown in the document, SDMx makes data discoverable and meaningful for □rtificial Intelligence, improving results by addressing issues with the quality of data outputs produced by Large Language Models (LLMs). □cross all these domains, SDMx has a proven track record of strengthening operational efficiency and improving data quality and ensuring the long-term sustainability of investments.

2. Focus Areas

2.1. Modernisation of Business Processes

Modernising business processes is essential for statistical organisations seeking to enhance operational efficiency, reduce costs, and respond more effectively to evolving demands. This transformation requires reengineering workflows to enhance automation, interoperability, and scalability. The SDMx standard encompasses the entire data lifecycle and provides a robust framework that enables statistical organisations to achieve these goals by streamlining data management and fostering cross-functional collaboration. Its alignment with the Generic Statistical Business Process Model (GSBPM) ensures that process improvements are anchored in a widely used framework for designing and operating statistical production systems.

One of the most significant advantages of SDMx is its record of **accelerating implementation** while improving **cost efficiency**. By leveraging a diverse suite of open-source, enterprise-grade SDMx software tools, organisations have reduced development timelines and avoided the overhead associated with custom-built solutions. These tools and applications are designed to integrate with a wide range of software environments, allowing teams to select software that best aligns with their existing infrastructure and skill sets. The tools facilitate automation, another key cost-efficiency benefit, as it reduces reliance on

[3] These areas are interdependent: governance enables consistent data management; integration and interoperability make full use of the data and metadata across systems and partners; dissemination and reporting operationalise them for data consumers.

manual processes and improves their quality while significantly lowering associated costs. The use of industry best practices embedded in the SDMx tools further improves system reliability and lowers the total cost of ownership.

SDMx's standardised, **modular information model** serves as a common modelling vocabulary, simplifying **harmonisation** and systematizing **data governance**. SDMx provides a universal language for statistics, ensuring that data from diverse sources can be easily combined and compared. The information model enables the creation of standardised, reusable structural metadata[4] such as concepts and code lists, which can be shared within and across organisations and platforms, as harmonisation is facilitated both under the organisation's internal governance and at the global scale through agreed structures and definitions.

SDMx introduces a high degree of **agility** and **scalability** into business operations. The optimum value of modernisation is achieved through harmonised, robust structure definitions managed at an **SDMx registry**. Centralising data structures and business logic at a registry enables updates to be made without modifying application code. This **metadata-driven architecture**[5] empowers business users to manage their own data processes independently, reducing reliance on IT and improving the velocity of data processing while reducing the effort required. The data processes are easily scalable with support of technologies such as cloud computing, microservices, and metadata caches.

The reusability of SDMx metadata **reduces duplication of effort**, fosters harmonisation, and drives both efficiency and **data quality**. The core functionality of data governance is enhanced through easily built SDMx metadata catalogues, facilitated by the registry and standardised data processing architecture at the organisational level.

Operational efficiency is another area where SDMx delivers measurable value. The framework supports automated schema validation and rule enforcement, significantly reducing manual intervention and the risk of human error. Data pipelines can be composed using widely adopted programming environments such as Python and R, making processes more agile, reliable, and repeatable. Centralised SDMx registries promote consistency, facilitate reuse of data structures, and enhance collaboration across departments.

SDMx is broadly compatible with other standards and technologies, enabling it to function effectively within modern integrated data management environments and across the entire data lifecycle. Its flexibility extends beyond structuring dimensional data; SDMx is

[4] Structural metadata refers to concepts, code lists, data structure definitions (DSDs), and other data structures used to model and describe statistical data domains.

[5] systems architecture where data processing is governed by standardised updateable metadata rather than hard-coded rules or procedures.

also adaptable for use in survey design and other complex data collection scenarios, further broadening its applicability. SDMx simplifies the integration of disparate and legacy systems by providing a common language for communication, and it streamlines the maintenance of data flows, as updates to one part of the system do not necessarily affect others.

Modernisation of business processes can take place gradually as new approaches are introduced along the statistical value chain. Framing these within GSBPM facilitates the development of a coherent transformation strategy that maps SDMx-enabled improvements to each phase of the statistical production process. Fully realising these benefits requires organisational adoption and business transformation; and achieving harmonisation and reaping the associated efficiency and quality gains calls for a commitment to change management and staff engagement throughout the organisation.

2.2. Dissemination and Sharing of Statistical Data and Metadata

Much of the strong growth of SDMx use seen in recent years has been driven by dissemination, as countries from all regions of the world have realised benefits brought by SDMx in this context. Thanks to SDMx-native dissemination platforms[6], statistical agencies publish their data online in searchable databases and make it available in a machine-readable format accessible via a standardised **Application Programming Interface (API)**. Moving to SDMx-based dissemination significantly enhances **data discoverability and accessibility**, as well as the quality and usability of statistical data, while improving the efficiency and scalability of dissemination processes.

As outlined earlier, SDMx contributes to improved data quality through its emphasis on harmonisation and standardised validation processes. Reusable, standardised concepts and code lists, along with standardised APIs and data formats, ensure consistent and correct interpretation of data and associated reference metadata and reduce the cost of data wrangling for the user. The intrinsic structural integrity of the SDMx Information Model reduces ambiguity and ensures that data complies with controlled vocabularies and value domains. In addition, support for the concept of **Single Source of Truth**, where data is maintained in a centralised, authoritative repository, reduces discrepancies, ensures transparency, and helps build trust in data being disseminated.

SDMx enhances the accessibility and discoverability of data by leveraging a centralised global metadata registry and the **SDMx Global Discovery Services (SGDS)**[7]. These platforms act as a global index of data and metadata, further strengthening their discoverability and effective reuse and thus making it easier for users to find the resource

[6] For a full list of SDMX tools, see https://sdmx.org/tools/
[7] See https://www.sdmx.io/datascience/sgds/

they need. The SDMx □PI facilitates uniform, streamlined access to data and metadata and is supported by various applications, including widely used commercial platforms such as Power BI, open-source analytics and visualisation tools such as □pache Superset, and, increasingly, □I clients and agents**.** The highly structured nature of the SDMx information model facilitates consumption of data by □I platforms, enabling more efficient and effective discovery and visualisation for users. SDMx also serves as a key enabler for the **F.A.I.R. principles** [8] (Findable, □ccessible, Interoperable, Reusable), ensuring that statistical information is not only available but also useful, reusable, and well-documented for long-term use and international comparability.

SDMx promotes a highly **portable** and **cost-efficient** approach to data dissemination. The open standard allows for the use and reuse of various back-end and front-end systems, allowing organisations to select tools that best fit their needs and change them when appropriate without affecting other components. Most of these tools are open-source and supported by a global community, significantly reducing development and maintenance costs. The modular architecture provides flexibility and scalability, allowing organisations to adapt to changing business needs, scale individual services independently, and seamlessly integrate components developed by other parties into their platforms.

2.3. Data and Metadata Governance

Modern, enterprise-grade data management covers the full D□M□ [9] spectrum of data governance, quality, architecture, and lifecycle operations. National Statistical Offices continuously modernise data management practices, which demand a framework that is standards-based, interoperable, and scalable, with clear roles, artefacts, and controls applied across the data lifecycle, from processing through dissemination. Furthermore, National Statistical Offices have the expertise to lead data stewardship in the National Statistical System, and some are also increasingly looking at stewardship responsibilities across the national data ecosystem[10]. □ll these scenarios require common data governance rules and standards, and SDMx can be used as an enabler to maximise the value of data assets in various types of data ecosystems.

□t the core of these processes is data modelling: the disciplined design, maintenance, and versioning of structural and reference metadata such as concepts, code lists, and data structures, to ensure that data are consistently defined, linked and governed. SDMx offers a suite of technical and statistical standards, guidelines, and tools that meet this demand

[8] See https://www.go-fair.org/fair-principles/
[9] Data Management □ssociation International, see https://dama.org/
[10] See https://unece.org/sites/default/files/2024-01/Data_stewardship_summary.pdf

allowing organisations to **strengthen data governance**, improving the quality of structural metadata and the data it describes.

The **modular information model** promotes the reuse of data structures and fosters collaboration. Concepts, code lists, and other structures are defined once and referenced across datasets, ensuring consistent interpretation. This is the core of data modelling in SDMx and the main lever to reduce silos and enable harmonisation. Modularity benefits from clear ownership, version control, and coordination supported by the information model; in return it enables reuse, harmonisation, reduced duplication, and faster onboarding. The SDMx registry serves as the enterprise **Single Source of Truth** for structural and reference metadata[11], avoiding silos and supporting consistent use across the complete lifecycle.

A distinct benefit offered by SDMx is its ability to embed **formal data quality specifications** directly into data structures, defined once and reused. This ensures that rules are precise, clear, and maintainable; enables consistent interpretation across systems and stakeholders; enhances auditability; and provides a common foundation for structural metadata management across the value chain.

A proactive **"shift-left" approach** – embedding data quality checks early in the lifecycle so issues are detected at the earliest stage, ideally at source – prevents the propagation of bad data and reduces the cost of late-stage corrections. This aligns closely with data governance practices and the "data-mesh" accountability[12], ensuring that issues are resolved before they impact decision-making or compliance. Introducing early checks requires strong governance; done well, it prevents errors, boosts reliability, and builds a culture of accountability.

Organisations implementing SDMx may, where it adds value, maintain **mappings** with complementary standards – such as DDI (microdata/process/provenance), DCAT (dataset catalogues/discovery), and ISO 19115/19139 (geospatial metadata) – with a lightweight decision path for conflicts to ensure that canonical vocabularies remain coherent across systems and the burden of transformations is reduced. This inter-standard mapping is itself a data modelling task and should be planned, resourced and versioned in support of data governance.

As described earlier, SDMx promotes **scalability and agility** by decoupling data modelling rules from the technical mechanics of data engineering, reducing complexity and empowering business users to take ownership of the business logic, and enabling faster

[11] Reference metadata refers to textual, explanatory information about statistical data including methodology, quality, data sources, and other aspects.
[12] An approach where responsibility for data is assigned to business domains; see https://cloud.google.com/discover/what-is-data-mesh .

adaptation to changing requirements. These improvements benefit from the Reference Framework for SDMx Structural Metadata Governance[13], and the SDMx content-oriented guidelines[14] offering practical, consistent foundations for implementation.

In summary, SDMx offers a standards-based approach to data management that strengthens governance and offers guidelines and tools to effectively manage data quality. rtificial Intelligence has been used to accelerate this process and reduce the effort required. The standard and tools support starting efforts in a limited scope and scaling up to the enterprise level. Enterprise-wide adoption typically requires an upfront effort to set up roles, align models, and adjust legacy processes; the payoff is sustained automation, consistent data, faster processing, and stronger governance at scale.

2.4. Data Integration and Strategic Interoperability

 significant issue faced by statistical offices has been the proliferation of tools, technology platforms, data definitions, and institutional arrangements for the purposes of managing, sharing, and using data and metadata, from data collection through to dissemination. These are often incompatible with each other, increasing the cost of moving data through the statistical value chain and requiring dedicated resources to manage and reuse the data.

SDMx enables various tools to communicate with each other and exchange, interpret, and use data. By providing common standards-based interfaces, SDMx thus improves efficiency by facilitating **interoperability,** leveraging the SDMx Information Model as the semantic glue that allows both SDMx and non-SDMx sources to be understood consistently. Furthermore, the availability of a large number of globally standardised concepts, code lists, and other structures[15], which can be easily reused and extended for the national context, both simplifies data management and improves interoperability, while international comparability improves transparency, credibility, and trust.

In contrast to interoperability, **data integration** refers to the technical process of combining, linking, and harmonising data from multiple sources that do not yet have a common standards-based interface, to produce coherent and usable outputs. This involves harmonising data structures by resolving semantic differences and applying transformations to ensure consistency and quality. Within the SDMx framework and related standards including the **Validation and Trans ormation Language**[16] (VTL), data integration benefits from standardised data structures and widely available free-to-use software tools,

[13] See https://sdmx.org/wp-content/uploads/SDMX-Structural-Metadata-Governance.docx
[14] See https://sdmx.org/guidelines
[15] See https://sdmx.org/sdmx-global-registry/
[16] See https://sdmx.org/validation-and-transformation-language-vtl/

libraries, and converters, which enable automation and reduce the burden of manual reconciliation. □n **integrated data pipeline** with the use of SDMx supports automation, improves timeliness, and enables faster production of key indicators, while consistent structures ensure methodological alignment across outputs.

□chieving interoperability requires aligning local practices with shared standards while balancing autonomy and collective efficiency. SDMx supports scalability in the attainment of interoperability. Early efforts may involve mapping spreadsheets to a simple shared data structure, while an advanced implementation can entail a shared registry across the National Statistical System storing canonical vocabularies and constraints, and integration with data lakes to enable data pipelines and services to efficiently consume SDMx endpoints.

SDMx also facilitates **strategic interoperability**: a broader organisational capability that enables systems, standards, and processes to work seamlessly both within and across institutions and subject-matter domains. It goes beyond technical compatibility to encompass governance, semantic alignment, and long-term collaboration. This includes mapping between metadata standards such as SDMx and DDI, harmonising definitions, and establishing shared infrastructure. Strategic interoperability also clarifies the NSO stewardship role as convener and steward of canonical vocabularies and shared registries across the national statistical system. □s described earlier, interoperability promotes scalability through processes based on structural metadata stored at shared registries and drives cost efficiency by enabling the reuse of tools and processes.

Modern platform patterns such as data lakes, virtualisation, and microservices, fit naturally with SDMx registries and □PIs; and emerging □I use cases can safely exploit retrieval-augmented generation (R□G) over structured SDMx metadata to improve discoverability while preserving semantic guardrails. Measurable outcomes can include reductions in manual reconciliation steps and time-to-ingest, a higher share of indicators using common concepts and code lists, greater validation at source, and increased partner uptake of SDMx □PIs. These benefits demand governance, skills development, and coordination; over time, the long-term gains in efficiency, consistency, and strategic capability outweigh the adoption effort.

Strategic interoperability supports the vision of the High-Level Group for the Modernisation of Official Statistics[17] (HLG-MOS) by fostering innovation and streamlining data production lines. Data integration is particularly valuable in multi-source statistics, where combining microdata and aggregate data enhances analytical depth and policy relevance. For example,

[17] See https://unece.org/statistics/networks-of-experts/high-level-group-modernisation-statistical-production-and-services

integrating survey data with administrative records improves the accuracy of indicators and reduces manual processing, ultimately supporting better informed decision-making. Together, data integration and strategic interoperability enable statistical organisations to transition from siloed operations to collaborative, agile, and data-driven environments, and empower them to respond to emerging data needs with agility and confidence.

2.5. Exchange and Reporting

SDMx-based systems have a proven track record of significantly reducing the **reporting burden** for both data providers and receivers. By enabling scalable, automated, and standardised data exchange processes, SDMx replaces fragmented and manual reporting practices with streamlined workflows that are easier to maintain and extend over time; this is further facilitated by a structured approach to managing data and metadata updates and revisions. □ choice of several common open data exchange formats simplifies implementation. Furthermore, built-in structural validation and increasingly common automated content validation ensure that data errors are detected and corrected early on, before a dataset is officially submitted. This proactive approach improves overall data quality while substantially reducing follow-up efforts, corrections, and bilateral communication between reporter and receiver of the data.

SDMx facilitates efficient **reuse o□ reporting structures**. Global structures developed for data reporting can be reused for dissemination, which in addition to reducing the effort improves interoperability, consistency, and usability. Dissemination platforms have been developed for high-value datasets that can directly consume global reporting structures without additional transformation. This enables countries to bridge reporting and dissemination and establish user-friendly data portals at a very low cost. In the long term, this integration has the potential to reduce the reporting burden to near zero, as reporting becomes a streamlined, integrated part of the overall dissemination process.

SDMx further enables a shift from traditional "push" reporting toward more efficient **pull-based reporting models**. In a pull reporting environment, data providers maintain authoritative SDMx endpoints from which data users can retrieve the required datasets automatically, according to agreed schedules and structures. The European Census Hub[18] and SDDS Plus [19] are well-established examples of such an implementation, where participating countries expose harmonised data through SDMx services that are accessed directly by data users. This minimises repetitive data submissions, reduces operational

[18] See https://ec.europa.eu/CensusHub/
[19] See https://dsbb.imf.org/sdds-plus/overview

overhead, and ensures that users always access the most up-to-date and officially validated data.

SDMx plays an increasingly important role in facilitating the **exchange o re erence metadata**. Reference metadata – covering methodological explanations, definitions, classifications, and quality statements – is essential for correct interpretation and meaningful use of statistical data. SDMx provides standardised mechanisms for structuring and transmitting this metadata alongside datasets, ensuring that users at national, regional, and global levels can fully understand the context, limitations, and comparability of the reported figures. This is particularly important in international reporting, where differences in methodology or data coverage can otherwise lead to misinterpretation or misuse of statistics.

The benefits of SDMx use apply equally well in the context of **data exchange and reporting across the National Statistical System**, including the national statistical office, ministries, and other agencies, as well as the central bank. s in the case of international data exchange, reduction of the reporting burden improves data availability and accessibility. Equally important, interoperability and comparability of data produced by different institutions, coupled with improved timeliness and data quality, simplify data analysis crucial to evidence-based policymaking. The use of SDMx data is further facilitated by support in major analytical tools such as PowerBI, which does not require SDMx expertise, as well as common data analysis environments such as R and Python. In addition, standardisation of reporting strengthens institutional coordination, as all stakeholders operate within a common reporting architecture that clearly defines roles, responsibilities, and data expectations. Together, better data quality, timeliness, and comparability increase trust in official statistics and foster improved analysis and evidence-based policymaking.

3. SDMx and Artificial Intelligence

Pairing I with SDMx empowers statistical organisations to deliver more: providing intuitive access and accurate statistics to non-experts, accelerating the production of structured and well-documented data, and managing data quality at scale.

While Large Language Models are powerful for synthesis, they are notoriously unreliable at returning accurate data values[20]. SDMx addresses this gap by supplying a clear schema, rich reference metadata, and a standardised PI for data retrieval, enabling LLMs to understand, query, and interpret data in context, as intended by the data producers.

[20] See http://arxiv.org/abs/2409.05746

SDMx not only standardises formats, classifications, and APIs; it also provides tools like Global Discovery Services that facilitate data discoverability across institutions. In addition, beyond the advantages of the standard and its tools ecosystem, SDMx already underpins dissemination for numerous national statistical offices and international agencies, creating strong network effects that lower adoption costs and enhance interoperability. In turn, AI can reduce the effort of building and maintaining SDMx-based systems by drafting metadata, extracting structured content from documents, and automating checks. The result is a virtuous cycle: SDMx sharpens AI's accuracy and transparency, while AI accelerates and simplifies the creation of production-ready SDMx data and metadata.

SDMx enables AI to deliver accurate, transparent, and user-friendly access to official statistics through rich metadata, structured data, and consistent classifications. On this foundation, AI can translate plain-language questions into precise queries, retrieve the correct series via standardised services, and present results with the appropriate context thanks to linked reference metadata. Such structured information also supports interpretation and comparisons across time and geography. Products are available that enable this integration of SDMx and AI and are used to present the user with reliable and accurate data. These SDMx features can also be leveraged by AI to assemble self-service data products, such as dashboards, by auto-discovering relevant series and mapping dimensions to visuals while preserving contextual metadata for interpretation, trust, and accountability.

AI is also an enabler for SDMx implementation and operations. Creating and maintaining SDMx structural artefacts is essential but resource-intensive. Dedicated AI systems have successfully been used to draft data structure definitions, propose concept schemes and code lists based on existing documentation or international classifications, and flag semantic gaps or overlaps across agencies. AI can also shorten the path from unstructured to structured data: large volumes of statistical content reside in questionnaires, PDFs, and reports; AI has been used to extract information and propose mappings to SDMx structures. Finally, AI offers strong potential for scalable data-quality management – for example, by generating consistency validation rules from structural metadata and enriching these with business constraints derived from reference metadata.

Positioning for the future goes beyond adopting new tools. To avoid duplicating AI solutions, pool resources, and stay at the frontier, the SDMx community has engaged with leading public and private AI actors while prioritizing open-source tooling and interoperable practices that prevent vendor lock-in. Compatibility with standards such as schema.org has been achieved, and work is underway to improve the integration of SDMx with other standards. In parallel, efforts are ongoing to evaluate potential adjustments to the standard

and best practices to ensure that all information is present that is required for models to interpret data and explain results transparently, cementing SDMx's status as the backbone of AI-enabled official statistics.

4. The SDMx Ecosystem

The SDMx Ecosystem encompasses more than the technical and statistical standards that form the foundation of SDMx. It represents a mature, globally coordinated environment supported by a broad community of implementing organisations and practitioners – including statisticians, data experts, IT professionals, and specialists in emerging technologies – who collectively contribute to the development, implementation, and continuous improvement of the standard.

A principal feature is the cooperative development of **open-source software tools** based on SDMx technical specifications and statistical guidance. These freely available tools make SDMx solutions cost-effective to implement and maintain, thereby **reducing the total cost of ownership**. When new features are needed, co-investment enables institutions to share the costs of enhancing specific software products, supporting evolving requirements. Furthermore, reliance on an open standard makes it possible to change these tools as and when appropriate, avoiding **vendor lock-in**. This approach delivers much of the flexibility typically associated with in-house solutions, while significantly lowering capital expenditure.

In recent cycles, **private-sector players** – from start-ups to large platform and cloud providers – have shown growing interest in SDMx as demand rises for well-structured, metadata-rich statistical content that can be safely consumed by AI clients and agents. This trend is expected to accelerate as AI-ready data access becomes a differentiator for data products and services with an emergence of commercial offerings around SDMx tooling and a whole new range of private sector players.

A comprehensive set of **guidelines** has been developed to support effective SDMx-based implementation of statistical business processes. These cover a wide range of topics including terminology, data modelling recommendations, implementation best practices, and other areas essential for ensuring consistency and quality. The guidelines are regularly updated, and new ones are developed in response to evolving needs.

The **SDMx User Forum**[21] serves as an open platform where users can pose questions, obtain guidance from domain experts, stay informed about new developments, and engage with practitioners from national and international organisations, academia, and the private

[21] See https://www.linkedin.com/groups/13325027/

sector. The forum facilitates an exchange of experiences, enables users to find solutions to technical and methodological challenges, and supports the adoption of best practices across the community.

Capacity development constitutes another important part of the SDMx Ecosystem. A comprehensive and growing set of self-paced **e-learning courses**[22] has been developed to reduce entry barriers for new users while supporting continued development for experienced practitioners. These range from introduction to the fundamentals of SDMx to more advanced training courses on data modelling in specific statistical subject-matter domains and the use of various tools.

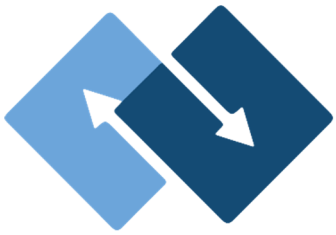
Complementing these online resources, **regular training programs** – delivered virtually or in person – are organised by SDMx Sponsor agencies and other international organisations. These programs provide targeted, hands-on instruction and often form part of broader technical assistance initiatives. Together, they have enabled many countries to implement SDMx-based platforms for data management, dissemination, and reporting, allowing them to benefit from improved efficiency, harmonisation, and interoperability.

The SDMx Ecosystem is further strengthened by global events. The **SDMx Expert Workshops**, held biennially in even-numbered years, offer opportunities for SDMx practitioners to share technical advancements, implementation experiences, and innovations. The **SDMx Global Conferences**, held biennially in odd-numbered years, address more strategic and governance-related aspects of SDMx adoption and are designed for both technical practitioners and senior management of statistical organisations. Both events are open to participants from any organisation involved in data production or use, and do not charge attendance fees, providing opportunities for broad and inclusive engagement.

The **SDMx Technical and Statistical Working Groups** include members from the diverse community of national governments, international agencies, academia, the private sector, and other data producers and users. Experts are invited to join the Working Groups and contribute to the development of the standard, ensuring that the needs of the community are met and the standard continues to evolve and address emerging issues.

Collectively, these components constitute a dynamic and growing SDMx ecosystem, which not only supports effective implementation of the standard but also strengthens the global statistical system's capacity to produce timely, high-quality, and interoperable data, enabling statistical agencies to meet the growing demand for reliable and harmonised data.

[22] See https://sdmx.org/learning/ for learning resources



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