# Unlocking the Data Potential in PFM: Overview of Global Trends and Challenges

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Governance


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# ECA > FMIS & GovTech Maturity

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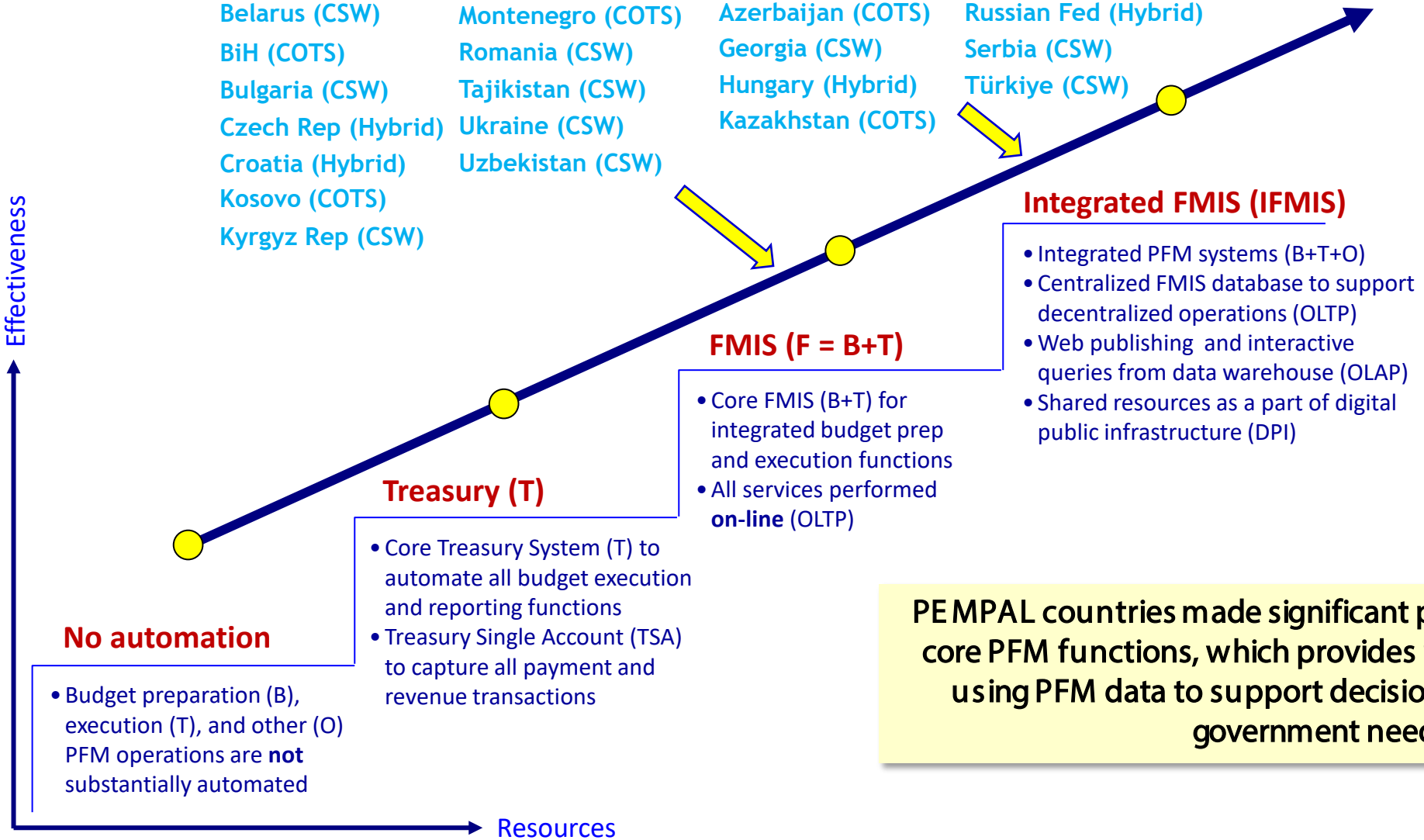
# Maturity of FMIS in PEM-PAL Members

**Transition to FMIS**

Armenia (CSW)
Belarus (CSW)
BiH (COTS)
Bulgaria (CSW)
Czech Rep (Hybrid)
Croatia (Hybrid)
Kosovo (COTS)
Kyrgyz Rep (CSW)
Moldova (CSW)
Montenegro (COTS)
Romania (CSW)
Tajikistan (CSW)
Ukraine (CSW)
Uzbekistan (CSW)

**Transition to IFMIS**

Albania (Hybrid)
Azerbaijan (COTS)
Georgia (CSW)
Hungary (Hybrid)
Kazakhstan (COTS)
North Macedonia (CSW)
Russian Fed (Hybrid)
Serbia (CSW)
Türkiye (CSW)




**PEMPAL countries made significant progress in automating core PFM functions, which provides new opportunities for using PFM data to support decision-making and other government needs.**

**CSW** : Custom Software **COTS** : Commercial off-the-Shelf **Hybrid** : CSW + COTS

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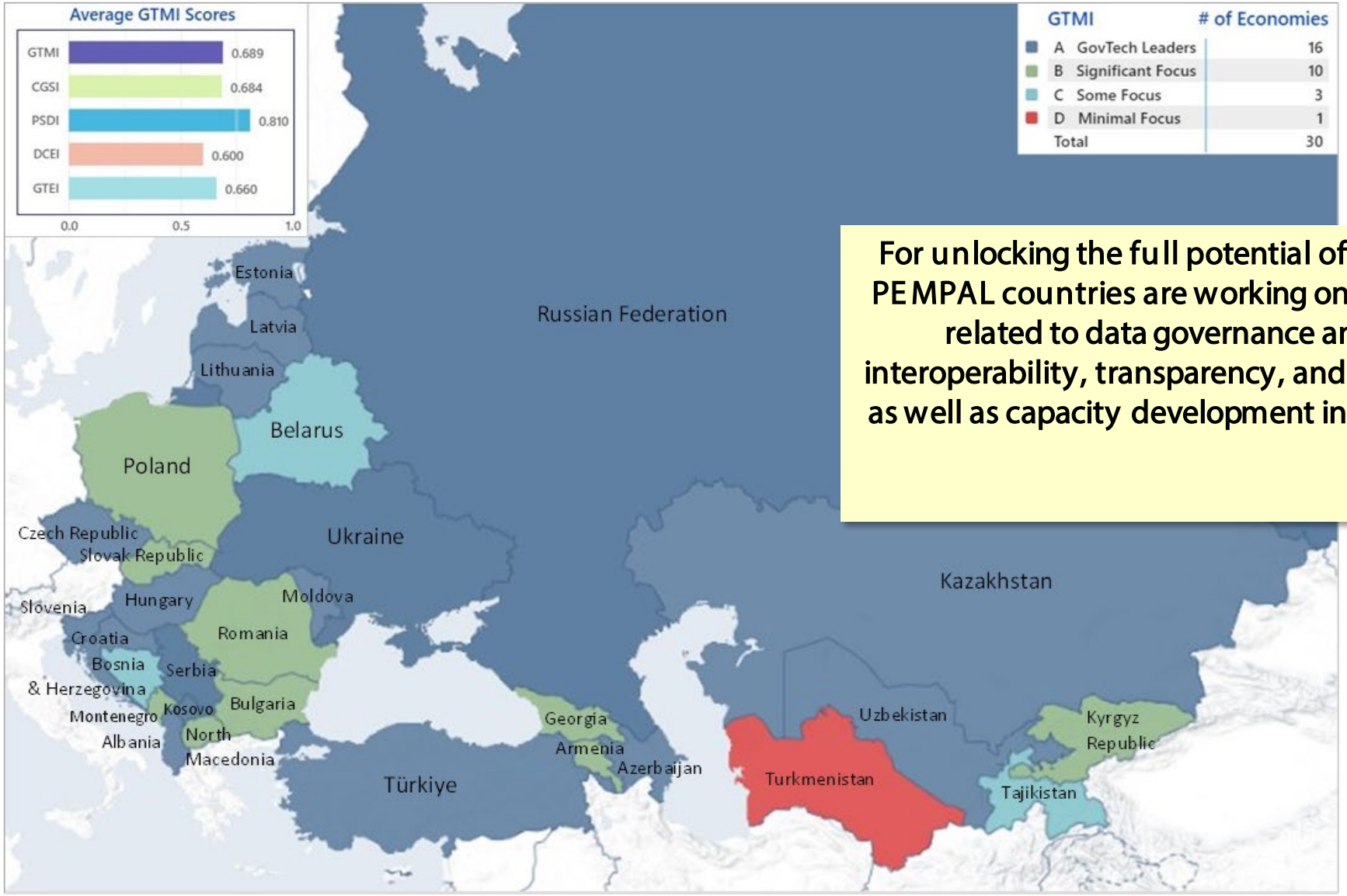
# Maturity of GovTech in the ECA Region




**For unlocking the full potential of PFM data, the PEMPAL countries are working on the challenges related to data governance and system interoperability, transparency, and accountability, as well as capacity development in data analytics.**

*Source: World Bank data (30 economies). Please refer to the 2022 GTMI Update report for details.*

# Trends in Effective Use of PFM Data

## Trends

- Integrating core FMIS (OLTP) with Data Warehouse (OLAP) and other systems to improve data quality & value, and to expand the scope of transactions / TSA.
- Growing focus on results (monitoring & publishing budget performance): Program-Based Budgeting & Public Investment Mgmt.
- Rapid IFMIS modernization by combining traditional & agile approach
- Enhanced interoperability through Application Program Interfaces (APIs) & Government Service Bus (GSB) as a part of Digital Public Infrastructure (DPI).
- Exploring the use of new/disruptive technologies (Big Data & AI/ML) for performance monitoring, decision support and savings.
- Improving data governance; Transition to data-driven culture in public sector.

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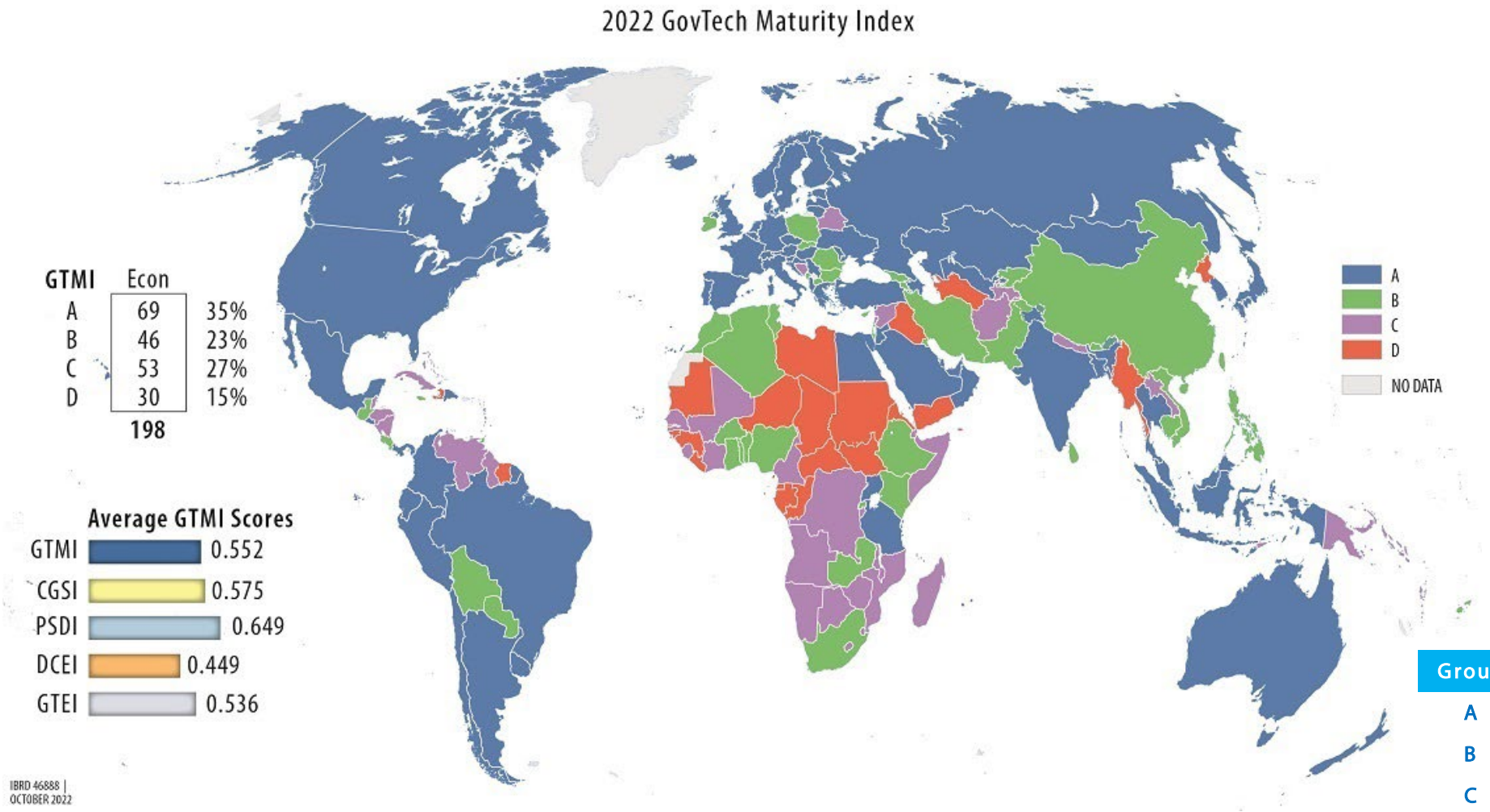
# 2022 GTMI: International Outlook

*There are 154 established Digital Government/GovTech entities around the world, and **good practices are highly visible in 69 economies** out of 198.*




GTMI showcases a country's overall advancement in digital transformation.
**GTMI is not intended to create a ranking or assess a country's readiness for or performance of GovTech.**

2020 GTMI is based on remotely collected data

2022 version is mainly based on online survey data provided by government officials

Based on the GTMI component scores, each economy is grouped into one of four categories (A to D)

| Group | Score | GTMI |
|---|---|---|
| A | 0.75-1.00 | Very High > GT Leaders |
| B | 0.50-0.74 | High > Significant Focus |
| C | 0.25-0.49 | Medium > Some Focus |
| D | 0.00-0.24 | Low > Minimal Focus |

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# GTMI Key Indicators Linked to PFM Data

| Ind | GTMI Key indicators | Points | Weight |
|---|---|---|---|
| | **Core Government Systems Index (CGSI)** | | |
| I-1 | Is there a cloud platform available for all government entities? | 0 - 2 | W 1 |
| I-2 | Is there a government enterprise architecture framework? | 0 - 2 | W 1 |
| I-3 | Is there a government interoperability framework? | 0 - 2 | W 1 |
| I-4 | Is there a government service bus platform? | 0 - 2 | W 1 |
| I-5 | Is there an operational FMIS in place to support core PFM functions? | 0 - 2 | W 3 |
| I-6 | Is there a TSA supported by FMIS to automate payments and bank reconciliations? | 0 - 2 | W 3 |
| I-7 | Is there a Tax Management Information System in place? | 0 - 2 | W 3 |
| I-8 | Is there a Customs Management Information System in place? | 0 - 2 | W 3 |
| I-9 | Is there a Human Resources Mgmt Information System with self-service portal? | 0 - 2 | W 3 |
| I-10 | Is there a Payroll System (MIS) linked with HRMIS? | 0 - 2 | W 3 |
| I-11 | Is there a Social Insurance system providing pensions and other SI programs? | 0 - 2 | W 1 |
| I-12 | Is there an e-Procurement portal? | 0 - 2 | W 2 |
| I-13 | Is there a Debt Management System in place? (Foreign and Domestic debt)? | 0 - 2 | W 3 |
| I-14 | Is there a Public Investment Management System (PIMS) in place? | 0 - 2 | W 2 |
| I-15 | Is there a gov Open-Source Software (OSS) policy/action plan for public sector? | 0 - 2 | W 2 |
| I-16 | UN Telecommunication Infrastructure Index (TII) | 0 - 1 | E 1 |
| I-17 | Does gov have a national strategy on disruptive / innovative technologies? | 0 - 2 | W 2 |
| | **Public Service Delivery Index (PSDI)** | | |
| I-18 | UN Online Service Index (OSI) | 0 - 1 | E 1 |
| I-19 | Is there an online public service portal? (Also called "One-Stop Shop" or similar) | 0 - 2 | W 2 |
| I-20 | Is there a Tax online service portal? | 0 - 2 | W 2 |
| I-21 | Is e-Filing available for tax and/or customs declarations? | 0 - 2 | W 2 |
| I-22 | Are e-Payment services available? | 0 - 2 | W 2 |
| I-23 | Is there a Customs online service portal (Single Window)? | 0 - 2 | W 2 |
| I-24 | Is there a Social Insurance/Pension online service portal? | 0 - 2 | W 2 |
| I-25 | Is there a Job portal? | 0 - 2 | W 2 |
| I-26 | Is there a digital ID that enables remote authentication for (online service access | 0 / 1 | E 2 |
| | **Digital Citizen Engagement Index (DCEI)** | | |
| I-27 | UN E-Participation Index (EPI) | 0 - 1 | E 1 |
| I-28 | Is there an Open Government web site / portal? | 0 / 1 | W 2 |
| I-29 | Is there an Open Data portal? | 0 / 1 | W 2 |
| I-30 | Are there national platforms for citizens to participate in policy decision-making? | 0 / 1 | W 1 |
| I-31 | Are there gov platforms for citizens to provide feedback on service delivery? | 0 / 1 | W 1 |
| I-32 | Does the gov publish its citizen engagement statistics and performance regularly? | 0 / 1 | W 2 |
| | **GovTech Enablers Index (GTEI)** | | |
| I-33 | Is there a gov entity focused on GovTech (digital transform, whole-of-gov? | 0 - 2 | W 1 |
| I-34 | Is there a dedicated gov entity in charge of data governance or data mgmt? | 0 - 2 | W 1 |
| I-35 | Is there a GovTech / digital transformation strategy? | 0 - 3 | W 3 |
| I-36 | Is there a whole-of-government approach to public sector digital transformation? | 0 - 2 | W 1 |
| I-37 | Are there RTI laws to make data/info available to the public online or digitally? | 0 - 2 | W 3 |
| I-38 | Is there a data protection / privacy law? | 0 - 2 | W 3 |
| I-39 | Is there a data protection authority? | 0 - 2 | W 3 |
| I-40 | Is there a national ID (or similar foundational ID) system? | 0 / 1 | E 2 |
| I-41 | Are records in the national ID system stored in a digitized (electronic) format? | 0 / 1 | E 2 |
| I-42 | Is there a digital signature regulation and PKI to support service delivery? | 0 - 3 | W 3 |
| I-43 | ITU Global Cybersecurity Index (GCI) | 0 - 1 | E 1 |
| I-44 | UN Human Capital Index (HCI) | 0 - 1 | E 1 |
| I-45 | Is there a gov strategy / program to improve digital skills in the public sector? | 0 - 2 | W 1 |
| I-46 | Is there a strategy and/or program to improve public sector innovation? | 0 - 2 | W 1 |
| I-47 | Is there a government entity focused on public sector innovation? | 0 - 2 | W 1 |
| I-48 | Is there a gov policy to support GovTech startups and private sector investments? | 0 / 1 | W 2 |

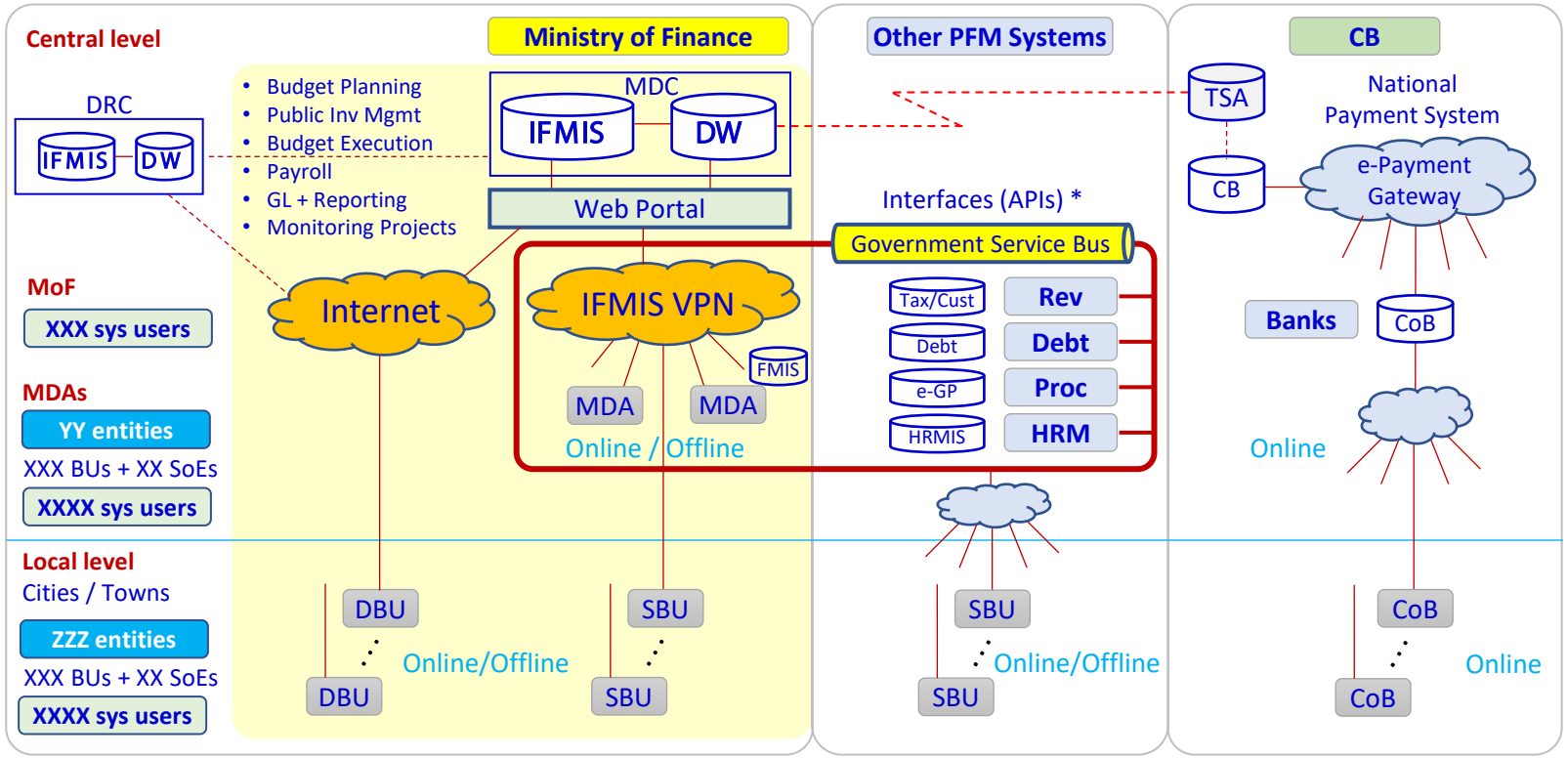
# IFMIS Model to Capture Comprehensive PFM Data

## Centralized web-based cloud-ready IFMIS platform

Shared IFMIS modules supporting all budget users online

IFMIS Scope: Central and local governments

PFM business processes can be simplified and optimized to avoid a substantial **opportunity cost** while transitioning to IFMIS.



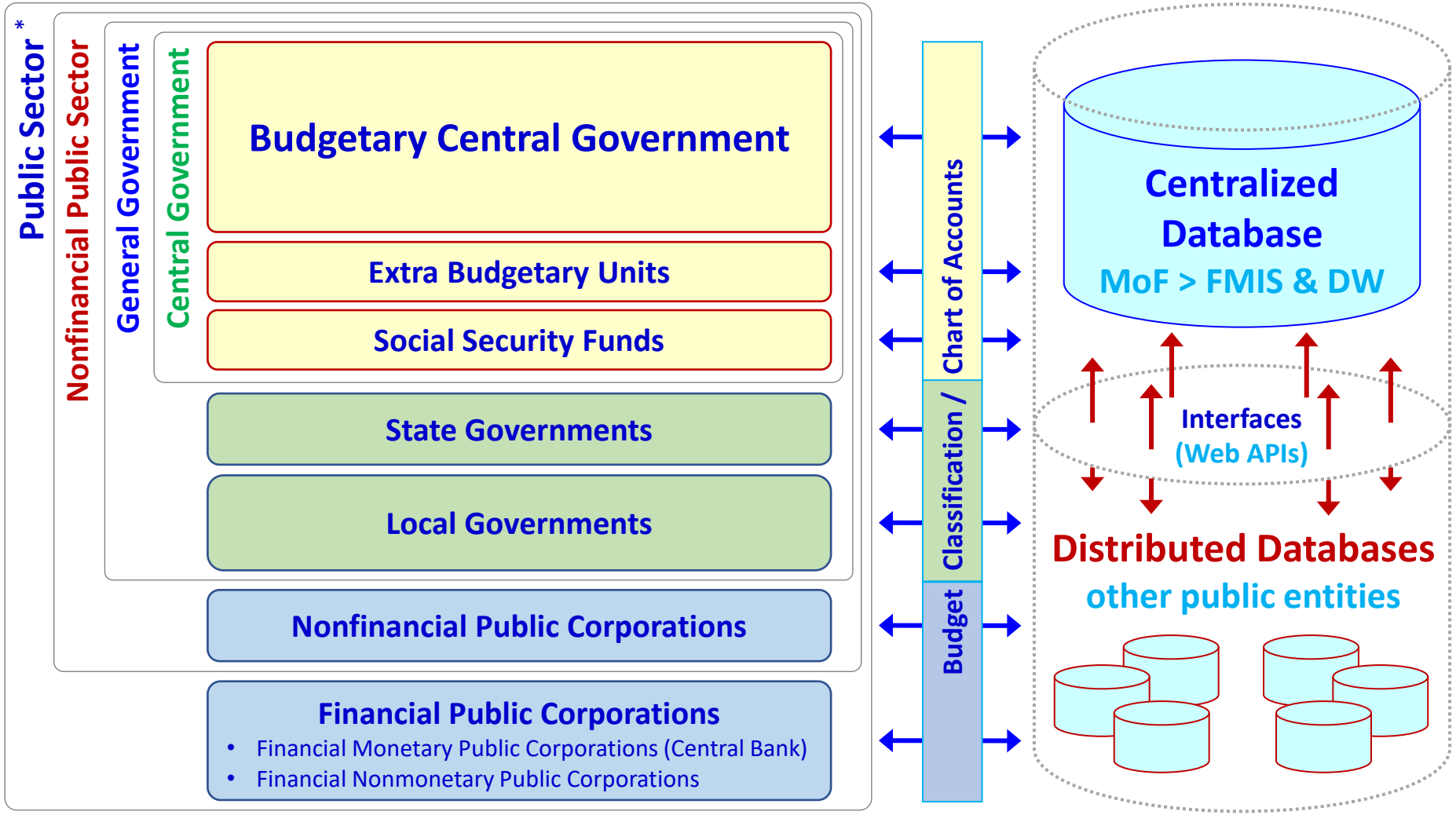

IFMIS can be designed as a **cloud-ready** platform for seamless integration with the future Government Cloud once it arrives

**MoF** : Ministry of Finance
**CB** : Central Bank
**DBU**: District Budget User
**MDC:** Main Data Center
**GovTech** : GovTech
**CoB** : Commercial Banks
**SBU:** State Budget User
**DRC:** Disaster Recovery Center
**MDA:** Ministries, Departments, Agencies
**TSA** : Treasury Single Account
**VPN:** Virtual Private Network
**API:** Application Programming Interface

**(*)** There will be additional interfaces (APIs) with other PFM and government systems to use existing shared platforms such as National Digital ID and more.

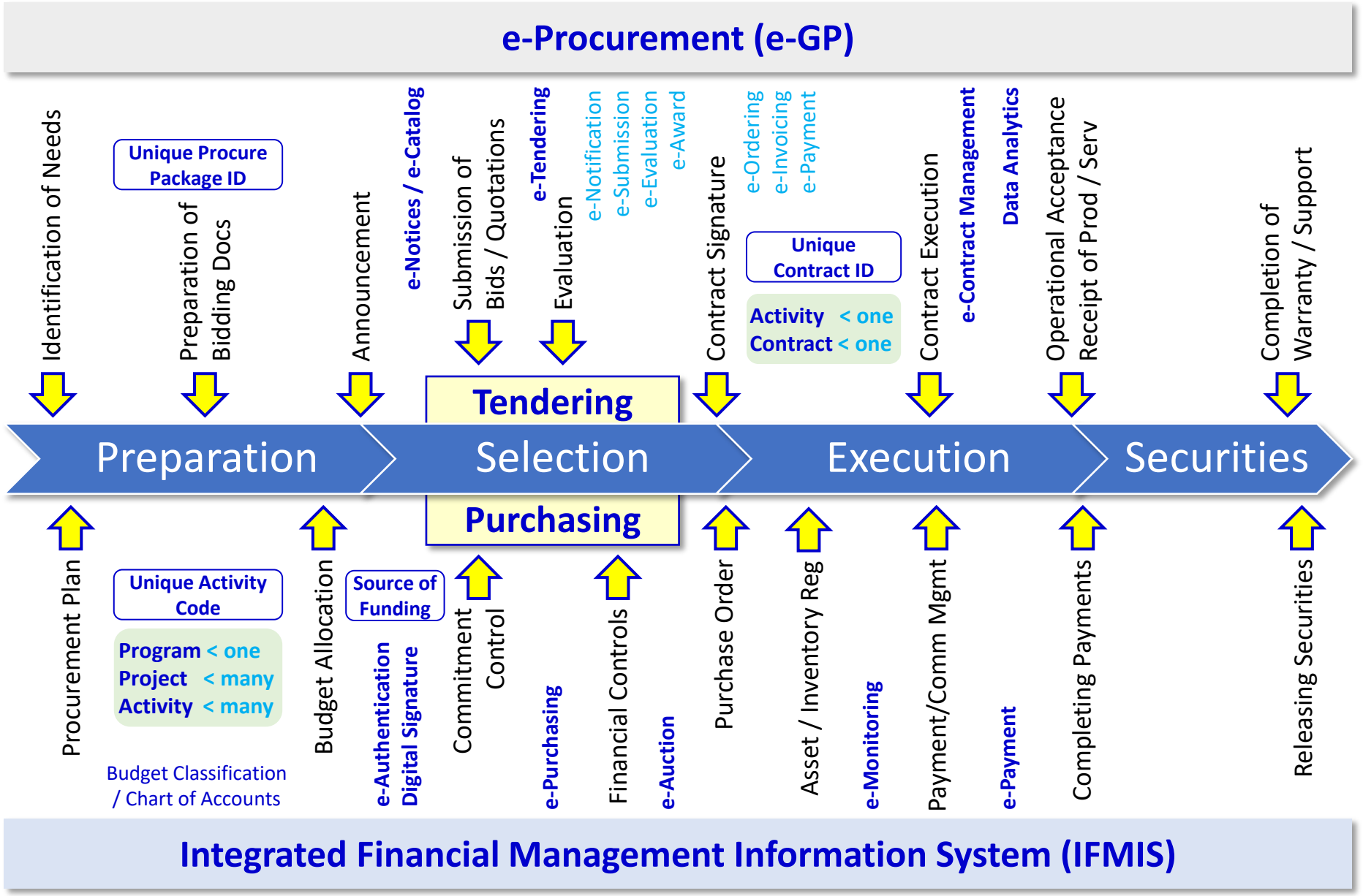
# Expansion of IFMIS Scope to Capture PFM Data

## How to Automate Recording and Reporting of Public Finance Data?

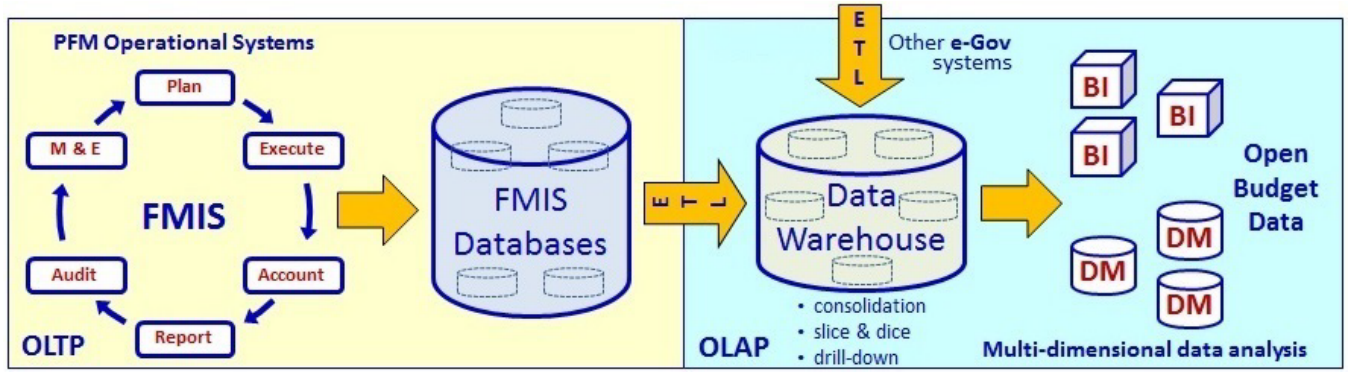



* Institutional structure of "Public Sector", as defined in the IMF Govt Finance Statistics 2014 Manual

# IFMIS & e-GP Data Exchange



# Brazil > Connecting Foundations & Frontiers

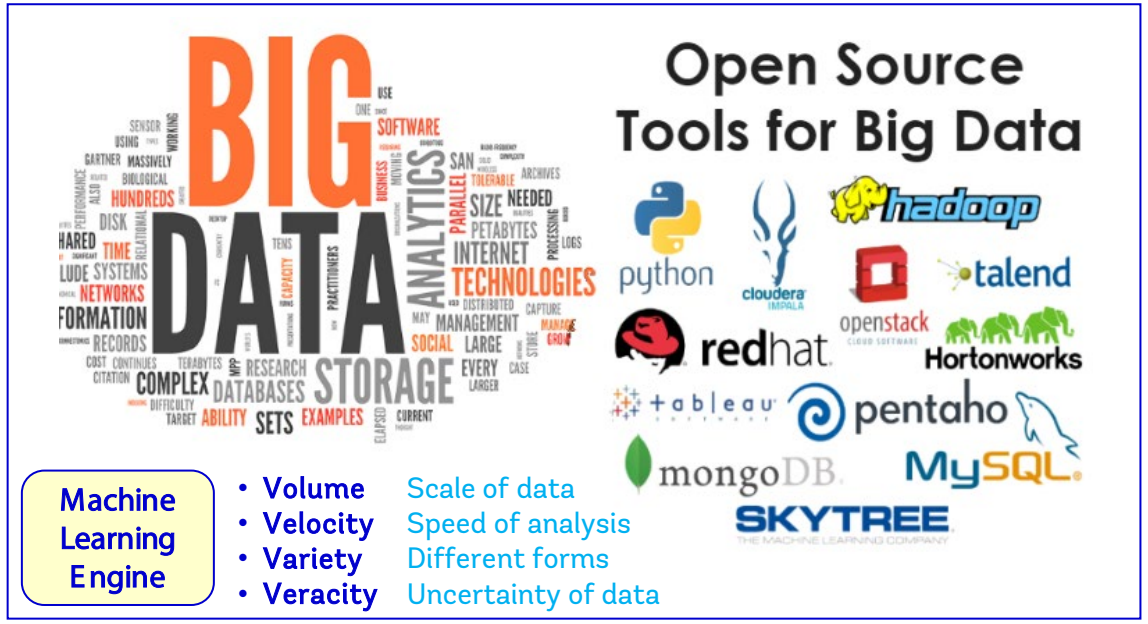



Foundations → Frontiers

Provide feedback to IFMIS for improving data quality & value

**CGU, Brazil**

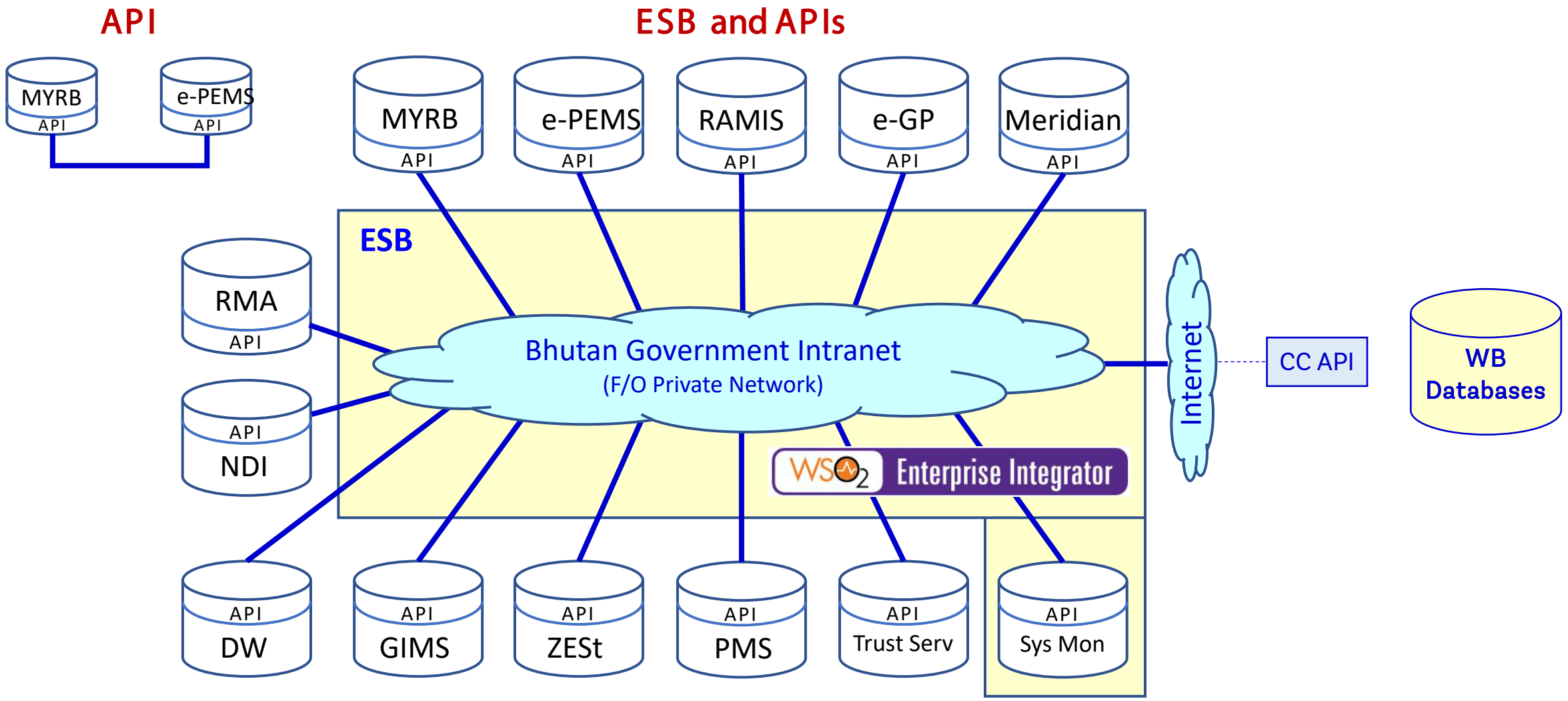
Apply Machine Learning (AI)




Combine "digital value" of FMIS with "out of government" data

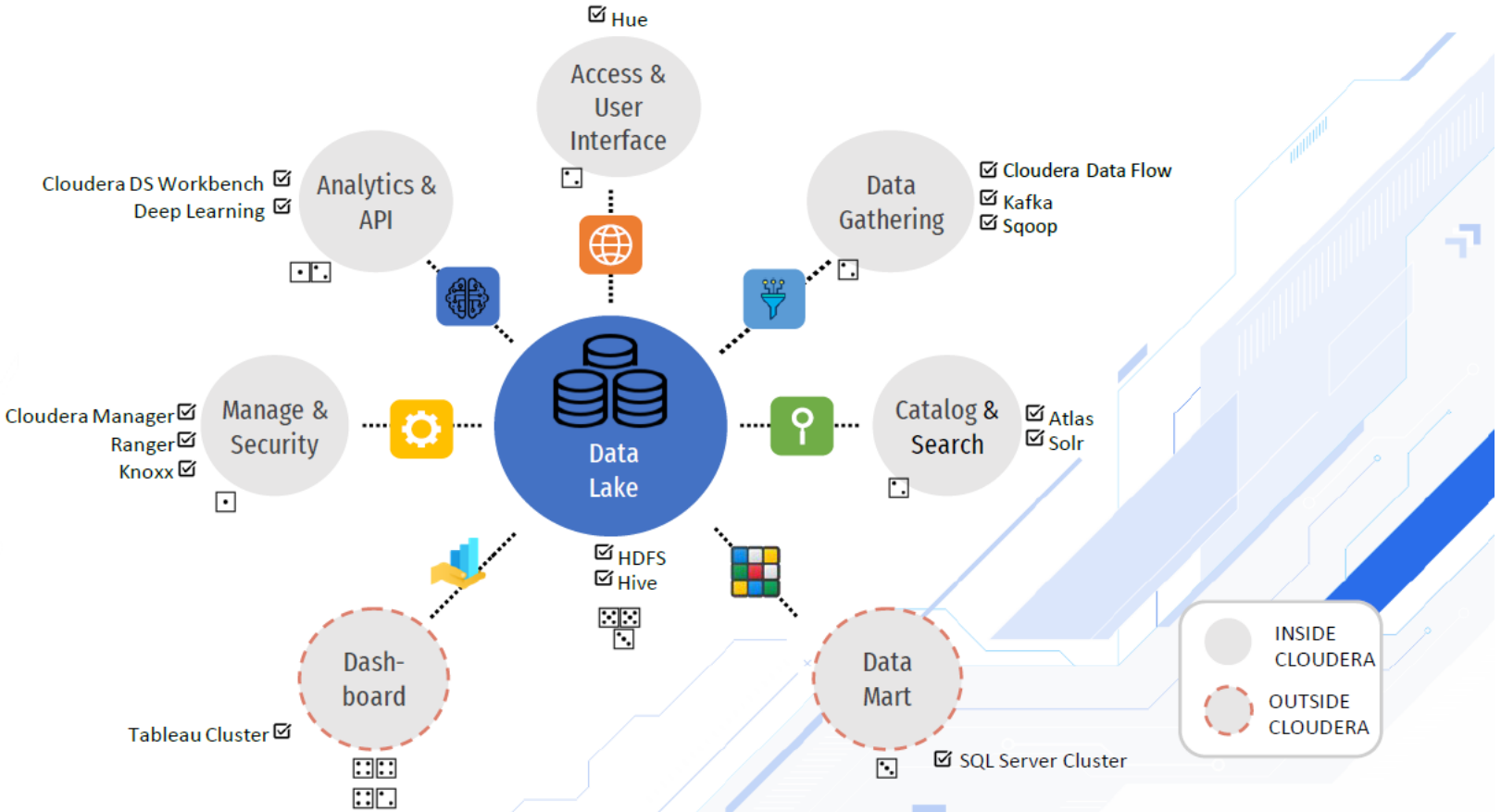
Satellites, Sensors, IoT, Smart phones, ...

# Using GSB (APIs) to improve PFM interoperability



# Indonesia > Use of Advanced Data Analytics

## Enhancing Treasury Big Data Environment for the Next Data Science Projects




*Source: Indonesia's presentation during June 2024 PEMPAL TCoP event in Belgrade in June 2024.*

# Challenges

## Challenges

Key challenges in transition to IFMIS are Adaptive (non-technical):

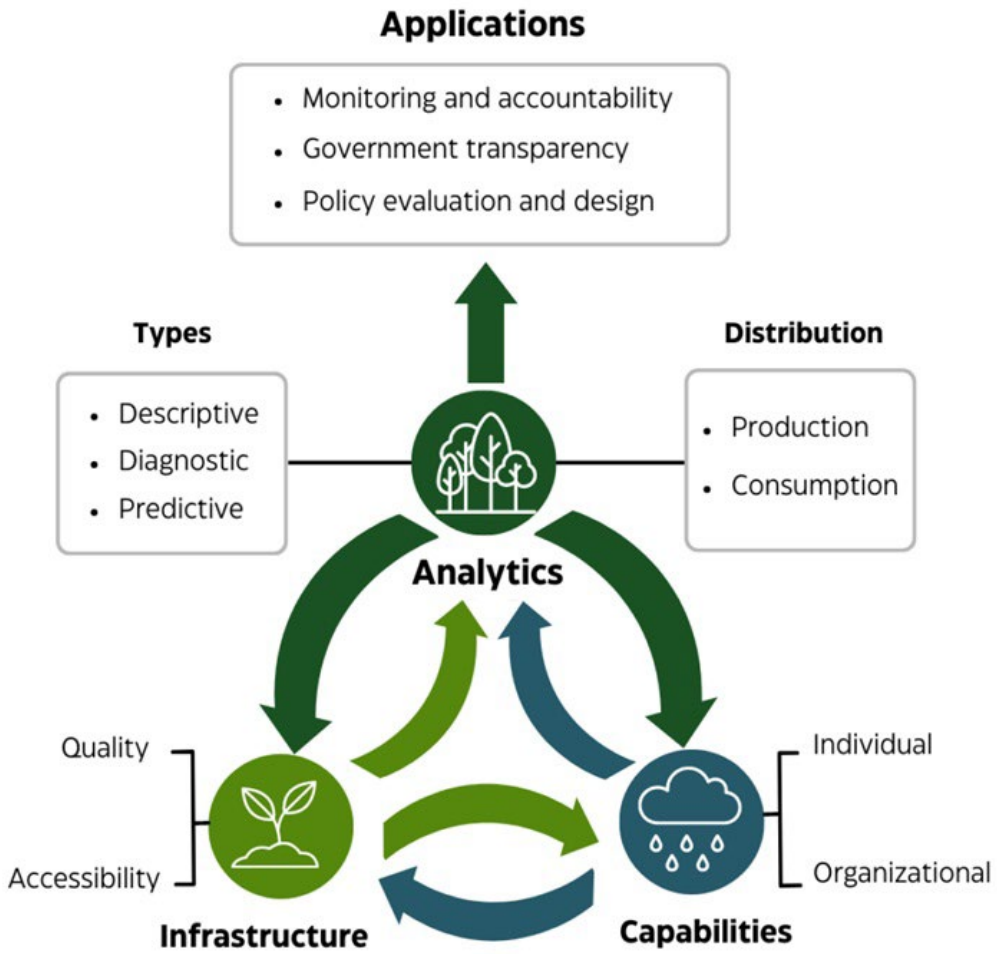
- Leadership & change management for transition to digital culture in the public sector.
- Enforcing the use of IFMIS and other MIS platforms for daily recording of all budget transactions, and web publishing of results (for building trust)
- Improving the interoperability of IFMIS with other government systems.
- Adopting policies and governance frameworks to promote human-centric AI and manage the risks involved.
- Developing a comprehensive cybersecurity strategy to protect data and Critical Information Infrastructure (CII).

# Used of PFM Data and Change Management

- Effective use of IFMIS/PFM data is not only a "digital transformation" challenge. It requires a change towards data-driven culture in the public sector.
- PFM reforms supported through IFMIS affect not only the MoF operations, but the whole public administration, as well as the way the government presents itself.
- "Change Management" is broadly defined as "the process of helping people understand the need for change and to motivate them to take actions which result in sustained changes in behavior".
- Critical aspects highlighted in various studies to focus on for mobilizing a large group of individuals (reform teams) to work together effectively and achieve reform objectives:
  - Developing adaptive leadership skills (sharpening problem-solving skills of reform teams)
  - Stakeholder mapping to identify key actors (commitments) and support/resistance (constraints)
  - Development of a shared vision (direction) to clarify what will be achieved and when
  - Communication strategy (alignment) to coordinate and integrate different components

*Source: Managing Change in PFM System Reforms: A Guide for Practitioners. FMIS CoP Publication. June 2015*

# Government Analytics in the LCR Region




Conceptual Framework for the Government Analytics

- **Government analytics** is the use of administrative and survey data to diagnose and improve the functioning of government operations.
- A report was prepared in May 2024 based on a survey on the use of data analytics in six platforms (FMIS, Tax, HRMIS, e-GP, Edu MIS, Health MIS) of 19 LCR countries.
- Challenges identified in the use of data analytics include:
  - Limitations in the digitalization, comprehensiveness, and data governance of the systems hosting admin data.
  - Limited interoperability and data sharing due to fragmented systems and lack of data access protocols.
  - Inadequate data quality control measures, imposing challenges for the accuracy, reliability, timeliness, replicability, and sustainability of analytics.
  - Difficulties in developing analytical skills/capabilities across the institutions.

*Source: Government Analytics in the LCR Region: Creating an Ecosystem for Evidence-Based Policy Making. May 2024*

# Used of AI/ML > Priorities Going Forward

- Governments must adopt policies and governance frameworks that promote human-centric AI while maximizing opportunities. Critical aspects of the **policy framework** are listed below:
  - AI policy anchored in ethical principles would be essential.
  - Transparency and accountability through inclusion and multi-stakeholder engagement at every step of the AI policy design and implementation.
  - These policies should also promote digital skills, and broader education in science, technology, engineering, and mathematics (STEM) to support people as they adjust to the shifting nature of work in the coming decades.
  - The regulatory framework to fight online propaganda, misinformation, libel, and cybercrimes should be given priority.
  - Strengthen privacy, data protection, and civil liberties and monitor compliance, which is typically weak in most settings.
- Investments should be made in **human capital** and **digital infrastructure**.
- **Risks** should be identified and managed, rather than avoided.

*Source: Artificial Intelligence in the Public Sector: Maximizing Opportunities, Managing Risks (2020); EFI Insight-Governance. Washington, DC, World Bank*

# Thank You

# Q&A

- **GovTech/GTMI web page:** https://www.worldbank.org/en/programs/govtech/gtmi
- **GTMI Dashboard:** https://www.worldbank.org/en/data/interactive/2022/10/21/govtech-maturity-index-gtmi-data-dashboard
- **GTMI Report (OKR):** https://openknowledge.worldbank.org/handle/10986/36233
- **2022 GTMI Update (OKR):** https://openknowledge.worldbank.org/handle/10986/38499
- **GovTech Dataset:** https://datacatalog.worldbank.org/search/dataset/0037889/GovTech-Dataset
- **GovTech Projects Database:** https://datacatalog.worldbank.org/search/dataset/0038056/digital-governance-projects-database
- **GovTech OLC e-Learning course # 1:** https://olc.worldbank.org/content/govtech-fundamentals-and-key-concepts
- **GovTech OLC e-Learning course # 2:** https://olc.worldbank.org/content/trends-govtech-solutions-public-financial-management

# Reference

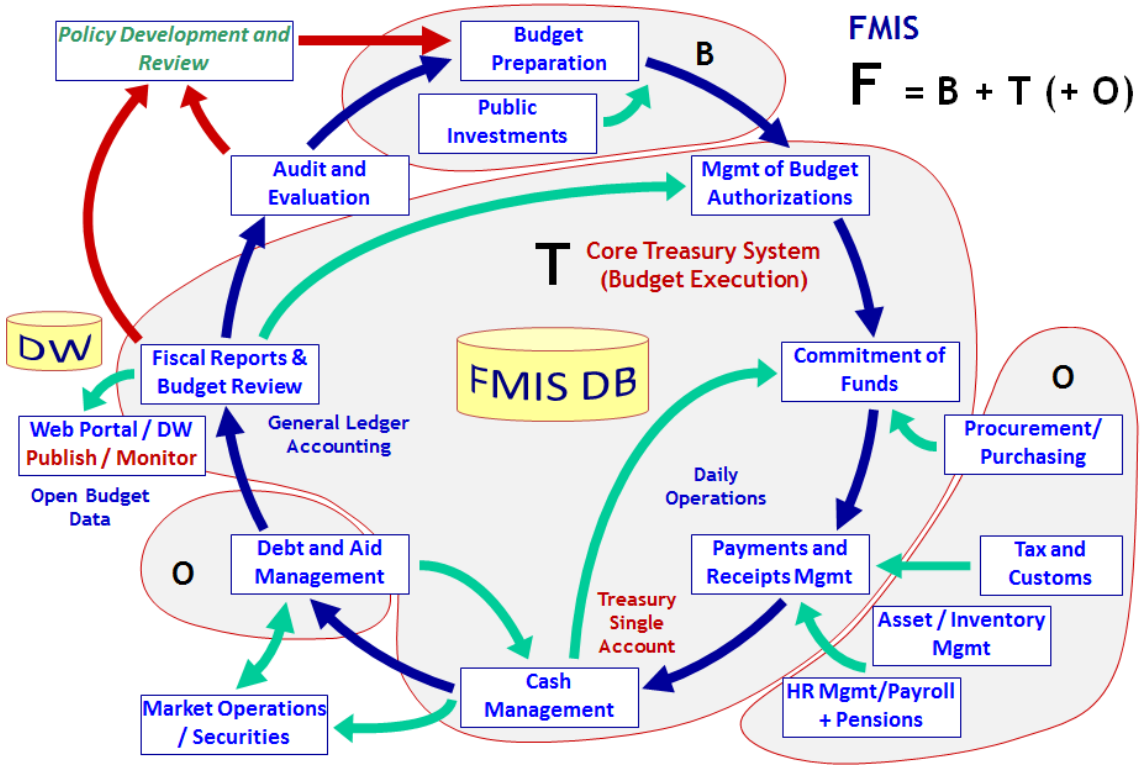
# W hat is IFMIS ?

Core Financial Management Information Systems (FMIS) can be broadly defined as a set of automation solutions that enable governments to plan, execute and monitor the budget.

Core FMIS = OLTP

IFMIS = OLTP + OLAP

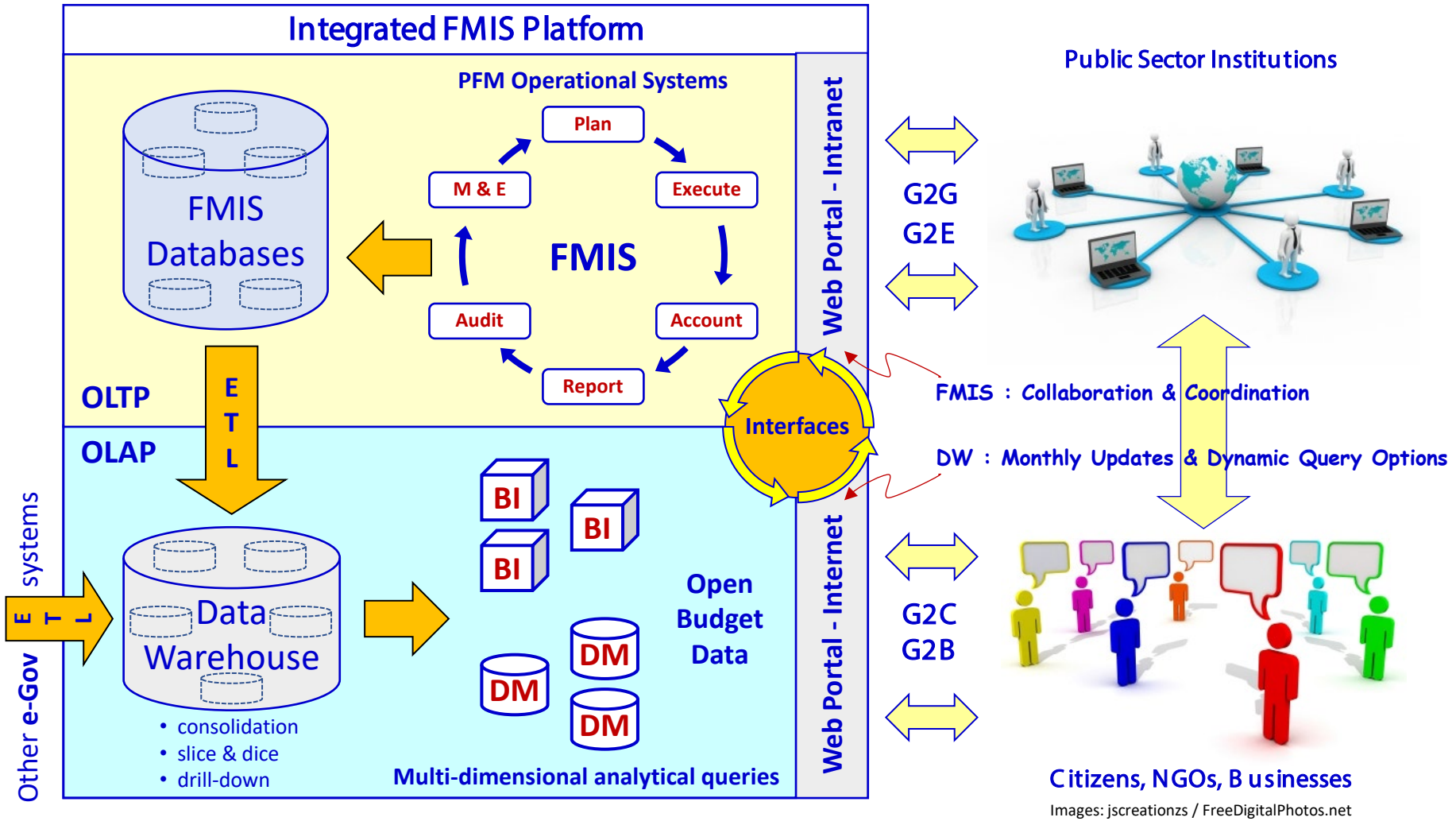
## Core FMIS functional modules and interfaces




Integrated FMIS (or IFMIS) combine core FMIS modules (OLTP) with powerful Data Warehouse (DW) capabilities and multi-dimensional data analysis tools (OLAP) for effective planning, decision support, service delivery, and performance monitoring.

# IFMIS = OLTP + OLAP

**Goals >** Sustainable public resource management + Effective public service delivery + Open and accountable government




Images: jscreationzs / FreeDigitalPhotos.net

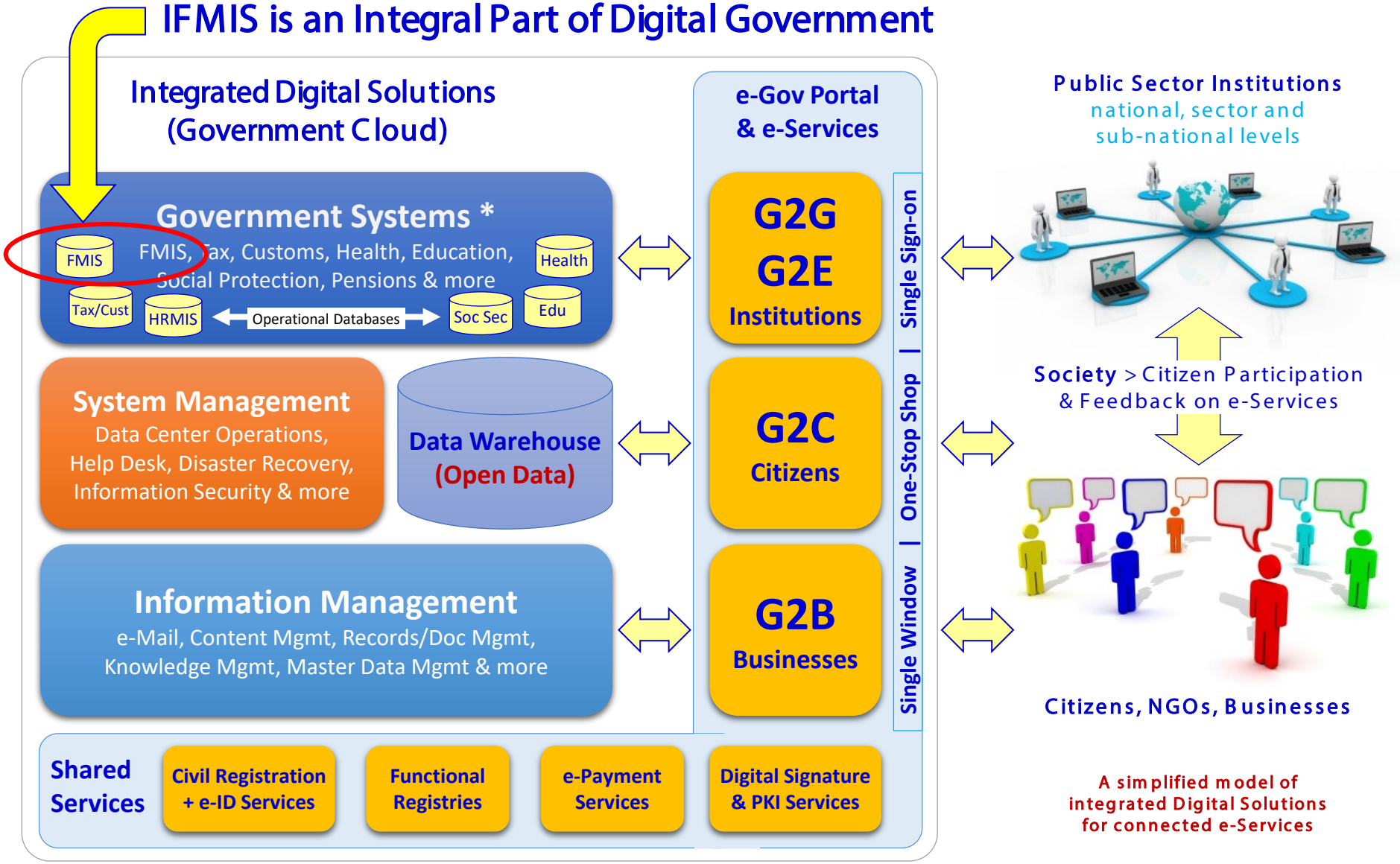
**OLTP** : Online Transaction Processing **OLAP** : Online Analytical Processing **DW:** Data Warehouse **ETL** : Extract, Transform, Load **BI** : Business Intelligence **DM** : Data Mining

# IFMIS Modules to Capture Comprehensive PFM Data

1. **Planning and Budgeting Modules**
   - **MYB** > Multi-Year Budget Preparation (including MEF)
   - **PIM** > Public Investment Management
   - **MPC** > Monitoring of projects and contracts
   - **REG** > Management of registries & budget classification
2. **Budget Execution Modules**
   - **MBA** > Management of budget allocations
   - **MEX** > Management of expenditures
   - **MRE** > Management of receipts
   - **PAY** > Payroll Calculations / Database
   - **CCM** > Commitment control & management
   - **CFM** > Cash forecasting and management
   - **ACC** > Accounting / General Ledger
3. **Transparent Government Reporting**
   - **DWH** > Data Warehouse, BI tools, Web Portal
   - **OBD** > Financial Reports / Open Budget Data
4. **Interfaces with other Government Systems**
   - **TSA interface** > Interface with National Payment System
   - **HRMIS** > Human Resource Management
   - **e-GP** > Public Procurement and **AMS** > Asset Management
   - **Tax & Customs** > Revenue Administration
   - **Debt** > Debt Management
   - **PMS** > Pension Management System
   - **AMS** > Audit Management System

# W hat is IFMIS ?

## IFMIS is an Integral Part of Digital Government




A simplified model of integrated Digital Solutions for connected e-Services

* Government Systems cover the integration (interconnectivity & interoperability) of sector applications, back-office systems, as well as the improvement of institutions, capacity, regulations, processes, information management, and more (National Enterprise Architecture, e-Gov Interoperability Framework, Single Window, and One-Stop-Shops).

Images: jscreationzs / FreeDigitalPhotos.net

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# What is GTMI?

GovTech Maturity Index (GTMI)
measures the state of four GovTech focus areas
in 198 economies
using 48 key indicators
to inform operations, research & analytics

- **Core Government Systems Index (CGSI)**
  17 indicators
- **Public Service Delivery Index (PSDI)**
  9 indicators
- **Digital Citizen Engagement Index (DCEI)**
  6 indicators
- **GovTech Enablers Index (GTEI)**
  16 indicators

**Target users:** Government officials, World Bank teams, and practitioners involved in digital transformation


## 2025 GTMI Update is in progress

# OLAP & Business Intelligence

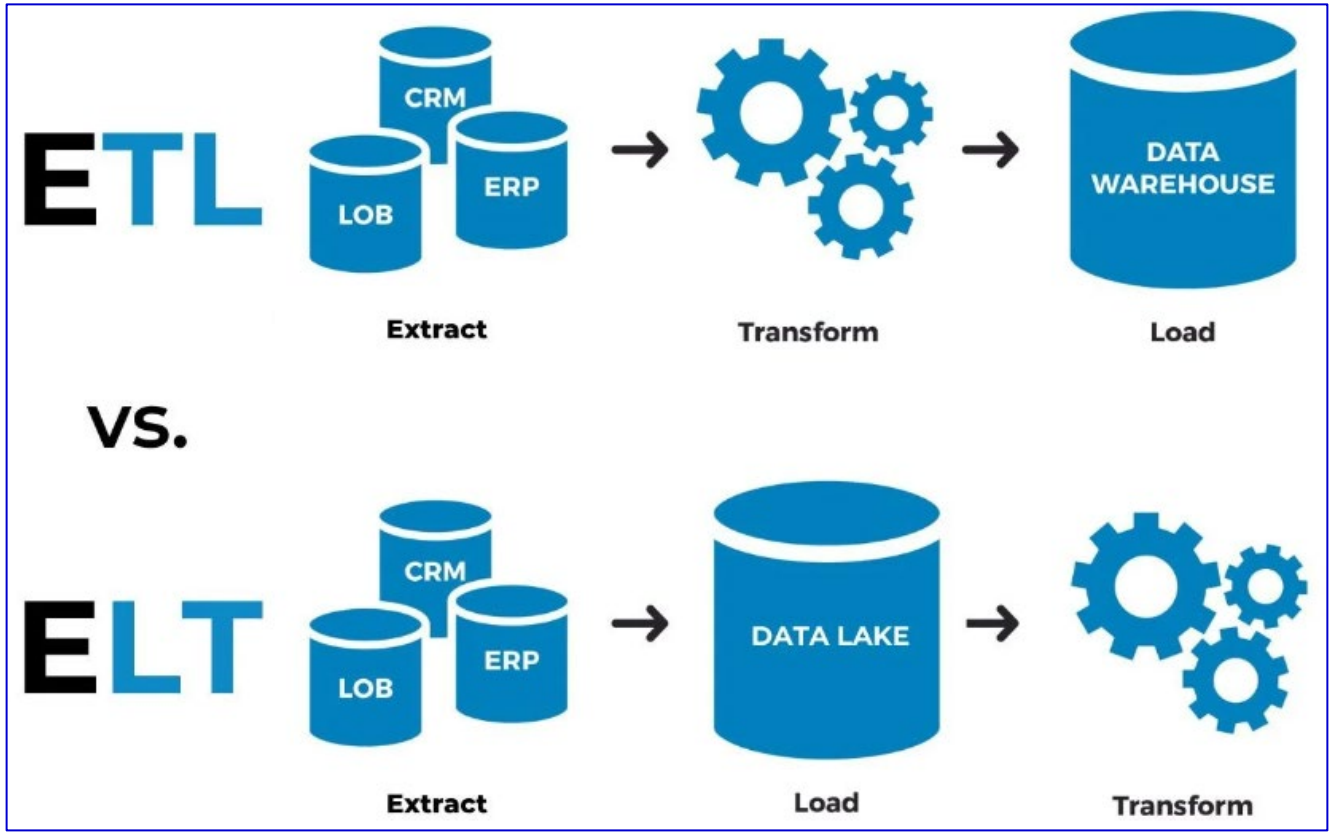
**Business Intelligence (BI)** refers to the technologies and strategies involved in collecting and analyzing data from internal and external systems to provide a detailed view of budget performance.

Using reports, dashboards and query tools, historical data can be analyzed, and custom reports can be generated. BI is a powerful tool providing real-time access to data to support decision-making.

**Online Analytical Processing (OLAP)** is technology for performing high-speed complex queries or multidimensional analysis on large volumes of data in a data warehouse, data lake or other data repository.

OLAP is used in BI, decision support, and a variety of forecasting and reporting applications.

*Source: Microsoft*




ETL (Extract, Transform and Load) has been the most used methodology for carrying out data integration processes since the 1970s. However, new demands in terms of volume, velocity and variety in data management have led to the emergence of a new approach to the traditional ETL process: ELT

# Dimensions of Interoperability

## 1 Legal Interoperability

Refers to regulations aimed at: lifting sectoral restrictions in the use and storage of data; unify data licenses; define data recording practices, among other things.

Removing legal barriers to interoperability and encouraging cooperation between administrations

## 3 Semantic Interoperability

Refers to vocabularies, database repositories, and other elements that make it possible to understand the contents of a table, file, or statistic and their storage and transmission format.

Develop common schemas, catalogues and protocols to describe data exchanges

**Main focus of many countries so far**

## 2 Organizational Interoperability

This is how administrative entities align their process. Organizational IoP is composed of two pillars, business process harmonization, and organizational relationships.

Align organizational processes, responsibilities, and expectations, institutional structure for leadership and coordination

## 4 Technological Interoperability

Technical IoP covers applications and infrastructures that enable data sharing between different entities. This includes interface specs, connection and data integration services, secure communication protocols, etc.

Have the applications and infrastructure connecting systems and services

# IFMIS & Advanced Analytics

**Advanced Analytics (AA)** uses Data Science beyond traditional business intelligence (BI) methods, to make predictions or generate recommendations.

AA techniques include machine learning, pattern matching, forecasting, visualization, semantic analysis, simulation, sentiment analysis, deep learning/neural networks, and more.

## Business Intelligence vs. Advanced Analytics

| | Business Intelligence | Advanced Analytics |
|---|---|---|
| **Answers the questions:** | ▪ What happened?<br>▪ When?<br>▪ Who?<br>▪ How many? | ▪ Why did it happen?<br>▪ Will it happen again?<br>▪ What will happen if we change X?<br>▪ What else does the data tell us that we never thought to ask? |
| **Includes:** | ▪ Reporting (KPIs, metrics)<br>▪ Automated monitoring and alerting (thresholds)<br>▪ Dashboards<br>▪ Scorecards<br>▪ OLAP (cubes, slice and dice, drilling)<br>▪ Ad hoc query<br>▪ Operational and real-time BI | ▪ Statistical or quantitative analysis<br>▪ Data mining<br>▪ Predictive modeling<br>▪ Multivariate testing<br>▪ Big data analytics<br>▪ Text analytics |

BI is focused on historical data to identify what has happened and why. It's a reactive, rearview mirror approach.
AA takes a proactive, forward-looking approach that extrapolates data to forecast what could happen and how various actions might alter an outcome.

*Source: TechTarget*

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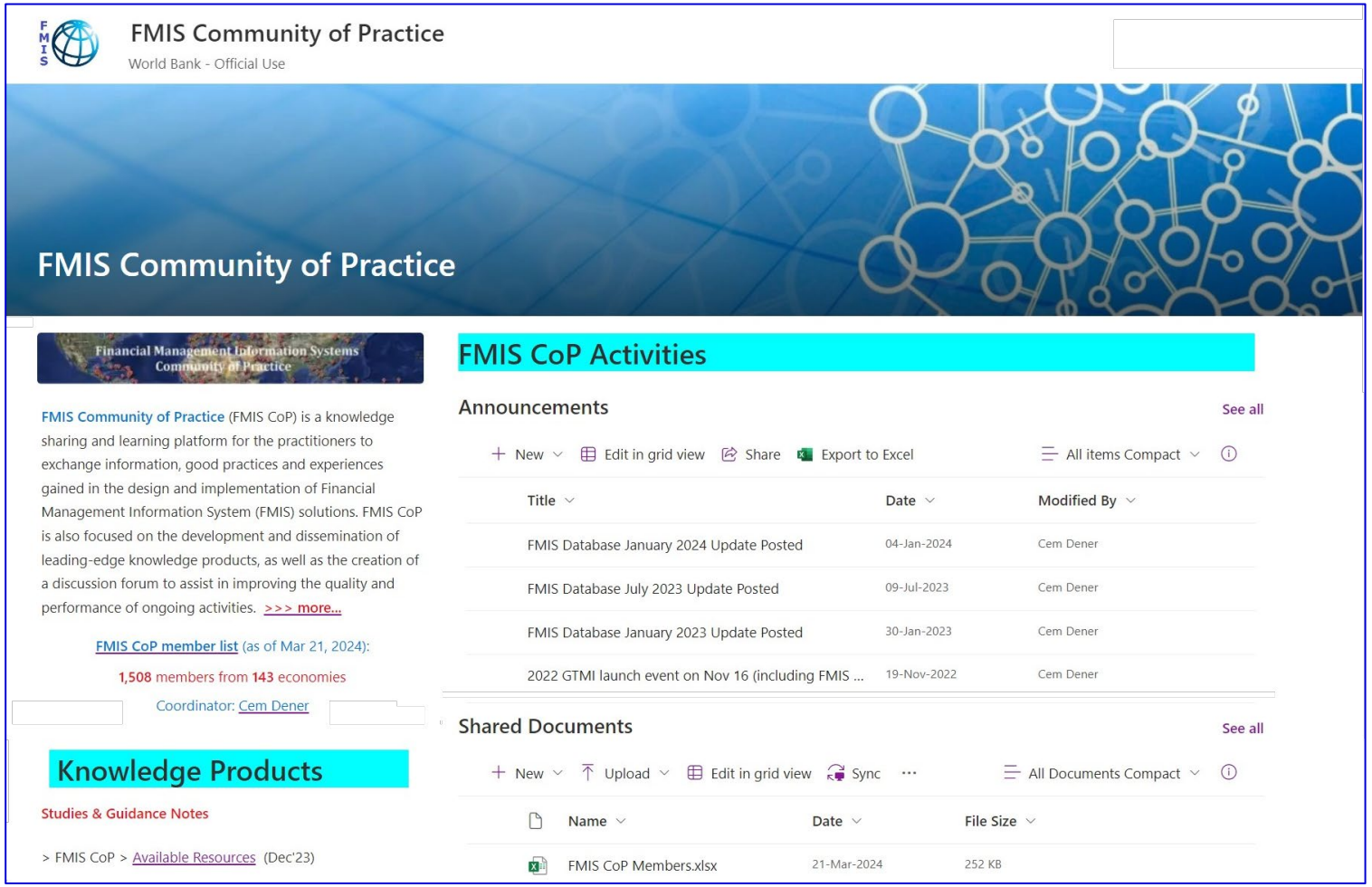
# FMIS Community of Practice

- Objective : To assist the practitioners (government officials, WB staff/consultants, and development partners) in improving the effectiveness of PFM operations and service delivery by sharing knowledge and experiences, and producing relevant, leading edge knowledge products on integrated FMIS solutions.
- FMIS CoP was established in Sep 2010. As of Apr 2024, 1,500+ members from 143 economies.



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# GTMI Data Dashboard