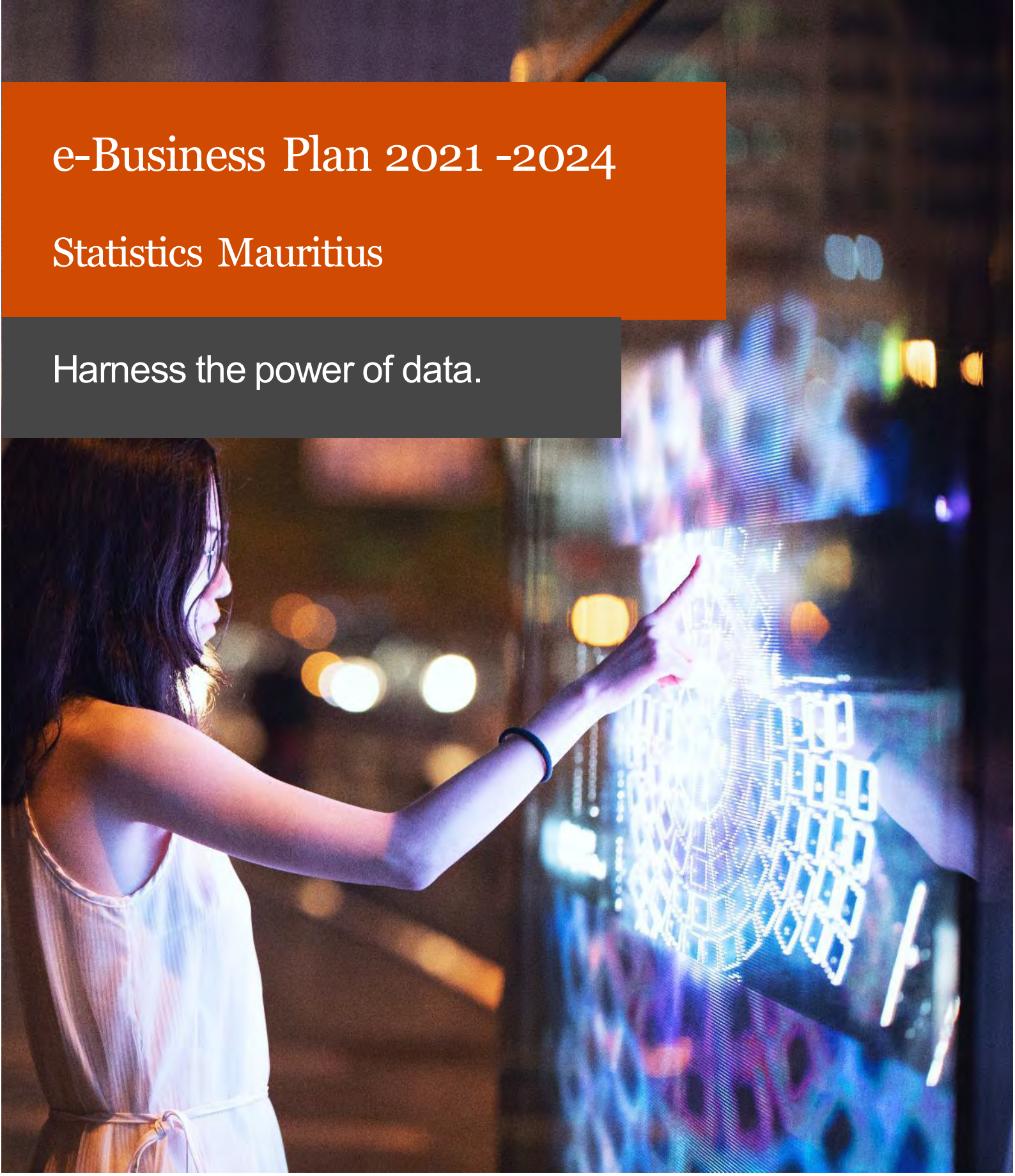
e-Business Plan 2021 -2024

Statistics Mauritius

Harness the power of data.



pwc

UNDP Mauritius and Seychelles

13 May 2021

Consultancy Services for the development of Business Continuity Processes (BCP) for the Republic of Mauritius (RFP/MUS/2020/004)

Lot 2: Preparation of an E-Business Plan for harnessing IT to enhance the operations of Statistics Mauritius

Mr Satyajeet Ramchurn
Head of Environment Unit
UNDP Mauritius and Seychelles
6th Floor Anglo-Mauritius House
Intendence Street
Port Louis

13 May 2021

Our Reference: Confidential/CON/1460/0521
Your Reference: Contract No: FS-MUS-SER2020-012

Dear Mr Ramchurn

Final e-Business Plan for harnessing IT to enhance operations of Statistics Mauritius

In accordance to our contract reference FS-MUS-SER2020-012 dated 15 December 2020, we are pleased to submit the third deliverable, that is **Final e-Business Plan 2021- 2024 for Statistics Mauritius**. We would like to thank the United Nations Development Programme ("UNDP") team, Statistics Mauritius (SM) Director and team for the support in preparation of this deliverable. This report comprises of the following chapters:

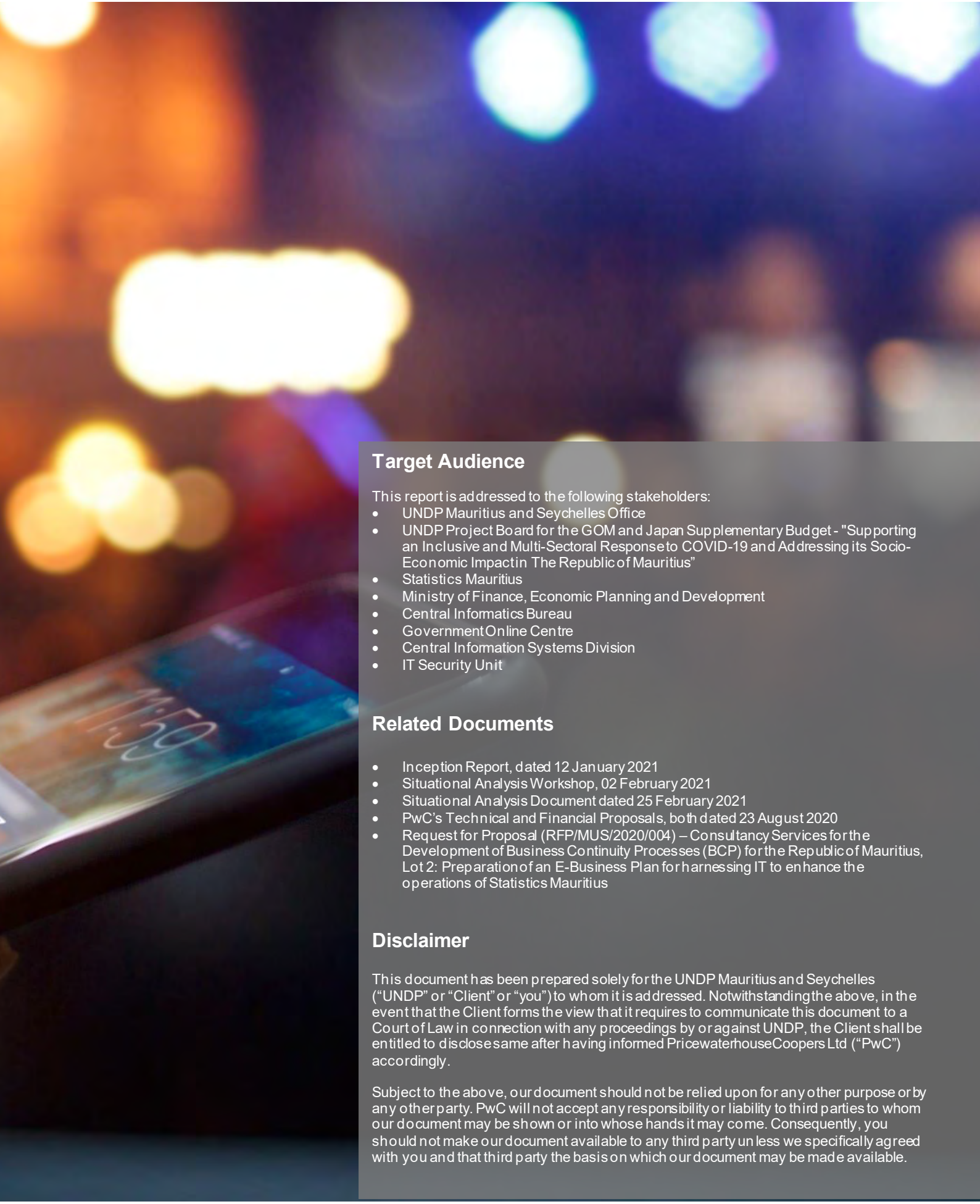
- **Executive Summary** – Summary of the report in terms of the need for change, objectives of the e-Business Plan 2021- 2024, Future Operating Model (MauStats), Strategic initiatives, and implementation roadmap.
- **Introduction** – Background, scope and approach for this project.
- **Situational Analysis** – High level findings of the study, key challenges and benchmarking of SM operating model vis a vis global leading practices.
- **Overview of the Proposed Model** – Design Principles, Future Operating Model of SM and six (6) key strategic initiatives.
- **Deep Dive into Mode of Operation and Processes** – Detailed to-be process flows and user journeys with enablement of MauStats.
- **MauStats Architecture** – Architecture design principles, application architecture, infrastructure architecture, Security and interfacing considerations.
- **Regulatory and Policies** – Highlights envisaged changes to the existing regulatory framework and new policies to be adopted.
- **Implementation Roadmap** – A roadmap provided for the projects identified as part of SM e-Business Plan 2021-2024.
- **Monitoring and Evaluation** – Provides framework to be taken to implement projects identified.

Additional information supporting the preparation of the e-Business Plan have been detailed in Appendices.

Should you require any further information or need clarification, please do not hesitate to contact us on +230 404 5000.

Yours sincerely

Vikas Sharma
Director



Target Audience

This report is addressed to the following stakeholders:

- UNDP Mauritius and Seychelles Office
- UNDP Project Board for the GOM and Japan Supplementary Budget - "Supporting an Inclusive and Multi-Sectoral Response to COVID-19 and Addressing its Socio-Economic Impact in The Republic of Mauritius"
- Statistics Mauritius
- Ministry of Finance, Economic Planning and Development
- Central Informatics Bureau
- Government Online Centre
- Central Information Systems Division
- IT Security Unit

Related Documents

- Inception Report, dated 12 January 2021
- Situational Analysis Workshop, 02 February 2021
- Situational Analysis Document dated 25 February 2021
- PwC's Technical and Financial Proposals, both dated 23 August 2020
- Request for Proposal (RFP/MUS/2020/004) – Consultancy Services for the Development of Business Continuity Processes (BCP) for the Republic of Mauritius, Lot 2: Preparation of an E-Business Plan for harnessing IT to enhance the operations of Statistics Mauritius

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Document Release Notice

Version 1.0

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Project Coordinator, Statistics Mauritius		16 April 2021
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Revision History

Release	Issue Date	Change Details	Reviewed by
Draft e-Business Plan v1.0	31 March 2021		
Final e-Business Plan vF	13 May 2021		

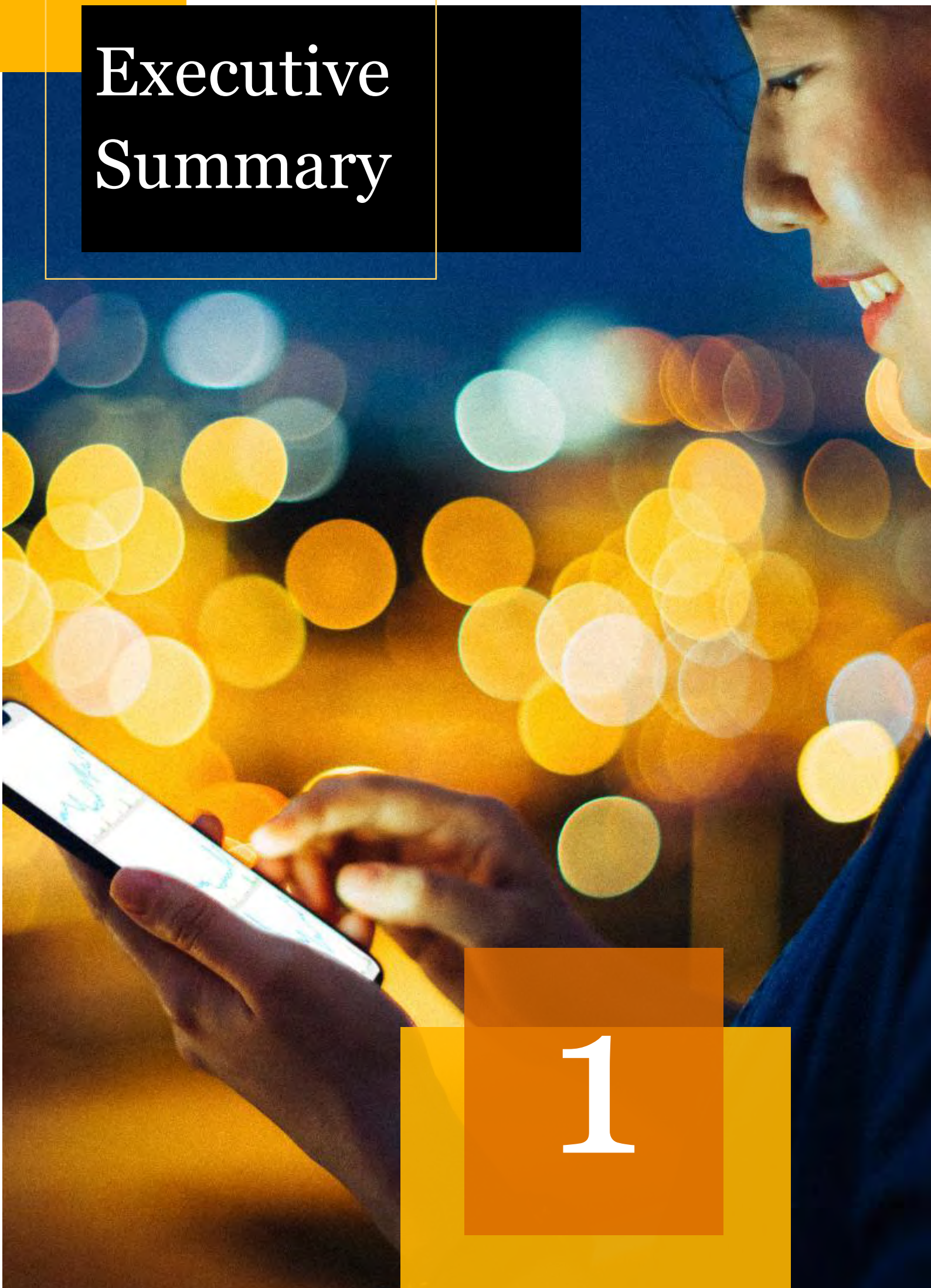
List of Abbreviations

Acronym	Definition
ABI	Analytics and Business Intelligence
AI	Artificial Intelligence
API	Application Programming Interface
BI	Business Intelligence
CA	Certificate Authority
CBRD	Corporate and Business Registration Department
CEA	Census of Economic Activity
CES	Conference of European Statisticians
CIB	Central Informatics Bureau
CISD	Central Information Systems Division
CMPHS	Continuous Multi-Purpose Household Survey
CSV	Comma-separated values file format
DDI	Data Documentation Initiative
DGO	Data Governance Office
DSBB	Dissemination Standards Bulletin Board
DSC	Digital Signature Certificate
ESI	Economic Social Indicators
ETL	Extract Transform Load
FAREI	Food and Agricultural Research & Extension Institute
FOM	Future Operating Model
GAMSO	Generic Activity Model for Statistical Organisation
GDDS	General Data Dissemination System
GDP	Gross Domestic Product
GDPR	Global Data Protection Regulation
GINS	Government IntraNet System
GOC	Government Online Centre
GoM	Government of Mauritius
GSBPM	Generic Statistical Business Process Model
GUI	Graphical User Interface
HoD	Head of Department
HTTPS	Hypertext Transfer Protocol Secure
ICT	Information Communication Technology
IMF	International Monetary Fund
ITSU	IT Security Unit
KPI	Key Performance Indicators
LDAP/AD	Lightweight Directory Access Protocol, Active Directory
MAIFS	Ministry of Agro Industry and Food Security
MDG	Millennium Development Goals
MITCI	Ministry of Information Technology, Communication and Innovation

Acronym	Definition
ML	Machine Learning
MOFEPD	Ministry of Finance, Economic Planning and Development
MRA	Mauritius Revenue Authority
MUR	Mauritian Rupees
NAF	National Authentication Framework
NGO	Non-Governmental Organisation
NIST	National Institute of Standards and Technology
NSDI	National Spatial Data Infrastructure
NSO	National Statistics Office
OECD	Organisation for Economic Co-operation and Development
PSBTS	Public Sector Business Transformation Strategy
PSC	Project Steering Committee
PwC	PricewaterhouseCoopers Ltd
RA	Registering Authority
RFP	Request For Proposal
RPA	Robotic Process Automation
SAS	Statistical Analysis System
SDDS	Special Data Dissemination Standard
SDG	Sustainable Development Goals
SDMX	Statistical Data and Metadata Exchange
SI	Strategic Initiative
SM	Statistics Mauritius
SOA	Service Oriented Architecture
SPOC	Single Point of Contact
SPSS	Statistical Package for the Social Sciences
SSL	Secure Sockets Layer
TLS	Transport Layer Security
UAT	User Acceptance Testing
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNSC	United Nations Security Council
UNSD	United Nations Statistics Division
URL	Uniform Resource Locator
UTM	Unified Threat Management
UX	User Experience
VPN	Virtual Private Network

Contents

Executive Summary



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1. Executive Summary

The **increasing popularity of the internet and social media** has generated an explosion in new data, coupled with increasing computing capacity to exploit them. Governments in both developed and developing countries are **prioritising a data driven culture** on top of the agenda while focusing on **open data, governance and high quality and big data analytics**. It is imperative that National Statistics Offices (NSO) provide the necessary support to sustain the Government vision and strategic direction.

NSOs are, on their side, experiencing a series of technological and societal changes that redefine how official statistics are collected, processed, and disseminated. **Availability of new data sources** and emergence of new data producers has led to an increase in the supply and demand of information as well as a rethinking of the business model to meet **stakeholder expectations on data availability, quality, relevance and reliability.**

Global trends across NSOs indicate that providing accurate, complete, reliable, relevant, and timely data by giving **unique experience is a norm**. NSOs need to **adapt to the digital era**, seizing opportunities and re-define their strategies in a new data ecosystem. International statistical communities are actively discussing the challenges brought, including the emerging **new institutional roles for NSOs in 'ecosystems of data'** and include the United Nations Security Council (UNSC), the UN Global Working Group on Big Data for Official Statistics, European Statistical System (ESS), Net Big Data project, the Organisation for Economic Co-operation and Development (OECD) and Conference of European Statisticians (CES).

What are the stakeholders demands?

- **Minimum 'time-to-market'** – Self Service access to data, quick analysis, graphical data
- interpretation and how these data impact lives.
- **Granularity** – Expectation that data are granular, for example locally relevant ('how is my community doing?') and a broad array of social, economic and environmental subject matters.
- **Trusted quality** – Adding value means differentiating knowledge from data by bringing the **statistical expertise** (structure, rich metadata, documented and proven methodologies and analysis); **ethical standards** (transparency and respect of data privacy); **findability and openness (machine readable data**, available codes) – all of which contribute to build 'trust'.
- **Active Contribution** – Experts and Citizens want to contribute on projects especially around data innovation and modernisation. NSO are shifting from traditional boundaries to nowcasting data, to engaged with the public in data modelling work, data collection or sharing algorithmic knowledge and code.

To keep with the **digital acceleration** pace, **global trends** and standards, **new demands** and most importantly to align with Government of Mauritius **Digital Transformation Strategy 2018- 2022**, it is imperative that Statistics Mauritius (SM) **rethinks its business model to adhere to its vision, that is "To be a key provider of world class statistical information**".

PwC was appointed as Consultant, out of a competitive bidding process, to assist SM in this transformation journey and develop an e-Business Plan for harnessing IT to enhance the operations of SM.

The case for change

Statistics Mauritius (SM) prepared an e-Business Plan back in 2006. As part of the Situational analysis, initiatives from previous e-Business Plan were assessed to understand actions taken by SM vis a vis the plan, bottlenecks/ constraints and implementation status for each project as of date. The e-Business Plan proposed three (3) strategic initiatives as follows:

- **Introduce Service Essentials** – Modernise IT environment, clean/enrich data, rationalise data channels, new application architecture.
- **Adopt e-Government Best Practices** – Web portal through GOC, Data integration, Call Centre.
- **Achieve World Class Operations** – Central depository of all statistics, Library management, Workflow application, Optical Character Recognition, Computer based interviews.

From the Situational Analysis, it has been observed and brought to the attention of SM that **only 5 out of 12 initiatives (~40%)** which included implementation of a core statistical system was completed. Possible constraints for partially and not implemented initiatives are:

- **Absence of a Monitoring and Evaluation Framework** to make sure intended objectives are met.
- **System Fitment** - Only (6 out of 30) 20% of SM business units uses the core system as the system is implemented in a modular approach per department.
- **Absence of Skills and capacity building plan** to sustain the e-Business Plan.

It was also observed that **24 out of 30 SM business units** are heavily dependent on excel and perform manual data cleansing and analysis, which results in **operational inefficiencies** and increases risk of **compromising data integrity**. On the infrastructure and security aspect, **several vulnerabilities** were noted and reported to SM. It includes **improper network zoning, single point of failure, end of life of servers, absence of a Business Continuity and Disaster recovery plan among others.**

Based on the Situational Analysis findings, it is imperative that SM revamp its current operating model both in terms of its **Mode of Operations and Processes, Technology, People and Structure and Regulatory, policies framework** to achieve its strategic vision and mission.

Conceptualisation of SM of the future

In order to bridge the gap of 12+ years, there is a critical need for SM to rethink its e-Business Plan 2021-2024 objectives and approach towards modernising its business operations. The objectives for the e-Business Plan 2021-2024 have been defined as follows:

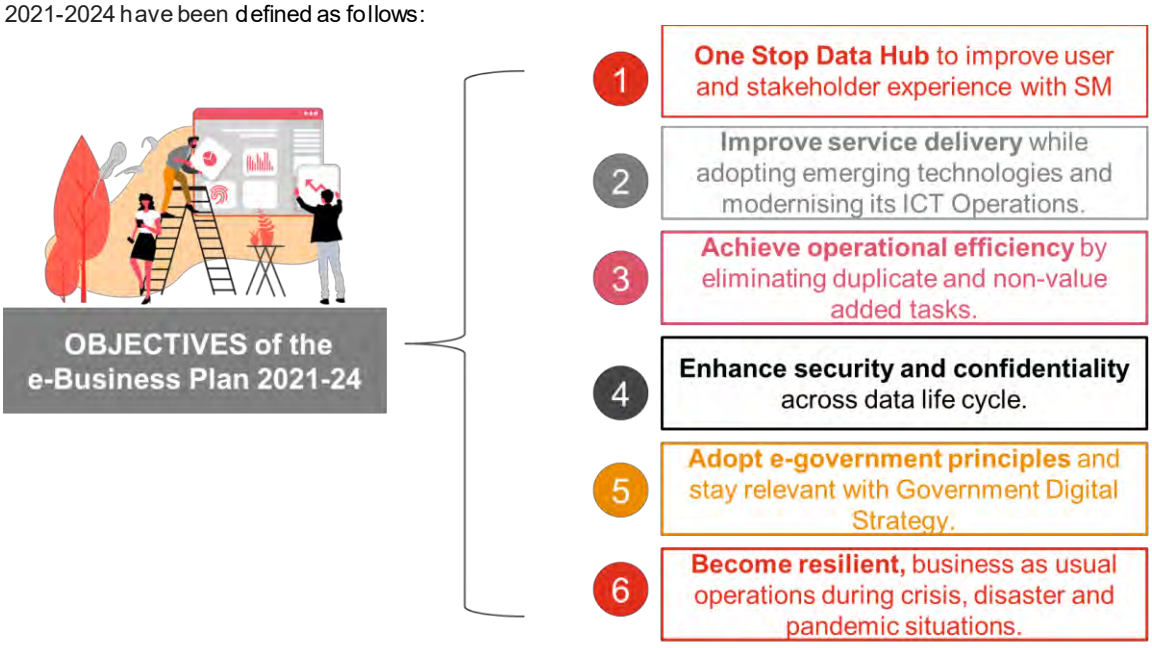


Figure 1: Objectives of the e-Business Plan 2021-2024

Based on the above Strategic Objectives, the Future Operating Model (FOM) for SM, hereafter referred to as MauStats has been crafted. While defining the Future Operating Model, the following have also been taken into consideration: key stakeholders' expectations, channels for service delivery, functional and technical capabilities of proposed technologies. The diagram below summarises the proposed FOM for SM, i.e. MauStats.

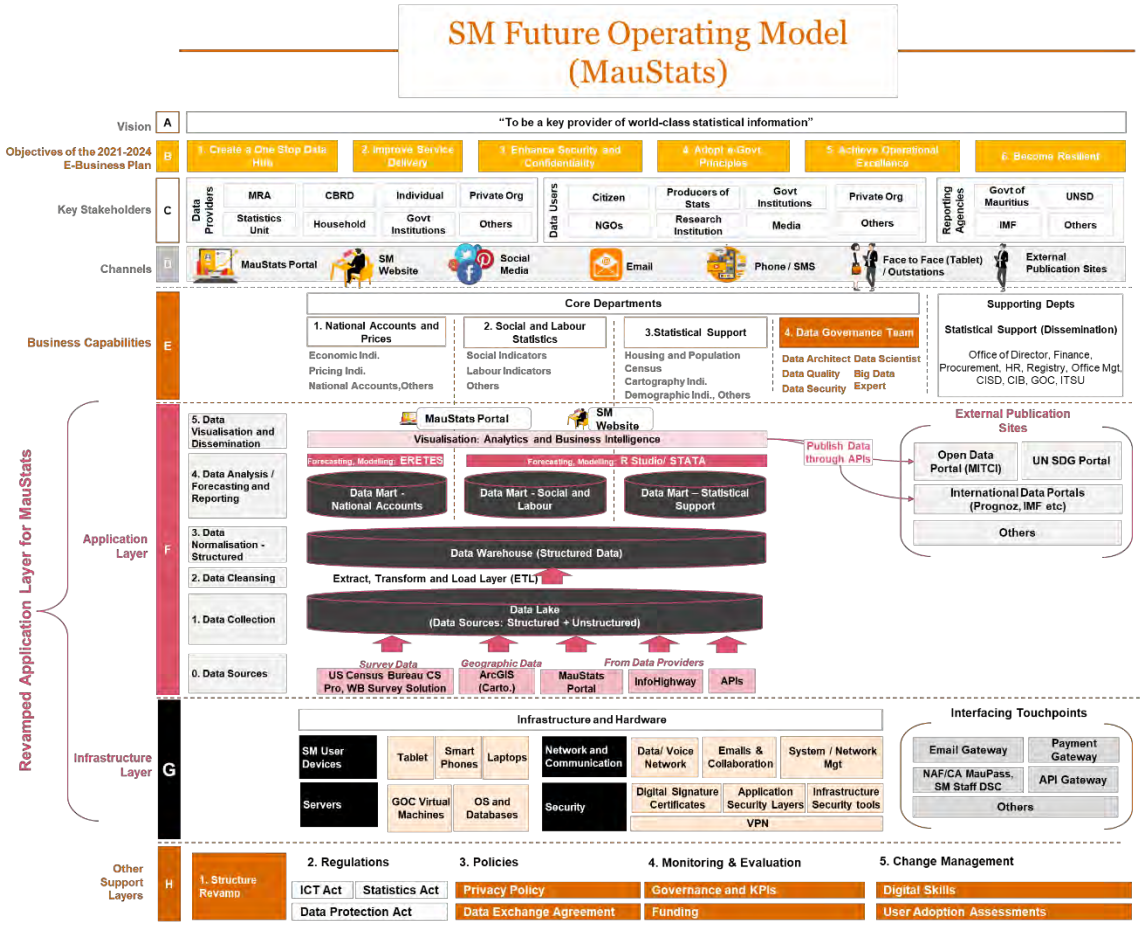


Figure 2: Future Operating Model (MauStats)

The diagram below illustrates the strategic initiatives that will support SM transition from current operating model to the above Future Operating Model. These initiatives comprise of distinct projects as demonstrated below:

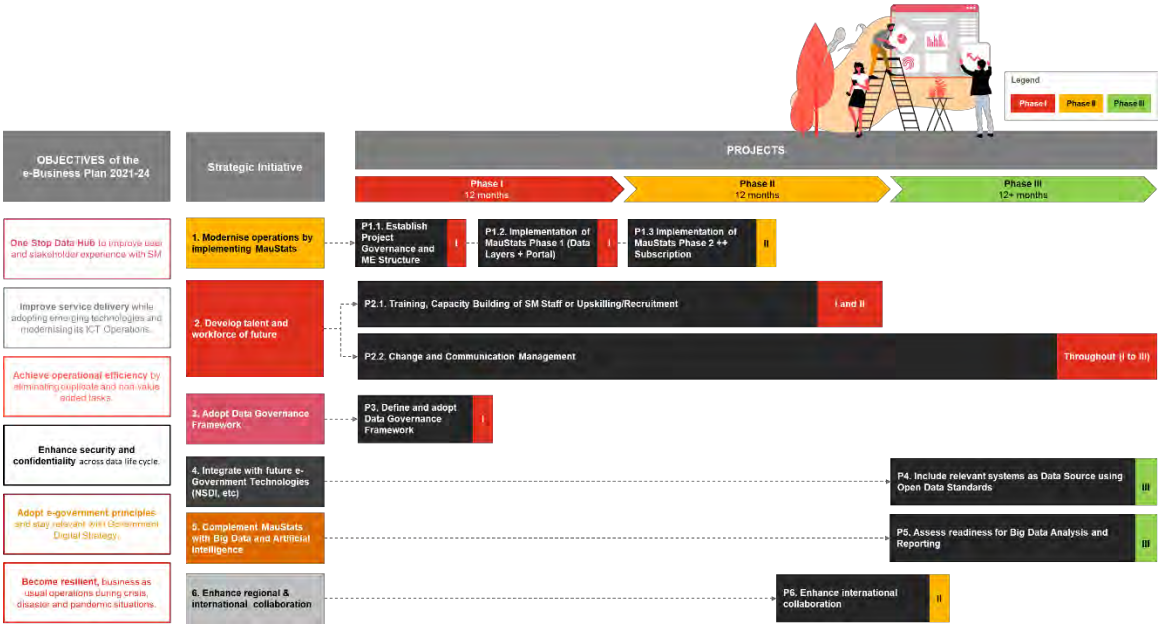


Figure 3: Implementation Roadmap

1. Modernise operations by implementing digital technologies

The implementation of MauStats will automate and integrate the data lifecycle from acquisition to dissemination using GSBPM framework. It comprises of a robust and scalable data layer with interfacing capabilities to collect data via APIs from external stakeholders. It also promotes a single source of truth on data assets. MauStats comprises of the One Stop Data Hub for users to have interactive visualisation with Do Your Own Analysis capabilities.

2. Develop talent and workforce of the future

In order to support SM Future Operating Model, existing structure has been revised and includes **Core Functions, Corporate Services, Data Governance Office** and **Monitoring and Evaluation**. Implementing a rigorous and efficient Training and Capacity Building plan is critical to develop in house talent to operate MauStats in the future.

3. Adopt data quality and governance framework

Implementing the right data policies and standards will provide the guidance, assurance and support needed to transform SM into a trusted, reliable and secure data-driven organisation. The main purpose of this framework is to help SM comply and enforce relevant regulatory and legal requirements in line with MauStats implementation.

4. Integrate with future e-Government technologies

SM to leverage on existing, ongoing or new government initiatives rather than re-implement. This will promote standardisation of government-wide operations. As such, it is recommended that MauStats uses existing InfoHighway Infrastructure for data exchange across government entities. With the NAF, users will be authenticated via Single Sign On. MauStats will also be hosted at GOC Data Centre. SM to consider leveraging on NSDI in the future for geographic and spatial data exchange.

5. Complement MauStats with Big data and Artificial Intelligence

This initiative will allow SM to continuously improve and innovate in its reporting and service delivery. SM to complement MauStats with Big Data in the future, to tap into alternative data sources and mainstreaming data science techniques such as machine learning or text mining. MauStats has been designed to accommodate big data with high volume and frequency in the future such as spatial, sensors, social media, images, videos among others.

6. Enhance regional and international collaboration

This initiative will help SM to position on the regional and international benchmarks and enhance collaboration by providing high quality, inclusive and efficient economic and social statistics that are internationally recognised, on a timely basis. It includes developing strategic alliances and partnerships to enrich data collection, develop a centre of excellence, benchmark achievements, and conduct national level workshops to promote data culture mindset.

Implementation Roadmap

It is important to adequately prioritise and plan the roll out by adopting a successful and practical approach - **"Start Small and Scale Fast".**

The implementation of the projects depicted above will support SM to shift from Innocence (Today) towards Excellence, the Future Operating Model, i.e. MauStats. The diagram below illustrates the holistic outcome of the projects defined as part of the transformation journey.

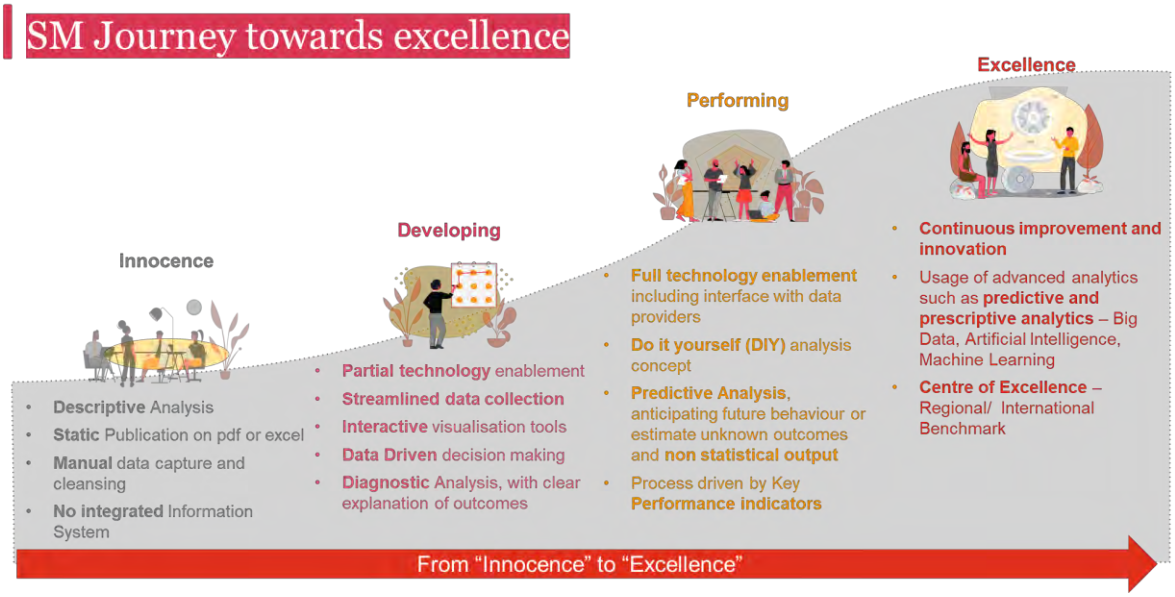
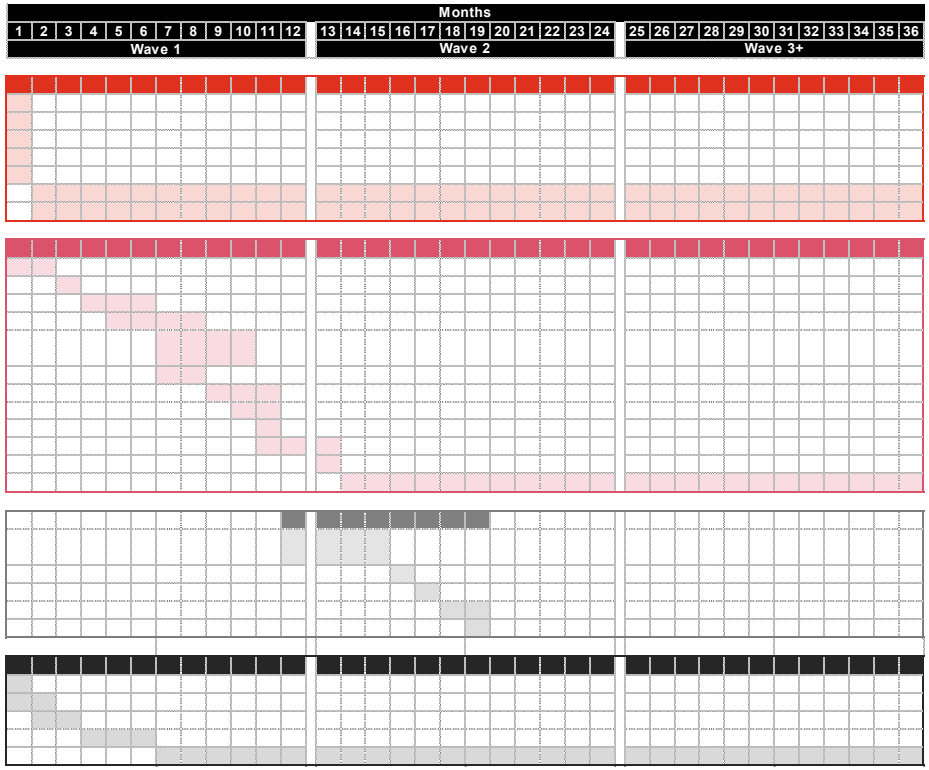


Figure 4: SM Journey towards Excellence

The figure below illustrates the proposed implementation roadmap elaborated over a period of 3 years that SM needs to undertake in order to roll out MauStats.

Recommendations	Projects	Teams Involved
Across all initiatives	**P1.1: Establish Project Governance and ME Structure**	SM and UNDP with Support from CIB
	1.1. Setup a MauStats Project Steering Committee (PSC)	
	1.2. Set up Project Management Office (PMO)	
	1.3. Define governance mechanism for each functions.	
	1.4. Identify Project champion and stakeholder for each initiative	
	1.5. Identify and onboard Programme and Quality Advisors	
	1.6. Monitor implementation activities	
	1.5. Report progress to respective working groups, PMO, PSC	
SI1: Modernise operations by implementing digital technologies	**P1.2: Implementation of MauStats - Phase 1**	SM, UNDP with support from CIB, CISD, GOC,ITSU and external Programme and Quality Experts
	1.2.1. Prepare and launch Request for Proposal	
	1.2.2. Evaluate, select and onboard solution implementer (SI)	
	1.2.3. Conduct requirement gathering for phase 1 and phase 2	
	1.2.4. Design MauStats components	
	1.2.5. Develop MauStats components (Phase 1), including integration touchpoints, and perform system testing.	
	1.2.6. Conduct Data Cleansing	
	1.2.7. Conduct Data Migration and testing	
	1.2.8. Conduct User Acceptance Testing (UAT)	
	1.2.9. Conduct Training	
	1.2.10. Pilot roll out	
	1.2.11. Full roll out (System Go Live)	
	1.2.12. Warranty, Operation and Maintenance	
SI1: Modernise operations by implementing digital technologies	**P1.3: Implementation of MauStats - Phase 2**	SM, UNDP with support from CIB, CISD, GOC,ITSU and external Programme and Quality Experts
	1.3.1 Develop and test MauStats components (Phase 2), including integration touchpoints and system testing	
	1.3.2 Conduct User Acceptance Testing (UAT)	
	1.3.3. Conduct Training	
	1.3.4. Pilot roll out	
	1.3.5. Full roll out (System Go live)	
SI2: Develop talent and workforce of future	**P2.1: Upskill/Recruit**	SM Senior Management and HR with support from PRB
	Review and finalise proposed structure	
	Create detailed job descriptions	
	Prepare onboarding pack by category of staff	
	Upskills/ Recruit new resources	
	Monitor effectiveness of training and capacity building initiatives	



Implementation Plan

Recommendations	Projects	Teams Involved
SI2: Develop talent and workforce of future	**P2.1 Training and Capacity Building** Conduct skills gaps assessment or training needs analysis Develop a training plan by category of staff Launch training programme for staff upskilling Set up a mentorship/shadowing programme, develop inhouse training materials using government elearning platform	SM HR Team
Across all initiatives	**P2.2: Change and Communication Management** Identify key project stakeholders and perform stakeholder mapping Develop change and communication plan Conduct pulse check survey to understand stakeholders perception Implement activities identified as part of the plan Implement public awareness campaign Measure effectiveness of activities rolled out	SM with the support of CIB, CISD
SI3: Adopt Data Governance Framework	**P3.1: Define and adopt Data Governance Framework** 3.1. Define data governance strategy and goals 3.2. Review and finalise proposed Data Governance Structure 3.3. Identify and implement data policies and standards 3.4. Assign roles and responsibilities within Data Governance Structure 3.5 Implement Data Governance Framework and perform ongoing monitoring	SM (Data Governance Office)
SI4: Integrate with future e-Government Technologies	**P4: Integrate with government system using open data standards** 4.1. Assessment of new platforms 4.2 Perform Gap analysis to assess fitment to connect to MauStats 4.3. Design solution blueprint for implementation 4.4. Develop APIs (1 way or 2 way) to retrieve or push data to the platforms 4.4. Testing and Go Live	SM, UNDP with support from CIB, CISD, GOC,ITSU, DPO
SI5: Complement MauStats with Big Data and Artificial Intelligence	**P5: Assess readiness for Big Data Analysis and Reporting** 4.1. Conduct gap fitment assessment 4.2. Develop use cases for data to be used for analysis and reporting 4.3. Design solution blueprint for implementation 4.4. Implement, connect Big Data Sources with MauStats 4.4. Go Live	SM (Data Governance Office)
SI7: Enhance regional/international collaboration	**P6: Enhance international collaboration** 6.1. Develop strategic alliance partnership 6.2. Develop Center of Excellence 6.3. Benchmark achievements on a regional and international scale 6.4. Promote secondment of staff	SM (Data Governance Office + Office Of Director)

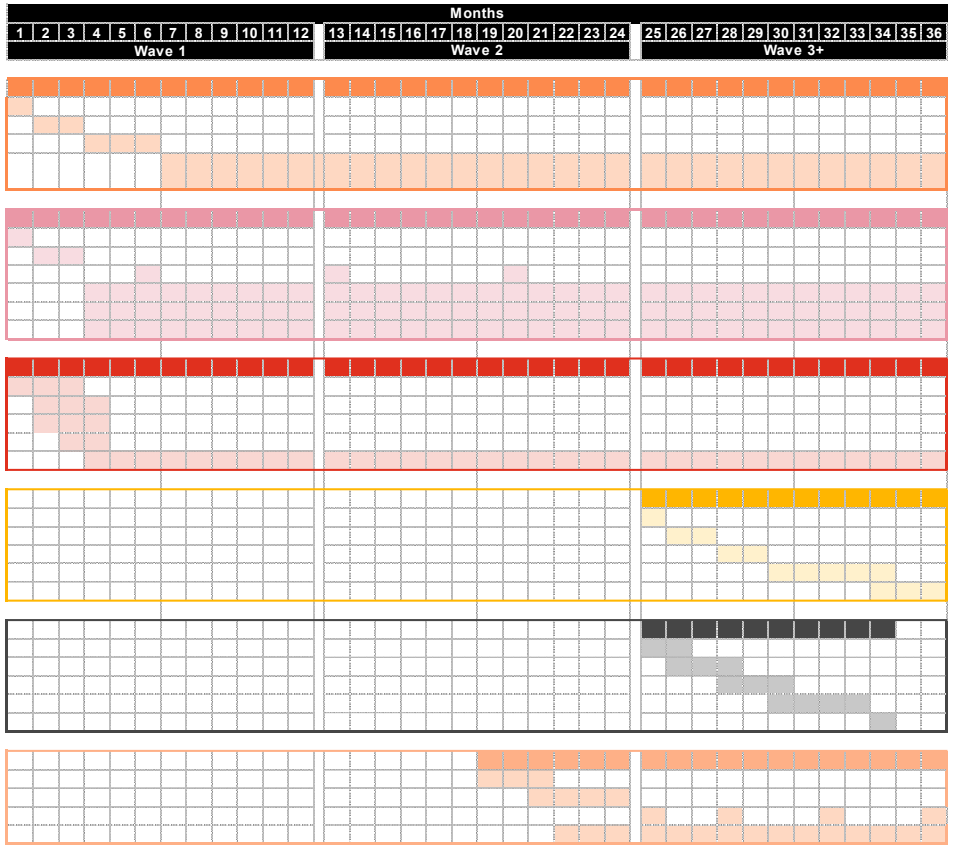


Figure 5: Implementation Roadmap

Cost implications

Cost estimates will be provided in the Final e-Business Plan report.

Introduction

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2. Introduction

2.1 About Statistics Mauritius

Statistics Mauritius ("SM") previously known as Central Statistics Office, was set up in 1945 and is the central statistical authority and depository of all official statistics produced in Mauritius. SM is the official organisation responsible for **collection, compilation, analysis and dissemination** of the **official statistical data** relating to the economic and social activities of the country with a few exceptions such as fisheries, health and banking which is managed by respective Ministries and Bank of Mauritius.

Statistics Mauritius acts under the aegis of the Ministry of Finance, Economic Planning and Development. It has decentralised its activities through the creation of Statistical Units in several Government Ministries. These units are staffed by officers on the establishment of Statistics Mauritius and directly servicing their respective Ministries in all statistical matters.

Vision

To be a key provider of world-class statistical information.

Mission

To provide coherent, timely, relevant and reliable statistics, consistent with international principles and standards, for effective policy and decision-making, and for monitoring national development processes.

Goal

To improve development outcomes and governance by strengthening National Statistical Systems in the country.

Figure 5: Mission, Vision Statement

Statistics Mauritius is mandated to provide reliable and timely statistics to Government to assist in the formulation and monitoring of policies in the economic and social areas. Statistics Mauritius also increasingly provides statistical data to the public, the private sector, international organisations and research bodies within and outside the country. Apart from its normal functions, Statistics Mauritius is increasingly called upon to provide targeted support on key emerging social and economic policy issues, and to participate in national, regional and international committees.

Approximately 138 publication are released each year on Statistics Mauritius Website (https://statsmauritius.govmu.org.). These includes:

- Monthly Reports
- Economic and Social Indicators (ESI)
- Digests of Statistics
- Census and Survey reports
- Mauritius in Figures
- Adhoc Reports

Statistics Mauritius graduated from IMF's Special Data Dissemination Standard (SDDS) in 2012 and is now working towards becoming fully compliant with SDDS+.

SM classifies its data in classes based on international level standards, while adapting them to the national context. Some of the classifications used by Statistics Mauritius are as follows:

Classification Standards	Description
NSIC	National Standard Industrial Classification of Economic Activities Rev.2 (NSIC Rev. 2) adapted from the UN International Standard Industrial Classification of Economic Activities, ISIC Rev.4 of 2007.
NASCO	National Standard Classification of Occupations (NASCO-08) adapted from the UN International Standard Classification of Occupations, ISCO-08, adopted by the International Conference of Labour Statisticians (ICLS) in December 2007.
NSCED	National Standard Classification of Education (NSCED-97) adapted from the UNESCO International Standard Classification of Education, ISCED-97.
SITC	Standard International Trade Classification.
COICOP	National Classification of Individual Consumption According to Purpose based on UNSD classifications, COICOP 2000.
CPC	Central Product Classification.
Country Code:	Country Code based on International Organisation for Standardisation (ISO 3166-1).
Codes for administrative areas of the Republic of Mauritius	1. Codes for Municipal Wards and Village Council Areas (MWVCAs) of the Island of Mauritius based on Local Government Act 2011. 2. Codes for administrative regions of the Island of Rodrigues based on Rodrigues Regional Assembly Act 2001.

Table 1: International Standards for Data Classification

SM currently produces official statistics on the following subject areas:

- Population and Vital Statistics
- Agriculture and fishing
- Construction
- Education
- Energy and water
- Environment and climate change
- External trade
- Government and public finance
- Housing and households
- Household income and expenditure
- Industrial production
- International travel and tourism
- Labour force, employment and unemployment
- National accounts
- Crime, justice and security
- Poverty
- Prices and inflation
- Productivity
- Road transport and accidents
- Social security
- Gender
- Information and communication technology

Refer to Appendix 1 for existing data sources.

2.2 Project Background

Statistics Mauritius ("SM") plays a pivotal role as it is the central authority responsible for producing **official statistics in Mauritius**. SM is also increasingly providing statistical data to public, private sector, international organisations and research bodies within and outside the country. It is important to now look beyond the next 5 years, and think about long-term business model, particularly based on innovative and emerging information technologies.

We understand that SM realises the need to accelerate innovation to address new and better ways of doing things and take this opportunity to define its e-Business Plan.

In this respect, PricewaterhouseCoopers Ltd (PwC) has been awarded the contract with Reference No: FS-MUS-SER-2020-012 out of a competitive bidding exercise to assist in the Preparation of an E-Business Plan for harnessing IT to enhance the operations of Statistics Mauritius, with the objective to:

- **Improve service delivery** while adopting new technologies and modernising its ICT Operations;
- **Enhance security and confidentiality** across data lifecycle;
- **Adopt e-government principles** and stay relevant with Government Digital Strategy; and
- **Achieve operational efficiency** by eliminating duplicate and non-value added tasks;
- **Become resilient,** business as usual operations during crisis, disaster and pandemic situations.

2.3 Project Scope

In accordance to the contract, the engagement scope is as follows:

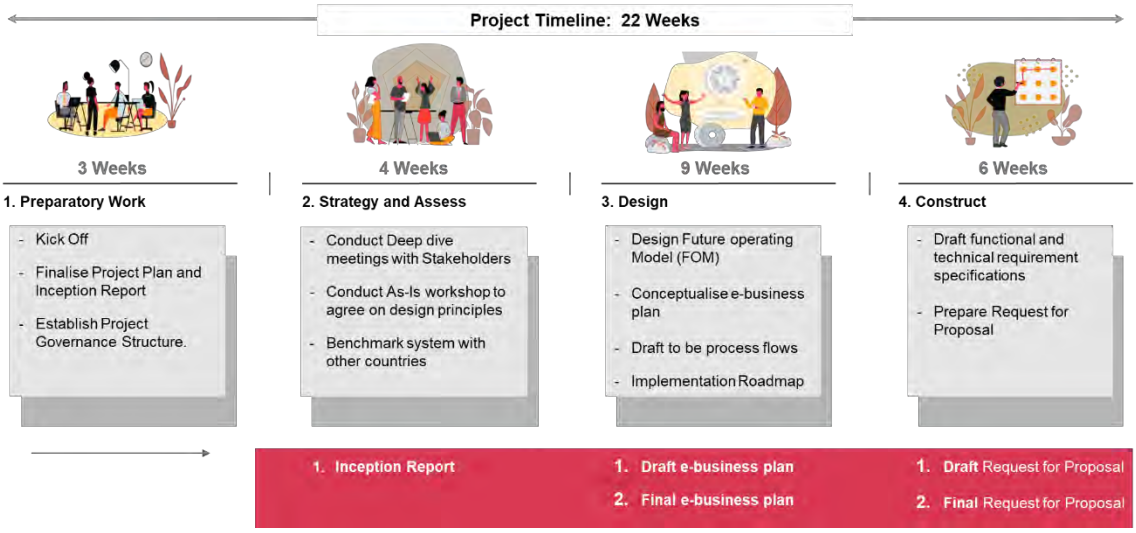


Figure 6: Project Scope

2.4 Approach to Execution

The approach undertaken for the Situational Analysis required constant involvement of various stakeholders through one to one interviews, and working sessions. Existing documentation were also consulted and analysed as demonstrated below.

Methods used

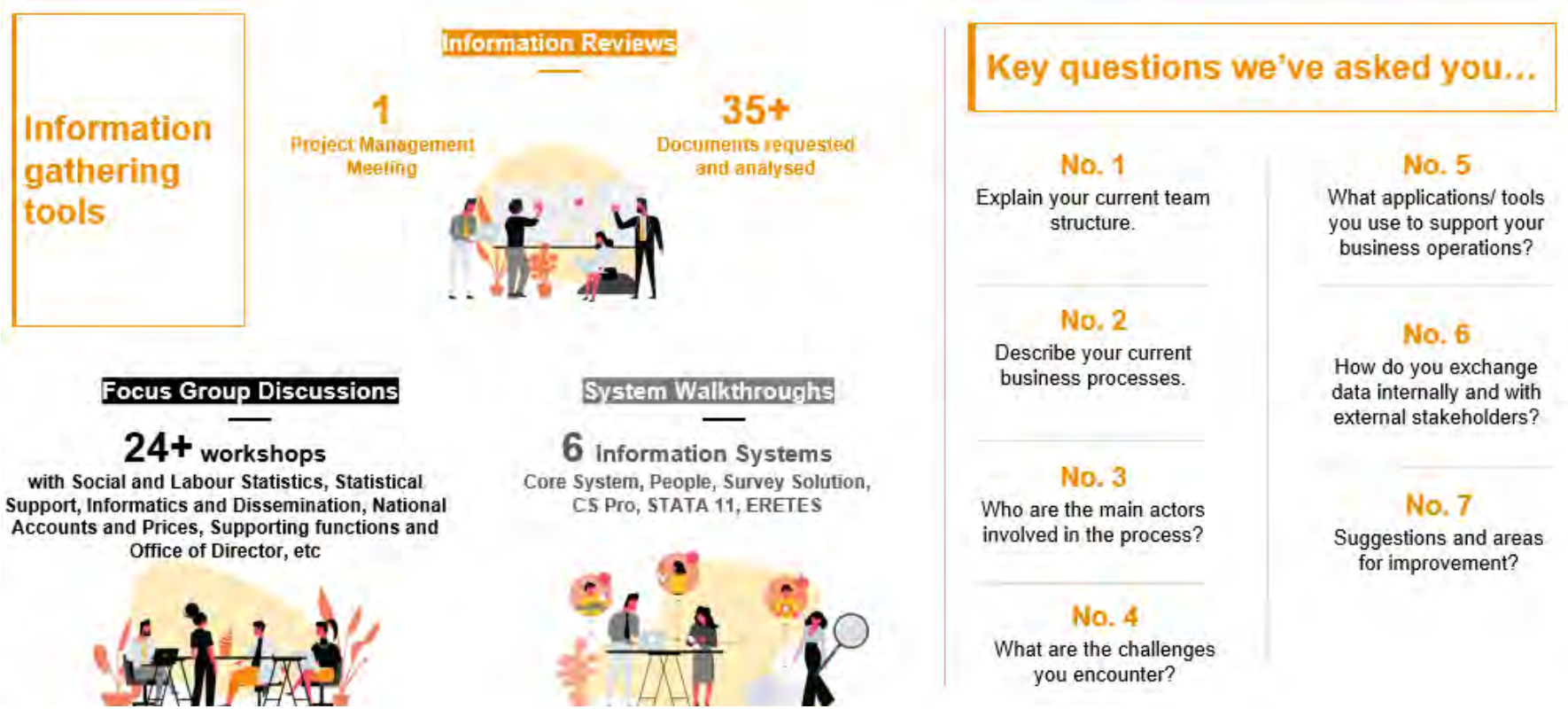
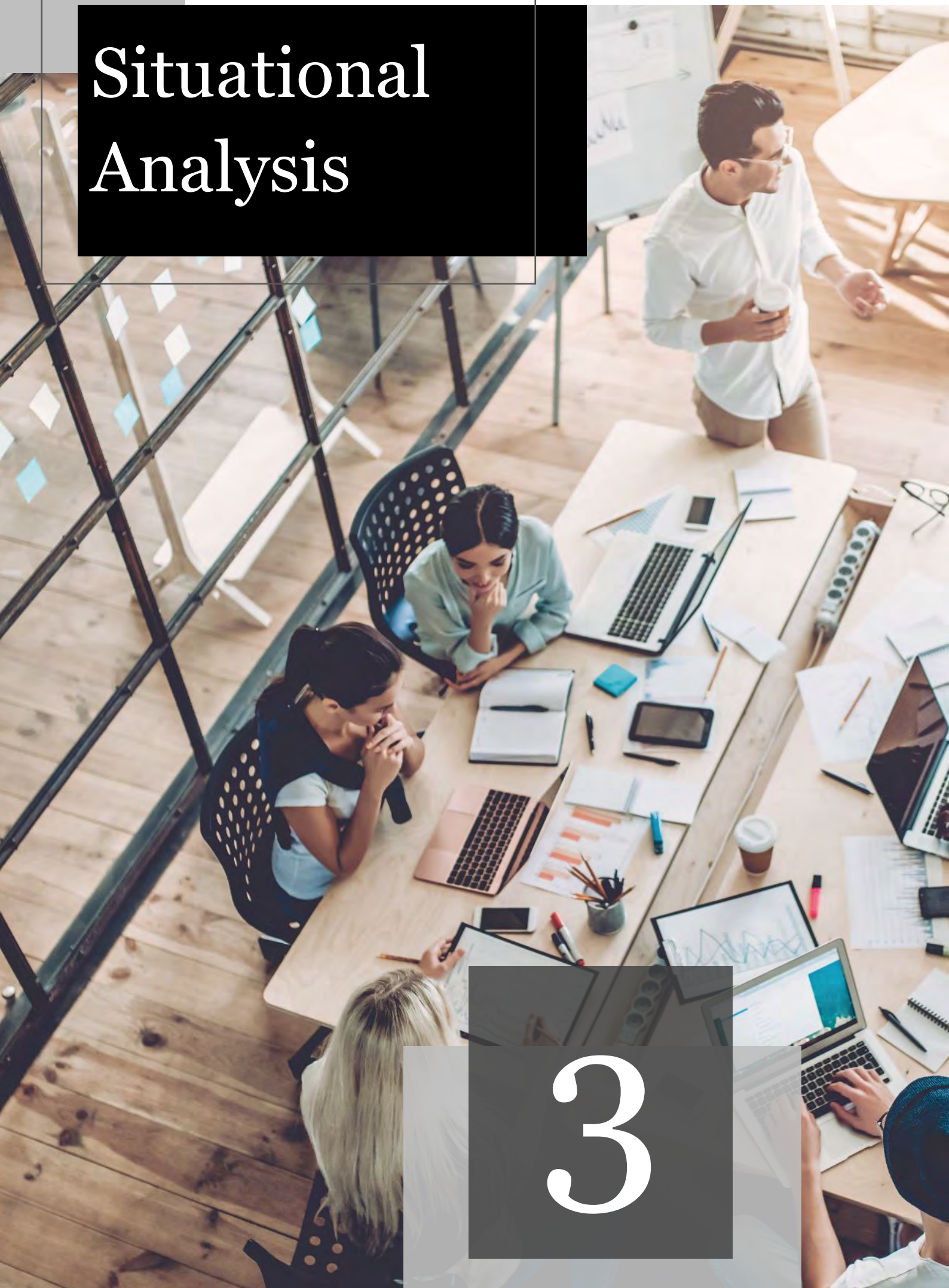


Figure 7: Approach to Execution

Situational Analysis



3

3. Situational Analysis

This section describes the current operating model of SM encompassing the four lenses of our an alysis:

1. Mode of Operation and Processes
2. Application Technology and Collaborative Platform
3. Structure and People
4. Legal and Framework

SM is the official organisation responsible for **collection, compilation, analysis and dissemination** of the **official statistical data** relating to the economic and social activities of Mauritius and Rodrigues with a few exceptions such as fisheries, health and banking which is managed by respective Ministries and Bank of Mauritius. SM publishes **approximately 138 publication** each year on Statistics Mauritius Website. Publication includes: Monthly Reports, Economic and Social Indicators (ESI), Digests of Statistics, Census and Survey reports, Mauritius in Figures, Adhoc Reports.

Key stakeholders with which SM interacts are classified as follows:

1. **Data Producers** – Ministry of Health and Quality of Life (Health Statistics), Statistical units in line Ministries, such as Ministry of Public Utilities (energy and water statistics), Ministry of Environment (environment statistics), among others;
2. **Data Suppliers** – Mauritius Revenue Authority, Households, Establishments, Individuals and groups within specified organisation among others;
3. **Data Users** – Government and Ministries, Private Sector, Individuals, Research and Training organisation, Media; and
4. **External reporting sites** – Open Data Portal (MTCI), Prognoz, IMF, UN SDGs among others.

Refer to Appendix 2 for existing data sources.

High Level Process Overview and Technology Landscape

Figure 8: Current Processes and Technology

Current **channels** include SM website, Phone, Email, Face to Face, external survey firms (CATI), Tablets. Refer to Situational Analysis Report for detailed overview of current mode of operations and processes, technology, structure and regulatory framework of SM.

3.1 Current Operating Model

The diagram below illustrates the current operating model of SM in terms of its key stakeholders, existing channels, core and supporting business functions, current application systems, databases and infrastructure to run its day to day operations.

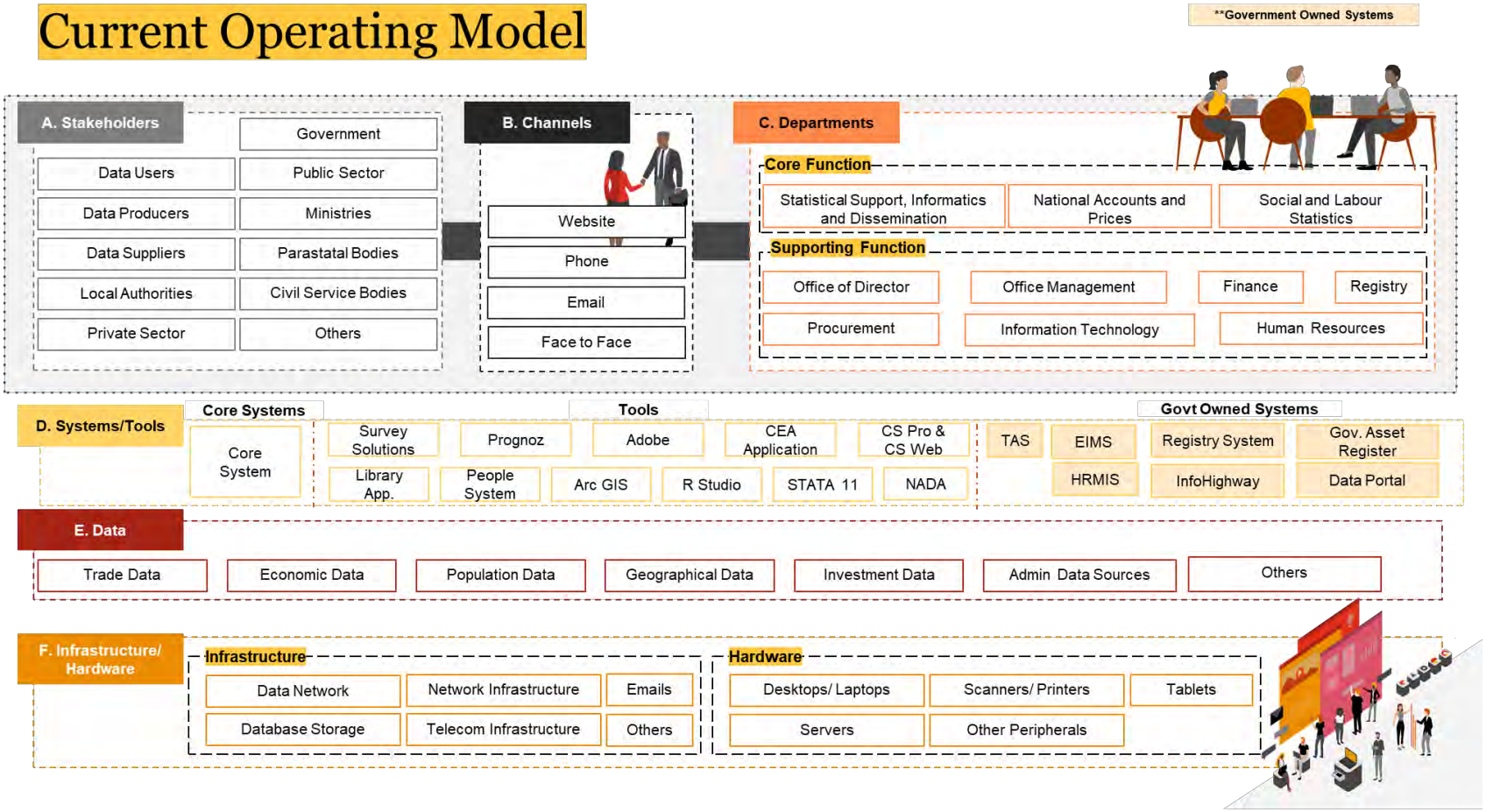


Figure 9: Current Operating Model

The six layers of the Current Operating Model are described below:

Reference	Layer	Layer Description
A	**Stakeholders**	This layer describes the key stakeholders who interact with SM and also includes Information Technology Partners such as the GOC, CIB and CISD who provide IT support to SM.
B	**Channels**	This layer describes the existing communication channels through which SM delivers/ receives insights and information to/ from its stakeholders.
C	**Departments**	This layer represents the Core and Supporting functions that enable SM to run its business operations.
D	**Systems/ Tools**	These are the systems and tools currently being used by SM to support the core and auxiliary functions.
E	**Data**	These are the different types of data that are used by SM to produce official statistics.
F	**Hardware and Infrastructure / Security**	These are the underlying technology infrastructure and hardware components at SM to support existing business operations.

Table 2: Current Operating Model Layers

3.2 Key Challenges

Mode of Operation and Processes

1. **High Turn Around time** in service delivery from data collection to publication due to extensive manual processes (~70%).
2. **Duplicate and non-value added tasks** as data is manipulated on excel.
3. **Limited automation** – Overall level of automation is approx. 30%. Only 6 out of 30 units are using the core system. For instance, some processes like Approval, Dissemination, Calculation of value added / growth rate for services sector are fully manual.
4. **Extensive data manipulation** from tables generated from Core System. E.g. creation of charts and consolidation of multiple tables for analysis. Might also lead to compromise in data integrity.
5. **High dependencies on other units** to access available data, internal request must be sent.
6. **Lack of harmonisation in key processes** such as data collection, creation of questionnaire etc.
7. Publication of tables may **take up to 2 years** following completion of data collection exercise. E.g. for Housing and Population Census.
8. **Overall major delays** from employers to provide information. Follow-up calls is a must. Data is not provided on a timely basis.
9. **Absence of central data repository** to store survey results, such as CEA.

As part of the Situational Analysis, a survey was also conducted with SM staff to collect further insights on the current mode of operation and processes. At a glance, the survey findings correlate with the above observations. Survey results has help in shaping up of the Strategic Initiatives and projects detailed in the ensuing section of this report.

Survey Population

Figure 10: Survey Population

Below is a snapshot of the survey observations in terms of:

1) **Data Collection**
2) **Data Cleansing**
3) **Data Analysis and Report Preparation**

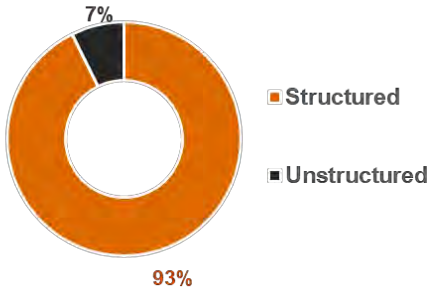
1 Data Collection

On **average 1,600 – 3,300 records** are received and processed monthly.

Channels for receiving information

70% Data Collection is via email. The remaining 30% relates to surveys, physical copies and other **dated channels such as CD, Floppy disk.**

Structured vs Unstructured data format



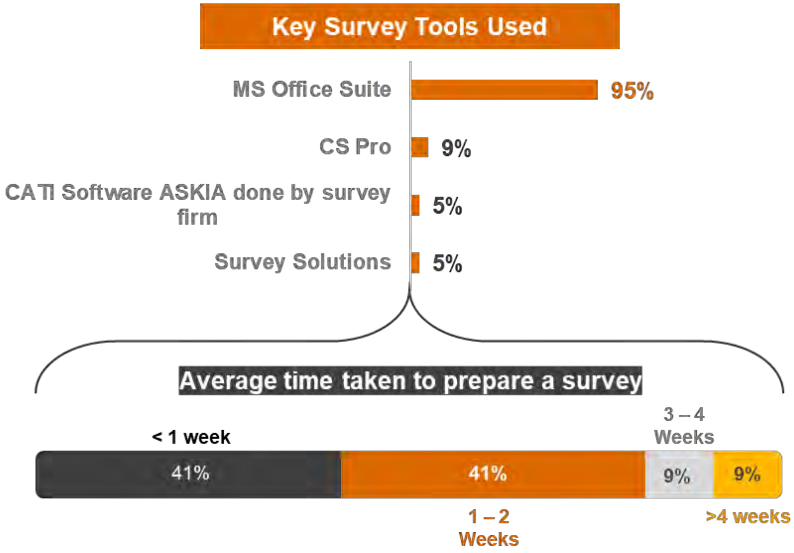
Main Data Source

- Websites, Reports, Financial statements in pdf format
- Police Department, ICAC and MRA
- Ministry of Arts and Cultural Heritage
- Ministry of Youth Empowerment, Sports and Recreation

Survey Preparation

54% of units run surveys.

Various tools are available at SM to enable survey preparation. However, **Ms Office Suite is most commonly used (95%)**, which does promote operational efficiency.



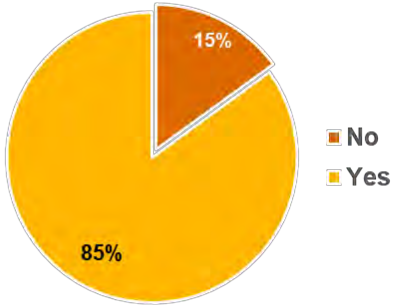
Survey Launching

The survey demonstrated that most of the time **(41%)** surveys are shared with participant either by sending survey **web link shared via email or by publishing on website.**

Figure 11: SM Survey Findings

2 Data Cleansing

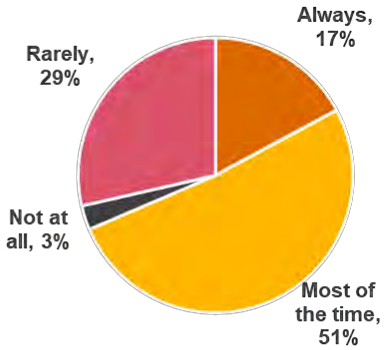
Need for Data Cleansing



85% of respondents claim that data received **needs to be cleansed.**

Overall, **average time taken for cleansing is 1 to 2 weeks.**

This may be due to the need to reach back to data sources for clarifications most of the time, which on average take **1 to 2 weeks to get back to SM with revised data.**

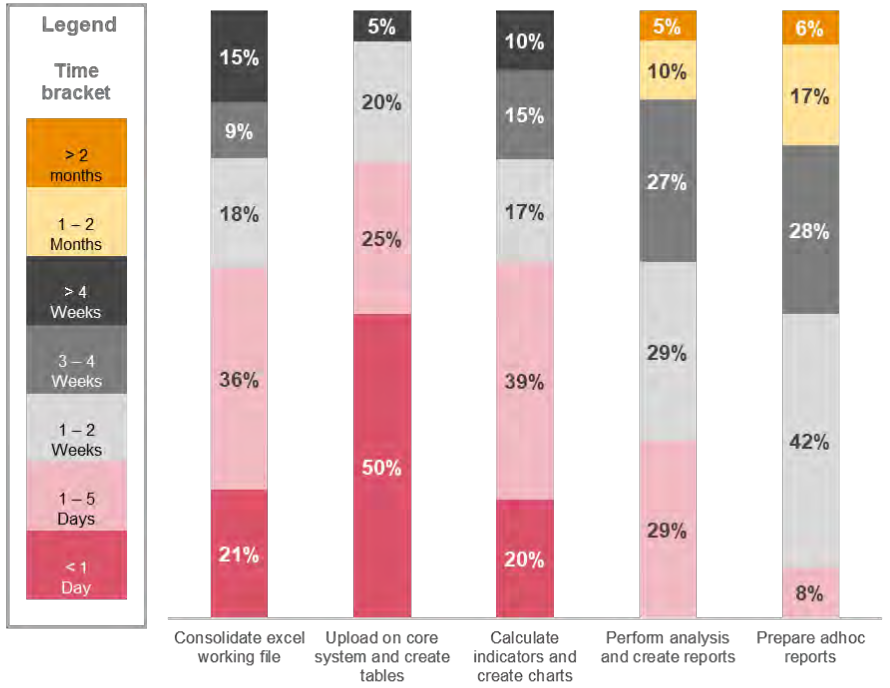


There is thus an **opportunity to relook at the overall data collection process and implement data quality measures** to reduce/eliminate the need for rework/cleansing.

3 Data Analysis and Report Preparation

On average, **1 to 2 weeks are required at each step of data lifecycle,** i.e. from data collection to preparation of report.

The chart below highlights the current time taken from processing of collected data (consolidation, cleansing, calculate indicators, etc.) up to analysis and report preparation.



Note: On average, SM receives between **10 to 50 external inquiries monthly**. Similar to the above, around **1 week** is taken to process/address such inquiries.

Figure 12: SM Survey Findings

Application Technology and Collaborative Platform

1. **Core System does not fully address SM business needs.** (6 out 30 Units are using the core system).
2. **Multiple data sources** – no "Single Source of Truth". Absence of centralised and integrated information leading to highly manual processes.
3. **Lack of reporting functionality,** such as generation of graphical charts on Core System.
4. **High dependency on external consultants** for creation of report/variables/design questions on Core System and CS Pro.
5. **Lack of harmonisation in the use of available tools,** leading to underutilisation of some of them. E.g. Survey Solutions.
6. **Absence of real time status tracking and notification** leading to use of email and paper base for collaboration and approval processes.
7. **Statistical Software such as R Studio** are not being optimised to its full potential and are instead used to anonymise data for upload on the Data Portal.
8. **Multiple applications are used** to meet similar business requirements e.g. 3 systems are used to run surveys: Survey Solution, CS Pro and CEA Application.

Hardware and Infrastructure

1. **Flat Network** increasing risk of unauthorised access and cyber-attacks due to absence of zoning in the network.
2. **End of Life Systems** (Windows Server 2008) on 5 Servers + 2 VMs and application system 'People' used by Demography.
3. **Non Compliance to TIA-942** Data Centre Standards.

Security Architecture

1. **No session time-out** on Core System, exposing it to session-based cyber-attacks.
2. **No password complexity enforced** on the Core System which increases the risk of unauthorised access.
3. **Unreliable backup** of Excel files on hard drives, pen drives and CDs. Also, restore of backup has never been performed.
4. **Absence of a business continuity plan/disaster recovery** exposing SM to risk of unable to recover business operations in the event of a disaster or crisis.
5. **High risk of information theft** due to open USB ports.

Structure and People

1. **No formalised plans/ curriculum** for training and capacity building.
2. **High dependency** on few named staffs or external consultant for amending survey questions
3. Overall, there is need to **combine data and digital skillsets** across all grades in SM.

3.3 Global Leading Practices

With the 4th industrial revolution, data has proved to be a natural resource offering unprecedented benefits to economies by powering innovation eco-system in science and technology.

Prior to development of the e-Business Plan for Statistics Mauritius, a study of the global leading practices across National Statistical Offices was undertaken in order to align the strategic direction for SM vis a vis global trends. This research was conducted based on publicly available information.

The figure below illustrates Global Trends with regards to data revolution.

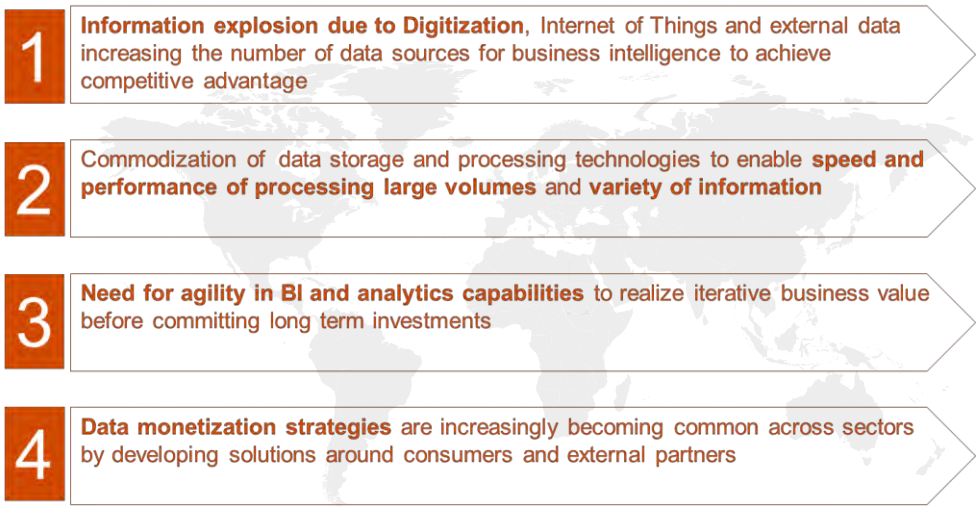


Figure 13: Global Leading Practices

Selection criteria for identifying National Statistical Offices to perform the comparative analysis are as follows:
International Standards and Collaboration – Standards adoption, partners with international players such as UNECE for continuous development and innovation.

Open Data Barometer[1] – A global measure of how governments are publishing and using open data for accountability, innovation and social impact.

Use of Innovative and emerging technologies – How far technology is embedded in their statistics business models, and actions being taken for continuous innovation using emerging technologies such as Internet of Things, Artificial Intelligence, Machine Learning, Big data among others.

One Stop Data Hub – Availability of an Interactive, user-friendly and smart data platforms for users to derive their analysis.

This section of the report presents a case study of five (5) National Statistical Offices, in line with above defined parameters:

1. Statistics of Poland / Główny Urząd Statystyczny (GUS), Poland;
2. Office of National Statistics (ONS), UK;
3. Australian Statistics Bureau (ABS), Australia;
4. Statistics Estonia (SE), Estonia; and
5. National Institute of Statistics of Rwanda (NISR), Rwanda.

[1] https://opendatabarometer.org/

The ensuing section of the report provides a high level snapshot of the initiatives adopted by the above National Statistics Offices. It summarises initiatives into four (4) main categories **International collaboration, Regulation, Framework and Policies, Technology and People.**

Statistics of Poland / Główny Urząd Statystyczny(GUS), Poland

Rank: 2nd on Open Data Inventory
Overall Score: 85 Out of 100, similar to Finland

GUS hires over 5700 employees and was formed 102 years ago in 1918, therefore has a rich history and tradition of serving for public statistics. Public statistics in Poland involves **GUS and 16 regional statistical offices.** GUS has a strong international position. President of GUS chairs the UN Global Working Group on Big Data for Official Statistics. The group supports and coordinates implementation of big data in official and public statistics. It analyses users' satisfaction related to the use of office resources to the certain extent, however it is not an integral part of the data sharing process.

GUS runs a project "**Gates of Statistics**". Its goal is the construction or **modernisation of systems** / applications / functionalities for combining (and sharing) **digitised public sector information** as well as process optimization.

International Collaboration

- **Strong international position.** President of GUS chairs the UN Global Working Group on Big Data for Official Statistics.
- **Active member with** global organisations and partnerships such as UNSC, UNCE, WB,ESS, OECD etc.

Technology

- **National Reporting Platform (SDG Platform).**
- **Gates of Statistics -** modern access and communication channels.
- **API Portals –** automatic data collection.
- Others such as STRATEG, Geostats

Regulation, Policy and Framework

- Forms part **of European Statistical System**, hence complied to EU regulations.
- **Internal policies include** managing statistical data, public information security and security of the operational microdata base.

People

- **50% of training** courses for employees includes data analytics, business intelligence, Big data in public statistics, GSBPM models.
- **Statistical Research and Education Centre-** serves as nationwide and international statistical education institution

Office of National Statistics (ONS), UK
Rank: 1st on Open Data Barometer
Overall Score: 76 Out of 100, similar to Canada

Office for National Statistics (ONS)[2] is the UK's largest independent producer of official statistics and is responsible for collecting and publishing statistics related to the economy, population and society at national, regional and local levels. Digital technology is fast changing the way ONS operates. More surveys are moving online and new devices are helping ONS to better engage with the public. Approx. 600+ publications are released each year.

International Collaboration

- **Active collaboration** for statistical purpose with UN, EU, Japan, Australia and New Zealand.
- **Provides support** to other countries such as Rwanda.
- Works towards the **removal of unnecessary barriers** for cross border data flows.

Technology

- **Dedicated big data team** working on projects such as machine learning and natural language processing.
- **Online e-Census in 2021**.
- Creating a national underground asset register (NUAR) on top of **existing geospatial data**.

Regulation, Policy and Framework

- Developed **Policy of 'Open by Default'**
- Introduced primary legislation to **implementation Smart Data**.
- **Independent Office for Statistics Regulation (OSR)** and Data Standards Authority
- Developed frameworks for **personal data transfer**

People

- Invests heavily in **improving the skills and capabilities** of analysts and across the public sector.
- **Established Data Science Campus in 2017** with qualified data professionals to build skills across UK and internationally.

[2] https://digitalblog.ons.gov.uk/2021/02/15/how-to-access-data-from-the-ons-beta-api/
https://opendatabarometer.org/
(https://www.gov.uk/government/publications/open-data-white-paper-unleashing-the-potential)
ONS Strategic Business Plan 2020-2025
(https://www.ons.gov.uk/aboutus/whatwedo/datasciencecampus)

Australian Bureau of Statistics (ABS), Australia

Rank: 3rd on Open Data Barometer
Overall Score: 75 Out of 100

Australian statistical system is composed of the Australian Bureau of Statistics (ABS) as the national statistical office; a range of national statistical authorities such as Australian Institute of Health and Welfare (AIHW) and government agencies producing official statistics. Australian Bureau of Statistics (ABS) operates under a legal framework (United Nations Fundamental Principles of Official Statistics) designed to support its role as a provider of high quality and trusted official statistics. The operations of the ABS are divided into three groups: Statistical Services Group, Census & Data Services Group and Enterprise Services Group.

International Collaboration

- **Active contributor** to the UN's **High Level Group for the Modernisation** of Official Statistics.
- Developed **quality framework** models such based on IMF, OECD, European Statistical System Quality Assurance, Total Quality Management and ISO EN 9001, etc

Technology

- Developed a **big data strategy** in 2014.
- **Downloadable data** for the public through an interactive tool online.
- Implemented an online eCensus.
- Publications are in **electronic format** directly accessible on the website.
- Web browser interface to **view, query and download data** in any required format.

Regulation, Policy and Framework

- Established a **National Data Commissioner to implement and oversee** an efficient framework for sharing and release of data
- Setup of **National Data Advisory Council** to advise of leading industry practices.

People

- Implementing a **flexible working environment** and the staff can work from home effectively.
- Implementation of **Learning Management System** for training an capacity building
- Runs **annual** graduate programmes.

Statistics of Estonia, Estonia

Statistics Estonia (SE[3]) is a state authority acting under the Ministry of Finance responsible for producing official statistics for Estonia. It is part of the European Statistical System (ESS) contributing to the development of international statistics. The vision of Statistics Estonia is to become by 2022 the most effective and innovative producer of reliable and user-friendly statistics in Europe.

SE works in close collaboration with Ministries, government agencies and Eesti Pank. (Central Bank of Estonia). Annually interacts with **90K+ data providers and has recorded over 2 Million database visits**.

[3] https://valiskaubandus.stat.ee/profile/country/ee/,https://www.stat.ee/en
https://www.stat.ee/sites/default/files/2021-01/Annual%20report%202019.pdf
Development plan Estonia 2018-2022,https://e-estonia.com/

National Institute of Statistics of Rwanda (NISR), Rwanda

In line with national development policies including SMART Rwanda Master plan and National Strategy for the Development of Statistics(NSDS), Government of Rwanda implemented a **National Statistical System (NSS)** 2009-2014**,** which groups statistical organisations and units for data collection, processing and dissemination of official statistics on behalf of the Government of Rwanda. NSS constitutes of **National Institute of Statistics of Rwanda (NISR[4])** and various State institutions that provide statistical information. NISR is the national statistics body producing official statistics for the country.

Today, Rwanda ranks **41st in the Open Data Inventory 2020** with an overall score of 65. The Open Data Inventory (ODIN) measures how complete a country's statistical offerings are and whether their data meet international standards of openness. NSS under the lead of NISR publishes macroeconomic data on the National Summary Data Page (NSDP) as recommended by IMF's enhanced General Data Dissemination System (e-GDDS). Rwanda plans to transition towards subscribing to Special Data Dissemination Standards (**SDDS**) in the near future.

International Collaboration

- **Publishes data** on the National Summary Data Page as recommended by the IMF's e-GDDS.
- **Reports on SDG indicators** using the National Reporting Platform.
- Plan to transition to SDDS in future

Technology

- **Introduced web-based data platforms** with data modelling capabilities for specific data types and provides Interactive dashboards.
- **Use of APIs** to automate data sharing.
- **Partnering with UK Bureau of Statistics** to implement Big Data Analytics.
- **Dispenses** metadata and anonymized microdata of surveys on their portals.

Regulation, Policy and Framework

- Responsible for implementing the **data revolution policy (DRP)**.
- DRP focuses on **building big data and analytics capabilities** to derive insights.

People

- **Engaged in ongoing exercises** to:
  - assessing learning needs and capacity building
  - Develop Training Plan/Curriculum
  - Secondments into NISR/NSS
  - Secondments out of NISR/NSS.
- **Set up a dedicated team of data scientists** to report of DRP to NISR.

The ensuing section provides a comparative analysis between SM and National Statistics Offices.

[4] https://microdata.statistics.gov.rw/index.php/catalog, https://odin.opendatawatch.com/Report/countryProfileUpdated/RWA?year=2020, http://www.devinfo.statistics.gov.rw/di7web/libraries/aspx/Home.aspx, https://rwanda.opendataforafrica.org/

https://www.statistics.gov.rw/

The table below illustrates a bird's eye view of the comparative analysis of leading practices across National Statistics Offices. Although Statistics Mauritius has not embarked on leading practices, the implementation of MauStats will support the transition of SM towards a global player.

Parameters	GUS	ONS	ABS	SE	NISR	SM
One Stop Data Hub	☑	☑	☑	☑	☑	☑
Interactive Dashboards	☑	☑	☑	☑	☑	☒
Integrated Data Platforms	☑	☑	☑	☑	☑	☒
Cloud Infrastructure	☑	☑	☑	☑	☑	☒
Big Data	☑	☑	☑	☑	☑	☒
Artificial Intelligence	☑	☑	☑	☑	☒	☒

Legend: ☑ Completed ☑ In Progress ☒ Not implemented

Table 3: Comparative Analysis of leading practises

Note: Mauritius ranks 66th on the Open Data Inventory (ODIN) of 2020 with an overall score of 57/100. Areas for improvement is around Social Statistics more precisely Population and Vital Statistics, Education, Health Food Security and Nutrition, Poverty and Income among others.
Refer to **Appendix 1** for details on initiatives undertaken by National Statistics Offices

3.4 Maturity Assessment

Based on the Situational analysis of the current operating model and global leading practices, the maturity of SM has been assessed on a scale of 1 to 4 demonstrating Innocence to Excellence (Refer to the highlighted cells). The 'Innocence to Excellence' matrix is defined in the table below:

S.No	Parameters	Innocence – 25%	Developing – 50%	Performing – 75%	Excellence – 90%
1	**Mode of Operations and Processes**	- Processes are undefined or not followed. - Absence of standard operating procedures.	- Standard processes have been established across units. - Absence of standard operating procedures.	- Standard processes have been established and are followed 90-100% of the time. - Standard operating procedures is documented.	- Continuous process improvement and innovation is part of the organisation's culture.
2	**Technology (Application, Hardware & Security)**	- Minimal technology enablement across the organisation. - Application system and hardware has reached end of life. - Basic security and single firewalls. - Absence of a business continuity plan.	- Partial use of technology to support core business operations. - BCP/DR are in progress. - Minimum security controls, prevention and response in place.	- Optimal usage of technology to support core business operations. 90% of processes are automated. - BCP is in place. - Strong security mechanism in place. Self-manage, detect and prevent.	- Full technology enablement across the organisation. Innovative technologies are used for continuous monitoring of indicators. - Full fail over, BCP/DR in place.
3	**People and Structure**	- Structure is not lean, mix of roles and responsibilities. - No training and capacity building.	- Balanced skills within SM units. - Training and Capacity building in place – based on performance reviews.	- Well balance skills within SM units with subject matter experts in specific areas. - Formalised training and capacity building curriculum.	- Monitoring and evaluation on key performance indicators and implement specific training and capacity building plan.
4	**Leading Practices**	- Open Data Sources, Quality framework, Big Data/AI not in place. - Static publication. - Descriptive Analysis.	- Open Data Sources, Quality framework, Big Data/AI not in place. - Interactive visualisation tool. - Descriptive and Diagnostics Analysis.	- Open Data Sources, Quality framework, Big Data/AI partially in place. - Do your analysis concept. - Descriptive, Diagnostics and Predictive Analysis.	- Usage of advanced analytics predictive and prescriptive analytics – Big Data, Artificial Intelligence, Machine Learning. - Centre of Excellence – Regional/ International Benchmark.

Table 4: Maturity Assessment

SM Journey towards excellence

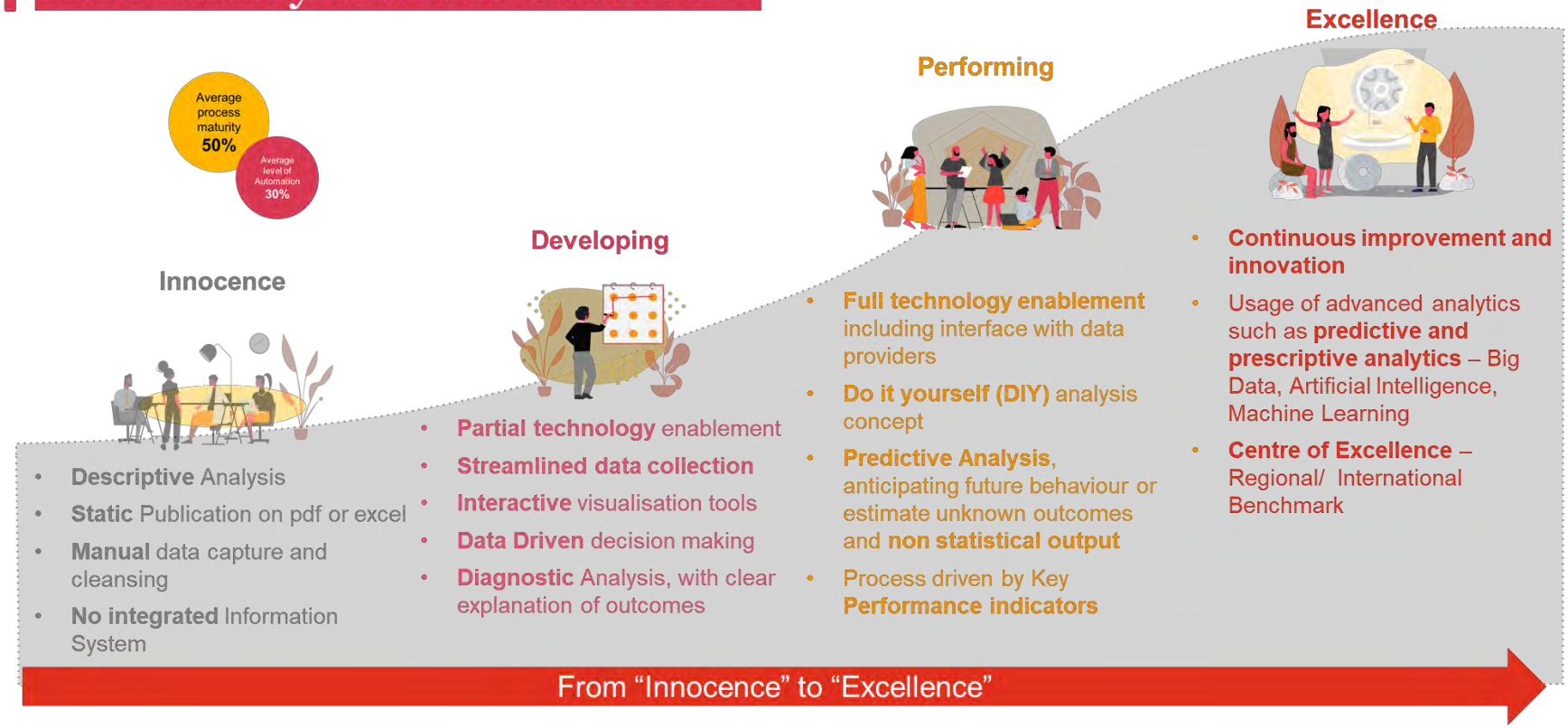


Figure 14: SM Journey towards excellence

Overview of Proposed Model

4

4. Overview of Proposed Model

For SM to transition from Innocence to Excellence, 6 Objectives for the e-Business Plan 2021-2024 have been defined as foundation pillars. These objectives have been crafted based on **global trends, SM Past strategy, existing challenges and PwC Experience** and are the foundation for revamping SM current operating model.

4.1 Our Approach to conceptualise SM Future Operating Model

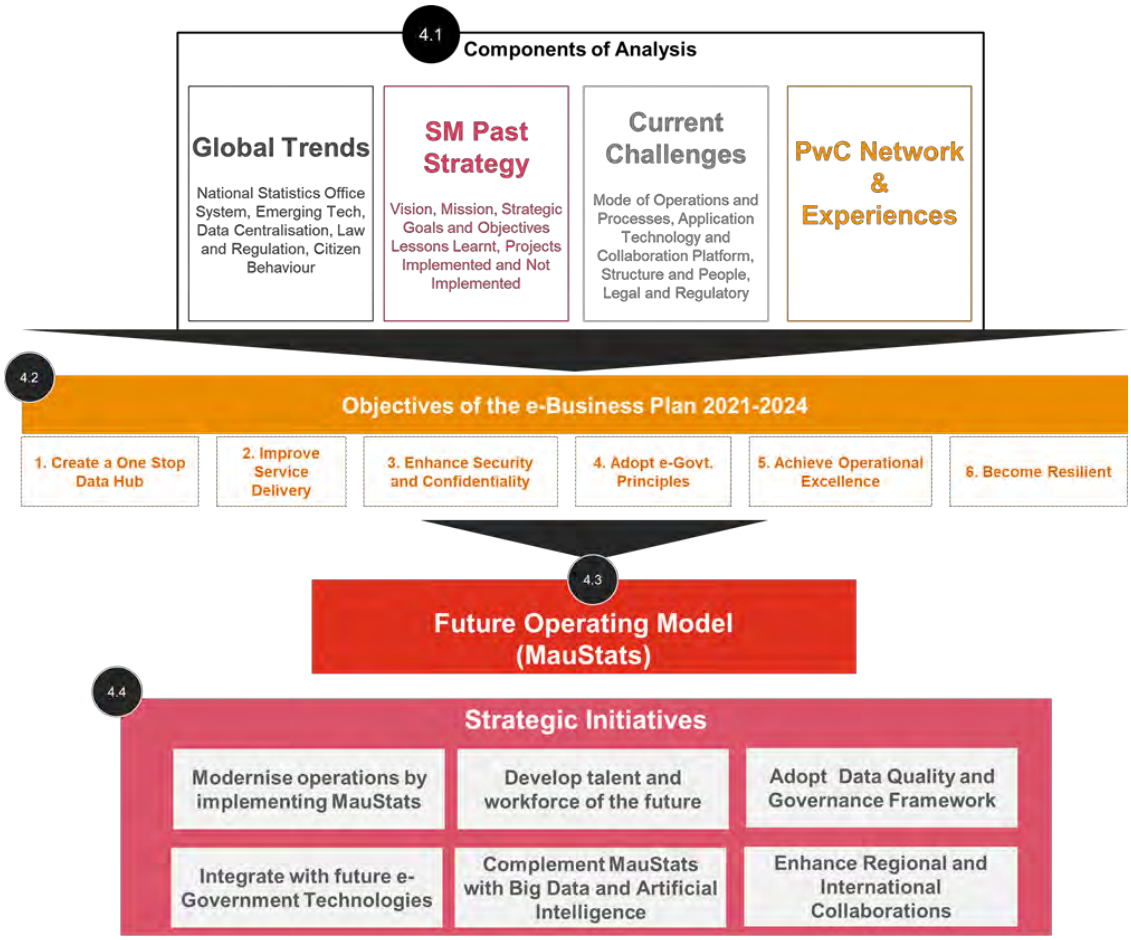


Figure 15: Our Approach

SN	Component	Description
1	**Global Trends**	Global practices across National Statistics Offices, including mode of operation, technology, standards, structure, regulatory framework among others. Data lifecycle from acquisition to dissemination have been studied to define the strategic objectives and conceptual design of SM e-Business Plan. This include international standards and frameworks implemented by IMF (SDDS and GDDS), SDGs, OECD among others.
2	**SM Strategy**	Based on SM strategic vision, mission, goals, new strategic objectives have been defined to conceptualise the e-Business Plan. Existing vision and mission are as follows: **A. Vision** SM realises the need to accelerate innovation to address new and better ways of doing things and take this opportunity to define its e-Business Plan. The vision[5] of SM is to be a key provider of world-class statistical information. **B. Mission** To provide coherent, timely, relevant and reliable statistics, consistent with international principles and standards, for effective policy and decision-making, and for monitoring national development processes.
3	**Current Challenges**	Key challenges across business functions in terms of mode of operations, application technology, structure and people skill set among others have been assessed and improvement opportunities have been identified as detailed in this report. Refer to Situational Analysis Document.
4	**PwC Network and Experiences**	PwC's experience in delivering similar assignment by re-designing operating model in other countries has been leveraged. In this context, 6 objectives have been drafted for SM e-Business Plan 2021-2024.

Table 5: Components of our analysis

4.2 Objectives of the e-Business Plan 2021-2024

Six (6) Strategic Objectives has been defined for SM to rethink its e-Business Plan 2021- 2024. These objectives govern the SM Future Operating Model, MauStats.

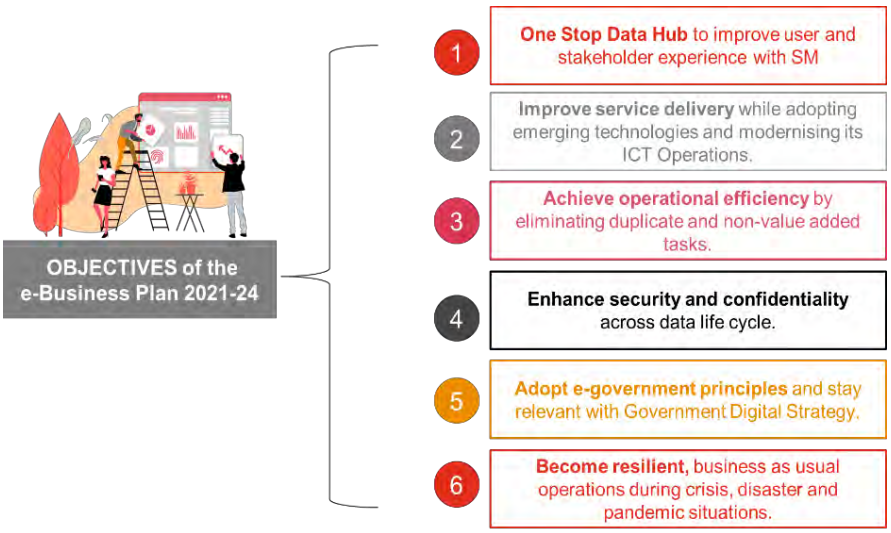


Figure 16: Strategic Objectives for MauStats

[5] https://statsmauritius.govmu.org/Pages/About_Us/Mission_and_Vision.aspx

These 6 Strategic Objectives are detailed below.

E-Business Plan 2021 - 2024 | No.1: Create a One Stop Data Hub	
Rationale	Data users expect information to be accessible "anytime, anywhere" – and by any communication means. A One Stop Data Hub will provide accurate and reliable information on any channels on a 24 by 7 basis.
Implications	• Introduction of new channels for service delivery – Revamped SM website, MauStats portal, Smart Phone/ Tablet, Internet, Contact Centres among others. • Automated data acquisition from data providers. • Implement national level change management programmes and communication plans to promote awareness on new ways of working and service delivery.

E-Business Plan 2021 - 2024 | No.2: Improve service delivery	
Rationale	SM should keep citizens' (data users) need at the core of every decision, from strategy formulation and design through to execution when offering public services such as access to information.
Implications	• Transition to 100% eservices to deliver high quality services to stakeholders. • Shift from department centric approach to citizen centric approach, i.e. service delivery mechanism to be cost effective with value being driven by citizen outcomes and user experience rather than organisation processes. • Service delivery to be integrated to make sure that user experience is at par with their expectations. • Rationalise existing surveys and census by leveraging on administrative data sources and prefilled templates.

E-Business Plan 2021 - 2024 | No.3: Achieve Operational Efficiency	
Rationale	To achieve operational efficiency, SM will need to adopt an integrated data platform which will centralise data and standardise business processes across SM. This will help reduce complexity, enable seamless integration and hence enhance operational efficiency.
Implications	• Single source of truth across SM departments/ units. • Accurate and up to date information available for analysis and dissemination. • Re-engineering of existing processes to streamline and standardise operations. • Data Providers may also need to review their current data exchange process with SM. E.g. use of InfoHighway instead of excel to submit data. **Note**: Minimal changes are foreseen from Data Providers. • Introduction of data lake, warehouse, marts as foundation data layer. • Integration with existing channels such as InfoHighway. • Internet based web standards and technology should be preferred as the basis for solutions.

E-Business Plan 2021 -2024 | No.4: Enhance security and confidentiality	
Rationale	Data users cannot replicate complex chain of operations in producing national statistics. They have to trust the result that are published as authoritative and unbiased. Producers of official statistics, not only SM, have to be free of conflicts of interest. Delivery of services would be done in a seamless, integrated, secure and transparent manner that will maximise citizen and other users convenience as well as increase public trust in the process. Enhancing security and confidentiality will help build trust and confidence of all stakeholders.
Implications	• Decisions on the choice of data sources, methodologies for data collection and dissemination must be disclosed and transparent to data users. • Implement a secure and reliable infrastructure with centralised authentication mechanism such as National authentication Framework (NAF) using NAF API Gateway. Each citizen will have a unique identifier for accessing government services. • Document Information security and privacy policies across business processes. • Clear definition on information security controls while balancing implicated costs and risk. • Dedicated personnel for Application, Infrastructure and IT Security. • Workflow management and audit trails to be implemented for tracking of approval, rejection, modification such as changes in Data Warehouse information among others. • Automated monitoring and reporting on any security and privacy breach on information. • Implementation of Digital Signature Certificates (DSC) for sign off on official documents.

E-Business Plan 2021 - 2024 | No.5: Adopt e-government principles	
Rationale	It is paramount that SM future operating model aligns with the Digital Mauritius 2030 Strategic Plan which calls for an intelligent and smart Mauritius and welcoming the capital importance of digital transformation for growth and competitiveness. As per the Digital Mauritius 2030 Strategic Plan, it is to be noted that five strategic waves have been devised namely: 1. Digital Government 2. ICT Infrastructure 3. Innovation 4. Talent Management 5. Cybersecurity
Implications	• Integrate with existing e-Government technologies – Information Highway and National Authentication Framework. • Harness cloud computing at GOC. • Use of GOC Data Centre for hosting of MauStats and adopting existing security policies and procedures. • Integrate with future e-Government Technologies - National Spatial Data Infrastructure.

E-Business Plan 2021 – 2024 | No.6: Become resilient	
Rationale	To provide round the clock services, there is need to have a resilient infrastructure to resume operations in the event of a crisis.
Implications	• Deploy MauStats on government cloud platform available at GOC. • Define and implement Business Continuity Plan/ DR plan to operate during crisis situations. • Implement Work From Home(WFH) protocols as per government framework. • Provide laptops with appropriate software and internet dongles (if needed) to employees. • Provide access to platforms from home through secured VPN connections. • Implement remote working tools such as video conferencing, chat, online document sharing etc. • Provide IT support 24x7 helpdesk facilities.

4.3 Future Operating Model

The purpose of official statistics is to produce and disseminate outputs/results designed to reliably reflect economically and socially relevant phenomenon of a complex and dynamic reality in the country. Users expect anytime anywhere access to information through various channels.

The diagram below illustrates SM Future Operating Model (FOM) in terms of its vision, strategic drivers, stakeholders, channels, core and supporting functions, system architecture and supporting layers/ enablers, which include the legal framework, project governance, monitoring and evaluation, change management and user adoption. This model will support the definition of needs and requirements for MauStats Integrated Data Platform.

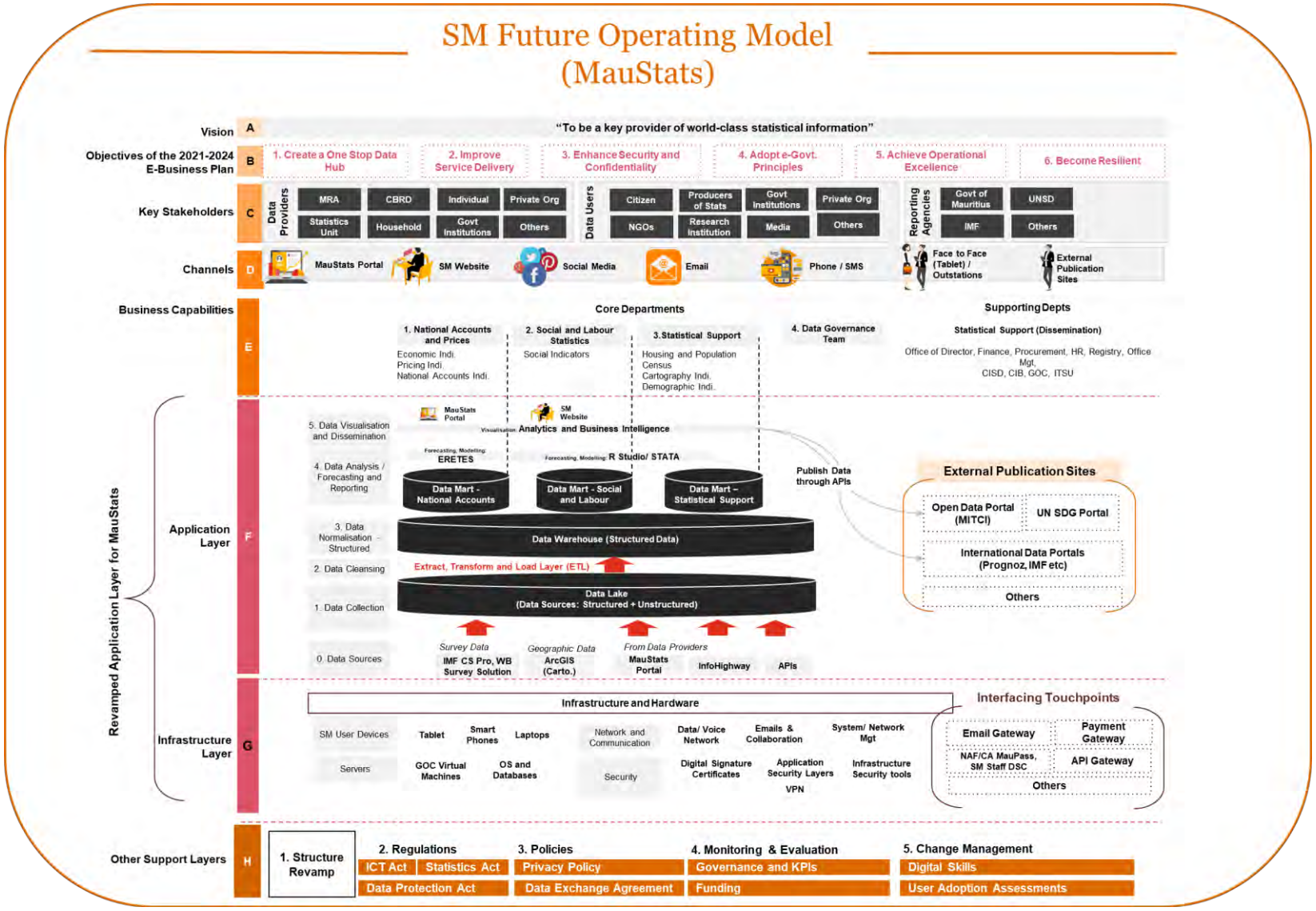


Figure 17: SM Future Operating Model

Reference	FOM Layers	Description
A	**Vision**	The first layer represents SM existing vision, which aligns with the strategic direction proposed for SM.
B	**Objectives of e-Business Plan 2021-2024**	Layer B illustrates the proposed strategic drivers of SM for this e-Business Plan.
C	**Key Stakeholders**	Layer C highlights the existing and new stakeholders of SM including data providers, data users and reporting agencies.
D	**Channels**	This layer showcases existing and proposed channels that SM can leverage on to collect and disseminate information.
E	**Business Capabilities**	Layer E highlights existing and proposed functions within SM that is core services, corporate services and supporting functions.
F	**Technology**	Layer F highlights the proposed application technologies, that is MauStats, existing system and tools and government owned system.
G	**Support Layer/Enablers**	Infrastructure layer elaborates on the hardware required across SM, such as user devices, servers, Network and Communication, Security infrastructure. It also demonstrates MauStats integration touchpoints.

Table 6: FOM Layers

The ensuing sections, detail each of the above components. Refer to Section 6.

Stakeholder identification and proposed interaction

The stakeholders of MauStats are classified into **three** main categories as follows:

1. Data Providers – Administrative sources;
2. Data Providers – Survey and Census; and
3. Data Users.

The table below illustrates key stakeholders and purpose of interaction with MauStats.

Stakeholder Category	S.No	Stakeholders	Description	Interaction with MauStats
Data Providers Administrative Data	1	Mauritius Revenue Authority (MRA)	Share administrative information such as VAT registration and transactional data such as income tax.	Data is integrated in InfoHighway or API based.
	2	Corporate Business Registration Department (CBRD)	Share source information with regards to business registration data.	
	3	Civil Status Division	Share source information with regards to Vitals (Births, Deaths and Marriages)	

Stakeholder Category	S.No	Stakeholders	Description	Interaction with MauStats
	4	Judiciary Department	Share source information with regards to Divorces.	
	5	Ministry of Health and Wellness	Codification for causes of death for demographic indicators.	
	6	Ministry of Health and Quality of Life	Provide Health Statistics. This information will be used to link with other statistical data and produce consolidated analysis.	Access MauStats portal to upload data using predefined template.
	7	Statistical units operating in Ministries, such as Ministry of Public Utilities (energy and water statistics), Ministry of Environment (environment statistics), among others	Share specific data sets as required by SM.	Access MauStats portal to upload data using predefined templates.
	8	Bank of Mauritius	Provide monetary, financial statistics, external sector statistics and survey results as required by SM.	Data push via APIs
Data Providers (Census/ Surveys/ Others)	9	- Households - Individuals or groups specified within organisations - Establishments - Government Ministries and Departments - Others as defined in survey/census frame.	Provide data as per survey and census questions.	• Access MauStats Portal or Mobile App to fill in Online questionnaire or Form. • For CATI – Survey firm will upload survey results on MauStats Portal. • For Computer Assisted Personal Interviewing (CAPI) – Survey/ Census questions will be available on mobile/tablet and

Stakeholder Category	S.No	Stakeholders	Description	Interaction with MauStats
				synchronised with MauStats.
Data Users	10	- General Public - Media - Producers of statistics - Government ministries and institutions - Private sectors, such as Economic agents (business enterprises, associations, trade unions, retail outlets etc) - NGOs - Data Analysts - Decision makers such as government institutions - Researchers - Regional and International organisation such as UNSD, IMF, COMESA, World Bank among others.	Data Users include both general public or registered users who have access to information on SM website or MauStats Portal.	• Access to SM services via website or MauStats Portal, Mobile App. These include interactive dashboards, data portals, among others. Users will be able to derive their analytics and save results in desired format (pdf, excel, SDMX, microdata etc) • For External Reporting Agencies such as IMF, information is shared by Metadata/ SDMX format as agreed with the external parties.

Table 7: Key Stakeholders and Interaction with MauStats

Channels for service delivery

Information channels define the interfaces through which SM provides information and delivers services to its stakeholders.

The purpose of the information channels is to:

- Provide a one stop data hub for accessing and visualising data/ official statistics;
- Act a medium to provide real time information to any stakeholders;
- Allow data providers to use digital means to submit data;
- Promote awareness to stakeholders on the services, policies and regulations; and
- Act as a communication channel between SM and stakeholders.

SN	Channels	Purpose of each channel
1	Website	• Dynamic website to publish real time and accurate information on indicators, news, events. • Interactive Dashboards for data visualisation with option to save in different formats, csv xls, json among others • Channel for registration of users. • Allow users to contact SM on data request such as microdata or send enquiries. • Provide general information on services offered by SM.

SN	Channels	Purpose of each channel
2	MauStats Portal	• Secure Self Service Portal where users can perform self-analysis. • A decision making tool that can be modulated to create specific views of indicators of interest, vis a vis trends and projections. • Allow data providers to upload or fill in information. • Provides data in a machine-readable format using the Statistical Data and Metadata Standard (SDMX) for sharing data.
3	Mobile MauStats (Mobile/Tablet)	• Information available on the website or MauStats Portal can be visualised on the mobile / tablet by both public and registered users. • Channel for registration of users. • Allow users to contact SM on data request such as microdata or send enquiries. • Subscribed users will get notifications on new publication, events, news or renewal of subscriptions among others.
4	Contact Centres	• Assist users to use the portal or submit data on MauStats • Respond to general enquiries
5	Emails/SMS	• Notification such as new releases or publications, registration, subscription renewals, reminders for submission of data and formal notices in case due dates have lapsed.
6	Social Media	• Big data collection such as perception surveys on specific topics. • Information dissemination to the general public.
7	Face to Face	• For Census or Surveys that require physical presence through Computer Assisted Personal Interviewing (CAPI) – Mobile/Tablet.
8	External Publication Sites	• To disseminate information to the public and other international organisations such as Open Data Portal, UN SG Portal, etc.

Table 8: Channels of service delivery

The channels will be used for specific purpose as follows:

SN	Channels	Registration of users	Data Collection	Analysis and Reporting	Dissemination	Communication
1	Website	✓		✓	✓	✓
2	MauStats Portal	✓	✓	✓	✓	✓
3	Mobile/ Tablet	✓	✓	✓	✓	✓
4	Contact Centres					✓
5	SMS/ Emails				✓	✓
6	Social Media		✓		✓	✓
7	Face to Face		✓			✓
8	External Publication Sites				✓	

Table 9: Channel purposes

Note: SM staff will be using MauStats Portal and Back End applications such as Analytics and BI tools, existing Survey Tools and Statistics Modelling among others.

The ensuing section of the report details the Future Operating Model, MauStats.

4.4 Strategic Initiatives

Based on the above Future Operating Model, the following Strategic Initiatives are proposed for SM.

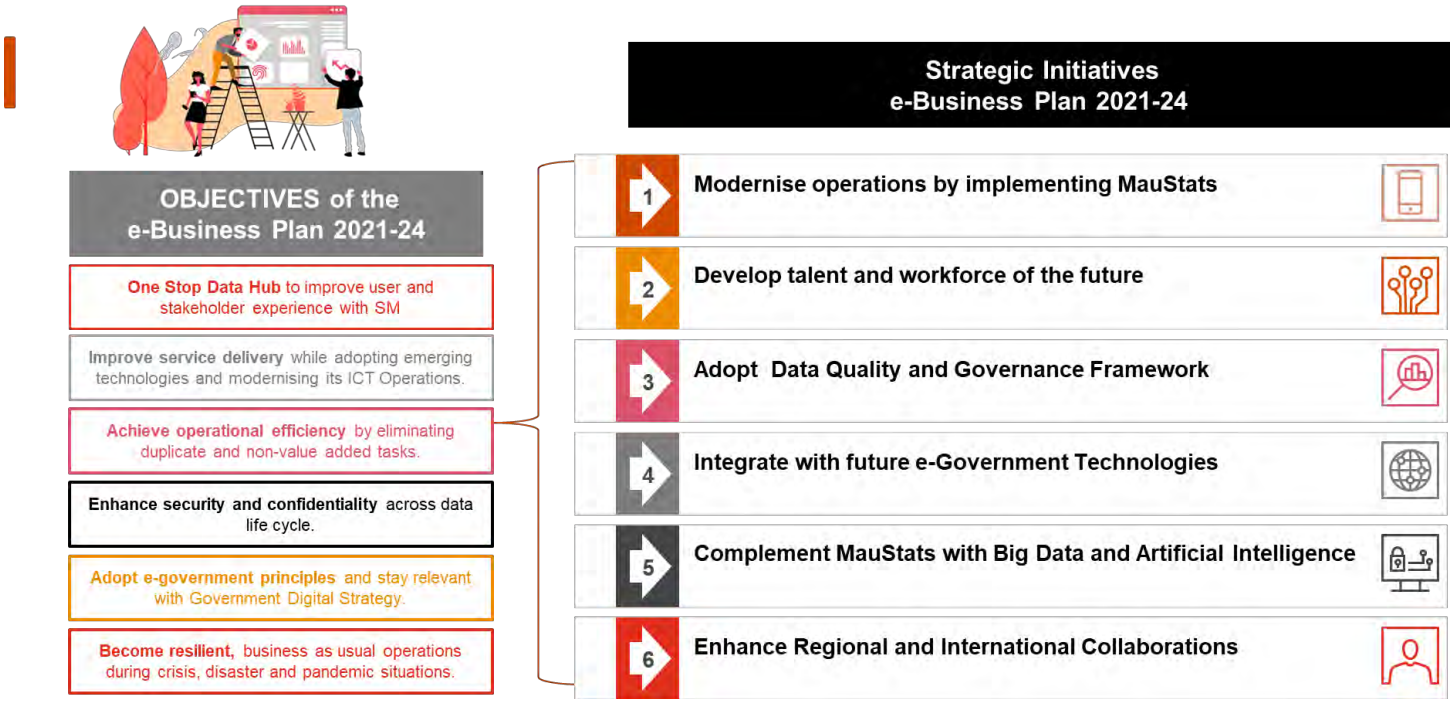


Figure 18: Strategic Initiatives of the e-Business Plan 2021 - 2024

These strategic initiatives have been detailed in the subsequent sections, followed by a prioritisation matrix and implementation plan.

Strategic Initiative No.1 – Modernise Operations by Implementing MauStats

This initiative is core for SM to modernise its operations and transition its journey from "Innocence" to "Excellence" by implementation of MauStats. It lays the **foundation SM to transition** from a manual intensive business model towards an **automated meta data driven and open standards** operating model where **user experience** is at the core.

MauStats aims to deliver a strategic, secure and user-friendly environment and with integrated data for research, analysis to data users via controlled access routes. Through this programme, SM will establish partnerships with a range of organisations to deliver high quality analysis that reflects the diversity of economic and social experience in our country.

With this approach, SM shifts from descriptive analytics approach towards a **predictive and prescriptive analysis** approach anticipating future behaviours or estimate unknown outcomes with clear set of actions. Data can be analysed under different lenses using data from the data lake, making correlations and assumptions based on the trends and visualised in a user-friendly and graphical manner. The diagram below illustrates what NSOs globally are adopting for **transitioning from traditional approach towards a Big data approach**.

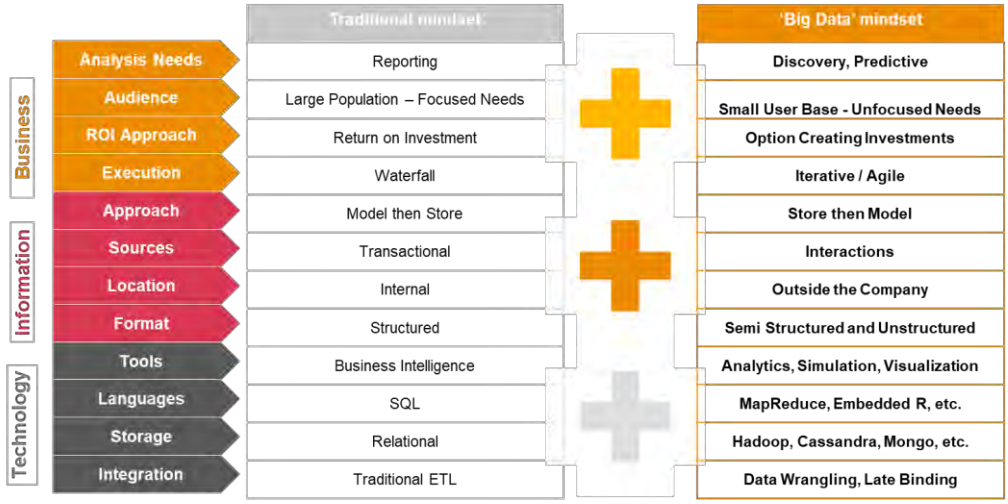


Figure 19: Big Data Approach

MauStats lays the platform for SM business processes to be metadata driven from end-to-end, within a common **data management framework**. The application of standards, in conjunction with revised business processes (as per GSBPM), increases re-use and automation of end-to-end statistical processes hence resulting in operational effectiveness and efficiency. Implementation of MauStats will allow SM to have an **automated data lifecycle** right from data acquisition up to dissemination. This will result as increase in efficiency in data operations, by overcoming fragmentation in tools, processes and data models, and enforcing a "quality by design".

The diagram below illustrates the data lifecycle in line with SM future operating model.

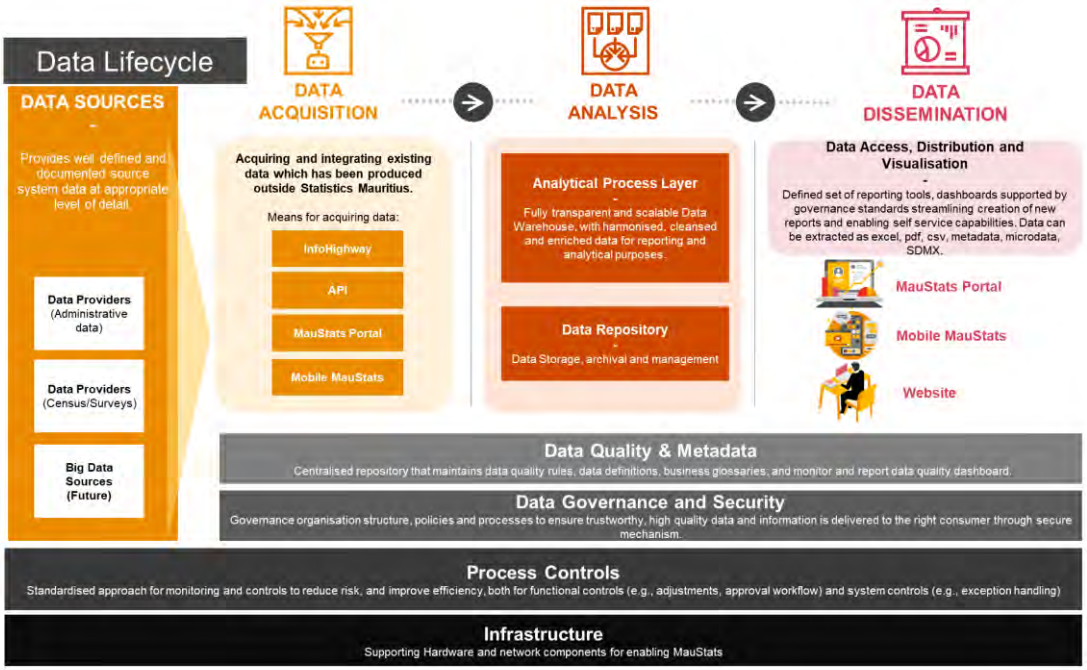


Figure 20: Data Lifecycle

The **core components** of MauStats application layer are as follow:

A. Integrated Data, Application and Business Logic Layer
B. Presentation Layer - One Stop Data Hub
C. Integration with InfoHighway and External Parties

A. Integrated Data Layer

The integrated data layer comprises of setting up a Data Lake, Data Warehouse, Data Marts, ETL tools for data collection from defined sources. With this concept, SM has the possibility to accommodate new data sources such as Big Data in the future. This technology stack also includes interfacing touchpoints such as InfoHighway, APIs with external data providers and publication sites among others.

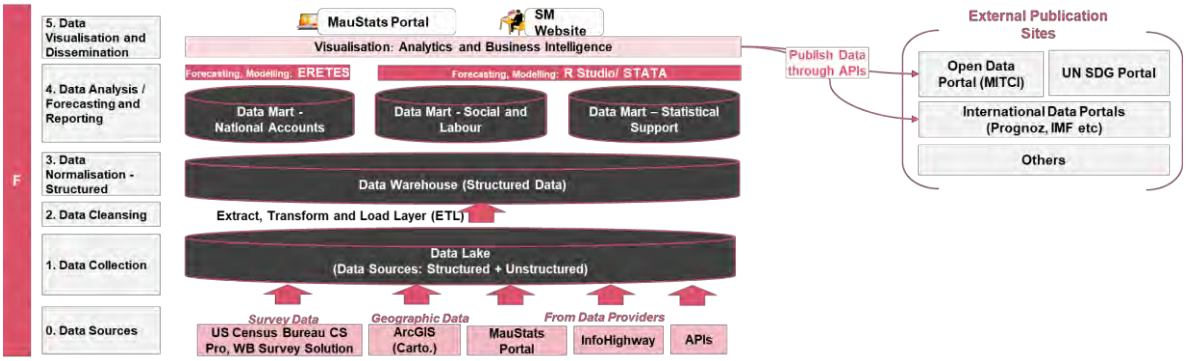


Figure 21: MauStats Integrated Layer

Refer to Section 6 for details for each component. Existing core system will be discontinued in the future as per revamped application layer for MauStats however data migration exercise will be performed to import existing data sets in MauStats.

B. One Stop Data Hub

SM should keep citizens' need at the core of every decision, from strategy formulation and design through to execution when offering public services such as access to information. The One Stop Data hub aims at enhancing service delivery to stakeholder including the general public and data providers. It is a combination of channels as follows:

- SM Revamped Website;
- MauStats Portal; and
- Mobile MauStats.

The diagram below illustrates the key features of the One Stop Data Hub.

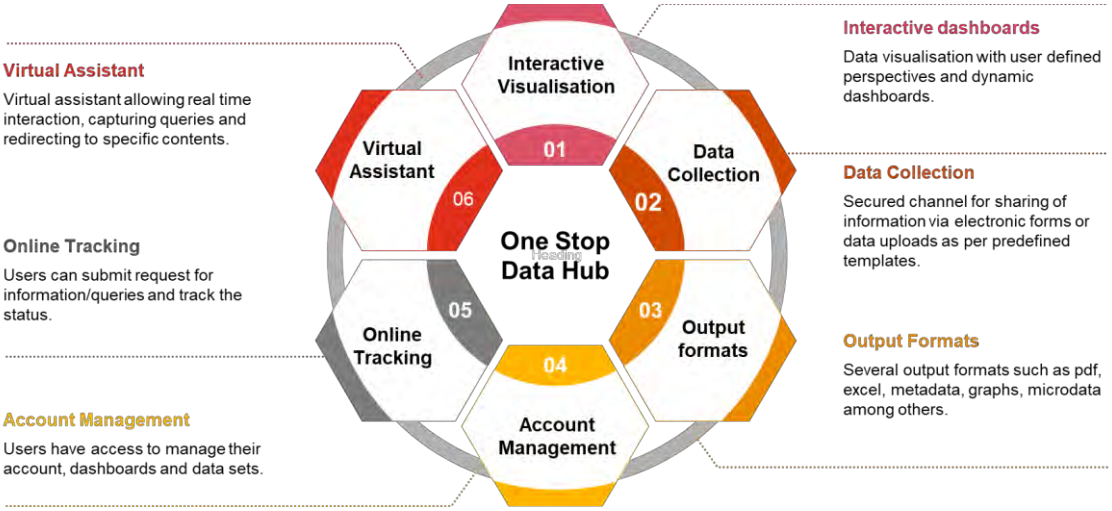


Figure 22: Key features of One Stop Data Hub

Features of the data hub includes:

1. **Interactive Visualisation –** Allows user to visualise data under different perspectives and also derive their own analysis based on published data sets. Users can create analytical rules, joins and correlate data sets as required and visualise on a dashboard.

2. **Data Collection –** MauStats portal allows registered users/data providers to submit data to SM. This can be done via filling e-Forms or upload of predefined templates published on the portal.

3. **Output Formats –** Data users have the option to save the analysis in various formats such as pdf, excel, csv, microdata, metadata, images for charts and graphs among others.

4. **Account Management –** This feature will enable users to update their account information on the portal. Users can reset their password, manage their contact details and update their subscription information.

5. **Online Tracking –** Users have the option to submit new data requirement to SM and track the approval status. Emails notifications are triggered on status updates.

6. **Virtual Assistant or Query Handling** – Users can interact with the virtual assistant 'bot' for any queries or use online query form as required.

How it works?

A. Dynamic Website

SM website needs to be revamped to provide dynamics contents. Key features of the website include:

- **Publish real time, accurate** information and latest contents such as indicators, reports, data sets, news and events.
- **Interactive dashboards** for users to drill down on indicators, view the charts/graphs, and download in desired format such as pdf, excel, csv among others.
- Acts as a channel for registration of **MauStats users**.
- Allow users to contact SM on **data requests or queries.**
- Include a **virtual assistant (chat bots)** to help users navigate and retrieve statistics.
- Provide **link to navigate to MauStats portal** for advanced analytics and visualisation capabilities.
- General information on SM services, FAQs among others.

B. MauStats Portal

MauStats Portal enhances **User Experience** as follows:

- Introduce Self Service Portal for registered users to derive their analysis (**Do Your Own Analysis).** Users are exposed to wider data sets as compared to the website users. Users are able to cross link data sets, add variables, business logic, formulas and design their own visualisation.
- Provide a **decision making tool** that can be modulated to create specific views of indicators of interest, vis a vis trends and projections.
- User friendly interface for data providers to **upload or fill in e-forms**.
- **Downloadable formats** such as pdf, excel, CVS, microdata sets.
- Provide data in a **machine-readable format** using the Statistical Data and Metadata Standard (SDMX).

C. Mobile MauStats

Mobile MauStats enables **Anywhere and Anytime Access.** Information available on website or MauStats Portal can be visualised on the mobile/tablet.

- **For Data User/Providers -** Personalized Content such as recent analytics, indicators of interest, trends and projection among others example pricing index. It also pushes notifications and alerts to users.
- **For SM users** - Use of Mobile/Tablet to conduct face to face census and surveys. Data collected is synchronised with MauStats. Use Device features, such as the camera, GPS, among others for data capture.

MauStats platform includes 12 critical capability areas, that is:

Figure 23: MauStats critical capability areas

C. Integration with existing e-Government Platforms

It is paramount that SM future operating model aligns with the **Digital Mauritius 2030 Strategic Plan**[6] which calls for an intelligent and smart Mauritius and welcoming the capital importance of digital transformation for growth and competitiveness. One of the recommendations with respect to the Digital Government front is: **Data should flow instead of paper – data sharing through the InfoHighway.** SM to leverage on existing infrastructure, such as **InfoHighway, National Authentication Framework, GOC, NSDI** among others for service delivery.

1. InfoHighway

InfoHighway[7] allows for sharing of data among Government Agencies and is designed as the service platform, which allows multiple Government agencies to share data via E-Services to other agencies. InfoHighway uses **'The Publish and Subscribe Model'** whereby the agency willing to share data Is the **Publisher** and the one requesting data is the **Subscriber**. Presently, a number of **SM's key stakeholders** such as the **Central Business Registration Department (CBRD),** the **Civil Status Division (CSD),** the **Economic Development Board (EDB)**, the **Mauritius Revenue Authority (MRA)**, the **National Land Transport Authority (NLTA)** and **Municipal Councils and District Councils** among others are connected to the InfoHighway. InfoHighway currently enables a total of **74 connections** between various Ministries and departments including parastatal institutions and **253 e-Services**.

By subscribing to the InfoHighway, and agreeing on the information to be shared, SM will be able to receive data from key stakeholders as and when required through webservices from MauStats. Leveraging the InfoHighway leads to

- Enhanced **data consistency;**
- **Minimised data duplication;**
- **Reduced time** spent on **rework;**
- **Real time data for analysis**;
- **Reduced delays** in receiving data from key stakeholders;
- Closer **adherence to the Data Protection Act**;
- **Data** being used for **specific usage** and not for other purposes; and
- **Reduced risk of data leakage** as opposed to data shared on CD or sent via email.

[6] https://ncb.govmu.org/portal/sites/ncb/strategicplans/DigitalMauritius2030.pdf
[7] https://ih.govmu.org/
https://ncb.govmu.org/portal/sites/ncb/govtcloud.html
https://cib.govmu.org/Documents/Reports/eGov%20Project%20Status%20by%20Ministry%20Mar_2018.pdf

2. National Authentication Framework and Certification Authority

The National Authentication Framework (NAF) for Mauritius also known as '**MAUPASS**' provides **a single window for authentication of user** and also provides a **convenient and secured access to e-Government services**. NAF is a comprehensive framework launched in December 2020 to deliver e-services to the intended user in a secured manner. SM can leverage on MAUPASS as an opportunity to enable end-users to securely access MauStats whilst allowing for more control with respect to whom is accessing the system and mitigating risks such as impersonation while accessing MauStats. Key channels where user authentication is required are the MauStats Portal and Mobile MauStats. **Digital Signature** Certificate will be used by following users to digitally sign documents in MauStats.

Department	Users	Transactions
SM	Director	Approval of specific publications/releases.
SM	Senior Statisticians	Approvals on all releases including data sets, reports, indicators for dissemination on the Website or MauStats portal.

MauStats Hosted at GOC Data Centre

Cloud computing is a dynamic business trend—one that is expected to have a significant impact on the way that business will be conducted going forward. In our experience, cloud computing is increasing its penetration into the business realm. The future operating model for SM has been designed by leveraging on GOC infrastructure.

Cloud computing has the potential to:

- Accelerate business innovation by eliminating technology as a barrier;
- Facilitate delivery of more personalised, context-aware services—e.g., customer-centric services;
- Improve employee productivity by providing ubiquitous access to services and data;
- Optimise the total cost of technology for the enterprise by sourcing certain commodity services to the cloud;
- Reduce dependency on IT; and
- Bring in increased agility within an organisation.

Going forward, cloud computing will be the supporting infrastructure for **MauStats and hosted at GOC.**

The **Government Online Centre (GOC)** operates **Government Datacentre** through which **hosting services are provided to Ministries and Departments**. GOC datacentre hosts physical servers as well as **cloud environments (g-Cloud infrastructure) for virtual servers**. These provide for back office applications, such as Registry, Central Personnel Systems, Labour Market Information System, Environment Information System, Central Population Database amongst many others.

Implementation Approach

The Implementation of MauStats has been planned over two (2) phases below:

S.No	Phase	Component
1	Phase 1	**A. Integrated Data, Application and Business Logic layer** **B. One Stop Data Hub including :** • MauStats Portal/ Mobile • Revamp of SM website for dynamic publication and Link to MauStats portal **C. APIs with InfoHighway and data providers for data exchange.**
2	Phase 2	**D. Enhancement/Add-Ons to MauStats** • Data exchange in SDMX format • Implementation of Chatbots • Subscribers to MauStats against payment

Table 10: Implementation Approach

Detailed Approach for Phase 1

Implementation of the MauStats Phase 1 is divided into three (3) key stages.

Stage 1: Preparation and floating of RFP

Preparation of Request for Proposal (RFP) will be the first stage of the project post submission of the Final e-Business Plan. The RFP will comprise of the Terms of Reference (ToR) functional, technical and information security requirement for implementation of MauStats. Other requirements such as bid evaluation and selection criteria, timelines, service level agreement, key performance indicators, payment terms, contractual terms etc will also be included in the RFP.

Stage 2: Floating of RFP and Selection of Solution Implementer

The selection of solution implementer for the implementation and roll-out of the proposed system shall constitute the second stage of the project. This stage will start immediately after finalising the RFP. SM shall perform the evaluation as per the selection criteria in the RFP once bidders submit their response.

Subsequently, a Letter of Intent (LoI) will be released to the successful bidder and activities of Solution Implementer on-boarding will start such as negotiation and contract finalisation.

Stage 3: Implementation of MauStats Phase 1

Once on-boarded, Solution Implementer will initiate implementation of the envisaged system. The implementation stage comprises of the project activities:

3.1 **Requirement gathering –** this activity comprise of gap analysis session for alignment between solution provider and SM staffs. Walkthrough on existing data structure, codification, classification and output formats/layouts for dissemination. Analysis of existing APIs such as InfoHighway by Solution Implementer will be a critical activity. It will also trigger data classification exercise for SM to align with proposed solution.

Deliverables: Business Requirement Document (BRD) and Software Requirement Specifications (SRS).

3.2 Design – This activity comprises of designing the system design blueprint prior to configuration and customisation. Solution Implementer will document how the system will work based on requirement gathering workshops. Design activity comprises of the design of data, application, business logic and presentation layers (MauStats Portal, Website and Mobile MauStats including interfacing touchpoints, data exchange protocols, workflows and notifications. Data structure and mapping will be defined at this stage. Sign off from SM is required prior to development and system configurations.

Deliverables: Solution Blueprint document (SB).

3.3 Deployment on GOC data centre – This activity comprises of deployment/installation of the required components on the infrastructure.

Deliverables: Installed components as per infrastructure specifications (submitted by Solution Implementer at the proposal stage).

3.4 Development, Configuration and Customisation of MauStats – This activity comprises of development, configuration and customisation of the proposed system. System Development should follow agile methodology, developed components are tested on an iterative approach. Each iteration is demonstrated to SM for feedback and sign off. SM users to make sure that developed components fully meets the requirement stipulated in the BRD.

Deliverables: Development Iterations Workshops.

3.5 Testing – This activity comprises of system, integration, hardware, performance and security testing of the developed application. It also Include the User Acceptance testing executed by SM staffs.

Deliverables: Testing Results, UAT Plan and UAT Scripts

3.6 Training – Solution Implementer to provide both user and technical training to SM users. Technical training should cover all aspects of MauStats for SM to make changes on the system in the future.

Deliverables: Training Plan and User Manuals (Functional and Technical), Standard Operating Procedures.

3.7 Data Cleansing and Migration – This activity runs in parallel to the above activities. Data from existing core system, excel files are migrated on MauStats central data repository. Typical approach for data migration is as follow:

1. **Define Data Migration Strategy** in terms of the planning, timeline, data migration team (Solution Implementer, SM and any other stakeholders engaged on this project) among others.
2. **Perform Data Discovery** – This activity is performed by data migration team to assess the existing application systems and supporting databases to understand the data sets they hold respectively, type of data, volume and expertise required for extraction. It also includes assessment of manual records (excel files).
3. **Data Mapping** – Mapping of existing data sets to the future application system, field to field mapping, formats and description of each data elements.
4. **Data Extraction, Cleansing and Transformation** – The Data Migration Team shall in this phase extract data from identified source systems SM to use an Extraction, Transformation and Loading (ETL tool) which will be provided by the Solution Implementer. After the data extraction, a cleansing process has to be initiated by the SM. Examples of common issues include invalid data sets, duplicate records, incorrect/incomplete records, incorrect data classification among others.

5. **Migration Test and Simulation** – Once data is cleansed and validated, it is migrated on the proposed system for testing. SM users are required to test whether data has been correctly migrated. Business process owners shall execute the simulation test using front end application system to make sure that data is accurate and reliable as per MauStats design.
6. **Data Migration Sign off** – A sign off on the results of the testing activities is a mandatory pre-requisite for the 'Go Live' activities. This ascertains that all steps of the Data Migration plan have been addressed completely.

3.8 Go Live Readiness – Project governance team must perform a go-live readiness assessment to make sure that MauStats is fully operational, issues raised during Vulnerability Assessment (VA) test by the GOC are fixed and all defects/issues raised during UAT have been addressed.

Deliverables: Transition Plan, Go Live Readiness Assessment Report.

3.9 Pilot Phase – The pilot stage shall start on upon recommendations from Go Live Readiness Assessment report. Pilot Phase shall run over a period of **3 Months** and executed as follows with focus on data collection process:

- Real time data exchange (API) via InfoHighway with 2-3 entities as identified by SM; and
- Expose MauStats portal for data collection with a minimum of 5 entities using e-Forms/ uploads;

Deliverables: Detailed report comprising tasks completed successfully, areas for improvement, failed/unsuccessful tasks, errors, bug recorded and mitigation actions.

3.10 Go Live – After successful completion of the pilot stage, SM to extend MauStats to all stakeholders as identified in the Future Operating Model.

Note: Operations and Maintenance will start at the end of warranty period, that is one (1) Year post go-live, for a defined duration as stipulated in the Solution Implementer contractual agreement.

Deliverables: Project Closure Report, Service Level Agreement

Note: IT support, 24x7 helpdesk facilities will need to be set up prior to Go-Live. As such, SM will need to make necessary arrangements such as onboarding of dedicated personnel with the help of MITCI/ MOFED.

Detailed Approach for Phase 2 (Enhancement/ Add-on on MauStats)

Prerequisite – Implementation of MauStats Phase 1

Phase 2 comprises of enhancement features, add-ons to MauStats as follows:

- Data exchange in SDMX format;
- Implementation of Chatbots;
- Subscribers to MauStats against payment; and
- eCensus Module.

This phase follows similar approach to the implementation of Phase 1, however it is expected that the selected Solution Implementer captures SM requirement for **both Phase 1 and Phase 2** during Requirement Gathering sessions and include the design of Phase 2 components in the Solution Blueprint document. Once development activities are complete for Phase 1, Solution Implementer can embark on Phase 2 Development activities in parallel. The approach for Phase 2 must be executed in the same approach as described in Stage 3.4 – 3.10 above.
Note: Both Phase 1 and Phase 2 functional and technical requirement will be defined in the Request for Proposal.

Envisaged Benefits of MauStats

The overall benefits envisaged with the implementation MauStats includes:

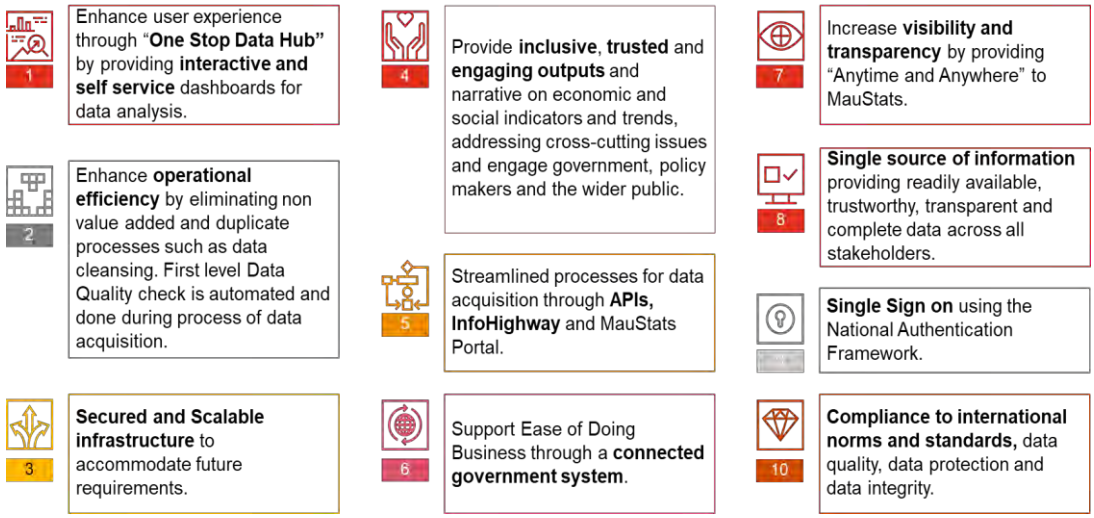


Figure 24: Envisaged Benefits with MauStats

Indicative Performance Metrics

Key performance metrics which may be adopted for MauStats are:

S.No	Performance Measures	Method	Target	Frequency
1	Stakeholder Trust = Average level of trust in SM and SM statistics	- Pulse Checks/ Surveys for Satisfaction Index	At least 85% average level for trust in SM and Statistics.	Bi-annual
		- No of statistics released free from significant errors	100% statistics released free from significant errors	Quarterly
		- % of statistical releases published on the advertised date	At least 95% of statistical releases are published on the advertised date	Quarterly
		- Time lag from the reference date/period to the release of the provisional output	At least 95% of statistical releases are within defined timeline.	Quarterly
2	Use of data products and services	- Counts ofcustomer per service or product	At least 200 usage of published data on Data Hub per each year	Bi-annual

S.No	Performance Measures	Method	Target	Frequency
			At least 50 new MauStats registrations each year At least 50 requests for customised data each year	
3	International Compliance = SM meets the standards for dissemination	- Compliance with IMF Special Data Dissemination	100% compliant	Annual
4	Stakeholder health = average stakeholder rating of the value of their relationship with SM and level of engagement through social media	- Surveys	Stakeholder survey scores which should be >= 95% satisfaction index.	Annual
		- Social Media Engagement	Increase the number of social media followers. Minimum 50+ followers annually. Increase in impressions/posts, minimum 2 posts per month.	Quarterly
5	Time taken to respond surveys	- Average time taken to complete business surveys	Approx. 5-10 mins	Quarterly
6	New statistics created	- New indicators/data sets published on MauStats	Minimum 5 quarterly	Annual
7	Access to Information	- Calls to APIs Services	Extend to 5+ APIs with data providers in the next 1 year	Annual
		- Survey/Pulse checks/e-polls	User Satisfaction Index >=95%	Bi-annual
		- Information search hits and fails	At least 95% search retrieve information requested by user	Quarterly
8	Ease of Access to avail information	- Survey/Pulse checks/e-polls	User Satisfaction Index>=95%	Bi-annual
		- Data collected within period	100% automated	Annual
		- Response rates	Above 80%	Quarterly
9	Service Delivery	- Number of Registered users on MauStats	At least 50 new MauStats registrations each year	Quarterly
		- Time spent on average on the portal	Minimum average time 10 -15 mins.	Quarterly
		- Number of Request submitted	>= 90% of service requests should be online	Quarterly

S.No	Performance Measures	Method	Target	Frequency
		- Turnaround time for approvals	Within 2 working days	Quarterly
		- Implementation of new request/ requirement	Within 1 week	Bi-annual
		- Query handling	Response within 2 working days	Monthly
		- Stakeholder satisfaction index	Satisfaction index >=80%	Bi-annual
		- Turnaround time for data quality checks and correction in case of outliers	Within 2 working days	Monthly
10	Compliance	- Percentage of risk mitigation factors complete on time	Above 80%	Quarterly
		- Data breaches	Zero data breach	Monthly

Table 11: Indicative Performance Metrics

Strategic Initiative No.2 – Develop talent and workforce of the future

Having the right structure, talent and capacity building framework in place are among the key success factors for the implementation of SM future operating model.

Therefore, to achieve the set objectives of the e-Business Plan, SM existing structure has been reviewed to identify **roles/teams that need upskilling** and **new roles/teams that needs to be introduced**. This will help SM innovate and develop the required digital and data-driven culture team to operate MauStats.

This initiative is required to support implementation of MauStats and comprises of two (2) main components:

A. Proposed Structure and
B. Training and Capacity Building Programme

A. Proposed Structure

The diagram below demonstrates the proposed structure as follows:

= Existing roles and teams (Unchanged)

= Changes in existing roles/teams

= New roles/teams introduced

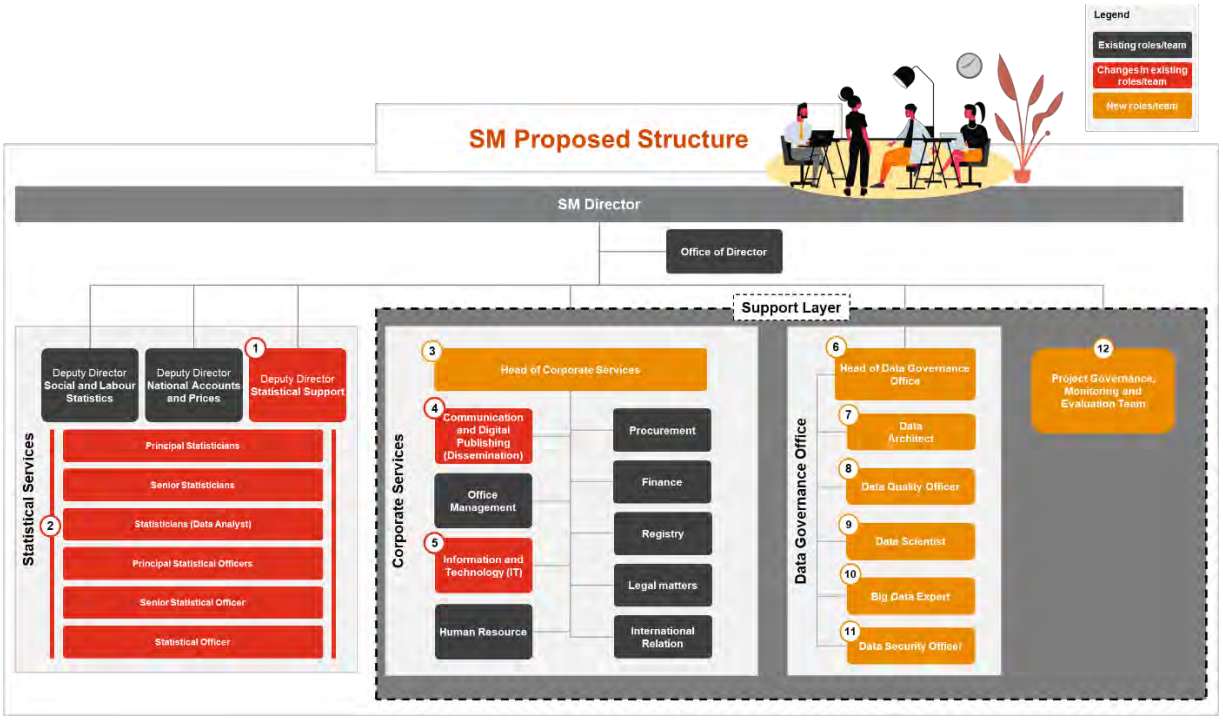


Figure 25: Proposed Structure

Key departments in the proposed structure include:

1) Office of Director

The role of Office of Director will remain as-is and thus will continue support the delivery of services by the Director and the Statistics Board among others. Office of Director will be responsible for continuous innovation and building relationship with regional and international partners.

2) Statistical Services

Statistical Services relates to SM current Statistical domains namely:

- **Social and Labour Statistics** (Labour, CMPHS, Agriculture, Energy and Outstation Among others).
- **National Accounts and Prices** (National Accounts, Trade Analysis, CEA, Services Sector, Public Finance Unit, Prices, Gross Fixed Capital Formation).
- **Statistical Support** (Demography, Cartography, Census).

Refer to ensuing section for details on each role.

Key changes: Responsibilities of **existing roles** in the above domains have been **aligned** with the new processes as follows. As a note, the responsibilities defined as per the ensuing tables are not exhaustive with respect to the listed role(s).

SN	Roles	Aligned Responsibilities*	Involvement in To-Be processes					
			Specify Needs	Design and Build	Data Collection	Data Processing	Data Analysis	Dissemination
Statistical Services								
1.	**Deputy Director**	• Oversees activities of Units falling across all process phases.	✓	✓	✓	✓	✓	✓
2.	**Principal Statisticians and Senior Statisticians**	• Review/approve new data requirements and data sources as well as requests for specific analytics/reporting. • Review statistical production/analysis from Statisticians on MauStats. • Approve output for information dissemination. • Work closely with Data Governance Office to implement innovation projects/standards.	✓	✓	✓	✓	✓	✓
3.	**Statisticians (Data Analyst)**	• Participate in processing/assessment of new data requirements and redesign of surveys/frames, when required. • Data Analysis and preparation of content for dissemination. • Work with Data Governance Office to review/test updates on MauStats, such as new business logics, new report layouts, updates in existing Frames, among others.	✓	✓	✓	✓	✓	✓
4.	**Principal Statistical Officer and Senior Statistical Officer**	• Process information requests as part of the 'Specify Needs' phase described in Section 5 (To-Be processes). • Responsible for review/approval of data validated/processed by Statistical Officer.	✓	✓	✓	✓	✓	

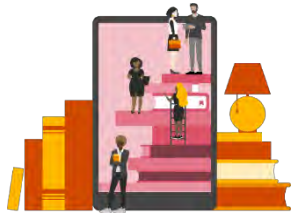
SN	Roles	Aligned Responsibilities*	Involvement in To-Be processes					
			Specify Needs	Design and Build	Data Collection	Data Processing	Data Analysis	Dissemination
		• Data quality check and liaising with data sources for clarification among others.						
5.	**Statistical Officer/ Census and Survey Assistant**	Data collection and processing which will include: • Validating and compiling of information from data sources; • Data quality check and liaising with data sources for clarification among others. • Conduct face to face Census/Surveys using tablet or mobile devices. • Support in data processing as required. E.g. Liaise with Census/Survey participants for clarifications.			✓	✓	✓	

Table 12: Roles and Aligned Responsibilities

3) Corporate Services

The Corporate Services department will encompass:

- Communication and Digital Publishing (Dissemination)
- IT Team
- Existing supporting Functions like Human Resource, Procurement, Finance, Registry, Office Management, Legal matters, International Relations.



Key changes:

1) **New role introduced – Head of Corporate Services**
2) **Review of existing roles – Dissemination and IT team**

The table below details the responsibilities for the above key changes.

SN	Roles	Aligned Responsibilities*	Involvement in To-Be processes					
			Specify Needs	Design and Build	Data Collection	Data Processing	Data Analysis	Dissemination
Corporate Services								

1.	**Head of Corporate Services**	• Oversee activities of supporting functions including Dissemination, Office Management, IT, Human Resources, Procurement, Finance, Registry, legal matters and International Relation.
		• **Note:**
		  • This resource might be involved throughout the process journey as required e.g., to oversee IT.
		  • Overall knowledge/experience in managing supporting functions required.
			✓	✓	✓	✓	✓	✓

2.	**Communication and Publishing – Dissemination Team**	• Approve/initiate information dissemination on SM channels – website, MauStats Portal, Mobile MauStats.
		• Improve SM digital footprint by:
		  o Setting up a social media strategy with key messages and content type (video, graphs and weblinks).
		  o Implementing editorial calendar based on SM publications calendar.
		  o Run digital awareness campaign to promote availability of e-Reports, interactive dashboards and 'do-your-own' analysis capabilities etc, on SM digital channels.
		• Coordinate with Government printing services for physical publications, as and when required.
			✓					✓

SN	Roles	Aligned Responsibilities*	Involvement in To-Be processes					
			Specify Needs	Design and Build	Data Collection	Data Processing	Data Analysis	Dissemination
3.	IT Team	• Address internal IT support requests, coordinating with external stakeholders such as GOC when higher level support required. • Implement and monitoring of information security such as data encryption, multifactor authentication, identity and access management, among others. • Provide first level support on MauStats. • Manage SLAs with Solution Implementer.	✓	✓	✓	✓	✓	✓

Table 13: Roles and Aligned Responsibilities

4) Data Governance Office

The purpose of the Data Governance Office (DGO) is to drive implementation and adhere compliance of Data Governance Framework **(see Strategic Initiative No.3)**. The team will also be responsible to maintain/operate MauStats. Key functions of the DGO are hence to:

- **Maintain compliance to statutory obligations** that governs collection of data, confidentiality, data sharing, data linking and release.
- **Make sure data management is transparent, quality and security policies and standards** are established and followed.
- **Apply leading industry standards and practices** across data lifecycle from collection to dissemination. Personal information should be kept safe and secure, applying relevant security standards and keeping pace with changing circumstances such as advances in technology.
- **Perform regular reviews** across SM to make sure data quality, data security and overall data management are appropriately robust. Key data quality dimensions to be considered by the DGO includes: **Relevance, Accuracy, Timeliness, Accessibility, Consistency and Interpretability**.
- **Support data governance issue analysis** and remediation for "strategic" data.

The table below illustrates the different roles required as part of the Data Governance Office.

SN	Role	No. of pax	Key Responsibilities	Key Skills	Involvement in To-Be process					
					Specify Needs	Design and Build	Data Collection	Data Processing	Data Analysis	Dissemination
1.	Head of Data Governance Office	1	• Drive mandate of Data Governance Office. • Report to SM director on the outcome of data quality and security audits, as well as mitigation actions / innovation to address risk / issues identified by the DGO. • Prioritise internal focus of innovation efforts and the corresponding training needed to drive towards an analytics-embedded organisation.	Understanding of: • Data lifecycle management, data modelling, master data management and carrying out quality/security audits and requirements gathering. • Relevant statutory frameworks applying to data governance such as the (e.g. Data Protection Act).	✓	✓	✓	✓	✓	✓
2.	Data Architect	1	• Research and discover new methods to acquire data. • Assess implications of new data / report/ business logic requirements. • Solve data issues around data integration, unusable data elements, unstructured data sets, and other data processing incidents. • Design blueprint/technical specifications based on requirements from Statistical Services and other stakeholders. • Develop/implement changes in MauStats such as implementation of Data Models and Data Views on Data Warehouse	• In-depth understanding of database structure principles, data management, statistical analysis, modelling, reporting and visualisation tools and software. • Knowledge and experience in: o Analytical and Reporting tools – such as PowerBI, QlikSense, etc; and o Statistical tools among others. o Database – such as MySQL, SQL PostgreSQL among others. • Expertise in big data architectures, tools and vendors. • Perspective on emerging technologies and architectures.	✓	✓	✓	✓	✓	✓

SN	Role	No. of pax	Key Responsibilities	Key Skills	Involvement in To-Be process					
					Specify Needs	Design and Build	Data Collection	Data Processing	Data Analysis	Dissemination
			and/or Data Marts, as per design blueprint.	• Information management and data processing on multiple platforms. • Proven analytical skills with the ability to analyse, profile and validate data to identify potential data quality and/or security issues.						
3.	Data Quality Officer	1	• Responsible for definition and monitoring of data quality policies and standards across SM. • Identify and implement continuous improvement activities based on lessons learnt from previous audits to improve or maintain data quality. • Educate SM staff on the implications of poor data quality, and highlight which errors may have the largest impact.	• Strong understanding of data management, statistical analysis, modelling, reporting, and software • Broad awareness of data needs and common pitfalls of current data management processes across SM. • Fully conversant with Generic Statistical Business Process Model (GSBPM).	✓	✓	✓	✓	✓	✓
4.	Data Scientist	1	• Deliver core analytics work, including model construction and hypothesis testing. • Synthesize analytics results to communicate insights to appropriate Statistical team. • Work with innovative tools and create applications that resonate to specific team problems. • Research macro trends and help prioritise necessary investments needed to keep pace with analytic leaders.	• Proven experience with data management, statistical analysis, modelling, reporting and visualisation tools and software. • Knowledge and experience in: o Analytical tools – such as PowerBI, QlikSense, etc. o Statistical tools like STATA, Eretes, etc. o End to end analytics project delivery.	✓	✓	✓	✓	✓	✓

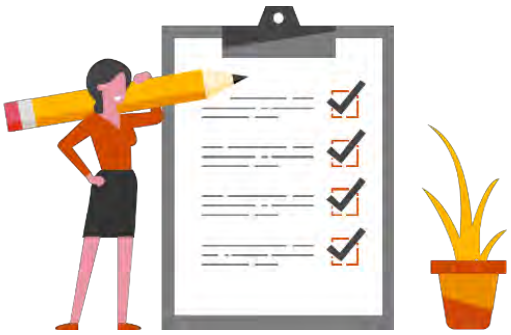
SN	Role	No. of pax	Key Responsibilities	Key Skills	Involvement in To-Be process					
					Specify Needs	Design and Build	Data Collection	Data Processing	Data Analysis	Dissemination
5.	Big Data Expert	1	• Collect and analyse data from other sources such as sensors, social media, mostly raw unstructured and semi-structured data. • Maintain big data structure, with the support of Data Architect. • Keep track of the trends and correlational patterns among complex data sets. • Collaborate with Data Scientists to identify new sources of data, develop innovative analytical tools and methods for reporting.	• Ability to translate unstructured information into structured information. • Comfortable in working with multiple technologies and computational frameworks including both basic tools such as MySQL as well as advanced frameworks like Hadoop, MapReduce, Spark, Storm, SPSS, Cognos, SAS among others.	✓	✓	✓	✓	✓	✓
6.	Data Security Officer	1	• Audit and enforcement of security policies/standards and statistics related regulation as per section • Conduct regular security audits to identify risk/issues, and implement mitigation actions, such as training or system enhancements. • Work closely with Data Architect, where required, for implementation of remedial actions affecting MauStats.	• Significant experience of information security, risk management and cybersecurity technologies and strategy. • Familiarity with industry security standards including NIST, ISO, etc. • Familiarity with current statistics related law and regulation, data privacy regulations, including GDPR and regional standards.	✓	✓	✓	✓	✓	✓

Table 14: Roles in Data Governance Office

5) Project Governance, Monitoring and Evaluation

Key responsibilities include:

- Oversight of entire programme life cycle, from approval to closure, providing effective supervision on project and control to minimise failures.
- Understand project requirements and produce detailed project Master Plan.
- Monitor project progress making sure project milestones are achieved as per plan.
- Manage change and user adoption by promoting awareness, feedbacks and communicate to stakeholders with multichannel interaction, among others.
- Project related communication and coordination.
- Measure effectiveness of projects/initiatives undertaken vis a vis identified metrics.
- Identify, quantify and escalate project issues/risks and propose mitigation strategies.
- Budget tracking and monitoring.
- Conduct impact Assessment, benefits realisation check and Metrics Reporting.
- Project Critical Path Management, if required, among others.



Note: Refer to section 8 for the proposed Monitoring and Evaluation team.

B. Training and Capacity Building Programme

As SM transitions from current environment where responsibilities are mostly manual and hands-off are standard practice, new and expanded skills must be provided to staffs for adoption of MauStats. The importance of capacity and skill building programme is hence critical for all stakeholders in respect of the MauStats implementation in order to support the new mode of operations. Capacity building will seek to address the skill gaps in the current system and people.

To make the most of the opportunities available, it is recommended to apply the **70:20:10 approach** to career development as follows:

- 70% of staff development and learning occurs on the job;
- 20% occurs through feedback, mentoring, coaching, seminars and self-paced learning; and
- 10% occurs through formal training.

Based on this approach, SM statistical and professional skill sets can be developed through a range of avenues including:

- on the job training;
- coaching and mentoring;
- buddying;
- networking;
- self-paced learning;
- conferences and seminars;
- formal training and study options;
- job rotation to enrich staff experience by working in different areas within the SM; and
- secondment to international statistical office to get more exposure or develop specific skills set.

The stakeholders identified for training and capacity building programme include:

- **SM users across various departments** such as Statistical Services, Corporate Services and Data Governance Office.
- **Data Providers** including admin data sources, private external stakeholders among others.
- **Data Users**, including Citizens, Ministries and other public bodies.
- Other stakeholders, as per SM.

Below is an indicative training type/mode for each stakeholder group:

S. No.	Stakeholders	Training objectives	Mode of Training
1.	**SM internal departments**	**Create awareness and build capabilities to use MauStats** through: • Deep dive of MauStats and its functionalities. • Deep dive of access role on MauStats. • Discussion on changes in roles and responsibilities as well as training needs. • Knowledge transfer from Solution Implementer on how to use each component of MauStats.	1. Class room and User Manual. 2. Hands On session. 3. Train the Trainer Model. Solution Implementer to train champions from each department. The champions will then be responsible to train other users such as Statistical Officer etc. *Note: This will be further discussed during System implementation with Solution Implementer.*
		Upskill data and ICT capabilities across SM through: • **Technical Trainings** such as Introduction to data related tools such as data visualisation, data modelling among others; data analysis in Microsoft SQL Server, Microsoft Excel - Power Query, Reporting Services, Integration Services, HTML5, JavaScript, Big Data in public statistics, SAS, and other specific programming training that will be identified from the skills assessment. • **Digital Foundation programmes** to establish familiarity with digital tools/channels, update skills and literacy on digital trends.	1. Class room and user manuals. 2. eLearning platforms.
2.	**Data Providers**	• High Level Overview of MauStats and functionalities relevant to Data Providers. • Overview of access rights on MauStats. • Integration touchpoints, if any. E.g. with InfoHighway and Data Providers through API. • Deep dive on working principles and Memorandum of Understanding.	1. Class Room and User manual.
3.	**Data Users**	Disseminate: • Changes in SM data dissemination approach – website, MauStats Portal/Mobile • How to avail data services from SM using the new channels	1. Press release and digital communication on SM website, news and other channels among others.

Table 15: Indicative training type/mode per stakeholder

Prior to implementation of the training and capacity building programme it is suggested that SM performs and in depth skills assessment which will inform the definition of the programme.

Also, SM to leverage on key government initiatives, **Talent Management programme**. This programme aims to:

- Understand **ICT skills requirements** to formulate **demand and supply plan;**
- Implement the **ICT skills** demand and supply plan **to address gaps;**
- Adopt the right mix of financing instruments for **training of human resources in ICT field;**
- Organise **trainings in collaboration with universities and polytechnics** ;
- Introduce **ICT training incentive schemes for employees;**
- **ICT skills exchange programmes** with international organisations; and
- **Attract foreigners and the Mauritian Diaspora** to come to Mauritius to work offering them better conditions and a conducive environment allowing for **know-how transfer.**

Implementation Approach

For SM to develop talent and build future workforce it is imperative that SM build a structured and formalised training and capacity building plan to **increase the knowledge base of its employees** especially in view of MauStats Implementation. Key project for SM to undertake are as follows:

- **Training, Capacity Building of SM Staff or Upskilling/Recruitment**
- **Change and Communication Management**

Training, Capacity Building of SM Staff or Upskilling/Recruitment

The objective of this project is to implement the proposed structure and gear SM towards a user experience centred, data-driven organisation.

Training, Capacity Building of SM Staff

1. **Conduct in depth skills assessment or training needs analysis**. Key components of the analysis include:
    - **Roles and responsibilities requirements** vis à vis MauStats.
    - **Available trainings** from international organisations such as World Bank Trust Fund for Statistical Capacity Building, among others.
    - **Career path needs** and **metrics/KPIs** defined.
    - Leverage on **Existing government initiatives**
2. **Develop the training plan by category of staff** over 6 months using different modes of delivery (on the job, online and virtual classroom among others).
3. Leverage on government e-Learning Platform to **create overall training database to monitor and track training.**
6. Launch training programme.
7. Set up a mentorship/shadowing programme to nurture talent and provide career guidance.

Note: At the end of each training/knowledge transfer, a pulse check will be performed as a **post training evaluation** to assess effectiveness of training, and thereby identify mitigation actions as required. This may include the need to change training approach or trainer, provide further handholding materials among others.

Training will need to be included as one of the components in the **Performance Management System**.

Implementation Approach

Upskill or Recruit

1. **Review and finalise proposed structure**.
2. **Create detailed job descriptions** to include key performance measures/indicators (KPIs), roles and responsibilities of each role category as well as training assigned.
3. Prepare **onboarding pack by category of staff**. The onboarding pack will be given to all staff and will include the following items, specific for each staff category:
   - Reviewed **roles and responsibilities** and an overview of access rights on MauStats.
   - **User manuals** focusing on MauStats functionalities and detailed processes.
   - Set of defined **policies and procedures** to be adhered to.
   - **Key performance and compliance metrics/KPIs** defined for respective staff category.
   - **List of trainings** to be completed as per training plan.
4. **Perform Upskilling or recruitment** of resources to fit in new roles required.
   Example of sourcing options for recruitment include from other government institutions, local/regional market, or from other regional/international statistics offices.

Implementation Approach

Change and Communication Management

This project will be implemented as follows:

A. Implement organisation wide culture change programme
B. Implement public awareness campaign

Key steps to implement the project:

A. Implement organisation wide culture change programme

1. **Identify key project stakeholders and perform stakeholder mapping** to define type of interaction with stakeholders. E.g. Inform and consult, work together or keep informed only.
2. **Conduct pulse check survey** to understand stakeholders perception vis a vis project implementation.
3. **Develop change and communication plan**, based on stakeholders' mapping and outcome of pulse check survey. The plan will elaborate on the stakeholder engagement interaction and communication channels to be used among others. *Refer to Section 8 for proposed stakeholder engagement interaction.*
4. **Implement activities** identified as part of plan defined.
5. **Measure effectiveness/success of activities conducted**. This will inform SM on do's and don'ts for upcoming activities to be rolled out.

B. Implement public awareness Campaign

1. **Upskill existing Dissemination team to take up the new responsibilities defined in section 4.4.**
2. **Setup and implement public awareness campaign plan**. The plan will typically include:
   - **Editorial calendar** on different types of media – online (website, social media (if any) etc.), physical (bill boards, newspapers, etc,.) to promote awareness on MauStats.
   - **Public awareness materials** for MauStats including content for bill boards, newspapers, TV and radios, etc.
   - **KPIs/Metric to measure effectiveness/success of campaign** and take note of lessons learnt to be considered for future activities.

Note: The objective is to promote awareness of SM future data services and upcoming changes through digital channels, such as social media and SM website.

Strategic Initiative No.3 – Adopt Data Quality and Governance Framework

Adopting a Data Quality and Governance Framework and implementing the right data policies and standards will provide the guidance, assurance and support needed to transform SM into a trusted, reliable and secure data-driven organisation.

The main purpose of this initiative is to help SM comply with relevant regulatory and legal requirements — particularly those linked to data and document management, access to data and documents (including open data), data protection, intellectual property and information security — thereby reducing associated risks.

With this an adequate Data Governance SM can make informed decisions in terms of managing available data assets and efficient utilisation of trusted, and secured transmission/dissemination to data users and providers. The data quality and governance framework must thus be:

- **Measurable**: The progress and impact must be measured regularly by the Data Governance Office as defined in the proposed structure.
- **Accountable and responsible**: A culture of collaboration and shared responsibility for data-related matters, from quality through to protection and security, will be nurtured, going beyond compliance to rules and requirements.
- **Transparency-oriented**: To increase trust in its policymaking process, SM enables its external stakeholders, public institutions and other third parties to access and reuse SM data assets, in particular those used for decision and policymaking.
- **Principle-based**: Data quality and governance policies will focus on laying down principles and providing guidance, rather than on specifying detailed processes.
- **Organisation-wide and comprehensive**: Data quality and governance policies will govern the way people interact with data assets, and must be implemented through changes in business processes, IT systems and staff.
- **'Comply-or-explain'**: Unless required by a binding instrument, such as a regulation or internal SM policy, data policies are implemented on a 'comply-or-explain' basis. SM internal departments are expected to implement the principles and requirements introduced by the data policies.

The proposed data governance encompasses end to end SM data management process, down to individual technologies, databases and data models of MauStats as follows:

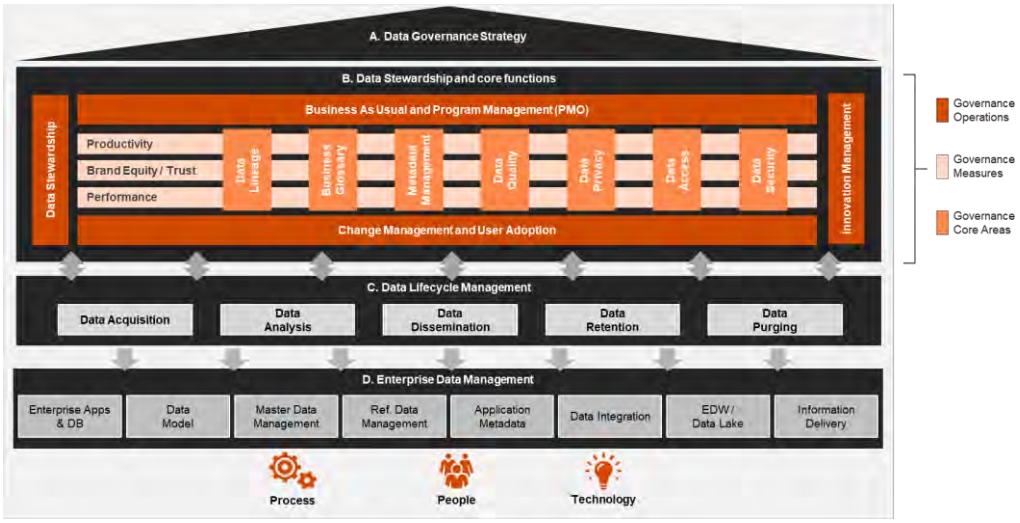


Figure 26: Data Governance Framework

A. Data Governance Strategy

The **Data Governance Strategy** component will detail organisation wide goals that will be achieved when the data governance will be in placed; and the corresponding performance metrics/KPIs to track the progress and milestone achievements.

B. Data Stewardship and Core Functions

Governance core functions cover business glossary set-up, metadata management, data lineage, data quality, data privacy and security and data access and control, among others. SM will need to decide on various key performance indicators (KPIs) across productivity and performance to measure data governance programme.

C. Data Lifecycle Management

It is a policy-based approach to manage the flow of data throughout its lifecycle – from acquisition and initial storage to the time when it becomes obsolete and is archived/deleted. It combines **data processes, business strategies** and **technologies** so that the strategic combination of all three could have the necessary impact on SM. Once a sound data lifecycle management strategy is in place, SM will be able to reap significant benefits including better accountability, higher compliance, efficient organisational governance, better data quality, data protection and greater reporting integrity.

D. Enterprise Data Management

This component will cover all the key areas essential for any organisational data ecosystem. This include approach/procedure for **data architecture management, data models, data integration, metadata management, reference data management and business intelligence/analytics**.

E. Data Governance Enablers

The components of the data governance framework revolve around three key pillars of the governance – **people and culture, process and operating models, and tools and technology**. All three enablers have been aligned with SM future operating model.

Implementation of the Data Governance will include introduction of policies, standards and procedures that will need to be defined and enforced by Data Governance Office

Definition	**Policy**	**Policy establishes accountability and sets standards** that will need to be followed to be compliant with the data related policy, laws and regulations to which SM needs to abide (e.g. Data Privacy, GDPR and other international policies imposed by IMF, UN, World Bank among others.)
	Standard	**Set of definitions** that encourage consistent and desirable behaviours across SM. (E.g. SDMX, GSBPM etc) that provide guidelines for ensuring consistency in the definition, usage and management of data across SM. T he standards serve as minimum documented requirements which must be met by data analyst, data scientist as well as data users.
	Processes and Procedures	The process should be clearly documented in a statement of operating procedure (SoPs) document at the time of implementation with clear definition of inputs and outputs, roles, responsibilities, controls, reporting metrics and templates.

Table 16: Data Governance Enablers

Section 7 elaborates on policies to be implemented/adhered to.

Finally, to make it happen, commitment from SM and buy-in of External Stakeholders is required in terms of:

- Compliance to statutory obligations governing the collection of data, confidentiality, data sharing, data linking and release.
- Endorsement of relevant international standards and guidelines.
- Transparency in purpose of data collection and information regarding data storage and usage.
- Regular data quality checks to track, monitor and identify exceptions.
- Ongoing communication to Stakeholders on changes in policies and application of disclosure controls especially before publishing statistics related to microdata.

Implementation Approach

For SM to implement a data governance framework, key steps to follow are:

1. **Review and finalise Data Governance Structure** (Data Governance Office - DGO) required to implement the Data Governance Framework.
2. **Recruit/Upskills resources as detailed in Project 2.1 above.**
3. **Define the data governance strategy and goals to be achieved with the implementation of the Data Governance Framework.** This strategy will be drafted by Deputy Director of Data Governance Office together with SM Director and Deputy Directors from Statistical Services. Outcome of the first exercise will be a data governance charter which will include:
   - **Governance vision**, that is, mission statement and explanation of the overall goals of the data governance. The vision will be aligned with the different layers of the core functions of the data governance, i.e. Data Quality, Data Security, Data Access and Control among others.
   - **Data Governance Office (DGO) structure** with key roles and responsibilities for each data support team member – Data Architect, Data Quality Officer, Data Scientist, Big Data Expert and Data Security Officer.
4. **Identify data policies and standards** needed to drive achievement of data governance strategy and also support the Data Governance Structure to deliver on key roles and responsibilities that will be assigned.
5. **Develop agreed data policies and standards.**
6. **Assign roles and responsibilities** to each role of the DGO structure based on data governance charter and developed polices and standards.
7. **Adopt/implement data governance framework,** including ongoing monitoring and audit to uphold compliance to data policies and standards. Where required, define and implement necessary measures to maintain data quality and security among others. Mitigation actions may require enhancement to MauStats or upskilling staff.

Once the framework is established, the DGO will work closely with Statistical Services and other SM stakeholders (as required), to implement data governance and data policies. Ongoing monitoring and evaluation will be performed to identify gaps and make sure there is continuous improvement of the Data Governance Framework.

Strategic Initiative No.4 – Integrate with future e-Government Technologies

MauStats has been designed using open data standards, web enabled and APIs driven technologies. These features shall allow SM to implement any future government initiatives as data can be seamless integrated with MauStats Data repository. Example is the National Spatial Data Infrastructure, in pipeline for implementation by Ministry of Housing and Land.

This initiative will provide significant value by facilitating **access to spatial data** beyond the boundaries between public and private entities. This implies that **GIS data** available across data providers will be brought under **a single blockchain technology platform**, hence leading to a trusted a secure data source on land related information. Key stakeholders include Ministry of Housing and Land, Registrar General's Department, Valuation Department, Notaries and Surveyors.

Leveraging on **NSDI** will streamline numerous activities carried out by SM Cartography Unit such as the production of maps for censuses and surveys, delineation of enumeration areas amongst others. Cartography unit will also have access to update the maps and boundaries for census as well as data collected during census/survey execution. Data captured in NSDI can also be retrieved in MauStats for geographic and spatial data analysis.

Strategic Initiative No.5 – Complement MauStats with Big Data and Artificial Intelligence

This initiative will allow SM to complement MauStats with Big Data and AI to tap into alternative data sources and mainstreaming data science techniques such as machine learning or text mining. MauStats has been designed to accommodate big data with high volume and frequency in the future such as special, sensors, social media, images, videos among others. This initiative will enable SM to scale up with new correlations and predictors that enable deeper analysis or improved simulation of policy effects and forecasts. Smart tools such as modern artificial intelligence and machine learning tools enable execution of business processes with automatic and self-learning algorithms, which allow doing data checks, include assumptions example on no response or even introducing virtual customer service agents (chat bots), which can independently answer simple and more frequent questions on finding data of statistical activities. These bots can even do the analysis and reporting based on user instructions.

A. Big Data

Significant technological changes that occurred in the information technology industry since the beginning of the 21st century, such as cloud computing, the Internet, and social networking has made the amount of data increase exponentially and highly scalable. Data scientists refers to this behaviour as the concept of Big Data.

Big Data[8] can be viewed as massive datasets which cannot be recognized, obtained, managed, analysed, and processed by current tools such as relational database management systems or traditional data processing applications. To gain value from this data, we must choose an alternative way to process it (Trnka, 2014:143).

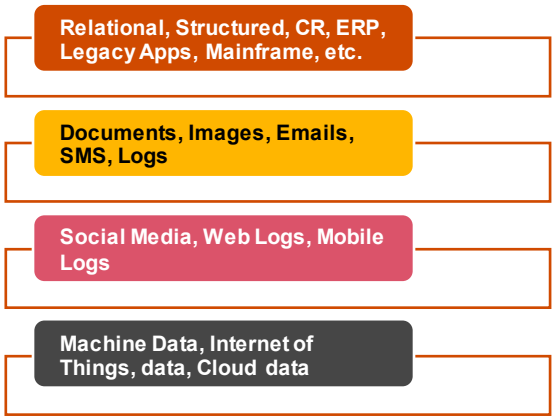
Big Data are largely referred to the compound of the 3V's i.e. volume, velocity, variety. These relate to:

- **Volume** - the amount of data generated.
- **Velocity** - the speed at which data is generated and it moves around.
- **Variety** - the different forms of data i.e. structured, semi-structured and unstructured data.

Big Data are generated from the following sources, but not limited to:

- **Administration** from Government or private sector such as electronic medical records, hospital visits, tax payer records, etc..
- **Commercial or transactional** such as credit card transactions and online transactions via mobile devices
- **Sensor networks**, such as satellite imaging, road sensors and climate sensors;
- **Tracking device**, such as tracking data from mobile telephones and Global Positioning System (GPS);
- **Behavioural data,** such as online searches (about a product, a service or any other type of information) and online page views; and
- **Opinion data**, such as comments, perception on social media.

Big Data can be retrieved from various sources as follows:



Sample Technologies:

- Hadoop
- CouchDB
- Cassandra
- MongoDB
- Teradata Aster
- Green plum HD
- Others

Figure 27: Big Data sources

[8] Trnka, A. (2014) Big data analysis. European Journal of Science and Theology, 10(1), pp.143-148 [Online]. Available from: http://www.ejst.tuiasi.ro/Files/48/15_Trnka.pdf [Accessed 17 March 2021].

Going forward, we see **Big Data** as being **the underlying foundation of SM future operating model** where the **Big Data platform based on Data Lake – repository for large quantities and varieties of data**, structured, semi-structured and unstructured shall ingest inputs from the following data sources among others:

- IoT
- Sensors
- Social Media
- Ministries and Governmental Bodies

SM to leverage on data originating from new sources and other technologies to **apply new analytics, statistical, data visualisations and computational modelling techniques**.

Artificial Intelligence (AI)

The modern world has been shaped by technological revolutions in views like Industrial Revolution and the Information Revolution. The former redefined the way the world values both human and material resources; the latter redefined value in terms of resources while democratizing information. Today, as technology progresses even further, value is certain to shift again, with a focus on sentiments more intrinsic to the human experience: thinking, creativity, and problem-solving.

The ability to make intelligent decisions that drive growth, disrupt the market and capitalise on emerging opportunities is now linked less to gut feeling and more **to a predictive and prescriptive analytics, artificial intelligence and data-driven insights.** AI, defines technologies emerging today that can understand, learn, and then act based on that information. Forms of AI in use today include digital assistants, chatbots, and machine learning. **Statistical environments to evolve towards AI-enabled statistics** (and, perhaps, blockchain-enabled) by automating lower-level tasks in the statistical cycle, and assisting the statistical operators especially in quality assurance tasks and perform predictive analysis. **AI-enabled statistics** proves to be a critical factor for statistical organisations to achieve the productivity gains needed for them to invest in becoming data science organisations.

Implementation Approach

P4.1 Assess readiness for Big Data Analysis and Reporting
It is recommended that SM assess the readiness for Big Data Analysis and AI Reporting once MauStats has been implemented and is fully stabilised.

Proposed approach is as follows:
Stage 1: Identify use cases and opportunities for Big Data Analytics. Use case should include the type of analysis required, envisaged data sources, output layouts among others.

Stage 2: Data Scientist (SM Staff) and Big Data Expert will assess the gaps (if any) and identify potential risks/challenges while handling big data in terms of new data sources, volumes, frequency among others.

Stage 3: Draft business case and submit to Data Governance Office for approval.

Stage 4: Once approved, prepare Big Data Design Blueprint.

Stage 5: Build application logics, business rules and configure MauStats to connect SM Data Lake to new Big Data sources.

Stage 6: Testing, Pilot Run and Go Live.

Note: SM staffs to undergo training and capacity building programmes to eliminate maximum dependency on Solution Implementer and are able configure new data sources, redesign application and business logics in MauStats.

Strategic Initiative No.6 – Enhance Regional and International Collaboration

This initiative will help SM to position on the regional and international benchmarks and enhance collaboration by providing high quality, inclusive and efficient economic and social statistics that are **internationally recognised**, on a timely basis.

Current Initiatives undertaken by SM

1. United Nations Sustainable Development Goals (SDG)

The SDG is a global action plan aimed at ending poverty, protecting our planet and ensuring that all people enjoy peace and prosperity. 17 Goals with 169 targets have been set to be met by 2030 with 232 indicators to monitor and evaluate progress. The indicators set by the UNDP are fit to the local context so as to facilitate data gathering and publication.

Value add with MauStats

- Accurate, complete and timely reporting on set SDGs indicators.
- Shift from tabular display to graphical visualisation.
- Publish dynamics data sets on Website/MauStats portal.
- Share Data using a secured connection such as SDMX protocols.

Statistics Mauritius (SM)[9] publishes data on SDG since 2015 when Mauritius joined the 2030 Agenda for sustainable development. SDG data is published yearly as an excel sheet with the 2019 set of data published in late 2020. The data comes from different sources including, Statistics Mauritius surveys and census, Ministry of Finance, Economic Planning and Development, Ministry of Social Integration, Social Security and National Solidarity among others.

Figure 28: SDGs

[9] Statistics Mauritius Website: https://statsmauritius.govmu.org/Pages/Statistics/By_Subject/SDGs/SB_SDG.aspx
Statistics Mauritius SDG Database: https://statsmauritius.govmu.org/Documents/Statistics/By_Subject/SDGs/UN_SDG_database.xls
Statistics Mauritius MDG Database: https://statsmauritius.govmu.org/Documents/Statistics/By_Subject/SDGs/2018/UN_MDG_database(1990%20-%202015).xls

Other publications relating to United Nations.

- SM publishes data on Millennium Development Goals (MDG) from 1990 to 2015.
- The goal of the MDG was to reduce extreme poverty in its many dimensions -income poverty, hunger, disease, lack of adequate shelter, and exclusion- while promoting gender equality, education, and environmental sustainability by the target date of 2015.

2. International Monetary Fund's Dissemination Standards Bulletin Board (DSBB)

The DSSB[10] is an initiative to promote transparency and good governance practices by establishing standards and codes. It includes measures taken by the IMF to improve statistical practices of countries by providing key economic and financial data and practical steps to be followed.

Statistics Mauritius graduated from IMF's Special Data Dissemination Standard (SDDS) in 2012 and is now working towards becoming fully compliant with SDDS plus. SM publishes data as per advanced release calendar on DSBB with the last update on March 10 2021. Data is manually captured on the IMF portal and includes data sets such as national data (GDP, Labour market data, financial sector data) among others.

Value add with MauStats

- Display advanced release calendar and progress on the Website.
- Accurate, complete and timely reporting as per SDDS standards.
- Shift from tabular display to graphical visualisation.
- Publish dynamics data sets on Website/MauStats portal.
- Share Data using a secured connection such as SDMX protocols eliminating manual data capture.

Future Regional and International collaborations

It is recommended that SM collaborates actively with international players and National Statistics Office to have a footprint on a regional and international scale. This includes:

- Develop **strategic alliances/partnerships** to enhance data exchange.
- Actively engage and **communicate with international players** to keep up to date with global trends and sharing of information using **open data standards** (transparency, accessibility and responsiveness) to build trust and develop sustainable initiatives.
- **Up to date, reliable and accurate data exchanged** on a timely basis.
- **Develop a centre of excellence** – Share experiences, provide training, technical inputs and assistance to other national statistics offices across Africa. SM may also envisage to train and upskill staffs across Government of Mauritius and public sector institutions.
- **Benchmark achievements** on a regional and international scale to continuously innovate and enhance service delivery.
- **Organise and participate** in Statistical Community Forums to share experience and best practices example UNSD, UNECE, OECD conferences among others.
- Conduct recurring **national level workshops** with stakeholders such as government, Private Sector amongst others to promote data culture mindset.
- **Promote secondment of staffs** to established and developed statistical offices for training and capacity building.

[10] IMF website: https://dsbb.imf.org/

Future Consideration - Business Model

MauStats encompass several options and channels through which SM can build robust value-added services to citizens and business that apart from augmenting productivity of the economy can also generate revenue. This section highlights selective options for SM consideration.

A. Monetisation of MauStats
Data collected by SM have rich use and impact in several businesses such as financial, real estate, management companies, tourism, data helps in decision making and policy management. Approved dataset will be available on MauStats portal for registered users to make their own analysis. There is a healthy revenue potential by imposing subscription charges for accessing MauStats Portal.

B. Developing a Centre of Excellence
SM may also consider **developing a centre of excellence** for providing training and developing analytical skills across government institutions or private establishments. SM may also organise conferences or workshops to share survey results among others. These events can also be considered as a revenue workstream in the future.

C. Data Analytics as a Service
SM may also consider to provide data analytical services as a revenue potential. SM can collect data, analyse and prepare non-statistical reports.

To-Be Mode of Operations and Processes

5

5. Deep Dive into Mode of Operations and Processes

This section details the to-be processes across Statistics Mauritius (SM). SM existing processes have been redefined based on the Generic Statistical Business Process Model (GSBPM)[11] developed jointly by UNECE/Eurostat/OECD Group; as well as global practices as identified in the benchmarking exercise conducted with Poland, UK, Australia, Estonia and Rwanda.

> The Generic Statistical Business Process Model (GSBPM) describes and defines the set of business processes needed to produce official statistics. It provides a standard framework and harmonised terminology to help statistical organisations to modernise their statistical production processes, as well as to share methods and components
>
> ~ Source: GSBPM, UNECE

The GSBPM is intended to apply to activities undertaken by producers of official statistics, at both the national and international levels, which result in data outputs. This version of the GSBPM is aligned with version 1.2 of the Generic Statistical Information Model (GSIM) and version 1.2 of the Generic Activity Model for Statistical Organisations (GAMSO). The aim of the GSBPM is to provide a basis for statistical organisations to agree on standard terminology for discussions on developing statistical metadata systems and processes. Key use cases which have been considered to redesign SM processes are as follows:

- **Standardisation of the processes** across various units by providing a structured approach for data collection, analysis and dissemination.
- **Sharing of statistical data** both internally and with external stakeholders using metadata and integration capabilities of MauStats.
- Provide framework for **process quality assessment and improvement.**
- Develop a business process model repository to store **process modelling outputs.**
- **Measuring performance** by implementing and monitoring quality process indicators.
- **Alignment with statistical and non-statistical data providers** (e.g. administrative data, geospatial data) facilitating communication by using harmonised terminologies and process.

SM processes have been redesigned based on the eight (8) phases of GSBPM as follows:

Figure 29: GSBPM Process Flow

The ensuing section describes how SM to be processes will be executed on MauStats in line with GSBPM framework.

Generic Statistical Business Process Model- GSBPM
Version 5.1, January 2019, United Nations Economic Commission for Europe (UNECE), on behalf of the international statistical community
UNECE Statistics Wikis - Uses of the GSBPM (https://statswiki.unece.org/display/GSBPM/Uses+of+GSBPM)
SDMX community (http://sdmx.org/index.php?page_id=38)

To Be Processes in line with GSBPM framework:

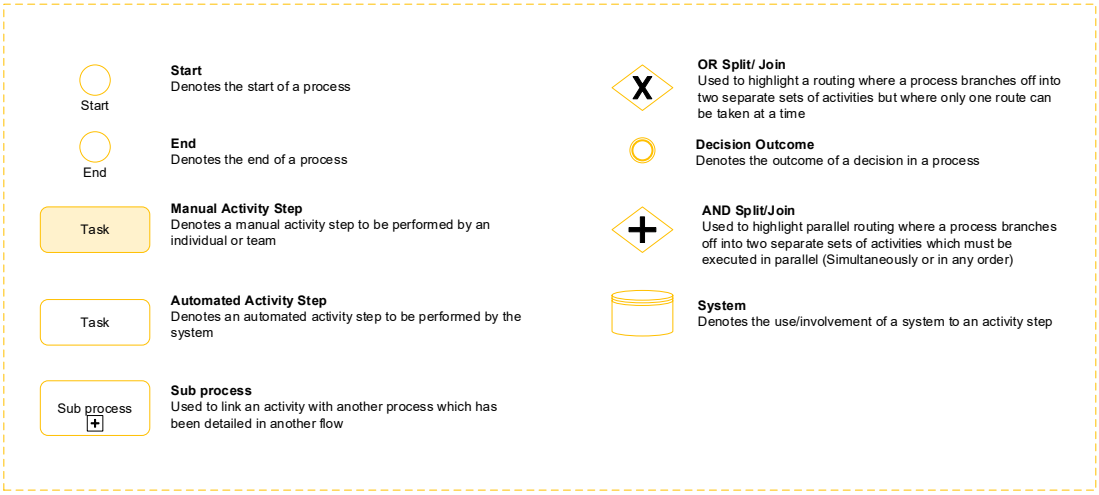
S.No	GSBPM Phase	'To Be' Process Description
1	**Specify Needs**	SM receives information requests from internal and external stakeholders such as ministries, government and public sector institutions. The following are examples of Needs specifications: • New statistics/information requirements to be developed. • Specific analytics and reporting based on budget exercise, environmental change or pandemic situations like COVID_19. Requests will henceforth be submitted on MauStats Portal by both Internal staffs and external stakeholders. Request is directed to business process owners for qualifying the requirement and approve/ reject the request.
2	**Design**	This process is triggered from above process, i.e. Specify Need, which include the following events: • New or update existing data sets; • New or update existing analytics/indicators, variables or business logic; • New or update on design outputs or report layout; and • New or update frames, sampling for surveys and census. Prior to make any change on the system, a design document must be submitted and approved by SM.
3	**Build**	This process refers to implementation of changes as per design document. Tasks such as development, customisation, configuration are done on test environment. Multiple test iterations are conducted prior to deployment on live production environment. Training and user guides are provided.
4	**Collect**	This process involves data collection from sources such as Administrative Sources, Surveys and Census, Big Data/Open Data providers among other. Data collected is validated prior to storing in MauStats. Channels for data collection include Info Highway/APIs, MauStats Portal, Online Surveys, Face-to-Face interviews, External Survey firms such as Computer Assisted Telephonic Interview (CATI) among others.
5	**Process**	Integrate, classify, check, clean, and transform input data, for analysis and dissemination as statistical outputs. With the implementation of MauStats, data is seamlessly integrated in a central repository. Exceptions are flagged to SM users for correction. Users manipulate and transform data as required.
6	**Analyse**	This process focuses on data analytics, preparation of contents, interpretation by statisticians, approval and release of publication. Analytics and BI tool will be used to produce output in the desired format. New requirement such as new data set, changes in existing calculations or amendments on the output must go through the specify needs and design process.
7	**Disseminate**	This process manages release of statistical contents to users. It includes assembling and releasing a static and dynamic contents on identified channels, that is Website, MauStats Portal and Mobile MauStats.
8	**Evaluate**	This process is geared toward enhancing service delivery by capturing queries and feedbacks from data users via any channels.

Table 17: To-Be Processes in line with GSBPM

The GSBPM also recognises several overarching processes that apply throughout statistical business processes. As such, it is suggested that SM complies with the following processes as per GSBPM guidelines which includes:

1. **Quality management** - This process covers quality assessment and control mechanisms. It recognises the importance of evaluation and feedback throughout the statistical business process.
2. **Metadata management** - Metadata are created/reused and processed within each phase, leading to a strong requirement for a metadata management system to make sure the appropriate metadata retain their links with data across business processes.
3. **Data management** - This includes process-independent considerations such as general data security, custodianship and ownership, data quality, archiving rules, preservation, retention and disposal.

Legend for ensuing sections



The ensuing section of the report details the To Be process maps.

5.1 Detailed Process Map

5.1.1. Specify Needs

SM receives information requests from internal and external stakeholders such as ministries, government and public sector institutions.

The following are examples of Needs specifications:

1. New statistics/information requirements to be developed.
2. Specific analytics and reporting based on budget exercise, environmental change or pandemic situations like COVID_19.

This process is triggered by submitting a business case, which thereafter must be assessed and approved/rejected by SM. The below diagram illustrates the to-be process for identifying and approving new data requirements both from internal and external sources.

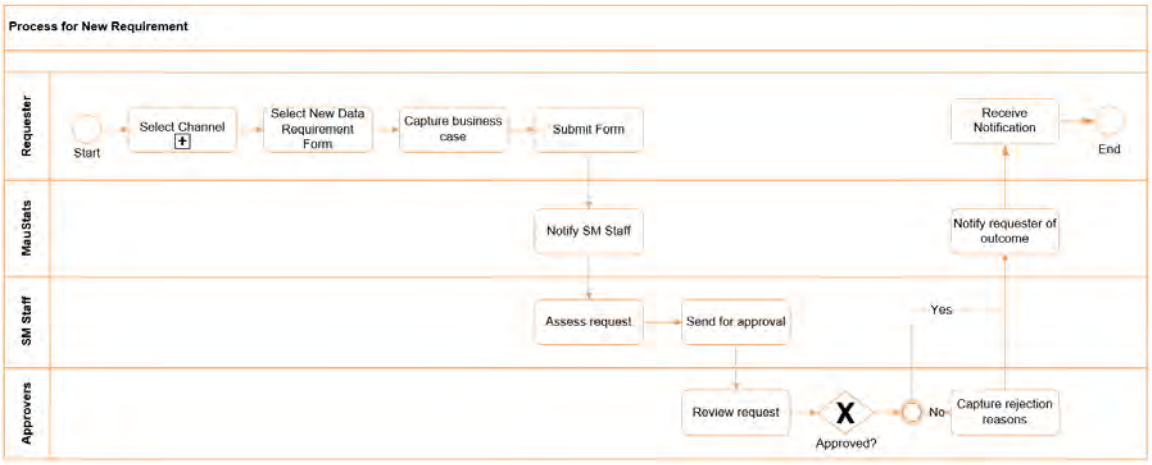


Figure 30: Process for new requirement

Detailed Process

S.No	Process Description
1.	Requester logs in MauStats Portal and selects new requirement form.
2.	Requester fills in new requirement (business case) including information needed, when it is needed and for what purpose, output required and attach supporting document (if any). Once filled, requester submits the form.
3.	MauStats sends a notification to SM staff via email.
4.	SM Staffs access MauStats and assess the business case in terms of: • Data availability; • Restriction on data usage; • Feasibility for new data capture in MauStats; and • Existing agreements with data providers.
5.	SM staffs capture recommendation and submit form for approval.
6.	HoD receives notification for approval/ rejection of the business case.
7.	Requester is notified on the outcome via email.
8.	Note: Above process is applicable for both internal and external request. Internal requests may include new frames for census/surveys.

Prerequisite

o Requester must be **registered in MauStats.**

5.1.2. Design and Build

This process describes design and development activities further to a new requirement. Design process includes define new statistical outputs, concepts, methodologies, collection instruments and operational processes. This process is triggered by event(s) such as, but not limited to:

1. New or update existing data sets;
2. New or update existing analytics/indicators, variables or business logic;
3. New or update design outputs or report layouts; and
4. New or update of frames, sampling for surveys and census.

SM staffs can leverage on existing datamarts, re-use data by creating unique views, update frames and design output as required in MauStats.

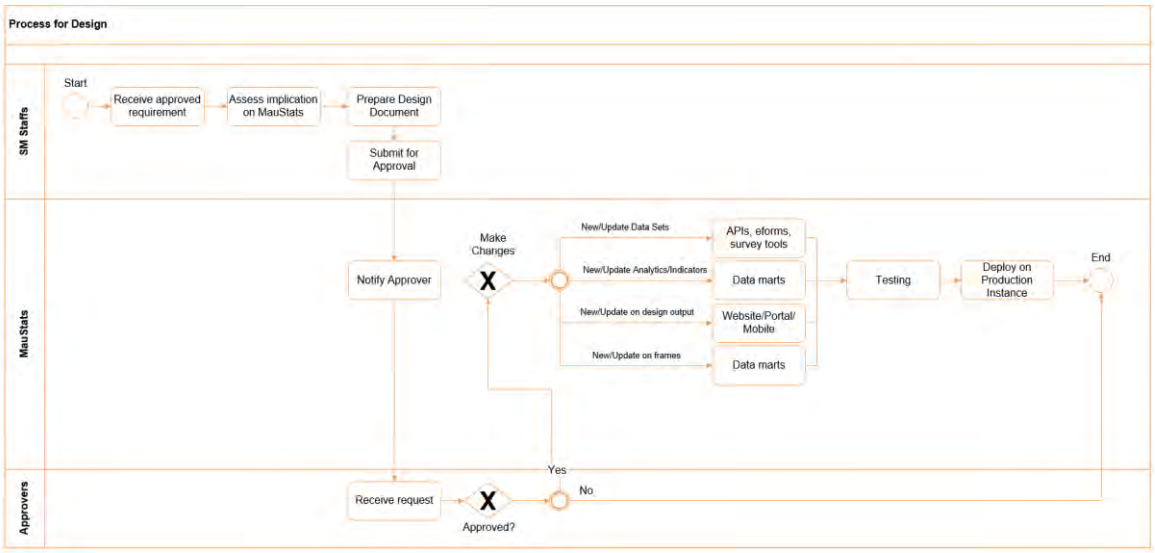


Figure 31: Process for Design

Detailed Process

S.No	Process Description
1.	SM Staff receive approved request – from previous process, that is Specify needs.
2.	SM Staffs assess implications on: • **Process** – whether requirement change business logic and identify which workflows/notifications are impacted; • **Technology** – Any changes on the data, application or presentation layer in MauStats. • **Regulations/ Policies/ Agreement** with external Stakeholders.
3.	For technology related changes, once assessment is complete, a design document is prepared and submitted for approval.
4.	Once approved, SM staffs proceed with making the changes on MauStats as follows: • For new/update on data sets – Changes are made at APIs levels, new APIs must be established or modify existing APIs for data exchange. This also include changes on survey questionnaire or e-Forms. • For new/update analytics/indicators, variables or business logic – Changes are made on data marts or views as required. • New/update on design outputs or report layout – Changes are done on the front end applications such as website, MauStats Portal or Mobile MauStats. • New/update of frames, sampling for surveys and census layout – Changes are done on data marts or views and required. Development is done on the test environment.
5.	Once development is complete, business users/ external stakeholders are requested to test the changes as detailed in the design document.

S.No	Process Description
6.	If successful, objects/components are deployed on the production environment.
7.	This completes the design process in MauStats for incorporating new requirement from internal users and external stakeholders.

5.1.3. Data Collection

Data collection is one of the key process for producing official statistics. This process covers data acquisition from four (4) key data sources namely:

1. Administrative Sources via InfoHighway/API or MauStats Portal/ Mobile
2. Survey/Census using online survey tool, face to face or external firm.
3. Other Sources; and
4. Big Data, among others.

Notifications/reminders will be sent to Data Providers as per SM business rules.

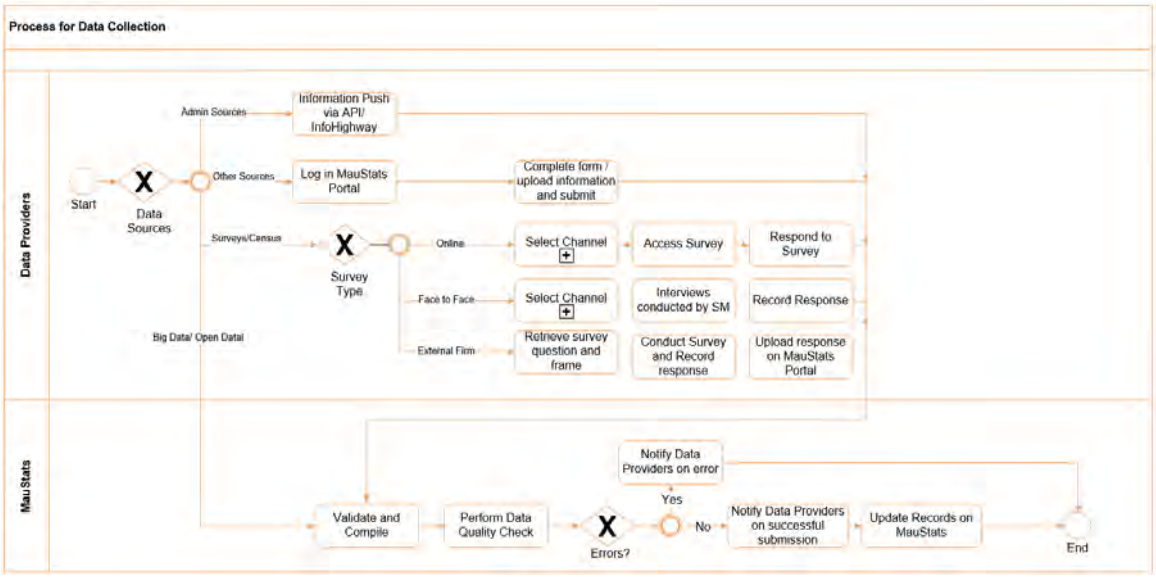


Figure 32: Process for Data Collection

Detailed Process

S.No	Process Description
1.	**Administrative sources:** • MauStats will be integrated with Data Providers systems either directly **using API or via InfoHighway.** • On a predefined schedule, information is pushed to MauStats. • No manual intervention required, except on clarifications/outliers. Authorised Person (AP) from Data Providers manually triggers API to push new data sets to MauStats.
2.	**Other Sources:** MauStats Portal is the front end application for stakeholders to share data with SM. There are two options 1. Submit data by filling e-Forms which is readily accessible on MauStats. 2. Download relevant template from MauStats portal and upload file after filling in the template. This channel is used mostly by establishments or any other stakeholders who do not have direct APIs or connected to InfoHighway. MauStats automatically validates data during the upload or while submission of e-Forms. Errors are flagged on a real time basis to the data provider.

S.No	Process Description
3.	**Surveys and Census:** **Case 1: Online Survey/Census** • Survey/Census respondent are notified by email (survey link and closing date). • Respondents fills in survey/census and submits the form. • Data validation is done on a real time basis. **Case 2: Face to Face interviews** • SM staffs access survey/census link via tablet or mobile devices. • SM staffs record and submit survey response. Information captured is synchronised with MauStats for further analysis and reporting. **Case 3: Outsourced to External Survey Firm (e.g. CATI)** • SM shares questionnaire and frame to external survey firm via MauStats portal. • Survey Firm receives an email notification and access survey questions and frame. • Survey Firm conducts survey and submits results as per predefined template on MauStats portal. • Same process as step 2 above.
4.	In all cases, data collected is validated in MauStats for data quality check in terms of completeness based on embedded business rules.
5.	**In case of errors**, data provider is informed on a real time basis and data cannot be submitted until correction are made. Data providers must make necessary changes and restart the process.
6.	Once data is validated, it is saved in MauStats, ready to be consumed, analysed and disseminated.
7.	Note: • In specific cases, e-Forms and surveys must include past information to pre-populate responses on questionnaire. This will save data capture time where SM can confirm responses or overwrite previous response. Another example is for Consumer Price Index Survey (CPI), results from last survey can be displayed to allow SM staff determine prices change and variance. • Prior to conducting surveys, questionnaire and frames must be checked. In case new data set is required, or there is a change in survey/census, a design request must be submitted internally to address those changes. Refer to Specify Needs and Design process. • Progress of data acquisition will be accessible in real time on dashboard or reports.

Prerequisite

- **Standard survey tool** must be used across SM.
- Survey tool to include **mechanism for approval of survey**, notifications among others.
- **Data Providers must be registered** with SM to access MauStats portal. Each Data Provider must nominate an Authorised Person (AP) internally who will be responsible for data submission and has the ability to address any clarifications/concerns from SM.
- **Memorandum of Understanding (MoU) /Contract agreement** must be established between SM and Data Providers where API is involved.

5.1.4. Data Processing

With the implementation of MauStats, data processing is automated as follows:

1. Integrate data – Data is validated from source using business logic rules and stored in a centralised data repository. For new data sets/indicators, an assessment is done prior to data collection, once approved changes are made on MauStats. Example for Producing National Account statistics, data sets are combined/correlated using data marts or specific user defined views directly linked to the central data repository.

2. Classify and Code – Embedded rules are applied on data collection process. Data providers must use standard codification in order to successfully submit data sets. Exceptions will also be flagged to SM staffs for further action.

3. Review and Validate – In this sub process, SM staffs review exception reports/dashboard flagged by the system and identify potential problems, errors and discrepancies such as outliers, item non-response and miscoding on data collection.

4. Edit and Impute – In case of errors and discrepancies, SM staffs contact data provider. Possible outcomes are as follows:

1) Request Data Providers to resubmit data sets and system flags this as a revision to the initial submission.
2) Make changes/adjustments based on user access rights and approval workflows. This change is flagged and recorded in the audit trail.

5. Derive New Variables and units, calculate weights, aggregates among others – Flexibility by SM to manipulate data, using data marts and analytics & reporting tools. Deriving new variables will not be a challenge in the future as SM can leverage on the central data repository to adding arithmetic logic, formulas, business logic, linkages, weights calculation among others. Data views can be saved for future use, in one click, data is refreshed with new data sets.

The diagram below illustrates the process flow for data processing.

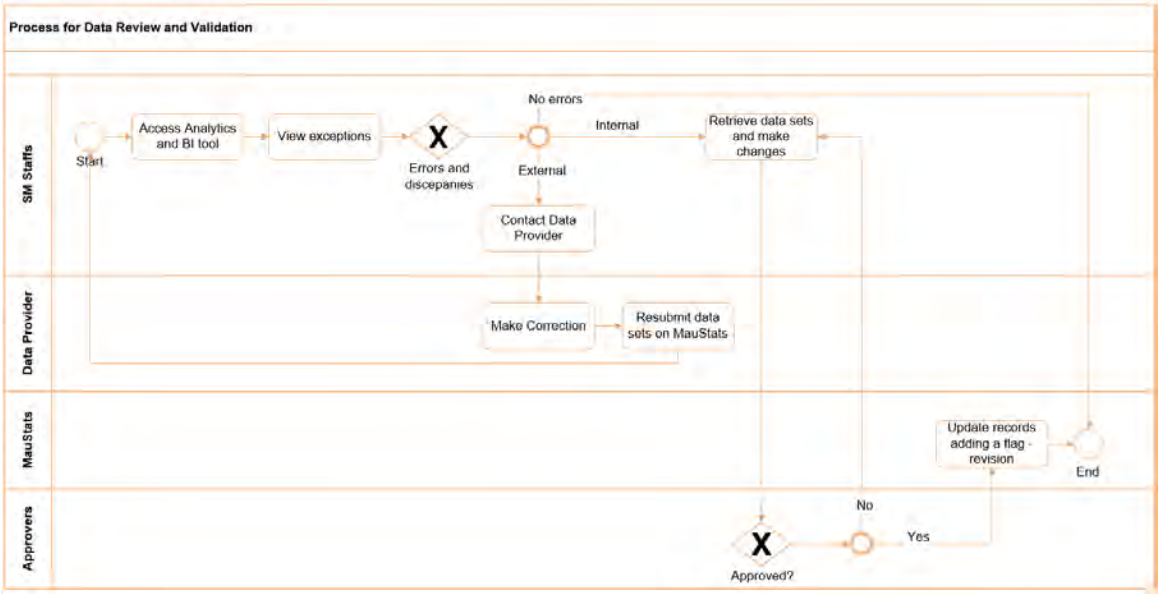


Figure 33: Process for Data Review and Validation

Detailed Process

S.No	Process Description
1.	SM staff access Analytics and BI tool and view exception report/dashboard.
2.	In case of errors, SM staff assess error/discrepancies whether it pertains to an external or internal error.
3.	**External error such as outliers:** SM staffs contact data provider and request for clarification. In some cases, data providers need to resubmit data sets.
4.	**Internal discrepancies:** SM staffs update erroneous data sets. Any amendment on the data requires and approval from Statistician or HoDs.
5.	Once approved, MauStats update the records by flagging it as a revision.
6.	This completes the process for data review, validation and making amendments.
	Note: User roles and permission to be clearly defined

5.1.5. Data Analysis

This process includes preparation of statistical contents and make sure that outputs are "fit for purpose" prior to dissemination to users.

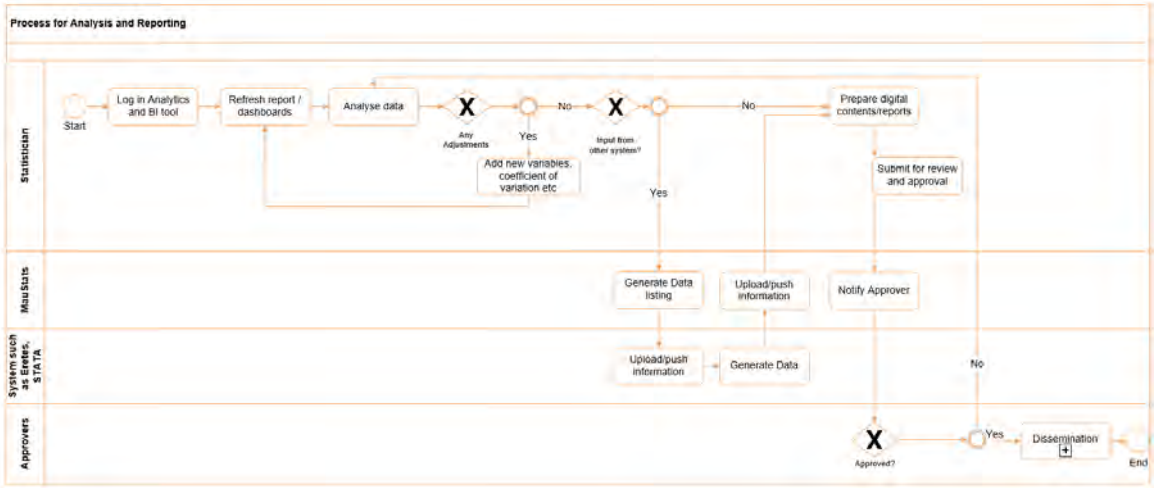


Figure 34: Process for analysis and reporting

Detailed process

S.No	Process Description
1.	Statistician access Analytics and BI tool to view data sets.
2.	Statistician analyse data and assess whether any adjustment is required for example on trend, benchmarks, cycle, irregular components, accessibility measures, etc. and recording of quality characteristics such as coefficients of variation.
3.	In case adjustments or estimations is required, Statistician make changes on Analytics and BI tool to reflect correct and accurate information.
4.	In case information from other system such as STATA or Eretes in needed, Statistician uploads information and generate data output e.g. Supply and Use tables and re-upload same in MauStats.
5.	Statistician interpret data and prepare output content (including commentary, technical notes, etc.) for dissemination. Contents can be in the form of report or digital contents that is published on the website. Output typically includes indicators (price index, value added, etc), charts, maps, tables, and corresponding explanatory texts and quality statements among others.

S.No	Process Description
6.	Once output are finalised, Statistician sends output for approval on MauStats.
7.	In case of changes, output file is sent back to the Statistician to make changes and resubmit contents.
8.	Once approved, content is ready for dissemination. Refer to section 6.4.5 for Dissemination process.
9.	Note: • Multiple approval levels can be defined in the system. • Director SM can digitally sign specific content and share with other parties such as Ministry of Finance and Economic Development. System will automatically send an email to concerned parties. • Interfacing of systems such as Eretes and MauStats will be assessed at implementation stage.

5.1.6. Dissemination

This process relates to dissemination or publication of information to data users. Channels identified are as follows:

1. Website;
2. MauStats Portal; and
3. Mobile MauStats.

Data dissemination is initiated automatically once output file has been approved for release on MauStats. The table below highlights the different types of dissemination.

S.No	Dissemination contents	Channel
1	Information sets such as **indicators, charts, graphs,** interpretations, assumptions and microdata sets, metadata among others.	Website – Interactive Dashboards
2	**Anonymised data** sets for users to do their own analysis	MauStats Portal, Mobile MauStats
3	**e-Report** such as Economic and Social indicators (ESI), Digest, Bulletin.	Website – Pdf format
4	**Internal dissemination –** Data analysed and components created such as indicators among others, are stored in MauStats Data Warehouse and is accessible to other units	MauStats – Data Warehouse

The diagram below details the different steps for information dissemination.

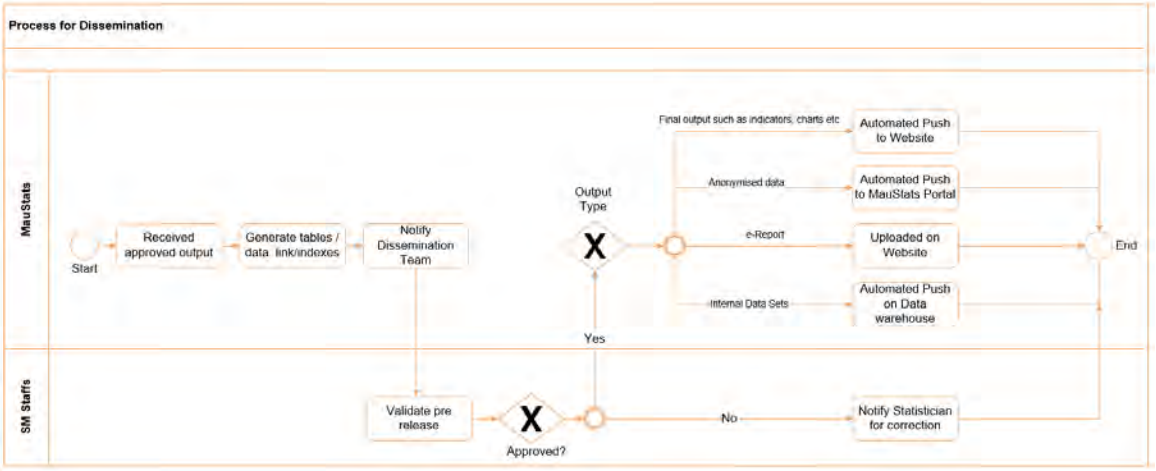


Figure 35: Process for Dissemination

Detailed Process

SN	Process Description
1.	This process is triggered upon approval of output content submitted by Statistician in the previous step.
2.	MauStats notifies SM staffs to validate the pre-release.
3.	In case of errors/discrepancies, Statisticians are notified to make necessary changes and resubmit for approval.
4.	Once validated, MauStats executes corresponding actions based on the dissemination type. Refer to above table.

Prerequisite

- **Templates for each type of dissemination** will need to be designed and configured to enable MauStats to automatically push data to the website, portal or data warehouse.
- **Approval workflow** to be configured for each division and based on dissemination type.

5.1.7. Query handling and Evaluation

This section details the to-be process to handle general queries and feedbacks from data users.

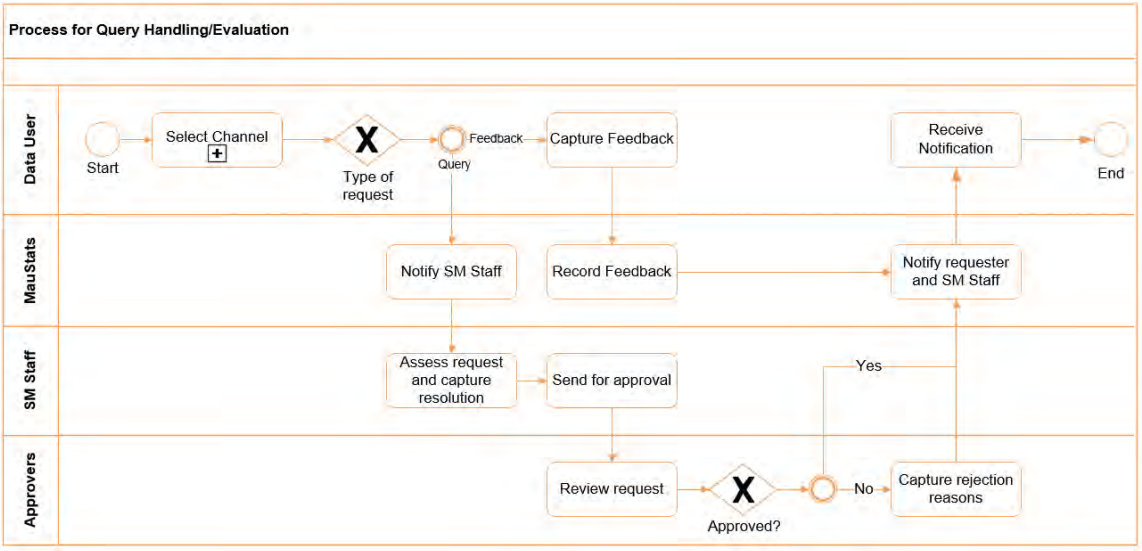


Figure 36: Process for Query Handling

Detailed Process

SN	Process Description
1.	Data users submit queries or feedback on any channels. Based on query categories, MauStats channels request to the respective division for resolution.
2.	Upon receipt of the query, SM staffs analyse query and respond accordingly. Response is approved by HoD.
3.	If no action taken by SM staffs within defined timeframe, request is escalated to HoD for action.
4.	For Feedbacks, Data users can submit feedback on any channels. Feedbacks are recorded on MauStats and concerned unit are notified for action. Example user satisfaction, data quality, among others.
5.	This completes the query handling and evaluation process.

5.2 User Journeys

The diagram below illustrates the key steps for data users to avail data outputs published by SM.

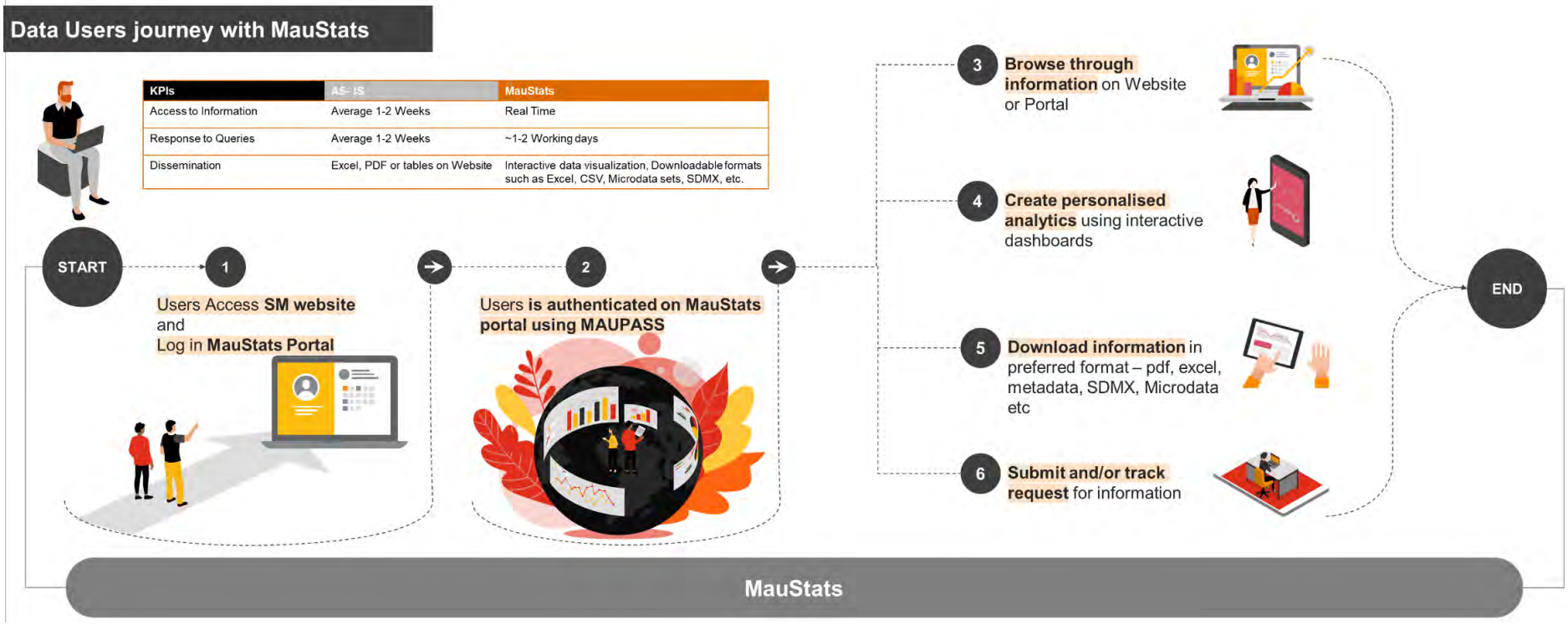


Figure 37: Data Users Journey

Note
Data Users have access to SM services/data sets via Revamped SM Website, MauStats Portal or Mobile MauStats.

The diagram below illustrates the key steps for SM staffs to perform analysis, reporting and preparation of publication for dissemination.

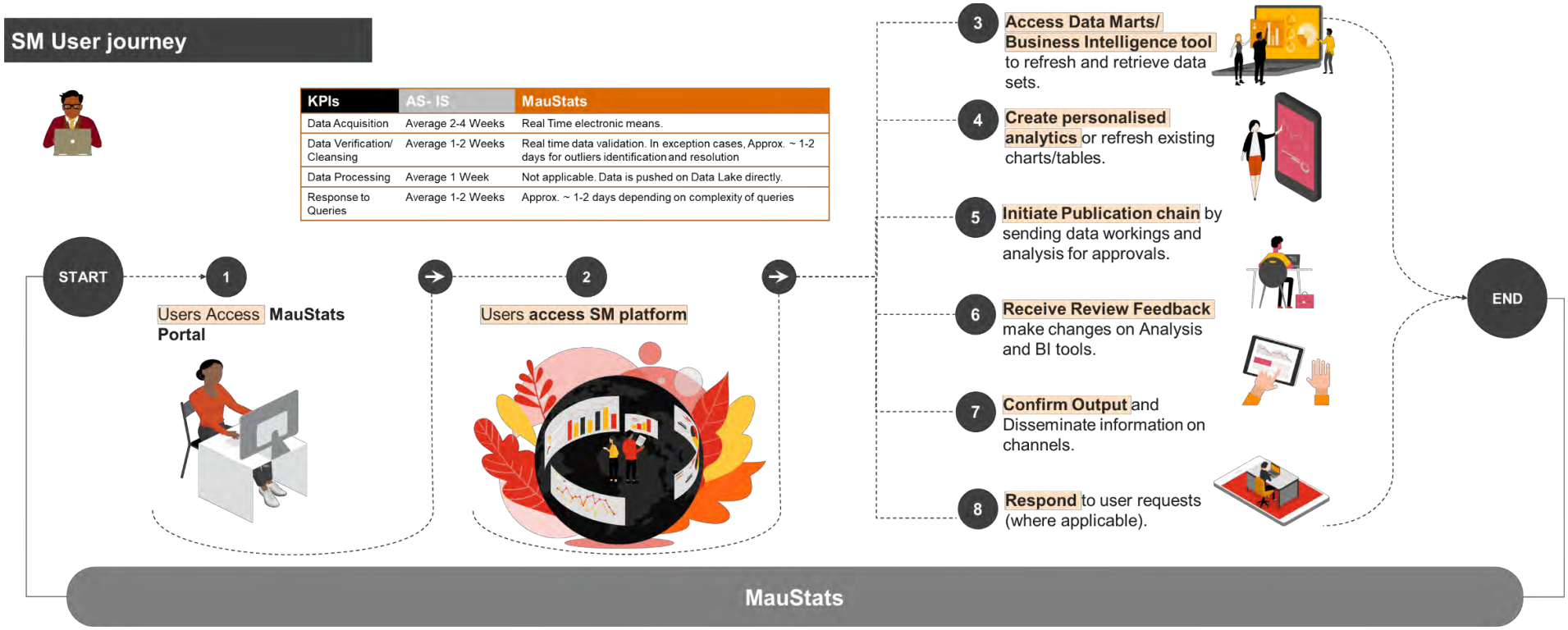


Figure 38: SM User Journey

Note
SM Staffs will have access to new tools such as MauStats Portal, Analytics and Business Intelligence Tools and existing one such as Survey Solution, CSPro, ERETES. Data from existing tools must be pushed into MauStats Data Lake for centralised data.

The diagram below illustrates the key steps for data providers to upload information on MauStats using a template agreed with SM.

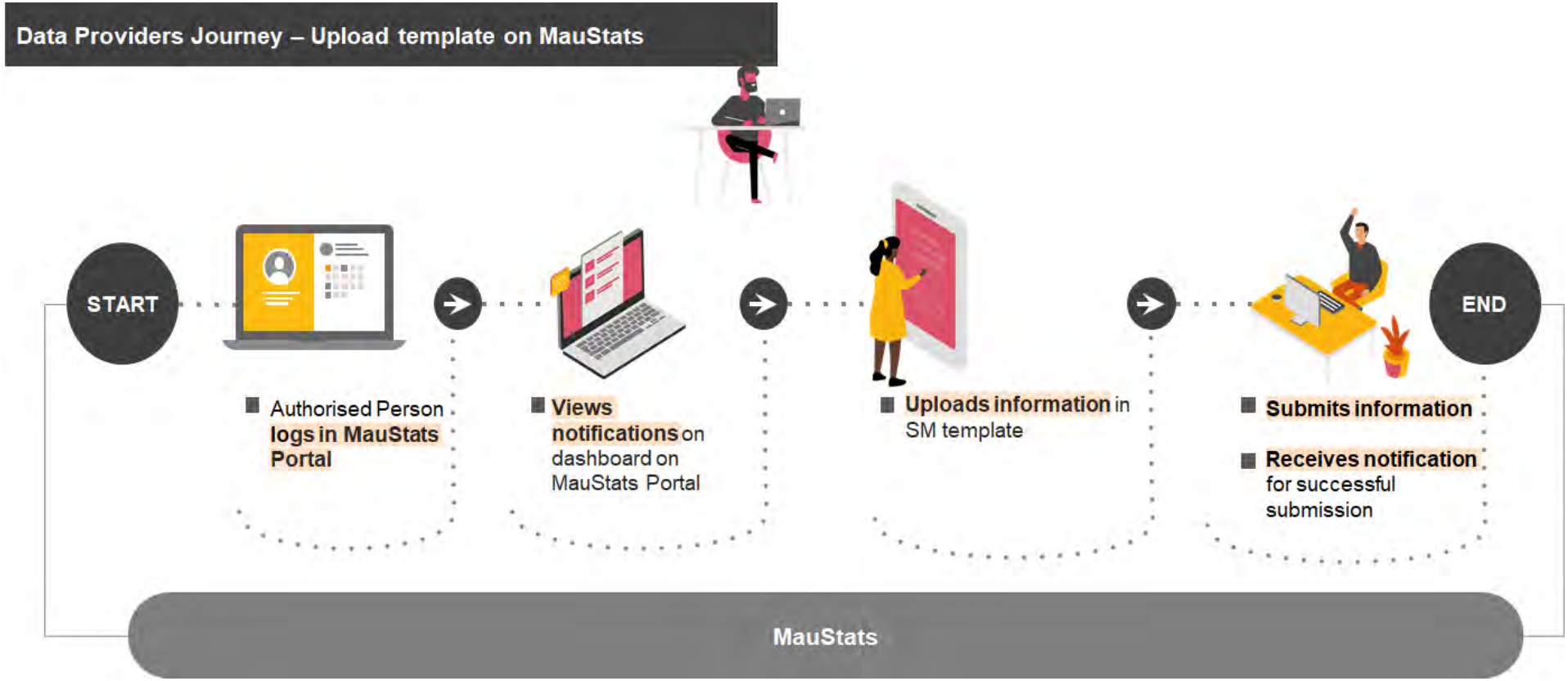


Figure 39: Data Providers Journeys (Template upload)

Note
This path is recommended for data providers who are not subscribed on InfoHighway or do not have an information system. Data Providers must identify an authorised person from their organisation who will have access to MauStats Portal and do the electronic submission.

The diagram below illustrates the key steps for data exchange with providers who do not have web services with MauStats or are not subscribed to InfoHighway to submit information to SM.

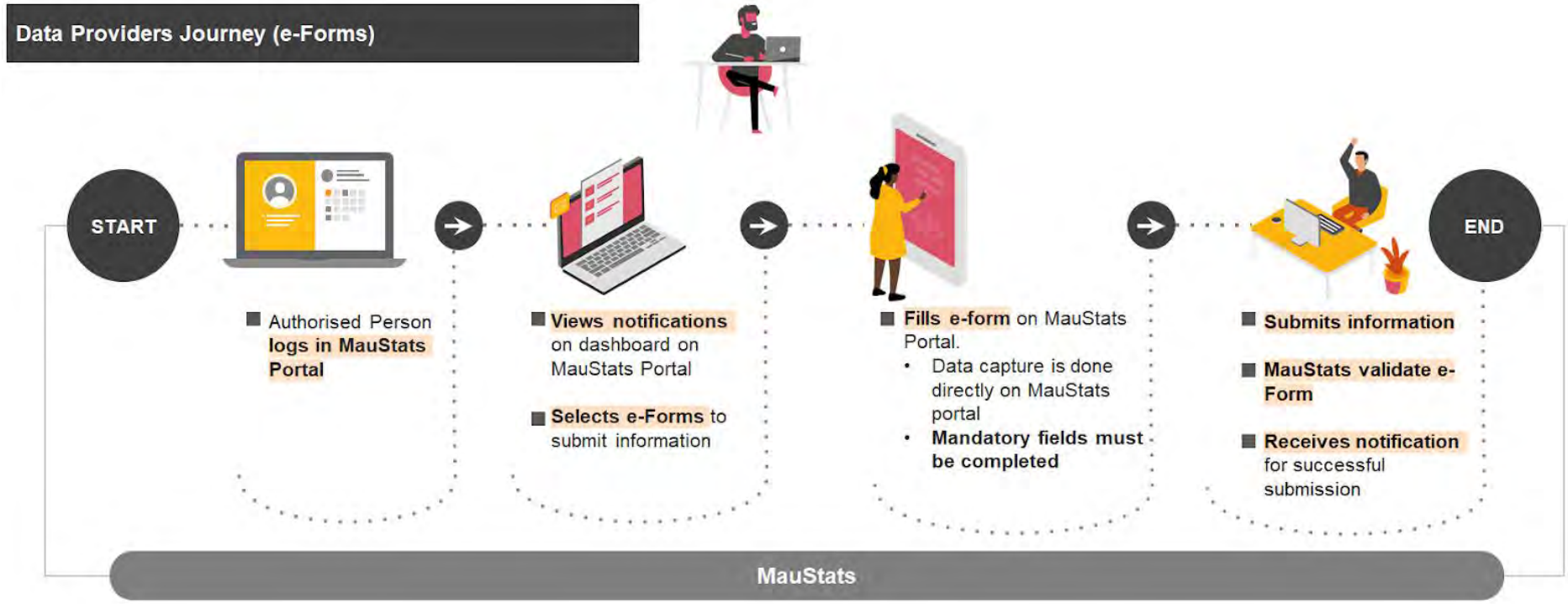


Figure 40: Data Providers Journeys (eForms)

The diagram below illustrates the key steps for data providers to submit information via survey link.

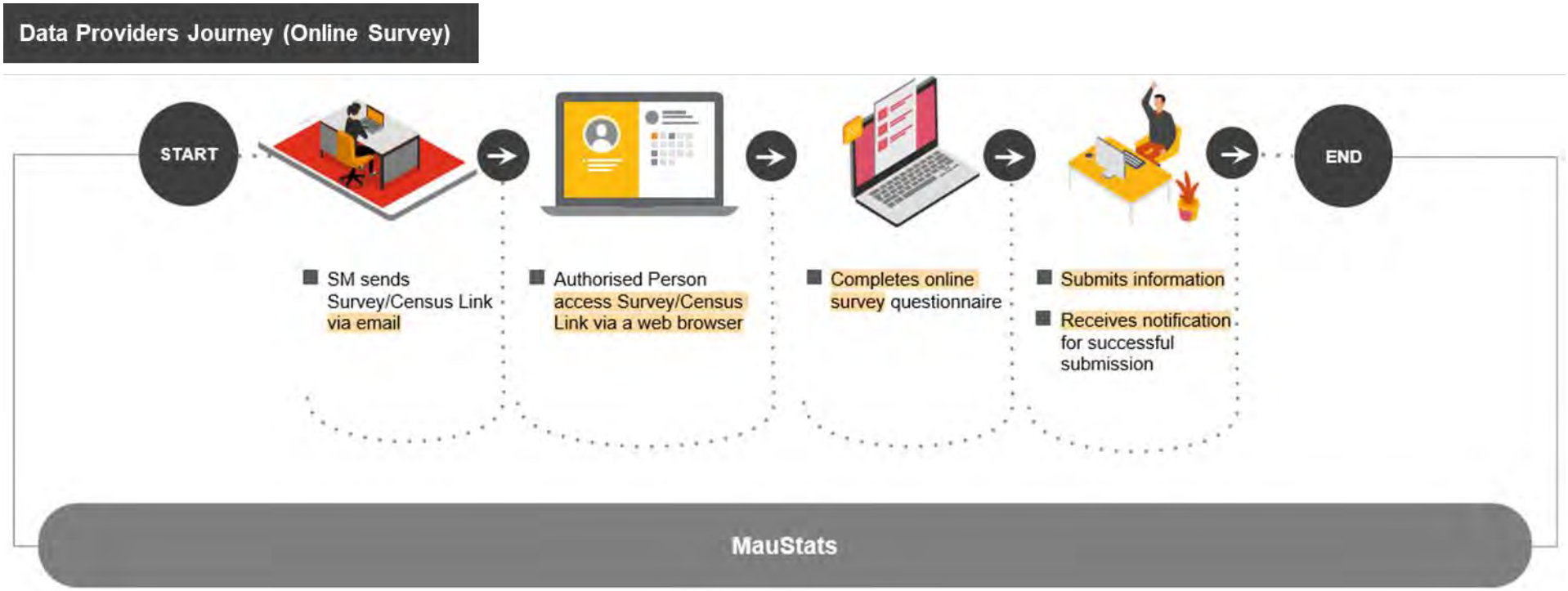


Figure 41: Date Providers Journey (Online Survey)

The diagram below illustrates the key steps for data exchange with providers or reporting agencies such as IMF.

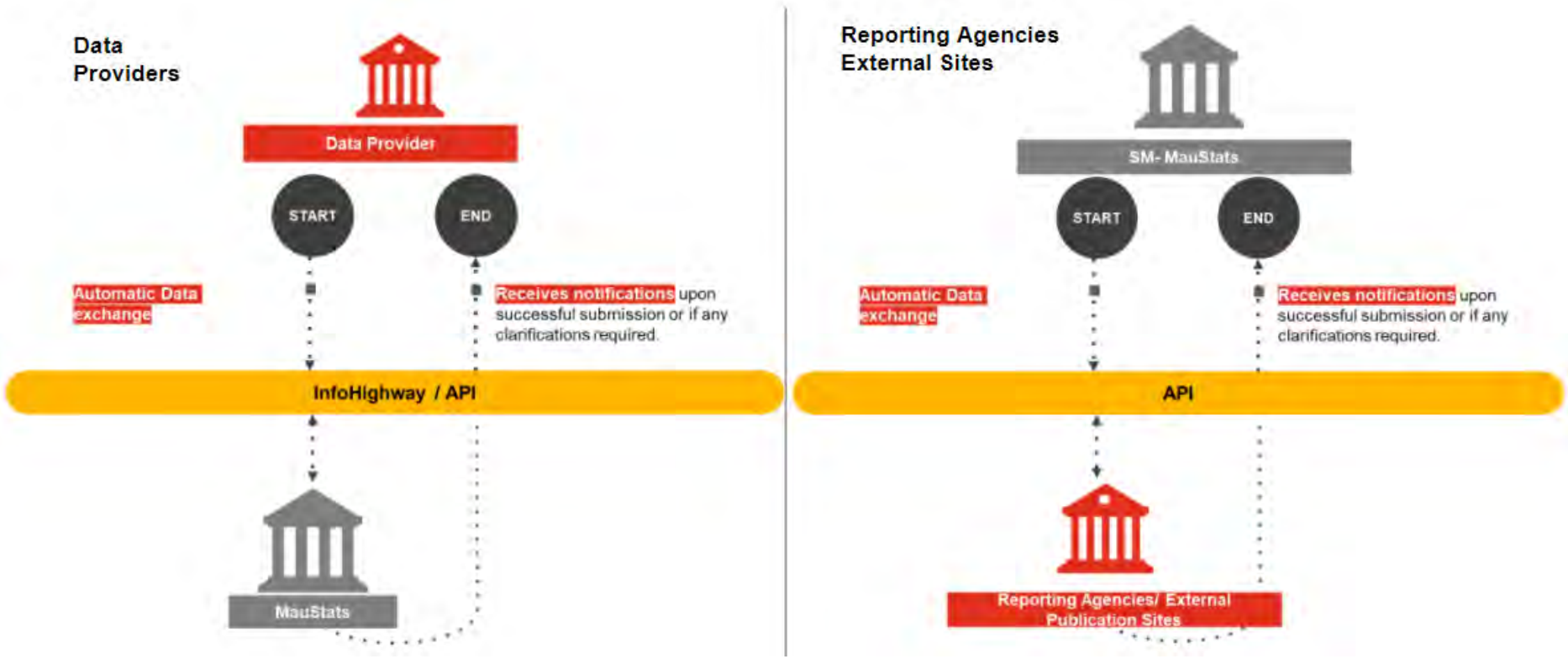
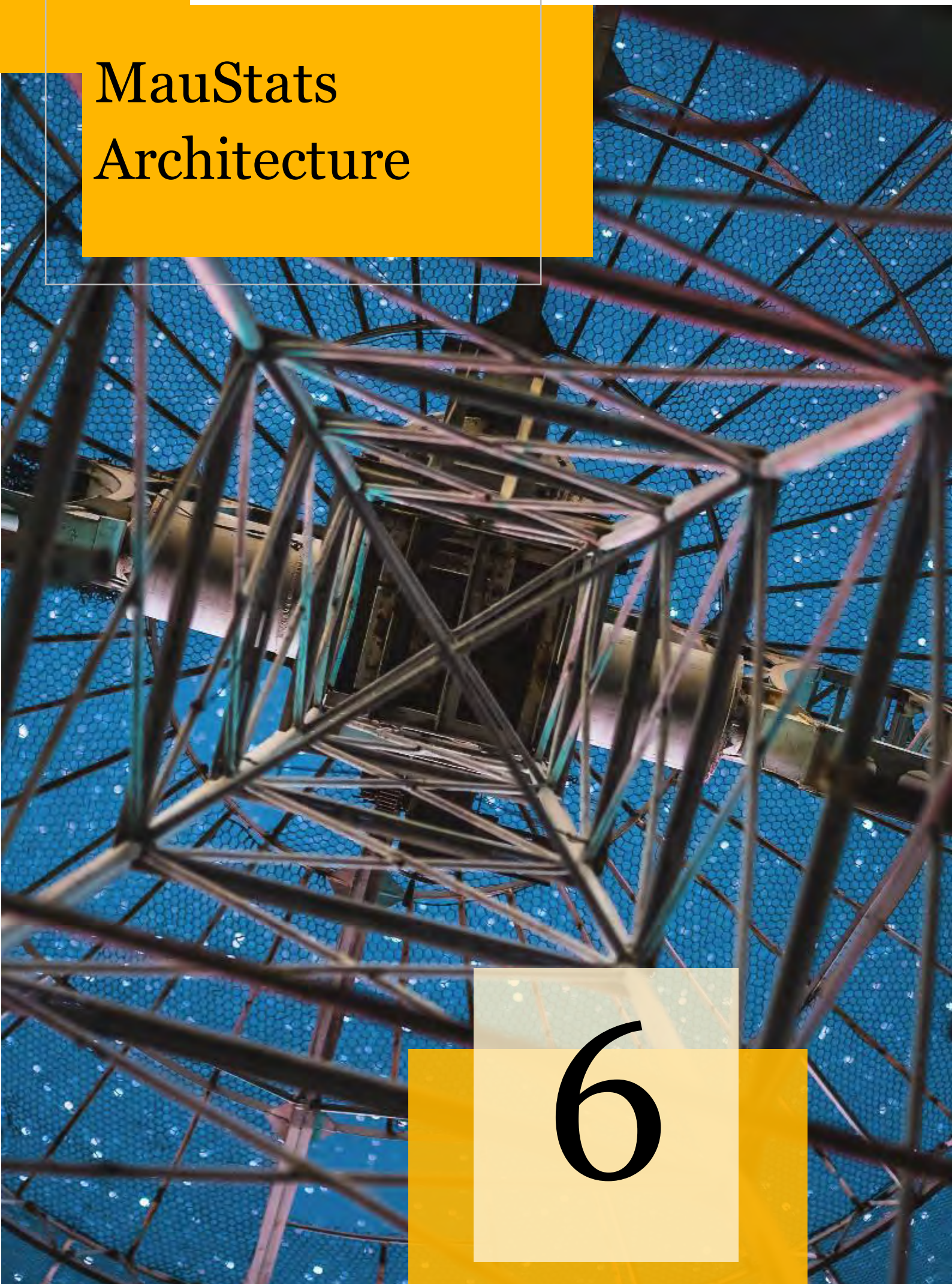


Figure 42: Data Exchange with Providers / Reporting Agencies

Notes

- This path is the recommended path to make sure that data is securely transmitted without compromise in data integrity.
- Does not require manual intervention, it is a system to system communication link for information exchange.
- Frequency and data sets for information exchange will be defined and agreed by both parties.
- Formal Data Exchange Agreement needs to be established to formalise data exchange within secured parameters.

MauStats Architecture



6

6. MauStats Architecture

6.1 Architecture Design Principles

Architecture principles are the corner stones of any IT architecture. Architecture Principles define the fundamental building blocks and methodologies for the construction of systems, methods, and processes. These principles help to structure and organize architectural thinking in a defined and structured manner. Architecture principles are regarded as a specific class of normative and functional principles that direct the design a solution and guide toward successful implementation.

The architecture principles include:

✓ **Availability**

MauStats being a web based platform should have a high availability for continuity of services, platforms, products and end user experience. Users must be able to interact with the system at any time.

✓ **Transparency**

Data owned by SM should be transparent across business units (basis on access rights) and to other stakeholders. Published datasets will be available on the portal in formats such as metadata, microdata, excel and pdf. Also, the integrated data layer will act as a single source of truth.

✓ **Interoperability**

Interoperability is the ability of different information technology systems and software applications to communicate, exchange data, and use the information that has been exchanged. It also supports reusable, loosely coupled modular and self-provision components promoting dynamic integration. It adheres to a service oriented architecture (SOA) to promote service based, loose coupling, interoperable, sharable and reusable architecture and seamless exchange of information across systems.

✓ **Scalability**

The architecture is scalable to cater for new data sources such as big data, increasing transactions, new or update in data requirements, indicators or output designs with minimal coding. MauStats is a modular and tiered/layered based architectural solution, aligned to business processes, that conforms to established open standards with well-defined roles and responsibilities. MauStats caters for future integration with external IT systems such as NAF and emerging technologies.

✓ **Open Standards**

Architecture design adheres to open standards based technology, products, tools, designs, applications, and methods. Open standards promote platform independence, vendor neutrality and ability to use across multiple implementations that will enable sustainable information exchange, interoperability, flexibility, data preservation and greater freedom from technology and vendor lock-in.

✓ **Usability**

MauStats has been designed keeping the user experience at the centre, simple UX to provide a rich user experience, compliant to the local software usability such as language, accessibility, fonts etc and reusability so that major changes are made on backend and minimal on the front end UX.

✓ **Metadata Management**

MauStats has been conceptualized taking into consideration the common metadata framework. Metadata will be readily available and useable in the context of the users' information needs (whether an internal or external user). Data can be automatically exchanged with other parties based on SDMX protocols.

✓ **Data Security**

Data Security is embedded in MauStats architecture from data, business logic, presentation layer. Data is to be protected from unauthorized access, use and disclosure. Open sharing of information must be balanced with the need to restrict the availability of classified, proprietary, and sensitive information. Information security must be managed as per international standards such as ISO 27001 standard, ISO/IEC 27002 code of practice among others for effective and timely management of security risks and implement mitigation controls.

✓ **Flexibility**

MauStats should be flexible to cater to any future requirements of SM. Integration with other applications systems will not be an issue due to its interoperability capabilities.

6.2 MauStats Technical Architecture

The section of the report describes application architecture of MauStats. It comprises of four (4) core components:

A. Supporting Business Logic Layer

The diagram illustrates the above components and interfacing touchpoints with external stakeholders.

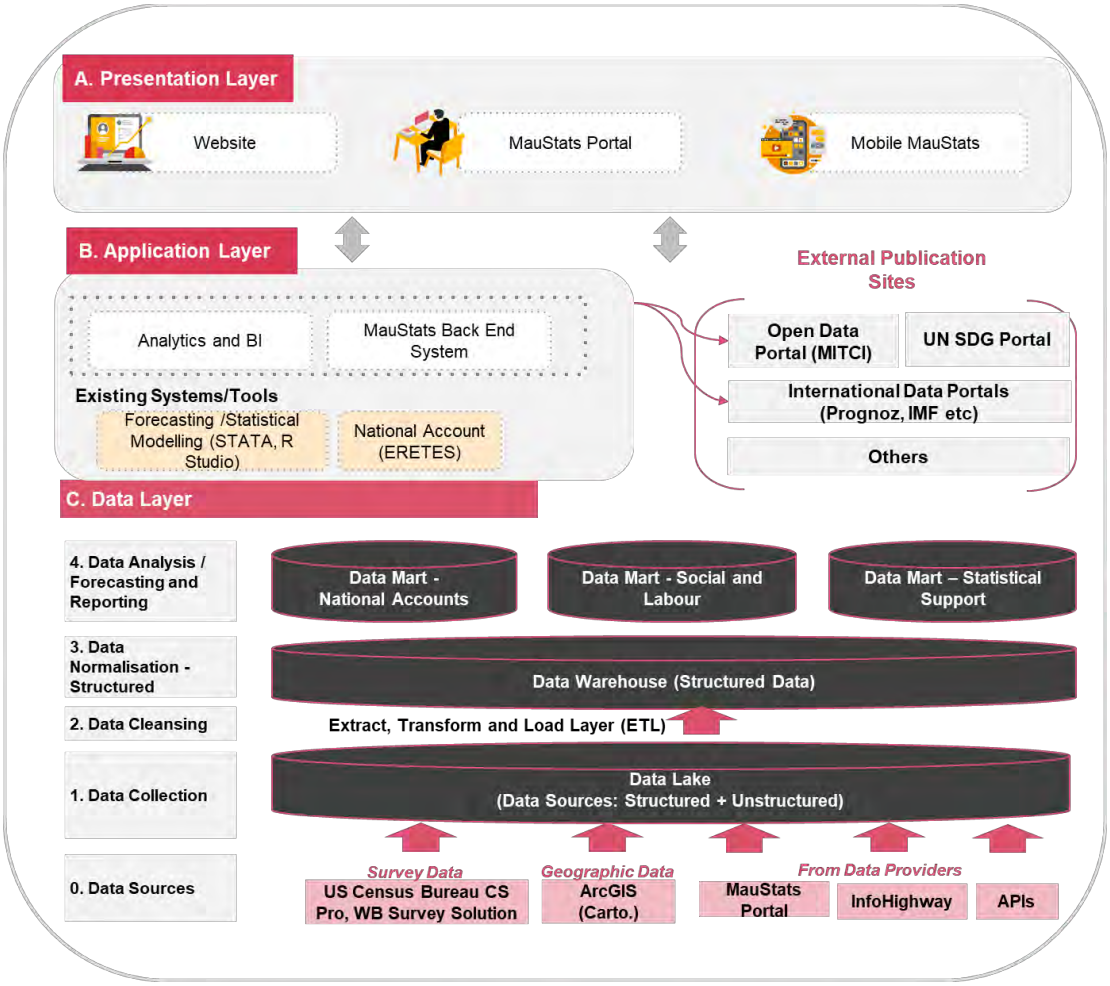


Figure 43: Application Architecture

B. Presentation Layer - One Stop Data Hub

The One Stop Data Hub comprises of three (3) main components (front end application) that stakeholders will use to interact with SM. This includes

1. Statistics Mauritius Website;
2. MauStats Portal; and
3. Mobile MauStats.

B.1. Statistics Mauritius Website

The Statistics Mauritius Website is main channel accessed by the public and used for disseminating official statistics.

- **User Registration:** Users are redirected to MauStats Portal from the SM website to register as a user of the portal.
- **Information Request:** Member of the public uses this feature to log in request or queries. SM staffs will get an automated notification on submission.
- **Publications:** Statistics Mauritius to have dedicated section of the website to publish reports, digests and documents for the members of the public to download. Documents published will be indexed accordingly to facilitate searching on information.
- **Data Visualisation:** Micro contents are posted directly on the website and it includes data such as indicators, charts and/or other visualisations. Website will be interfaced with Analytics and BI tool(s) to retrieve and display embedded contents such as graphical charts, tables among others.
- **Download Output**: Users are able to download information in Excel, CSV or Metadata file as required.
- **Notices:** Updates and notices regarding various matters such as extension given to a specific survey or announcing the start of a Census along with a URL link, wherever applicable can be posted on the website for the general public.
- **About Us:** A section dedicated to the work being done by Statistics Mauritius and a general background on the organisation, data policies and standards.
- **Virtual Assistant (Chatbot):** A virtual guide to assist users to navigate around, search for information, take up queries and redirect users to specific contents.
- **Website Administration:** This feature allows SM to manage the website and perform content management functions i.e. create, read, update and delete and also enable the workflow-driven upload of publications on the website.

B.2. MauStats Portal

MauStats Portal is the front end of the proposed system for Statistics Mauritius. Registered users such as data providers will access this portal to submit the data either using e-Forms or upload of data file as per predefined template.

It also acts as the window through which SM users are able to perform day-to-day activities such attend to requests made by external users, publish microdata sets for users to perform advanced analysis and initiate approval process. Request for new data sets/ indicators or reports are submitted via this portal to SM. **Key features of the MauStats portal are:**

- **Registration:** Users can register to the portal to submit data and access microdata sets and do their own analysis. Users monitor their registration progress and also authenticate themselves to activate their profiles on the portal. SM may consider using NAF for authentication of individuals in the future.
- **e-Forms:** Users registered as data providers have additional feature, that is, the option to submit data as per defined frequency and templates.
- **Request/Queries Handling:** Users can submit request for new data sets or specific statistical analysis or queries. Notification is sent to SM staffs for action and resolution via the portal.

- **Administration Module:** This module allows registered users to manage their accounts, by specifying data of interest, subscription model among others. It also allows SM to manage the user access on MauStats portal. Example imposing restrictions on confidential data sets strictly for government usage.
- **Data Visualisation:** Data Sets are available for users to make their own analysis by adding variables, correlation with available data sets, add business logic and visualise contents such as graphical charts, table among others.
- **Download Output:** Users are able to download information in Excel, CSV or Metadata, SDMX file as required.
- **Data Upload:** Data providers have the option to upload data in predefined formats onto the portal. Data provided is integrated in the Data Lake, ready for processing.
- **eCensus:** SM to consider implementation of eCensus module once MauStats is fully stabilised and administrative data is available from the e-population register. The concept around eCensus is based on citizen consent/confirmation with respect to the data available on the e-population register. Citizens shall authenticate themselves using MauPass and record their confirmation on MauStats portal. The responsibility for the accuracy of the data in registers lies with the government, but also with every individual.
- **Payment Module:** This module will be implemented in the event SM opts to provide Data as a paid Service. This module manages payment from subscribers, that is generate invoice as per defined frequency and receipt upon receipt of payment. Users shall have the option to effect payment using their credit cards. Once paid, users shall be able to access MauStats Portal. In case of non-renewal of subscription, access to portal is disabled. MauStats must be integrate with a payment gateway for seamless processing of payment.
- **Request Handling Module:** This module will manage requests and queries from data users or providers. Requests or queries will be submitted on the website/portal.
- **Workflows and Notification:** The portal is workflow based driven, for example automated notifications are sent to data providers when the due date is reached. Internal approvals are also managed on the portal.
- **Management information system/reporting/Exception handling**: With the implementation of MauStats, SM staffs can design **management and exception reporting** using the Analytics and BI tool. SM will be able to report on its key performance indicators and also identify exceptions such as outliers on data sets automatically.

B.3. Mobile MauStats

Mobile MauStats is an extension to the MauStats portal having the same features (scaled down) to match the layout of mobile device. Key features include:

- **For Data User/Providers -** Personalized Content such as recent analytics, indicators of interest, trends and projection among others example pricing index. It also pushes notifications and alerts to users.
- **For SM users -** Use of Mobile/Tablet to conduct face to face census and surveys. Data collected is synchronised with MauStats. Use Device features, such as the camera, GPS, among others for data capture.

C. Application and Business Logic Layer

This layer consists of a set of specific application systems and business logic tools both new and existing SM tools that are fully integrated with data repository to allow SM perform its day to day activities.

C.1. Analytics and Business Intelligence Tools – (NEW)

Analytics and business intelligence (ABI) platforms are characterized by easy-to-use functionality that supports a full analytic workflow — from data preparation to visual exploration and insight generation — with an emphasis on self-service usage and augmented user assistance. Through the use of ABI, SM will transition from a descriptive analytics approach towards enhanced visualisation, predictive and prescriptive analysis approach anticipating future behaviours or estimate unknown outcomes and prescribe the preferred course of action. Data can be analysed under different lenses using data from the data lake, making correlations and assumptions based on the trends and visualised in a user-friendly and graphical manner.

Statisticians are equipped with this tool to enhance existing reporting and add value using advanced visualisation techniques. Analysis and dashboards prepared by the statistician are published to MauStats website. Standard tools available including Power BI, Cluvio, Tableau and Qlik.

Key features of Analytics and BI tools are:

1. **User-friendly:** Standard tools available with user friendly interfaces. Users with basic IT knowledge and understanding of data structures can work with the tools to analyse data and build the dashboards.
2. **Visualisation:** Data can be brought to life with the help of visuals such as charts, Key Performance Indicator (KPI) cards, gauges and graphs to represent information graphically.
3. **Interactive dashboard:** In a single dashboard, data sets can be linked together to bring out the bigger picture e.g. a user is able to interact with a map and information linked with the selected region.
4. **Integration capabilities:** BI tools can connect multiple data sources and integrate seamlessly with the data warehouse, data marts or external systems/portals as embedded components such as ABI, Google Analytics, OpenStreet Maps among others.
5. **Benchmarks and Forecasting:** Data can be displayed against international benchmarks and forecasting based on historical datasets and trends.
6. **Management Reporting:** Allows management to benchmark performance against set performance metrics. SM will be able to have management dashboards to assess operations efficiency against targets, example of such indicators include turnaround time for implementing a change request or addressing a user query among others. Refer to Section 4.4 Key Performance indicators.

The diagram below illustrates data visualisation built on an Analytics and BI tool using existing data sets from SM website and dummy data to display Sustainable Development Goals, No Poverty. Poverty parameters such as number of people living under the international poverty line, the average income and expenditure of a poor household and access to basic amenities has been taken into consideration.

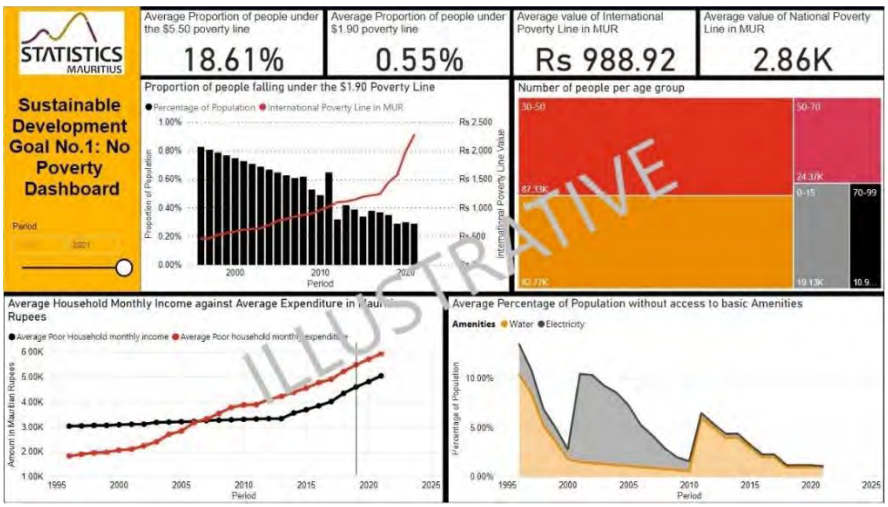


Figure 44: Data Visualisation using Analytics and BI Tool

C.2. Statistical Modelling – (Existing Tool)

The Statistical Modelling tool(s) gives data another perspective by allowing users to apply statistical analysis to datasets. Statistician will use the statistical tools to develop robust models which embodies a set of statistical assumptions to unearth data patterns. Examples of such tools are SPSS, R Studio, EViews and Stata to name a few. **Key features of these tools are:**

1. Data Sampling
2. Cost Analysis
3. Basic Data Visualisation
4. Time Series Analysis
5. Statistical Analysis
6. Text Analytics
7. Predictive Analytics

Example ERETES for National Accounts

NA tools are used to compile National Accounts statistics and relevant indicators to present macroeconomic data about the working and performance of an economy for a given period in a coherent and consistent manner. For the given application architecture, it is suggested that SM continue using the ERETES solution by the National Accounts unit.

Some key features of the National Accounts tool are:

1. Facility to compile the industry accounts and production approach of the GDP
2. Generation of the Supply and Use Table
3. Compilation of Integrated Economic Accounts table
4. Dedicated database to easily maintain the information required for the tool
5. Facility to test the computed results through the tool prior to generating the final tables and results to be used/published by the NA team

Note:

1. Automatic interfacing with MauStats Data Marts will be assessed at the time of implementation together with the solution implementer. It is also recommended that SM users have full-fledged training on ERETES to exploit its full potential.
2. Statistics Mauritius to continue usage of existing tools such as ERETES Stata, R Studio for performing statistical modelling. Automatic interfacing with MauStats Data Lake will be assessed at the time of implementation together with the solution implementer. It is also recommended that SM users have full-fledged training on the existing models to exploit its full potential.

C.3. Online Survey Tool (Existing Tools)

The survey processing tool is a software which will be used to manage surveys throughout their lifecycles. Some example of survey tools are Survey Anyplace, Surveygizmo, Qualtrics, CSPro and QuestionPro.

Key features of Online Survey Tools are:

1. **Survey Design:** Questions are designed on the Survey tool, which can be shared across a team to collaborate on respective sections of the survey questionnaire. Questions and survey logic shall be designed in a user friendly manner (wizard based, drag and drop features) to eliminate dependency on software developer.
2. **Survey Testing:** Surveys are tested by the users e.g. to make sure that survey questionnaire is correct and responses are captured.
3. **Survey Management:** Surveys can be centrally managed via a user interface i.e. modify, update, create, delete, launch or close surveys among others.
4. **Synchronisation with MauStats:** Survey tool will synchronise with MauStats Data Layer to push the survey responses in a centralised repository.

Note: It is recommended that the online survey tool uses past data sets to prefill the questionnaire. Respondents may overwrite or confirm the information. SM to continue usage of CSPro for conducting housing and population census until eCensus module is implemented on MauStats Portal.

C.4. ArcGIS (Existing Tools)

SM to continue usage of this tool especially by Cartography Unit to maintain a digital map of Mauritius and outer territories. Information is obtained from numerous sources such as local authorities and civil bodies to maintain an up-to-date map of the country. Information captured on the ArcGIS is pushed to the Data warehouse allowing users to perform geographical analysis. SM to also leverage on the government initiative NSDI upon implementation and contribute to the cadastre with updated data sets.

D. Data Layer

The Data Layer plays a pivotal role in the proposed architecture, MauStats. The data layer is the central repository throughout the data lifecycle that is collection, processing and analysis and dissemination. Data Layer consists of four (4) components;

1. **Data Lake;**
2. **Data Warehouse;**
3. **Data Mart; and**
4. **ETL (Extract Transform Load) tool.**

Each component plays a specific role throughout the data lifecycle process as described below

1. **Data Lake –** Staging Area where raw data (e.g. structured, semi-structured or unstructured) is stored and acts as the first point of entry to the pool of information maintained by Statistics Mauritius.

   Since Statistics Mauritius receives and handles information from numerous sources and in different formats, it is ideal for Statistics Mauritius to set up a Data Lake. It enables Statistics Mauritius to assess, manipulate and store received information in desired format and structure. Data Lake can be extended to accommodate new data source such as big data in the future. Data push on the lake is automated based on the configuration, templates defined and storing procedures. Data Scientists shall assess information received to identify how this information can be optimally stored for use by units at Statistics Mauritius. As per current data sources, channels identified to fuel the data lake is the InfoHighway and MauStats portal/mobile.

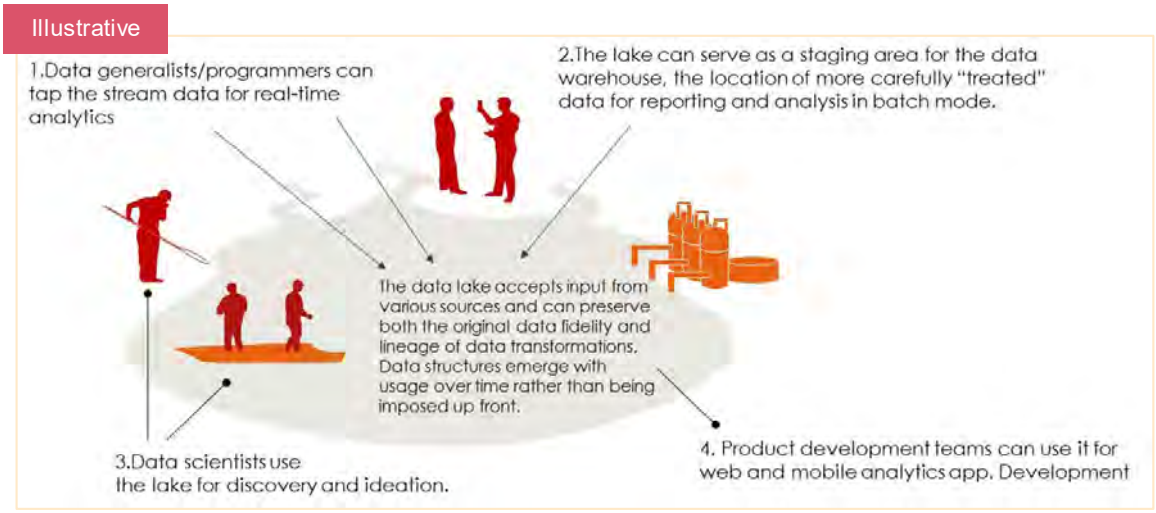


Figure 45: Illustrative Data Lake

Data lakes take advantage of commodity cluster computing techniques for massively scalable, low–cost storage of data files in any format. Hence significant cost efficiencies can be achieved with speed and agility

2. **Data warehouse –** is the core which connects with the Data Lake and structure datasets for analysis and reporting. Information from various data sources are integrated and centralised**.** With the need to constantly modify the dataset, data warehouse eliminates the need for Statisticians to manipulate and transform data for each reporting cycle. Information received is updated automatically on the data warehouse based on predefined rules thus enables SM to analyse new and historical data. Users with controlled access can view or modify the data sets as required. Interaction between Data Lake and Data Warehouse is demonstrated in diagram below.

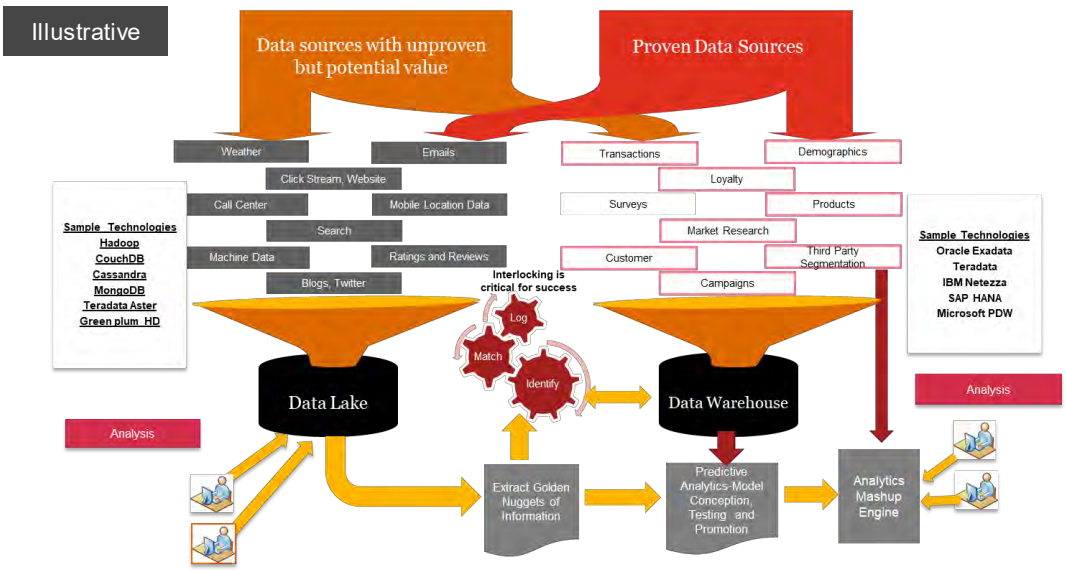


Figure 46: Interaction between Data Lake and Data Warehouse

3. **Data Mart –** A data mart is a subset of a data warehouse and is used by specific unit(s). Social and Economic indicators can be prebuilt in the data marts as a once off exercise. With new data sets, data marts are automatically refreshed and corresponding indicators are generated. The data mart will be accessible for statistician to design specific views, parameters and conditions. The advantage of using data marts is to eliminate the risk of data tampering which reside in the data warehouse. Hence, a replica of the information is extracted via data marts and used for analysis. Finalised outputs/indicators are also pushed to the data warehouse which may be used by other units such as national accounts or to re-actualise the baseline.

4. **ETL Tools –** Extract, Transform and Load (ETL) tool is a software that is used to extract, process, transform, refine different data types from one repository and load into another preconfigured repository. An ETL tool must be configured between data lake and data warehouse. SM receives data from a number of sources, there is need to process raw data sets from data lake towards a structured data warehouse. The ETL tool will be used to extract raw data from the data lake, transform the data to the required format and load the data in the different data tables created in data warehouse.

   Similarly, the ETL tool will be used to extract and load data from the data warehouse to the data marts. By using an ETL tool, the steps involved in processing information is streamlined hence leading to efficient data management. The ETL tool can also be used to check the quality of data to prevent erroneous data from accumulating in the data warehouse. This step can be automated by using a scheduler to run data processing and loading steps as per SM's requirement. Examples include Talend Open Studio, Kafka, JasperSoft.

E. Business Logic Layer between Application and Data Layer

Business Logic Layer include components embedded onto the Data Layer to make sure information flow from one point to another seamlessly as per defined business rules and intended results are achieved. The Business Logic Layer is made up of two main components, as follows:

1) Communication Stack

The communication stack regulates data/information flow across data, application and presentation layer. It is a set of standards and protocols that must be implemented to make sure information exchange is smooth.

Key elements of the communication stack includes:

- **API Gateway –** The API gateway must be configured for interfacing with external stakeholder such as InfoHighway or 1:1 with data providers. API gateways uses webservices to push/pull data as per API contract/protocols. APIs (an open data approach) for sharing content and data between stakeholders and application systems, in a secured way. Data exchange between SM and third parties including data providers, users or reporting agencies such as IMF will be done via APIs.
- **Email Gateway –** An email gateway is one of the ways through which an organisation can protect itself from cyber-attacks which are orchestrated through the use of malicious emails. It is effectively a firewall for your emails and scans both incoming and outgoing emails for malicious content. This channel will be used to send automated email notifications, updates or newsletters to subscribers.
- **Payment Gateway –** A secure payment gateway for subscribers of MauStats to effect online payment.

2) Technology Stack

The technology stack comprises of workflow and business logic components embedded in MauStats to automate business processes. It includes:

- **Workflow and Business Rule –** A statistical workflow management and business rule configuration to facilitates process execution, information flow and enforce series of events such as approvals. It facilitates the design, creation and orchestration of statistical processes. User rights will be defined to execute specific tasks. An example is publication of pdf reports, statistician

initiate the process on the workflow module. A tasks is created and report is attached and submitted to the respective users for review and approval. Multiple approval levels may be defined in the workflow module. Once approved, an email notification is triggered to the dissemination team for upload on the website.

- **Web Framework** A web framework is used to assist in the development and publication of web applications and web sites. Web services and additional resources can also be built on the web framework. This framework will reduce SM dependency on external parties to update the website or MauStats portal.
- **Statistician's Workbench –** which will allow staff to access the data layer for the management of data and metadata.
- **Metadata Registry and Repository –** provide end-to-end management, registration, storage and re-use of SM metadata. With the movement of huge amount of data occurring in SM's data layer, there is a need for the organisation to manage Metadata i.e. data storing information relative to other data. Effective metadata management makes sure that the movement of data is logged systematically and makes it easier for the database administrator to analyse exceptions or errors. It creates the opportunity for SM to leverage the SDMX protocol which pertains to a common language for data metadata exchange.

SM to adopt international metadata standards such XML metadata standards, GSBPM, SDMX and GSIM. Metadata Standard defines the schema required for describing information and services as Metadata. The standards must provide information about the description, source, generation, identification, extent, quality and dissemination of information. An example is as follows:

S. No	Description	Type
1	**Metadata reference**	
2	Metadata Date	dd/mm/yyyy
3	Metadata Standard Version	1.0
4	**Identification Information**	
6	Access (Public/Restricted)	Public
7	Usage advisory	Not for Legal Purpose
8	Generating Source agency	Xyz Ltd
9	Date of generation	dd/mm/yyyy
10	Contact person in source agency	Mr./Mrs.
11	Data Type	Numeric
12	Publisher	Xyz ltd
13	Publication Date	dd/mm/yyyy
14	Publisher Contact Person	Mr./Mrs.
15	Publisher Contact Telephone	(0) 234-1234567
16	Publisher Contact Fax Number	(0) 234-1234568
17	Publisher Email Address	abc@def.com
19	Completion Status	Completed
20	Update Frequency	Monthly
22	**Data Quality Information**	
23	Logical Consistency Report	Corrected, complies with schema
24	Completeness Report	Complete
25	**Entity/Attribute Information**	
26	Entity Definition	Definition of the entity/ attributes
29	Reference period	03/2021

Table 18: Example of Metadata Description and Types

Note: Definition of metadata standards across SM business processes will be conducted at the time of implementation with the solution provider and subject matter experts.

F. Statistical Data and Metadata Exchange (Phase 2 of MauStats)

Such an initiative targets to bring in common standards to exchange statistical data and metadata.

It is important to note that statistical data must be accompanied by relevant metadata to make the data available completely useable and at present, SDMX standards have only been applied to the final steps in the statistical data production chain.

SDMX can be used to collect information from data providers, in data exchanges between organisations and disseminate information for public among others in a standard format. SDMX promotes interoperability and interconnection among distributed statistical dissemination systems.

SDMX data can be transmitted by the following 2 methods:

1. **SDMX-ML aware toolkits:** These support the export of data in the SDMX-ML format by mapping the information from a given format such as Excel onto the SDMX-ML tags.
2. **SDMX-ML software tools:** These tools are designed to work in a similar fashion to the SDMX-ML aware toolkits by converting data to the SDMX-ML formats from particular formats.

Some of the benefits that SM could leverage after adopting SDMX are:

- **Increased usability** of statistical information.
- SDMX-ML data formats can be applied to a wider range of statistical information.
- **Eliminate the need to re-key statistical data** from paper based questionnaires, if any.
- **Better automation** used in the data collection process.
- SDMX data can be archived in a well described textual format.

It is recommended that SM implements SDMX as a future enhancement to the MauStats, as the first priority is to setup MauStats and automate the business functions. SM may also go for readily available open software (SDMX-RI).

6.3 Infrastructure and Security Considerations

Deployment Architecture

The deployment architecture depicts the mapping of a logical architecture to the physical environment of GOC and SM office. The following is a high level depiction of a deployment architecture for Statistics Mauritius on premise network and application / server hosting in GOC data centre.

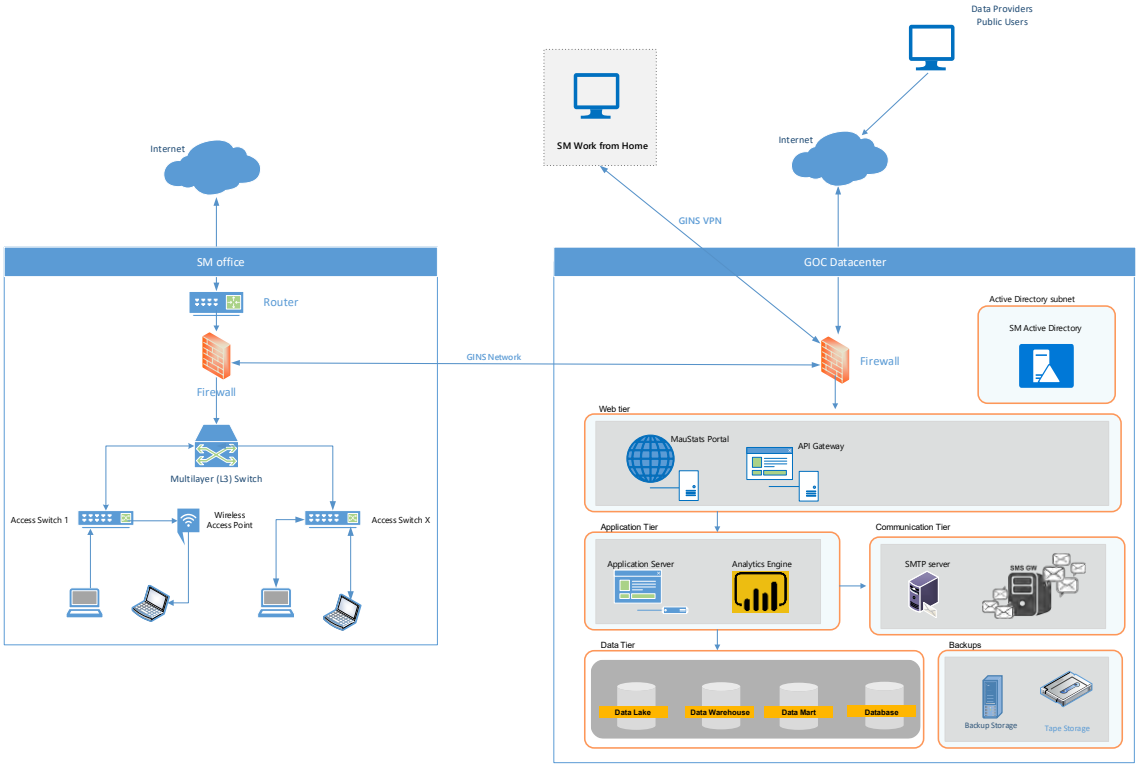


Figure 47: Overview of Deployment Architecture

The new architecture is an enhanced version of the current on-premise network of SM in terms of security and failure resistance. A high level network architecture for servers and applications has been proposed and will be hosted at GOC.

The architecture will consist of the following main components:

1. **Network Segmentation:** The network has been designed according to the segmentation principle which splits the network into smaller segments separating groups of systems or applications from each other. This has the following advantages in contrast with the current flat network at SM:
   - Improved Security: Network traffic can be isolated and / or filtered to limit and / or prevent access between network segments.
   - Better Access Control: Allow users to only access specific network resources.
   - Improved Monitoring: Provides an opportunity to log events, monitor allowed and denied internal connections, and detect suspicious behaviour.
   - Improved Performance: With fewer hosts per subnet, local traffic is minimized. Broadcast traffic can be isolated to the local subnet.
   - Better Containment: When a network issue occurs, its effect is limited to the local subnet.
2. **Enhanced Communication:** Users should connect to the application using HTTPS protocol. The HTTPS communication protocol will be applied in the deployment architecture to make it more secure. The HTTPS mode should use latest encryption of TLS 2.0 or more. The encryption within HTTPS is intended to provide benefits like confidentiality, integrity and identity.

3. **API gateway:** The architecture will also include an API gateway which will act as the major point of enforcement for API traffic. The gateway will authenticate traffic as well as control and analyse how APIs are used.

4. **Application Servers:** These includes Image servers, Application Servers, Email Servers, LDAP/AD, Backup Servers and Analytics Engine. Backup servers are added to increase the security of the system.
5. **Firewall:** GOC firewalls will used to secure network perimeter of SM applications hosted at GOC. The SM on-premise network must be protected using a UTM firewall installed at SM premises.

6. **High availability Mode** - High availability (HA) is the ability of a system or system component to be continuously operational for a desirably long length of time. Availability can be measured relative to "100% operational" or "never failing."

   Proper considerations should be made so that all components like switches, Firewall, etc.. are setup in high availability mode to make the system resistant to failures and make sure that there is no Single Point of failure.

7. The new architecture should also have Advanced Level Monitoring capabilities to manage the following:
   - Application Health Monitoring
   - Server Health Monitoring
   - Network Health Monitoring
   - Ticketing
   - Log Analysis

8. **Endpoint Protection**: Endpoint security or endpoint protection is an approach to the protection of computer networks that are remotely bridged to client devices. The connection of laptops, tablets, mobile phones and other wireless devices to corporate networks creates attack paths for security threats. Endpoint Security is increasingly important. Any device, such as a smartphone, tablet, or laptop, provides an entry point for threats. Endpoint security aims to secure every endpoint connecting to a network to block access attempts and other risky activity at these points of entry.

9. **Business continuity Considerations:** The high level architecture provides SM staff with the ability to work from home and connect to GOC hosted applications through Government IntraNet System (GINS) VPN. The MauStats Portal is also external facing which will allow business users as well as SM staff to access it remotely. Administrators will be able to manage all applications hosted at GOC remotely through GINS VPN. Additionally, no servers/applications will be hosted in SM premises as such users can connect and work remotely.

Hosting Consideration

SM application systems will be hosted in Government Online Centre (GOC) data centre. The following diagram provides a comparison between co-location model of hosting and cloud model of hosting.

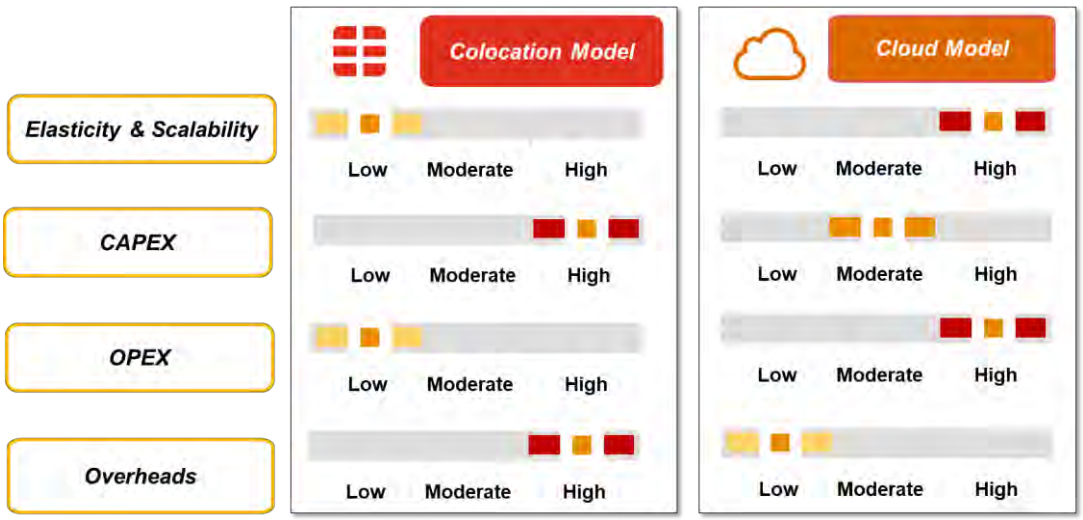


Figure 48: Hosting Options

Also, as discussed in the situational analysis document, the current hardware has reached a state of end of support and end of life and should be replaced. Thus, it is recommended that MauStats is hosted in cloud infrastructure at GOC.

Security Consideration

Since it is recommended that MauStats be hosted at GoC data centre. It is required that GoC security policies be taken into consideration.

Server-side validation

Data validation should occur on the client side (web browser, client) and the server side (webserver, API Gateway). Client-side validation provides a seamless experience to end users, as all user-provided input is validated quickly at the browser-level. Client-side validation does not require a data roundtrip to the server. Thus, it reduces the server load and helps improve its performance.

However, implementation of only client-side validation is not enough to protect against malicious users. In many cases, an attacker can easily bypass client-side validation. This is possible since an attacker can create their own requests or modify existing requests sent to the server independently from the web browser client. For example, an attacker may utilize a web proxy to intercept HTTP traffic between a web browser and the server. By intercepting the traffic, an attacker can alter parameters after client-side validation is performed.

To protect the application from user-provided malicious data, it is crucial to implement server-side validation along with client-side validation. The implementation of server-side validation prevents attackers from accessing the application through alternate means (e.g., proxy) to bypass client-side validation. Server-side validation should also perform strict input validation in the form of a white list.

Secure communication

Applications should use HTTPS to encrypt traffic over the network. HTTPS provides an end-to-end secure connection between the client application (browser) and the server. Communication via HTTPS helps protect data in transit. TLS and SSL are the two common protocols used to protect the confidentiality and integrity of the communication over HTTPS. At a high level, a server uses valid SSL certificates provided by a Certificate Authority to identify itself to a browser. The browser and server then generate a shared secret, which is used to encrypt all network communications.

If HTTPS is not enabled on the application server, the traffic between the browser and server flows over a non-encrypted connection. This helps an attacker retrieve sensitive information.

Even if the application server supports HTTPS, there are common considerations for all HTTPS implementations:

- Utilize TLS v1.2 or higher. Avoid SSL v2, SSL v3, and TLS v1.0 & 1.1 as these protocols have known security vulnerabilities.
- Support only strong cryptographic ciphers. Avoid any cipher with a key size less than 2048 bits.
- Disable TLS 1.0 compression on an application server.
- Disable client-initiated renegotiation.
- Enforce HTTPS. If any user tries to access an application over an HTTP connection, the application should redirect the user to the HTTPS version of the application.

API security

The API can be strengthened by applying the following:

- Use of tokens. Establish trusted identities and then control access to services and resources by using tokens assigned to those identities.
- Use encryption and signatures. Encrypt your data using a method like TLS(see above). Require signatures so that the right users are decrypting and modifying your data, and no one else.
- Use quotas and throttling. Place quotas on how often your API can be called and track its use over history. More calls on an API may indicate that it is being abused. It could also be a programming mistake such as calling the API in an endless loop. Make rules for throttling to protect your APIs from spikes and Denial-of-Service attacks.
- Reporting and analytics: This will allow SM to track usage metrics in a variety of ways. API platforms use a synthetic approach to monitor an API's response time, availability, and overall performance. API platforms can also integrate analytics programs and use protocols designed to extract data for automated and reporting and analysis over time. These analytics tools will play a key role in diagnosing and troubleshooting integration issues that may arise and help make better-informed decisions about their applications and services.
- API lifecycle management: API management platforms will allow for management of the entire lifecycle of all APIs, from their initial creation through all of their development stages and inevitable retirement. API management provides a sustainable solution for building, testing, onboarding, and managing APIs while ensuring adequate version control every step of the way.

Data at rest

Protect any data stored at rest within a backend database server. There are common considerations when protecting data at rest. These include:

- Use strong encryption algorithms (e.g., AES) to protect data. Avoid old or insecure encryption algorithms (e.g., RC4, DES).
- Do not create your own cryptographic algorithm or its implementation. Instead, use and implement algorithms widely accepted by the cryptographic community.
- Along with strong encryption algorithms, it is also necessary to use a strong (2048 bit encryption key. Avoid using encryption keys that are derived in a predictable manner. A cryptographically secure pseudo random number generator (Cryptographically Secure Pseudorandom Number Generator) can also be used to generate keys (e.g., Java's SecureRandom). It is also necessary to rotate the key periodically (every 1-2 years depending on data sensitivity level).

- Avoid storage of sensitive data within configuration files.
- If it is necessary to store the data within temporary files during data transmission or the extract-transform-load (ETL) process, for example, storing NID information of buyer and seller by Notary during the initial step in a land transaction, store data temporarily and clear it from the temporary location. Any sensitive information that needs to be stored within temporary files should be encrypted by the application.

Logging

Logging is an essential part of application security. Log files help identify security incidents and provide information about application problems and unusual conditions that the application may face. If the application or user account comes under attack, information logged by application within log files will be pivotal in understanding the attack and, in some cases, tracing it back to the attacker. Thus, a logging system is a huge benefit for developers and system administrators. It should be designed and maintained carefully with the following considerations:

- The client applications must log security events (e.g., successful or failed authentication events, failed authorisation events, session cookie modifications, data validation failures, etc.).
- In addition, an audit trail should be maintained to record additions and modifications made to user profiles and access rights
- The application must not log any sensitive information (e.g., login credentials, NID, credit card or payment information, session identifier values, etc.).
- Store logs using strong encryption algorithms
- Access control restrictions must be in place to restrict access to log files. Only the application should have write access to it. The privileges to read the log file should be restricted and reviewed periodically. All access to log files must be recorded and monitored, and if possible, should require prior approval. The log file should be accurately dated and time-stamped.

Backups

Data backup refers to save additional copies of your data in separate physical or cloud locations from data files in storage. It is essential to keep secure, store, and backup all data on a regular basis. This will help prevent from:

- Accidental or malicious damage/modification to data.
- Theft of valuable information.
- Breach of confidentiality agreements and privacy laws.
- Premature release of data which can avoid intellectual properties claims.
- Release before data have been checked for authenticity and accuracy.
- Keeping reliable and regular backups of our data protects against the risk of damage or loss due to power failure, hardware failure, software or media faults, viruses or hacking, or even human errors.
- Backup should be performed as follows:
- Three copies data should be kept
- Two different formats, e.g.: hard drive+tape backup
- One off-site backup, e.g.: have two physical backups and one in the cloud

The following must be considered to keep backup storage secure:

- Authentication of users and backup clients to the backup server.
- Role-based access control lists for all backup and recovery operations.
- Data encryption options for both transmission and the storage.
- Flexibility in choosing encryption and authentication algorithms.
- Backup and recovery procedures to be enforced.

Types of Integration with MauStats

Integration refers to the ways in which data and processes flow among different applications in the system. The act of bringing together the components that make up a system and combining them using suitable frameworks so that they are compatible with one another, and are together able to deliver the intended functionality, is called integration. The methods of integration vary based on the model of the same required. Computer networking, business process management enterprise application integration etc., are some modes of integration.

There can be different tiers/types of integration such as - Vertical integration, Star integration and horizontal integration. Using a common language within the applications concerned, or the same data format is another integration method that solves the issue of each layer having to convert data into a readable form. Integration allows systems both internal and external to communicate effectively with each other.

Integration levels include:

1. Invocation Type Integration
Invocation type integration involves calling up a completely different application to process the data that is otherwise not readable to the native application. This is the most commonly used method of integration and is more of a data processing technique.

2. Data Sharing level Integration
In this method, data used or transformed by one system is available, accessible and modifiable by another system. This means that more than one system can work on the same data and modify it to communicate with each other in the process, as well as dispense functionalities effectively. This method involves these three requirements- a method to access the data, a protocol to follow to handle the data and a consensus on how the data transformation will take place such that it can be read by all the participating entities.

3. API Based Integration
API level integration allows applications to access the required data through specific API's. API is a set of rules and functionalities, which is used for communication between two different systems. API's allow data of different sorts, to be accessed and manipulated by different applications. This provides a new set of possibilities meaning applications now, which could not communicate with each other, now are able to do so effectively and process the same.

4. UI Based Integration
The main advantage of UI based integration is that it is not important to aggregate, bundle, and discharge all the segments as a solitary unit. UI Integration allows the application to access other functionalities not native to the application in a way that lets the user feel as if they were a part of the same system. There are subdivisions to this category such as GUI only UI Integration, Hidden interface UI Integration and Published interface UI Integration. GUI only UI Integration relies solely on the logic inscribed in the pertinent UI system. Hidden interface UI Integration lets users control the UI using rule sets and protocols that are not publicly described. Published interface UI Integration combines both UI logic and API assistance and calls for an API at runtime for the control of individual UI elements.

An API based approach is recommended due to various benefits, such as the ease of addition of content from an application or a site via the API. It provides more fluid information delivery and an integrated user experience. In addition, it provides easy and seamless connectivity to cloud. It provides more strategic approach to the application as well. A hybrid of the above approaches can also be considered for SM depending upon the implementation model, whereby legacy system such as ERETES must be integrated with MauStats.

Regulatory and Legal Framework

7

7. Recommendations on regulatory and legal framework

Governing policies for MauStats

Currently the following policies govern the day to day operations of SM:

- Code of Ethics
- Code of Practice

Additionally, to support the implementation of the MauStats, the following policies should be deployed within SM:

- Data Privacy Policy
- Terms and Conditions (Any user requesting data)
- Data Exchange Agreements (Partners)

Data Privacy Policy

A **Data Privacy Policy** needs to be available to the users of the proposed website and MauStats Portal to inform them as to how the information submitted will be used or stored with respect to the Data Protection Act of Mauritius. The privacy policy should be drafted by SM Data Governance Office in conjunction with the Data Protection Act of Mauritius and EU General Data Protection Regulation (GDPR) if applicable, with the following:

A. What information will be collected from the users.
B. Why is the information collected.
C. When is personal data collected.
D. The legal basis on which the data provided will be processed.
E. How SM will use the data collected, what will be done with the data collected e.g. if the data will be used to generate statistical outputs.
F. How long will the data be retained.
G. Where the data will be processed and stored.
H. International Sharing (if applicable)
I. What rights do the users have as data providers.

Terms and Conditions

Standard Terms and conditions to be confirmed by data providers and users while registering on MauStats portal. Terms and Conditions should be defined at the time of implementation and shared with Solution Implementer to make sure that this requirement is mandatory for any MauStats users. SM to involve State Law Office to validate the terms and conditions.

Data Exchange Agreement

One of the strategic objectives of the e-Business Plan 2021-2024 is the creation of a One Stop Data Hub. To further enable the concept of One Stop Data Hub, SM should implement a Data Exchange Agreement with its local and international partners. The agreement will specify:

- Purpose of data exchange, Authorised system and users, data exchange requirements, schedule of transmission, payment (if applicable), duration of the agreement, contractual obligations, modification clauses, dispute resolution, data privacy and integrity, termination of mandate, governing law and enforcement actions.
- Electronic Submission Only.
- Data exchange agreement with Public institutions to mandate submission in timely and enforceable manner.

The activities of SM will be governed by the following regulatory frameworks:

1. **Statistics Act of 2000, amended in 2017**
2. **Data Protection Act 2017**
3. **ICT Act 2017**

The above legal acts have been analysed to identify changes/conflicts in the regulation with respect to MauStats implementation. One (1) change is envisaged in the Statistics Act as follows:

Name of Act	Statistics Act of 2000, amended in 2017
Application of Act	22. Confidentiality (1) Before performing any function under this Act— (a) every employee of a public sector agency shall, where he is engaged in the joint collection of information or the processing of information collected in the joint collection; (b) every person involved in the research or statistical project for which information is disclosed pursuant to section 19; and (c) Repealed 67* (d) every authorised officer shall make a declaration of confidentiality in the form set out in the Second Schedule or, where the person is abroad, in such form and manner as the Director may approve;. (2) Before performing any function under this Act or any regulations made under the Act, every member, every co-opted person under section 23(3)(b), every member of a committee set up under section 24(2) and the Director **shall take an oath of confidentiality in the form set out in the Third Schedule.** (3) Subject to subsection (4), every person referred to in subsections (1) and (2) who has access to the records of Statistics Mauritius shall maintain, during and after his period of service in Statistics Mauritius, the confidentiality of any matter relating to this Act and to any regulations made under this Act which comes to his knowledge. (4) No person referred to in subsections (1) and (2) shall communicate to any other person any matter relating to this Act and to any regulations made under this Act which comes to his knowledge in the performance of his functions except— (a) for the purposes of administering this Act; or (b) where he otherwise complies with the provisions of this Act. (5) Any person who contravenes this section shall commit an offence and shall, on conviction, be liable to a fine not exceeding 50,000 rupees and to imprisonment for a term not exceeding one year. (6) In this section – "abroad" includes Rodrigues, Agalega and any other island comprised in the State of Mauritius
Changes envisaged	Changes required on the clause (2) with implementation of MauStats. User registration does not require physical presence. Currently, foreign individuals request for information from SM directly without taking oath. It is recommended that same principle applies for citizens of Mauritius. Terms and Conditions (refer to proposed policies in above section) will be enforced on the website and MauStats Portal during user registration process. Users cannot register on MauStats without complying and accepting the Terms and Conditions..

Table 19: Legal Act(s) Analysis

The Data Protection Act 2017 and ICT Act have also been analysed in line with the implementation of MauStats, no change envisaged. MauStats fully complies with the above Acts.

Implementation Roadmap

8

8. Implementation Roadmap

This section elaborates on the projects/initiatives identified as part of the project. It also describes a 3-year implementation roadmap which highlights when should each project be implemented for SM to achieve its strategic goals and objectives.

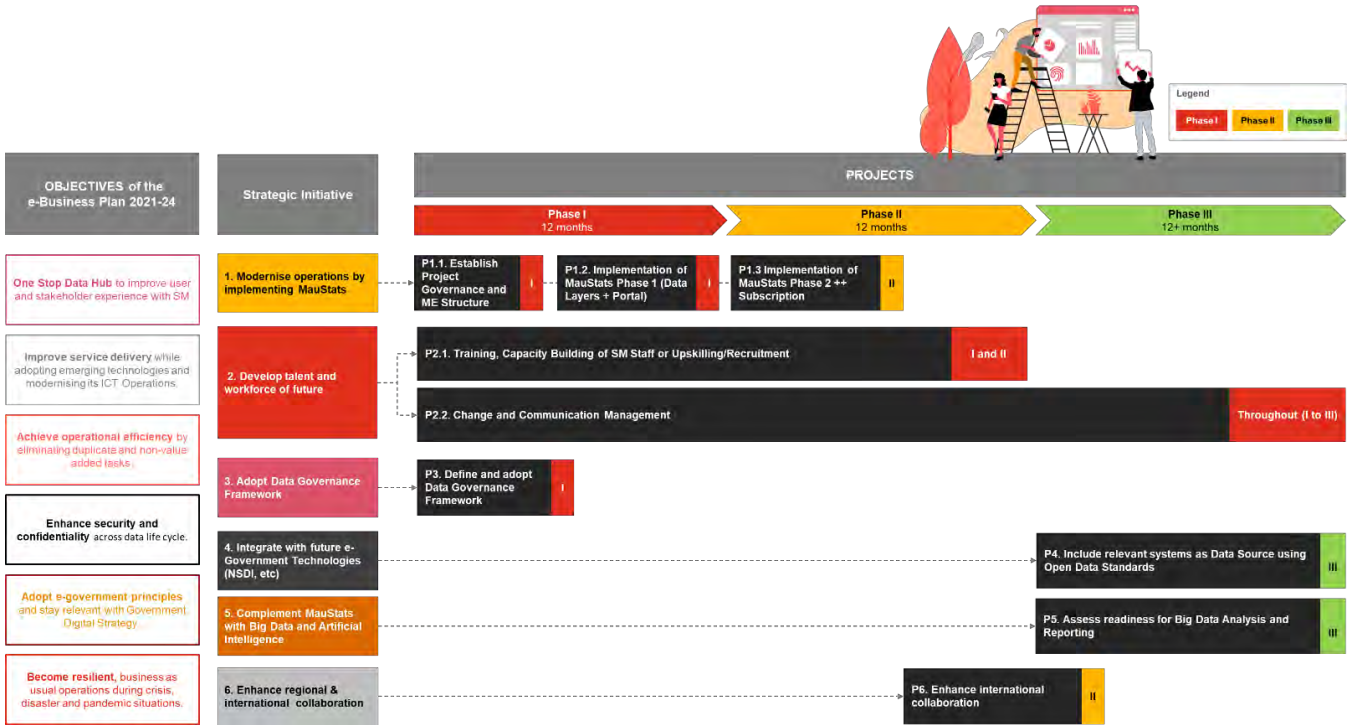


Figure 49: Implementation Roadmap

8.1 Projects identification and prioritisation

It is important to adequately prioritise and plan the implementation of MauStats and other projects identified by adopting a successful and practical approach "**Start Small and Scale Fast".** As such, projects/initiatives identified have been prioritised using the parameters and scoring below. Based on the above below framework, the prioritisation of initiatives has been done in terms of **Short term, Medium term and Long term.**

Short Term starts from 6 months to 12 months. Medium term starts from 12 to 24 months and Long term starts from 24 months onwards. The below scoring framework has been used for categorising the projects/initiatives in different implementation timeframe based on the rating of each initiative.

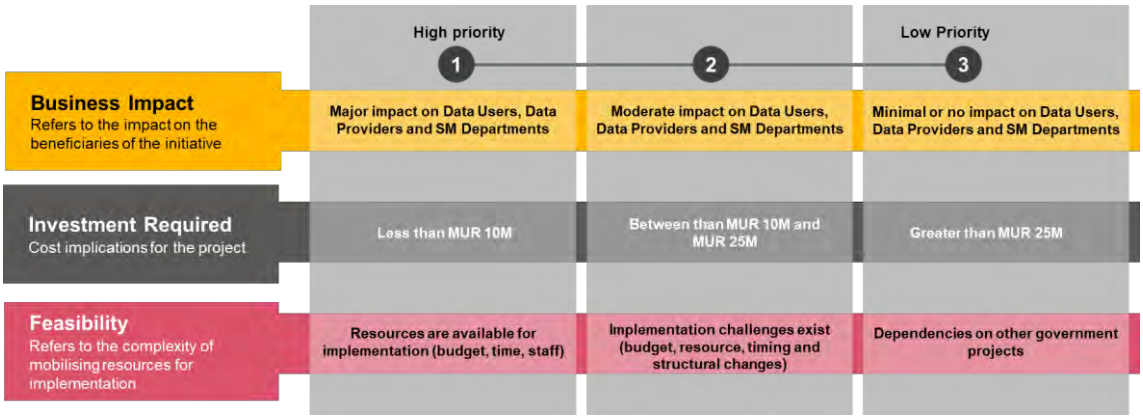


Figure 50: Prioritisation Framework

A prioritisation exercise has been undertaken for each initiative based on 3 parameters: business impact, investment/budget estimates and feasibility on a scale of 1 to 3; where 1 depicts highest priority and 3 lowest.

Parameter 1: Business Impact	Priority Rating
Major impact on Data Users, Data Providers and SM Departments	1
Moderate impact on Data Users, Data Providers and SM Departments	2
Minimal or no impact on Data Users, Data Providers and SM Departments	3

Parameter 2: Investment Required	Priority Rating
Budget estimate is less than MUR 10 Million	1
Budget estimate is between MUR 10 and 25 Million	2
Budget estimate exceeds MUR 25 Million	3

Parameter 3: Feasibility	Priority Rating
Skills and resources available for implementation of the initiative as budget, time, resources and structure are available	1
Challenges foreseen in the implementation as some decisions are dependent on budget, resource, timing and structural changes	2
Cannot implement the initiative as there are dependencies on other government projects or internal projects.	3

Based on the above rating framework, the prioritisation of initiatives has been done in terms implementation waves. These waves define specific time period over a timeline of 3 years. Wave I start from Statistics Board decision and spreads over the first 6 months. Wave II starts in the second semester and Wave III starts from second year and continues till end of year 2 or 3 depending on initiatives. The following scoring framework has been used for categorising the initiatives in different Implementation Waves based on their respective ratings.

Total Score Range	Implementation Timeframe	Term
3 – 5	Between 6 and 12 months	Wave 1
6 – 7	Between 12 and 24 months	Wave II
8 – 9	Beyond 24 months	Wave III

The below diagram illustrates the projects that have been identified as part of SM objectives to harness the power of IT to enhance operations of the organisation and the strategic initiatives identified as part of the future operating model.

Legend:

I = Wave 1, Priority HIGH, Implementation Timeframe – 6 to 12 months

II = Wave 2, Priority MEDIUM, Implementation Timeframe – 12 to 24 months

III = Wave 3, Priority LOW, Implementation Timeframe – Beyond 24 months

The detailed prioritisation matrix and implementation roadmap is as follows:

Implementation Plan	Strategic Initiatives	Business Impact	Investment Required	Feasibility	Total Score	Implementation wave
P1.1: Establish Project Governance and ME Structure	**Across all Initiatives**	1	1	1	3	**Wave I**
1.1. Setup a MauStats Project Steering Committee (PSC)						
1.2. Set up Project Management Office (PMO)						
1.3 Define governance mechanism for each functions.						
1.4 Identify Project champion and stakeholder for each initiative						
1.5. Identify and onboard Programme and Quality Advisors						
1.6. Monitor implementation activities						
1.5. Report progress to respective working groups, PMO, PSC						
P1.2: Implementation of MauStats - Phase 1	**SI1: Modernise operations by implementing digital technologies**	1	2	2	5	Wave I
1.2.1. Prepare and launch Request for Proposal						
1.2.2. Evaluate, select and onboard solution implementer (SI)						
1.2.3. Conduct requirement gathering for phase 1 and phase 2						
1.2.4. Design MauStats components						
1.2.5. Develop MauStats components (Phase 1), including integration touchpoints, and perform system testing.						
1.2.6. Data Cleansing						
1.2.7. Conduct Data Migration and testing						
1.2.8. Conduct User Acceptance Testing (UAT)						
1.2.9. Conduct Training						
1.2.10. Pilot roll out						
1.2.11. Full roll out (System Go Live)						
1.2.12. Warranty, Operation and Maintenance						
P1.3: Implementation of MauStats - Phase 2	**SI1: Modernise operations by implementing digital technologies**	2	1	3	6	**Wave II**
1.3.1 Develop and test MauStats components (Phase 2), including integration touchpoints and system testing						
1.3.2 Conduct User Acceptance Testing (UAT)						
1.3.3. Conduct Training						
1.3.4. Pilot roll out						
1.3.5. Full roll out (System Go live)						
P2.1: Upskill/Recruit	**SI2: Develop talent and workforce of future**	1	1	1	3	**Wave I - III**
Review and finalise proposed structure						
Create detailed job descriptions						
Prepare onboarding pack by category of staff						
Upskills/ Recruit new resources						
Monitor effectiveness of training and capacity building initiatives						

Figure 51: Prioritisation matrix and implementation roadmap (Part 1)

Implementation Plan	Strategic Initiatives	Business Impact	Investment Required	Feasibility	Total Score	Implementation wave
P2.1 Training and Capacity Building	**SI2: Develop talent and workforce of future**	1	1	1	3	**Wave I - III**
Conduct skills gaps assessment or training needs analysis						
Develop and implement a training plan by category of staff						
Launch training programme						
Set up a mentorship/shadow ing programme, develop inhouse training materials using government elearning platform						
P2.2: Change and Communication Management	**Across all initiatives**	1	1	1	3	**Wave I - III**
Identify key project stakeholders and perform stakeholder mapping						
Develop change and communication plan						
Conduct pulse check survey to understand stakeholders perception						
Implement activities identified as part of the plan						
Implement public aw areness campaign						
Measure effectiveness of activities rolled out						
P3.1: Define and adopt Data Governance Framework	**SI3: Adopt Data Governance Framework**	1	1	1	3	**Wave I**
3.1. Define data governance strategy and goals						
3.2. Review and finalise proposed Data Governance Structure						
3.3. Identify and implement data policies and standards						
3.4. Assign roles and responsibilities w ithin Data Governance Structure						
3.5 Implement Data Governance Framew ork and perform ongoing monitoring						
P4: Integrate with government system using open data standards	**SI4: Integrate with future e-Government Technologies**	2	2	3	7	**Wave III**
4.1. Assessment of new platforms						
4.2 Perform Gap analysis to assess fitment to connect to MauStats						
4.3. Design solution blueprint for implementation						
4.4. Develop APIs (1 w ay or 2 w ay) to retrieve or push data to the platforms						
4.4. Testing and Go Live						
P5: Assess readiness for Big Data Analysis and Reporting	**SI5: Complement MauStats with Big Data and Artificial Intelligence**	2	2	3	7	**Wave III**
4.1. Conduct gap fitment assessment						
4.2. Develop use cases for data to be used for analysis and reporting						
4.3. Design solution blueprint for implementation						
4.4. Implement, connect Big Data Sources w ith MauStats						
4.4. Go Live						
P6: Enhance international collaboration	**SI7: Enhance regional/international collaboration**	1	2	3	6	**Wave II-III**
6.1. Develop strategic alliance partnership						
6.2. Develop Center of Excellence						
6.3. Benchmark achievements on a regional and international scale						
6.4. Promote secondment of staff						

Figure 52: Prioritisation matrix and implementation roadmap (Part 2)

8.2 High level Implementation Plan

The figure below illustrates the proposed implementation roadmap elaborated over a period of 3 years that SM needs to undertake in order to roll out MauStats.

Recommendations	Projects	Teams Involved
Across all initiatives	**P1.1: Establish Project Governance and ME Structure**	SM and UNDP with Support from CIB
	1.1. Setup a MauStats Project Steering Committee (PSC)	
	1.2. Set up Project Management Office (PMO)	
	1.3. Define governance mechanism for each functions.	
	1.4. Identify Project champion and stakeholder for each initiative	
	1.5. Identify and onboard Programme and Quality Advisors	
	1.6. Monitor implementation activities	
	1.5. Report progress to respective working groups, PMO, PSC	
SI1: Modernise operations by implementing digital technologies	**P1.2: Implementation of MauStats - Phase 1**	SM, UNDP with support from CIB, CISD, GOC,ITSU and external Programme and Quality Experts
	1.2.1. Prepare and launch Request for Proposal	
	1.2.2. Evaluate, select and onboard solution implementer (SI)	
	1.2.3. Conduct requirement gathering for phase 1 and phase 2	
	1.2.4. Design MauStats components	
	1.2.5. Develop MauStats components (Phase 1), including integration touchpoints, and perform system testing.	
	1.2.6. Conduct Data Cleansing	
	1.2.7. Conduct Data Migration and testing	
	1.2.8. Conduct User Acceptance Testing (UAT)	
	1.2.9. Conduct Training	
	1.2.10. Pilot roll out	
	1.2.11. Full roll out (System Go Live)	
	1.2.12. Warranty, Operation and Maintenance	
SI1: Modernise operations by implementing digital technologies	**P1.3: Implementation of MauStats - Phase 2**	SM, UNDP with support from CIB, CISD, GOC,ITSU and external Programme and Quality Experts
	1.3.1 Develop and test MauStats components (Phase 2), including integration touchpoints and system testing	
	1.3.2 Conduct User Acceptance Testing (UAT)	
	1.3.3. Conduct Training	
	1.3.4. Pilot roll out	
	1.3.5. Full roll out (System Go live)	
SI2: Develop talent and workforce of future	**P2.1: Upskill/Recruit**	SM Senior Management and HR with support from PRB
	Review and finalise proposed structure	
	Create detailed job descriptions	
	Prepare onboarding pack by category of staff	
	Upskills/ Recruit new resources	
	Monitor effectiveness of training and capacity building initiatives	

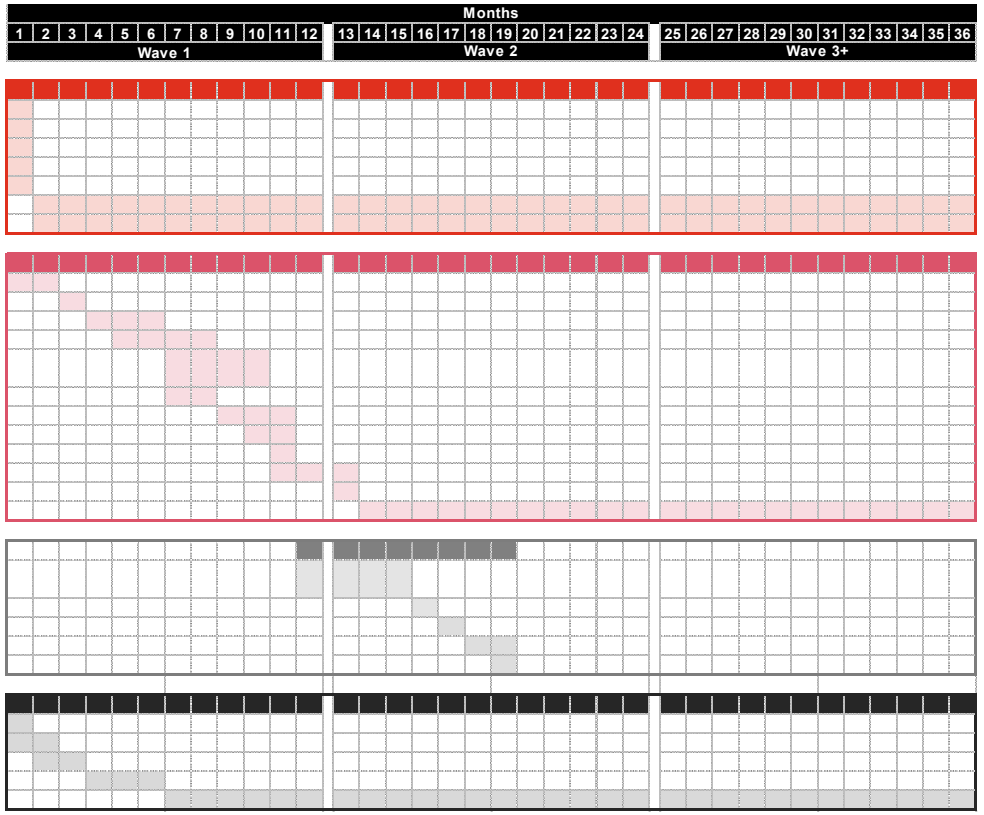


Figure 53: High Level Implementation Plan (Part 1)

Implementation Plan

Recommendations	Projects	Teams Involved
SI2: Develop talent and workforce of future	**P2.1 Training and Capacity Building** Conduct skills gaps assessment or training needs analysis Develop a training plan by category of staff Launch training programme for staff upskilling Set up a mentorship/shadowing programme, develop inhouse training materials using government elearning platform	SM HR Team
Across all initiatives	**P2.2: Change and Communication Management** Identify key project stakeholders and perform stakeholder mapping Develop change and communication plan Conduct pulse check survey to understand stakeholders perception Implement activities identified as part of the plan Implement public awareness campaign Measure effectiveness of activities rolled out	SM with the support of CIB, CISD
SI3: Adopt Data Governance Framework	**P3.1: Define and adopt Data Governance Framework** 3.1. Define data governance strategy and goals 3.2. Review and finalise proposed Data Governance Structure 3.3. Identify and implement data policies and standards 3.4. Assign roles and responsibilities within Data Governance Structure 3.5 Implement Data Governance Framework and perform ongoing monitoring	SM (Data Governance Office)
SI4: Integrate with future e-Government Technologies	**P4: Integrate with government system using open data standards** 4.1. Assessment of new platforms 4.2 Perform Gap analysis to assess fitment to connect to MauStats 4.3. Design solution blueprint for implementation 4.4. Develop APIs (1 way or 2 way) to retrieve or push data to the platforms 4.4. Testing and Go Live	SM, UNDP with support from CIB, CISD, GOC,ITSU, DPO
SI5: Complement MauStats with Big Data and Artificial Intelligence	**P5: Assess readiness for Big Data Analysis and Reporting** 4.1. Conduct gap fitment assessment 4.2. Develop use cases for data to be used for analysis and reporting 4.3. Design solution blueprint for implementation 4.4. Implement, connect Big Data Sources with MauStats 4.4. Go Live	SM (Data Governance Office)
SI7: Enhance regional/international collaboration	**P6: Enhance international collaboration** 6.1. Develop strategic alliance partnership 6.2. Develop Center of Excellence 6.3. Benchmark achievements on a regional and international scale 6.4. Promote secondment of staff	SM (Data Governance Office + Office Of Director)

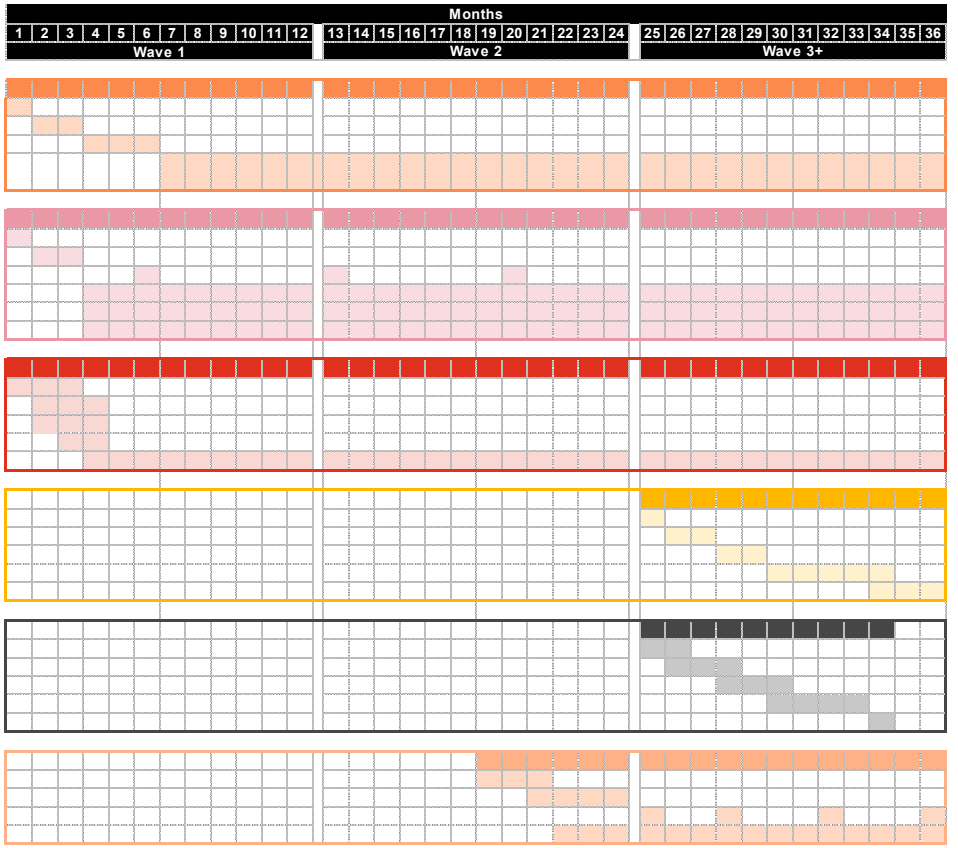


Figure 54: High Level Implementation Plan (Part 2)

Monitoring and Evaluation

9

9. Monitoring and Evaluation

This section details the approach that SM needs to undertake in order to deploy a robust and performance driven monitoring and evaluation programme for the success of implementing MauStats. Ongoing Monitoring and Evaluation (ME) is key for implementation of MauStats and other strategic initiatives identified as part of the e-Business Plan. This activity cuts across all project phase, from project conceptualisation, during and post implementation.

As SM embarks on the roll out of identified projects, it is critical to setup a dedicated team to perform monitoring and evaluation activities. M&E team will be responsible to undertake benefits realisation to measure effectiveness of MauStats project vis a vis envisaged benefits and set performance indicators as defined in Section 4.4 of this report.

For purpose of implementation of MauStats the following Monitoring and Evaluation team is proposed.

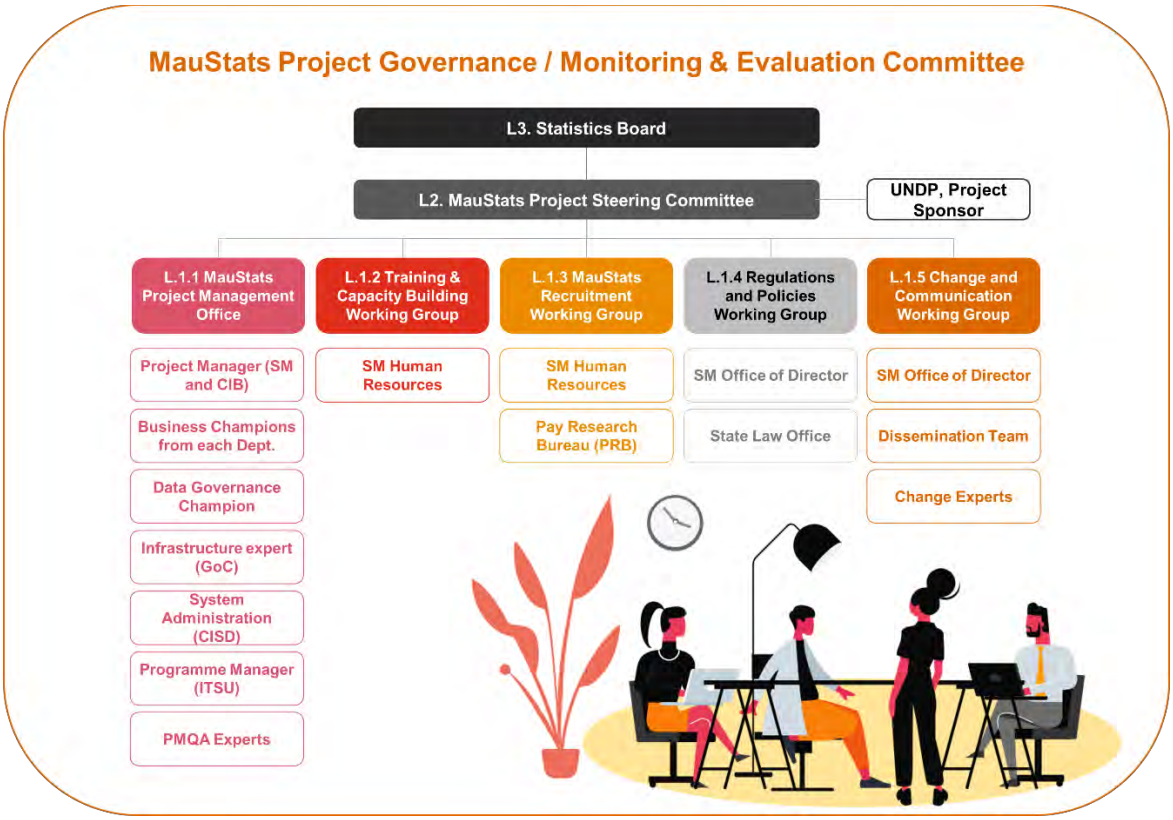


Figure 55: M&E Framework

This structure will therefore:

- **Provide cost benefit analysis** on MauStats matters for continuous improvement and control of deviations from desired service levels.
- Provide multiple **"listening posts"** to make it easier for citizens and other stakeholders to provide feedback.
- **Standardise and simplify** citizens' and businesses' experience in interacting with SM to avail data services.
- **Record**: Capture and record stakeholder experience issues consistently across touchpoints/channels.
- **Research**: Single view of data to enhance issue research and resolution process.
- **Resolve**: Frontline agents empowered to mitigate complaints (resolve first then investigate). Response standards have to be enforced by strong internal service agreements across and support help desks. Monitoring of these internal service agreements will be done by the Monitoring work stream through review of exceptions management in the processes cutting across multiple functions.
- **Report**: Close loop feedback mechanism with functions of SM to make sure the intent and execution initiatives are aligned to stakeholders' feedback.

Proposed approach for setting up a Monitoring and Evaluation Framework

1) **Setup Monitoring and Evaluation Team**
2) **Perform On going Monitoring and Evaluation**
3) **Reporting and Action Plan**

9.1 Setup Monitoring and Evaluation Team

Level 3 Statistics Board refers to SM existing board of directors. As such they will be kept updated on project progress. Statistics Board will also interact with Project Steering Committee(PSC) on a need basis for decision making when issues identified cannot be resolved at PSC level.

Level 2 Project Steering Committee (PSC) will be responsible for the overall direction and management of the project implementation and will have responsibility and authority for decision making. The PSC shall function as an independent body and shall consider all the issues in an unbiased and objective manner.

Level 1 Working Groups for the implementation of initiatives should be set up to strategise, operationalise and take key decisions on respective projects. These Working Groups will be set up at the time of project initiation as follows: MauStats Project Management Office, Training & Capacity Building Working Group, MauStats Recruitment Working Group, Regulations and Policies Working Group, Change and Communication Working Group.

The ensuing section elaborates on Level 2 and Level 1.

Level 2 MauStats Project Steering Committee

The PSC will be responsible for the overall direction and management of the project implementation and will have responsibility and authority for decision making. All the major open issues affecting the timely progress of the project shall be discussed in the PSC meeting. The Project Steering Committee shall hold a meeting, at least once a month, to take stock of project progress and resolve critical issues.

This position is pivotal in resolving intra-project issues, dependencies and establishes clear lines of communication with Ministries/Institutions, management and internal/external stakeholders to make sure that project requirements are met and delivered according to the project plan.

Governance Structure

Chairperson: UNDP

Reporting and Authority: MauStats Project Governance/Monitoring & Evaluation committee

Members/ Composition:

- **Project Manager,** SM Director
- **Project Coordinator,** SM Office of Director
- **Members:**
  - SM Deputy Directors
  - Project Manager from Solution Implementer
  - Program Manager, CIB
  - Technical Manager, CISD
  - System Analyst, CISD
  - Programme Manager, ITSU
  - Lead Analyst, MOFEPD

Responsibilities

- **Provide overall guidance during project implementation** in terms of its business decision, project direction, objectives and progress.
- **Make sure that project activities are consistent and aligned** with scope of work of the project.
- **Progress review to assess the adherence to project timelines** and approve any scope change requests as per request form Solution Implementer.
- **Assess project policy level challenges** for implementation of this project.
- **Endorse new policies or regulatory requirements** (as applicable).
- **Resolve any project challenges or changes** in legal requirements which may affect the project progress.
- **Support the necessary funding and approvals.**

Level 1 Working Groups

The following working groups have been identified to drive implementation of Strategic Initiatives defined as shown below:

Level 1.1. MauStats Project Management Office

Level 1.2. Training & Capacity Building Working Group

Level 1.3. Recruitment Working Group

Level 1.4. Regulations and Policies Working Group

Level 1.5. Change Management Office

Level 1.1. MauStats Project Management Office

The Programme Management Office (PMO) shall be responsible for overall programme management during and beyond the implementation phase. PMO will oversee the entire programme life cycle, from approval to closure, providing effective oversight on each project and control to minimise failures. The PMO will also provide input to the PSC to accelerate project issues and enhance decision making process to drive project success.

Governance Structure

Chairperson: UNDP

Reporting and Authority: Project Steering Committee

Members/ Composition:

- **Project Manager,** SM Director,
- **Co-Project Manager,** CIB
- **Project Coordinator,** SM Office of Director
- **Members:**
  - SM Business Champions
  - SM Data Governance Champion
  - System Analysts/Assistant System Analysts (SA,ASA)
  - Infrastructure expert, GOC
  - Technical Manager (System Administrator), CISD (Optional)
  - Programme Manager, ITSU
  - Lead Analyst, MOFEPD (optional)
  - Programme Management and Quality Assurance (PMQA) Experts

Responsibilities

- Manage, track and report on the project progress to the PSC.
- Review deliverables /coordinate review comments on deliverables submitted by the Solution Implementer.
- Report on various queries, decision points and escalation to PSC.
- Identify project risks and issues and devise mitigation plan.
- Provide guidance to the functional units in regard to project implementation.
- Manage project economics in terms of budget, expenses and other costs.
- Manage overall change control processes to achieve project success.
- Maintain project risk register.
- Organise appropriately skilled manpower to support the project execution.
- Coordinate meeting with solution implementer and stakeholders.
- Arrange for project logistics – meeting rooms, internet connection among others, as required.

KPIs for Project Management Office

- Make sure that Project is completed on time and budget.
- All High Risk issues have been mitigated prior to Go Live
- Smooth Pilot Run with minimal changes ~5-10% on the core system.
- Envisaged benefits and performance metrics with implementation of MauStats as defined in Section 4.4 are achieved.

Level 1.2. Training & Capacity Building Working Group

This working group will drive the development and implementation of Training and Capacity Building plan across the project lifecycle. This group will also be responsible to implement Project no.2.1 as defined in section 4 in this report.

Refer to section 4.4 for Training & Capacity Building Programme.

Governance Structure

Reporting and Authority: Project Steering Committee

Members/ Composition: SM Human Resources, SM Office of Director (adhoc), SM Deputy Directors (adhoc).

Responsibilities

- Conduct in-depth skills assessment to identify training needs.
- Develop training plan and required materials for capacity building.
- Create training database (leveraging on Government e-Learning platform) and monitoring mechanism to track completion of trainings.
- Make sure training is included in performance appraisal system.
- Facilitate organisation and launching of training to staffs.
- Assist in preparation of Onboarding Pack for SM staffs.
- Set up a mentorship/shadowing programme to nurture talent and provide career guidance.
- Ongoing monitoring of KPIs/Metris related to training and capacity building, among others.

Level 1.3. Upskilling / Recruitment Working Group

This group will be responsible for upskilling and/or recruitment of new staffs as per set roles and responsibilities. As such, they will lead in implementation of Project 2.1 – Upskill / Recruit.

Governance Structure

Reporting and Authority: Project Steering Committee

Members/ Composition:

- SM Human Resources
- PRB
- SM Director
- SM Office of Director (adhoc)
- SM Deputy Directors (adhoc)

Responsibilities

- Implement Project 2.1 – Upskill or Recruit, as detailed in section 4.4.
- Liaise with PRB for new roles to be defined as per the proposed structure.
- Collaborate with Training & Capacity Building Working group to upskill existing staff.

KPIs : 90% of SM staffs are ready to operate on MauStats. Training plan is prepared and deployed within a timeline of 2-3 months.

Level 1.4. Regulations and Policies Working Group

This group will work closely with PSC and PMO to make sure that mandatory legislations are in place for operation of MauStats.

Governance Structure

Reporting and Authority: Project Steering Committee

Members/ Composition: SM Office of Director, State Law Office

Responsibilities

- Draft laws and regulations which may have an impact in terms of data privacy among others.
- Draft policies to be enacted to support MauStats.
- Endorsement of the enacted laws and regulations; among others.

KPIs : Policies are drafted in parallel with MauStats implementation. Policies should be endorsed prior to Go Live of MauStats.

Level 1.5. Change and Communication Working Group

Change Management is a critical component to consider during transition from current operating mode to new desired environment. Embarking on MauStats will bring a radical change in production of statistics in Mauritius and this will have an impact on current process, people and technology landscape.

As such, it is important for SM to have a well-defined change management programme to achieve the strategic goals and objectives of MauStats. **This programme will be implemented and monitored by the Project Based Team, with the support and HR and other SM internal departments,** pre/during/post MauStats project roll out.

Effective change management will make sure that SM is prepared and ready to operate within the changed environment, including standard operating practices, clear accountabilities and aligned behaviour. It will also enable stakeholders to understand, commit to, accept and embrace changes during the project implementation.

This programme will therefore:

- Enable SM to own and drive change;
- Equip stakeholders to transition to new ways of working with clear roles and responsibilities;
- Engage key stakeholders and rewarding them for supporting in transforming the organisation;
- Develop an agreed model for long term support;
- Promote awareness and allow stakeholder to be part of the change to drive initiatives;
- Ascertain stakeholder support, commitment and active contribution to achieve project goals and objectives;
- Enable alignment on expectations from SM to stakeholders;
- Create a healthy and positive environment where change is embraced;
- Lower risk associated with MauStats; and
- Solicit feedbacks from stakeholders.

Governance Structure

Chair: SM Office of Director

Reporting and Authority: MauStats Project Steering Committee.

Members/ Composition: SM Office of Director, Dissemination Team and Change Experts

Frequency of meetings: Monthly

Scope of work of Change and Communications Working Group

- Establish a change and communication strategy and framework.
  - Who are the audiences to be targeted?
  - What information is to be communicated?
  - How often is communication required?
  - What methods of communication are best served to address each audience?

- Maintain a standardised approach to change and communication management within projects in line with a Change and Communication Management Methodology.

- Conduct surveys such as Pulse/Perception surveys, Impact Assessment surveys and Training Needs Assessment surveys to assess the readiness and capability of Ministry/ Institutions and its staff.

- Communicate the objectives and metrics for the proposed changes of the project implementations to stakeholders.

- Undertake training and engagement measures for Ministries/ Institutions and their staff, as well as citizens.

KPIs: Record ~80-90% score Stakeholder engagement index, Mass communication and awareness as per change and communication plan, no deviation. ~80-90% score SM Staff Buy In.

Refer to Appendix 3 for sample change and communication plan.

9.2 Perform On going Monitoring and Evaluation

For effective outcome-based monitoring and to enable evaluability, indicators should be formulated using SMART criteria (specific, measurable, attainable, relevant and time-bound):

1. **Specific:** The indicator is sufficiently clear as to what is being measured and specific enough to measure progress towards a result.
2. **Measurable:** The indicator is a reliable measure and is objectively verifiable. Qualitative measures should ideally be translated into some numeric form.
3. **Attainable:** The indicator can be realistically met.
4. **Relevant:** The indicator captures what is being measured (i.e. it is relevant to the activity/result).
5. **Time-bound:** The indicator is expected to be achieved within a defined period.

The proposed M&E framework is as follows:

Pre-Implementation:

1. Define key metrics prior to the project implementation with the following components:
    - **Objective**: This field describes the objective of the project for which measure, and targets have been defined.
    - **Measure**: This field represents the measures/KPIs of the concerned objective.
    - **Definition**: This field describes the method of calculating the measure.
    - **Baseline**: This field represents the current value of the measure.
    - **Target**: This field represents the target set against the measure.
    - **Data source**: This field shows the source where the data can be retrieved for measuring the progress.
    - **Frequency**: This field represents the frequency at which the progress will be measured.
    - **Ownership**: This field provides who is responsible to monitor, measure, report and take remedial action.

During Implementation:

1. Use the defined metrics during implementation of the project to monitor and track progress on each Key Performance Indicators defined and report to the Project Steering Committee accordingly.
2. Sample KPIs may be: % of deliverables compliant with quality review processes, % of deliverables rejected/approved, results of perception/ pulse surveys, change and capacity building progress amongst others.

Post Implementation:

1. Conduct up-to-date impact assessment before and after the deployment of project by using data analytics to report on the KPIs and metrics progress defined. This will also enable SM to derive the benefits assessment of the project.
2. Assess the effectiveness of project outputs in producing the intended long-term impacts.

9.3 Reporting and Action Plan

The reporting structure is proposed as follows:

SN	Report	Purpose	Frequency	Target Audience
1	Project Performance Reports	Capture the project performance based on expected accomplishments, indicators of achievement and performance measures, as recorded in results-based budgets.	Monthly	Level 3 Statistics Board Level 2 PSC Level 1.1 PMO
2	M&E Summary Report	Record results in relation to performance targets and highlight key issues/risks and proposed mitigation action.	Weekly	Level 1.1 PMO
3	Completion Report	Record any activity/tasks that has been completed as part of the M&E programme. Each champion must prepare a completion report.	Ad-hoc	Level 1.1 PMO
4	Independent Evaluation Report	Conducted by a third party to perform quality assessment on the findings with proposed recommendation for continuous improvement.	Ad-hoc	Level 3 Statistics Board Level 2 PSC Level 1.1 PMO
5	Evaluation Report	Highlight outcome-level results and summarize recommendations and lessons-learned, as well as provide an assessment of how evaluation processes have generated learning, quality improvement and enhanced decision-making. It also includes the survey results and analysis.	Monthly	Level 2 PSC Level 1.1 PMO

Table 20: Reporting Structure

Appendix

Attached separately

Preparing for the future.

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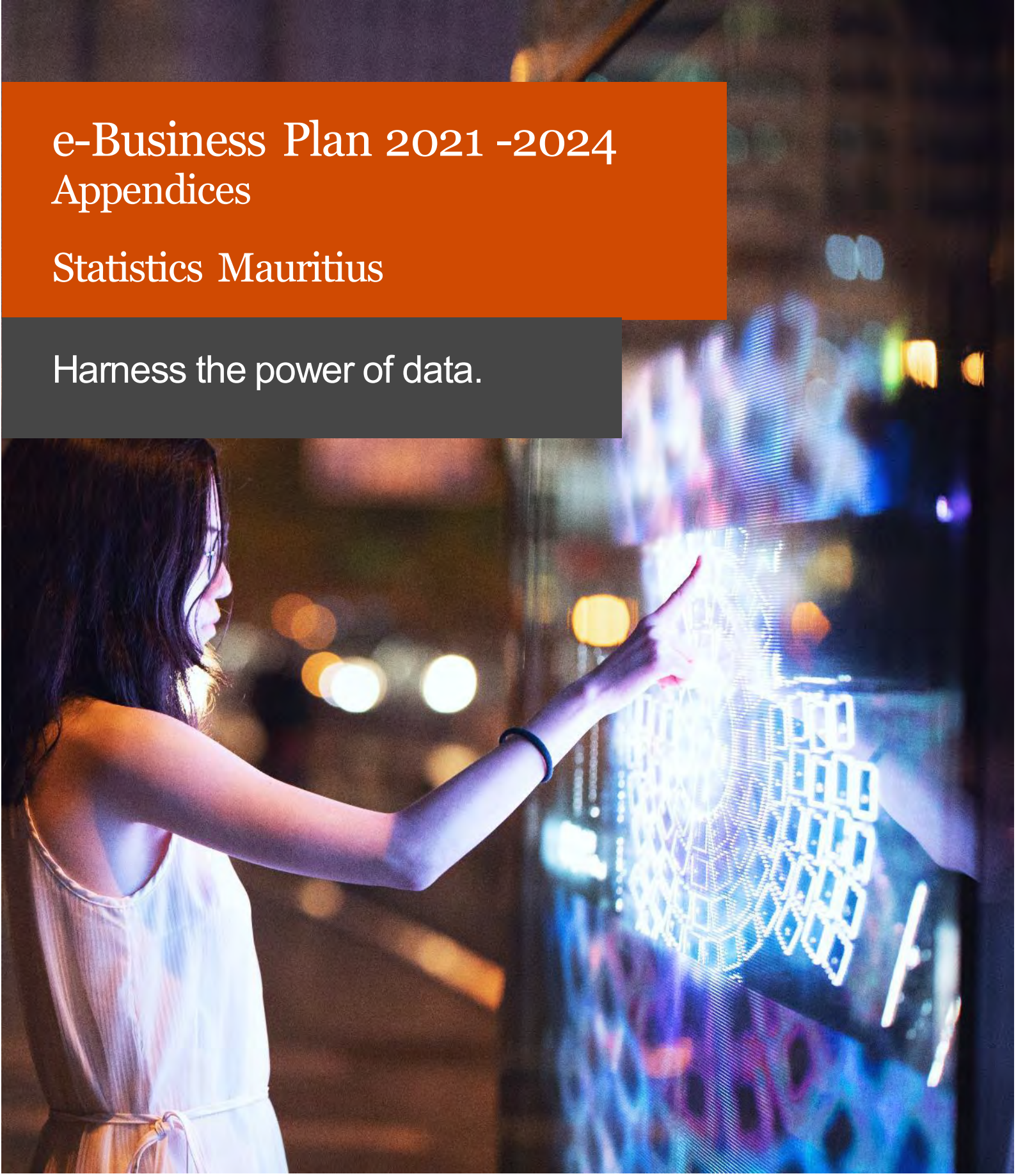
e-Business Plan 2021 -2024
Appendices

Statistics Mauritius

Harness the power of data.



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UNDP Mauritius and Seychelles

13 May 2021

Consultancy Services for the development of Business Continuity Processes (BCP) for the Republic of Mauritius (RFP/MUS/2020/004)

Lot 2: Preparation of an E-Business Plan for harnessing IT to enhance the operations of Statistics Mauritius

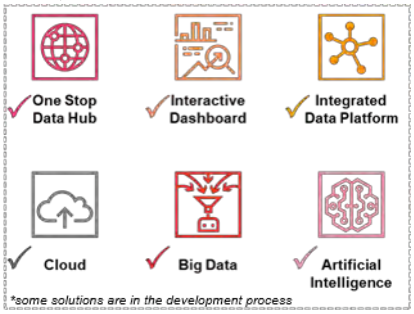
Appendix

Appendix 1: Global Leading Practices

Poland

Statistical system in Poland consists of:

- Statistics Poland (GUS) headed by the President of Statistics Poland,
- 16 Regional Statistical Offices,
- Official statistics service units: Statistical Computing Centre, Research and Statistical Education Centre, Statistical Publishing Establishment and Central Statistical Library,
- Advisory and opinion-making bodies supporting the President of GUS,
- The Statistical Council acting by the Prime Minister,
- National Bank of Poland and other units conducting statistical research.



Statistics Poland (GUS) is an office of government administration that serves the President of Statistics Poland and operates under his direct management. GUS provides reliable, objective and systematic information to the society about the economic, demographic, social and environmental situation. Its information and data are recognized as official. GUS employs over 5700 people and issues around 150 publications annually.

The main objectives of official statistics are specified at the legislative level, in Public Statistics Act. The scope of Statistics Poland's activity is accepted each year by a Resolution of the Council of Ministers on the *Statistical Survey Program of the Official Statistics*. A draft survey programme is prepared by the President of GUS, taking into account the office's obligations as well as recognising the needs of stakeholders and on the basis of broad consultations. The draft is submitted for an examination to the Statistical Council, which presents the document for approval to the Council of Ministers.

Rank: 2nd on Open Data Inventory **Overall Score: 85 Out of 100, similar to Finland**	
Metrics	**Score out of 100**
Coverage based on the availability and disaggregation of published indicators, the number of observations available in the last 10 years, and the existence of both national and local data.	81
Openness is based on the format and licensing of data sets, the complexity of metadata and the available options for downloading them.	89

The table below indicates key initiatives adopted by Statistics Poland.

Key Initiatives	Sub components	Description
Standards	**International Contribution**	GUS has a **strong international position**. President of GUS chairs the UN Global Working Group on Big Data for Official Statistics. The group supports and coordinates implementation of big data in official and public statistics. President of GUS has been also recently chosen for the position of President of International Association for Official Statistics in the next term. GUS participates in works of many global organizations and partnerships, such as United Nations Statistical Commission, United Nations Conference of European Statisticians, World Bank, European Statistical System,

Key Initiatives	Sub components	Description
		European Central Bank, Committee on Statistics and Statistical Policy at OECD or International Statistical Institute.
	Open National SDG Reporting Platform	**National Reporting Platform (SDG Platform)** is a publicly available tool for dissemination and presentation of global and national indicators monitoring the Sustainable Development Goals (SDGs) of the 2030 Agenda in Poland. SDG Platform is easily-accessible and enables quick data visualization. The Platform has been developed in accordance with international guidelines, in particular for open data and software produced in the open source model.
Regulation, Policy, Framework	**Regulatory bodies**	Official statistics in Poland is regulated by recommendations at the international level, Being part of European Statistical System, it is compliant with regulations at the European level (typically issued by European Union institutions) as well as national and internal regulations. Internal regulations of the greatest importance for statistical production are the *Policy of managing statistical data*, *Policy of public information security* and *Policy of the security of the operational microdata base*. The key component of public statistics is the statistical confidentiality which puts the confidentiality of microdata at the same level as medical or the legal privilege. The rules in Poland are strict in the area, limiting access to microdata even within Statistics Poland. The access is on a need-to-know basis, depending on the statistical research done by certain units.
	Quality framework	Statistics Poland attaches high importance to the **quality in terms of methodological accuracy, requirements for their production processes and the institutional environment**. The quality policy is based on continuous improvement of statistical processes in order to answer the needs of stakeholders and reduce respondents' burden. Quality improvements are in line with the international standards, among them: Fundamental Principles of Official Statistics (UNECE), European Statistics Code of Practice (Eurostat), the European Statistical System Quality Assurance Framework QAF (Eurostat), etc. Each study must be approved by the Methodological Commission, which includes statisticians, scholars and experts in the field of statistical research.
Technology	**Gates of Statistics**	GUS runs a project „**Gates of Statistics**". Its goal is the construction or modernization of systems, applications and functionalities for combining and sharing digitized public sector information as well as process optimization. In the course of the project the whole statistical production process is standardized and reorganized. The project intends to evaluate all IT solutions being at GUS's disposal. As a result of the project, it will be possible to provide recipients with access to the statistical information using modern access and communication channels, based on a **uniform, unified sharing platform with the possibility of conducting independent analyzes and summaries using open-source and API tools**.
	Metainformation system	GUS is currently working on the new product – **Metainformation System**. The objective is to increase the role of metadata in monitoring the implementation of official statistics processes. The system will enable the collection of information on the needs of recipients of statistical information (input), the creation of product requirements specifications that meet the

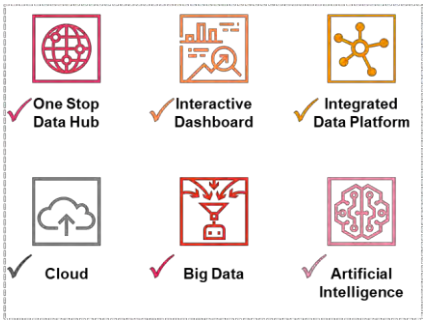
Key Initiatives	Sub components	Description
		identified information needs of users (output), and verification of customer needs satisfaction.
	API portal	Statistics Poland created the page that enables the access to various products of official statistics as well as the **automatic collection of data** from included systems. API is a mechanism that allows for the automation of communication between systems and the creation of new software solutions based on the data available. The Portal includes a description of the project and resources along with examples of making requests from the API.
	STRATEG	The STRATEG system is a **publicly available system supporting the development monitoring process** and evaluation of the effects of measures taken to strengthen social cohesion. The database contains an extensive set of key measures at the country and regional levels. The system also acts as a repository of indicators derived from various strategies - for example, the EU's Europe 2020 strategy and the Polish Strategy for Responsible Development. The analysis is facilitated by tools for data visualization in the form of maps and charts, as well as an extensive set of metadata describing the indicator.
	GEOstat	The Geostatistics Portal is a modern solution for the **cartographic presentation of statistical information** obtained from various censuses. Data is presented using such cartographic presentation methods as choropleth maps and cartodiagrams.
	Other databases	Statistics Poland maintains various complex databases. Among them is **Local Data Bank,** which is the largest database of the economy, society and the environment. It offers more than 40 thousand statistical features grouped thematically. Statistics Poland maintains **national official registers** as well, for example TETRYT that covers the systems of country territorial division or REGON that concerns entities of the national economy.
People	**Skills and Capacity building**	Key initiatives include: • A **wide range of training courses for employees** on various topics, including data analysis in Microsoft SQL Server, Microsoft Excel - Power Query, Reporting Services, Integration Services, HTML5, JavaScript, Big Data in public statistics, SAS, etc. Training related to data analysis and software operation account for approx. 50% of all training. • Defining **skills models** based on Generic Statistical Business Process Model. • Providing an opportunity to participate in **international specialist training** both on strategic issues concerning systems and procedures in European statistics and technical skills (Big Data, programming, etc). Participation in such trainings is possible regardless of the position held. • **Statistical Research and Education Centre**, subordinate to the President of GUS, serves as nationwide and international statistical education institution for employees of GUS and other institutions of official statistical services. Furthermore, the Centre supports statistical and innovative research as well as provides educational services in the field of statistics for commercial entities. • Statistics Poland is a co-organizer of the annual **statistical knowledge competition** for high school students as well as

Key Initiatives	Sub components	Description
		organizer of various contests for university students, such as competition for the best diploma thesis in the field of statistics that constitute an important tool to attract new candidates and build capacity.

United Kingdom

UK statistical system comprises of:

- Board of UK Statistics Authority, responsible for oversight of statistical system;
- Office for Statistics Regulation, regulatory arm of the Statistics Authority;
- Office for National Statistics (ONS), largest producer of official statistics and National Statistical Institute
- Government Statistical Service (GSS), a community of those involved in the production of official statistics.



Office for National Statistics (ONS)[1] is the UK's largest independent producer of official statistics and is responsible for collecting and publishing statistics related to the economy, population and society at national, regional and local levels. Digital technology is fast changing the way ONS operates. More surveys are moving online and new devices are helping ONS to better engage with the public. Approx. 600+ publications are released each year.

Rank: 1st on Open Barometer index Overall Score: 76 Out of 100, similar to Canada	
Metrics	**Score out of 100**
Readiness of the state, citizen and entrepreneur to secure the benefits of open data	83
Implementation – the extent to which timely and open data is published by each country government	89
Emerging Impact – the extent to which there is any evidence that open data release by country government has a positive impact in various domains/fields.	57

The table below indicates the key initiatives adopted by ONS.

Key Initiatives	Sub components	Description
Standards	International Collaboration	UK proposition to international partners is to leverage on data to drive innovation, economy, governmental cooperation and trade without compromising safety, security or privacy. UK has developed frameworks for transfer of personal data, and, where required, support other statistics offices to increase data availability in their own countries such as Rwanda. ONS is actively engaged with EU, US, Japan, Australia and New Zealand to remove unnecessary barriers to cross border data flows, advocate for the importance of global data flows in the World Trade Organisation (WTO), G7, G20 and Organisation for Economic Co-operation and Development (OECD).
Regulation, Policy, Framework	**Regulatory Bodies**	**Office for Statistics Regulation (OSR)** is the regulatory arm of UK Statistics Authority, a body established by the Statistics and Registration Service Act (2007 with clear mandates to: • Set the statutory Code of Practice for Statistics • Assess compliance with the Code of Practice • Award the National Statistics designation to official statistics that comply fully with the Code of Practice • Report any concerns on the quality, good practice and comprehensiveness of official statistics

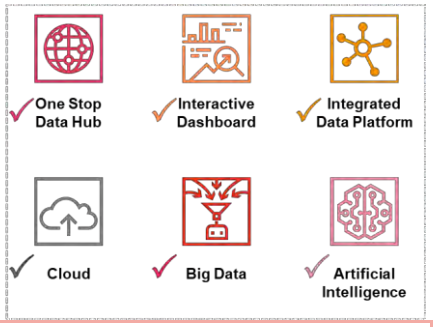
[1] https://digitalblog.ons.gov.uk/2021/02/15/how-to-access-data-from-the-ons-beta-api/
https://opendatabarometer.org/
(https://www.gov.uk/government/publications/open-data-white-paper-unleashing-the-potential)
ONS Strategic Business Plan 2020-2025
(https://www.ons.gov.uk/aboutus/whatwedo/datasciencecampus)

Key Initiatives	Sub components	Description
		Data Standards Authority, with ongoing work to identify and agree a prioritised list of data standards to adopt across government.
	Open Data	Government has adopted the policy of 'Open by Default' for public sector data across departments. This approach promotes the concept of open data release for a number of desired outcomes. Underlying **policies and mechanisms** have been created and includes technical frameworks for data use, governance forums and international commitments to transparency.
	Smart Data	Introduce primary legislation to improve its mandate in implementation of Smart Data initiatives in communications, finance, energy and pensions to support the development of high-quality standards and systems across sectors.
Technology	**eCensus**	The Census 2021 will be run **online** whereby ONS can monitor response in real time, provide online support or via contact centre and support centres for those who need assistance. ONS will maximise on administrative data sources and past census information.
	Integrated Data Platforms	An **integrated data platform** will be implemented that supports the integration of Government data in line with ONS Strategy 2020- 2025, which is a digital collaborative environment that will support government in unlocking the potential of linked data, building up data standards, tools and approaches that enable policymakers to draw on the most up-to-date evidence and analysis to support policy development, improving public services and improving people's lives.
	ONS Beta – Customise My Data	Data published at ONS is available in a more open, useful format for any user. It runs alongside regular publications as per release calendar. CMD comprises of: • Filter journey, with download features and • Application Programming Interface (**API**). Tools and programs used to work with API data include Python and JavaScript and returns data in a JSON format.
	Geospatial	Introduction of new initiatives 2019-20 by the Geospatial Commission for creating a national underground asset register (NUAR) on top of existing **geospatial data**.
	Big Data	Dedicated **Big Data team** working on projects such as exploring web-scraped price data, machine learning for matching addresses and natural language processing for coding textual survey responses.
People	**Skills and Capacity building**	Key initiatives include: • Provide **training to 500+ analysts** across the public sector. • Design a **career pathway** for data expertise in government • Recruit senior cross-government data leadership, including a Chief Data Officer • Launch an **online portal for learning and development**, accessible to the government agencies and private entities. • Introduce or integrate data **science courses at Universities** including wider subject such as AI, Cyber and Digital skills. • Leverage on a number of **national institutions** that are involved in data skills related work such as the Alan Turing Institute (National Institute for Data Science and Artificial Intelligence), the National Innovation Centre for Data, and the ODI.
	Data Science Campus	ONS established the Data Science Campus in 2017 with qualified data professionals to build skills across UK and internationally. It accomplished this by building public sector capacity and capability, strengthening the evidence base around data skills, investigating new sources of data and enhancing analytical methods and approaches to data policy. It provides mentoring

Key Initiatives	Sub components	Description
		programme, direct training, MSc in Data Analytics in collaboration with universities.

Australia

Australian statistical system is composed of the Australian Bureau of Statistics (ABS)[2] as the national statistical office; a range of national statistical authorities such as Australian Institute of Health and Welfare (AIHW) and government agencies producing official statistics. Australian Bureau of Statistics (ABS) operates under a legal framework (United Nations Fundamental Principles of Official Statistics) designed to support its role as a provider of high quality and trusted official statistics. The operations of the Australian BS are divided into three groups: Statistical Services Group, Census & Data Services Group and Enterprise Services Group.



Rank: 3rd on Open Barometer index Overall Score: 75 Out of 100	
Metrics	**Score out of 100**
Readiness of the state, citizen and entrepreneur to secure the benefits of open data	79
Implementation – the extent to which timely and open data is published by each country government	84
Emerging Impact – the extent to which there is any evidence that open data release by country government has a positive impact in various domains/fields.	62

The table below indicates the key initiatives adopted by ABS.

Key Initiatives	Sub components	Description
Standards	**International Contribution** E.g United Nations Statistical Commission and the United Nations Conference of European Statisticians	ABS is an active contributor to the United Nation's High-Level Group for the **Modernisation of Official Statistics** to oversee and coordinate international work relating to standards-based modernisation. The Australian Statistician is Vice Chair of the Bureau of the Organisation for Economic Co-operation and Development (OECD) Committee on Statistics and Statistical Policy. ABS is engaged in the following activities: • Subject matter specific fora, some examples being the OECD Working Party on Financial Statistics; • Meeting of the Group of Experts on National Accounts; • International Conference of Labour Statisticians; and • World Health Organisation Family of International Classifications meeting. • Maintain bilateral relationships with NSOs (including Statistics New Zealand, Statistics Canada, and United Kingdom's Office of National Statistics).
	Data Assets	• **Multi-Agency Data Integration Project** (MADIP) - MADIP is a secure data asset combining information on health, education, government payments, income and taxation, employment, and population demographics (including the Census) to create a comprehensive picture of Australia over time. • **Business Longitudinal Analysis Data Environment** (BLADE) - BLADE is an economic data tool combining tax, trade and intellectual property data with information from ABS surveys to provide a better understanding of the Australian economy and business performance over time. • **Australian Census Longitudinal Dataset (ACLD)** - ACLD combines data from the three most recent Censuses to create a research tool for exploring how Australian society changes over time.

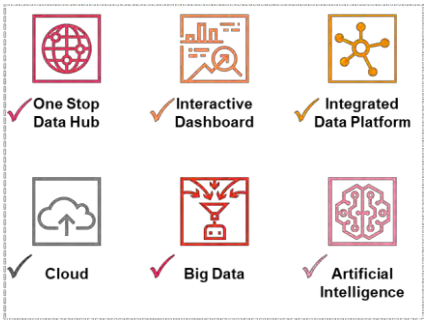
2 Link: https://www.abs.gov.au/
Link: https://www.oecd.org/statistics/good-practice-toolkit/countryassessments/Self-assessment_AUS.pdf

Key Initiatives	Sub components	Description
		• **Linked Employer-Employee Database (LEED)** - LEED is a cross-sectional dataset that brings together employer information from personal income tax to provide insights on the nature of jobs, employees and their employer.
	Quality Framework	Based on recognised models for quality frameworks, such as the IMF Data Quality Assessment Framework (DQAF), the European Foundation for Quality Management, European Code of Practice, the European Statistical System Quality Assurance Framework, Total Quality Management and ISO EN 9001, Quality Framework and Guidelines for OECD etc. Key quality dimensions includes **timeliness and punctuality, relevance**; **accuracy, credibility**; **coherence** and **comparability.**
Regulation, Policy, Framework	**Regulatory Body**	ABS has established a **National Data Commissioner** to implement and oversee a simpler, more efficient data sharing and release framework; established a National Data Advisory Council to advise the Commissioner on ethical data use, community expectations, technical best practice, and industry and international data developments.
Technology	**Data Portals**	ABS has implemented Stat Beta, an interactive free online tool that presents data in a searchable, flexible and dynamic way. It provides data in a machine-readable format using the Statistical Data and Metadata Standard (SDMX) allowing machine-to-machine mechanisms for accessing and sharing data. Key features include: • **Web browser** interface to view, query and download data in any required format excel, csv, metadata (SDMX); and • **Web services interface using SDMX** for accessing and sharing data.
	Mobile Mentor	Mobile Mentor helped ABS set a new benchmark for data collection, with a completion rate of more than 96 percent for the 2016 Australian Census. This app allowed Field Officers to leverage the power of their mobile devices. The app was securely delivered to 33,000 field officers by Mobile Mentor using device management software from MobileIron. It was one of the largest **bring-your-own-device (BYOD)** deployments in Australian history.
	eCensus	In 2016, ABS implemented **online census** via website and logins rather than paper based. ABS encountered few technical issues whereby forms were taken offline, however the next census is expected to be online.
	Online Publications	Publications are in **electronic format** directly accessible on the website. Users can further download as pdf, excel, metadata among others. ABS carries out a series of quality assurance tests prior to publication.
	Big Data	ABS developed big data strategy in 2014. A number of initiatives are being progressed to build future capability in the exploitation of Big Data sources and to position the ABS nationally and internationally as a leading agency in advanced data analytics. Potential uses of big data recently investigated include **satellite imagery data** in the context of environmental and agriculture reporting, use of **GPS tracking for freight statistics**; and **telecommunications data** for service populations and other fly-in-fly-out populations.
	Microdata	ABS provides access to microdata upon application, while meeting the **legislated requirement to protect secrecy**. Access is via a range of mechanisms including a virtual DataLab analysis environment, products such as TableBuilder and two-way staff secondments.
People	**Skills and Capacity building**	To equip and enable an agile workforce, ABS is currently implementing a flexible working environment. ABS staff can efficiently work from home, or

Key Initiatives	Sub components	Description
		remotely, through smarter use of technology, with staff working from mobile computing devices on an enhanced computing network. • **Implementation of Learning Management System**, CapabilityPlus, provides online access to capability development options for field and office staff, external clients. • **Developed a statistical capability framework** to guide building statistical capability internally, domestically and internationally. • **Run graduate program** is run annually and is a key part of how the ABS maintains capacity building.

Estonia

Statistics Estonia (SE[3]) is a state authority acting under the Ministry of Finance responsible for producing official statistics for Estonia. It is part of the European Statistical System (ESS) contributing to the development of international statistics. The vision of Statistics Estonia is to become by 2022 the most effective and innovative producer of reliable and user-friendly statistics in Europe.



SE works in close collaboration with Ministries, government agencies and Eesti Pank. (Central Bank of Estonia). Annually interacts with 90K+ data providers and has recorded over 2 Million database visits. The organisation structure includes Director General and four department namely Statistics, Development, Marketing and Dissemination and Data Governance and Science.

The table below indicates key initiatives adopted by SE.

Key Initiatives	Sub components	Description
Standards	**International Collaboration**	SE works together with Eurostat, UNECE, OECD among others. SE is part of ESS agreed by the UN Economic Commission for Europea and in the Treaty on European Union and European Statistics Code of Practice.
	SDDS Plus	SE to adopt **IMF SDDS Plus** standard by 2020. Estonia started to adhere to the IMF SDDS (Special Data Dissemination Standard) in 1998. A website must be created that meets the new requirements of SDDS plus whereby data is machine-readable **SDMX format**.
Regulation, Policy, Framework	**Quality Framework**	SE continuously invest in research and develop qualitative research methods and frameworks for improving data acquisition, processing and dissemination. Based on the work by the Ministry of Economic Affairs and Communications, a maturity model approach for monitoring data governance quality will be implemented by 2022. SE aims for up-to-date solutions for disseminating data and statistics to the whole society.
Technology	**Advanced Visualization and Interactive portals**	SE has implemented data portals with controlled access to avail and visualise data as follows: **Data Portal** – Interactive data manipulation and visualisation with option to save in different formats, csv xls, json among others. **Trade Portal** – Implemented in 2019, that provides real time information on the country's main export and import partners. **Labour Portal** – an interactive dashboard application (shiny.stat.ee) in cooperation with the Ministry of Social Affairs, which gives a clear overview of labour policy indicators. **Management Dashboards** – A decision making tool for public authorities, enterprises, journalists and everyone else for making informed and data-based decisions. Dashboards can be customised to create overviews of indicators of interest, which can be monitored for developments.
	eStat	eStat has been implemented to facilitate data acquisition from third parties. The portal allows companies to fill in questionnaires or upload the information in form of raw data. eStat also provide individual information back to the data providers by sharing their position vis a vis the same industry/sector.

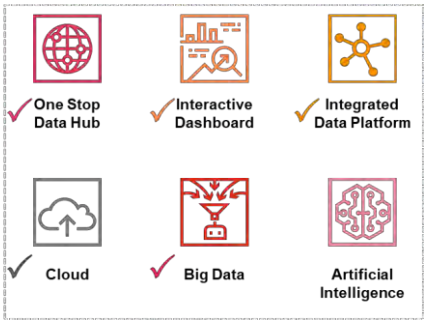
[3] https://valiskaubandus.stat.ee/profile/country/ee/,https://www.stat.ee/en
https://www.stat.ee/sites/default/files/2021-01/Annual%20report%202019.pdf
Development plan Estonia 2018-2022,https://e-estonia.com/

pwc

Key Initiatives	Sub components	Description
	API	SE uses **direct API's** with key administrative data providers such as Tax and Customs Board and central bank to reduce time spent on data acquisition.
	Data Anonymisation	Besides single access to data, different user groups (e.g. researchers, data analysts, SE statisticians) require the possibility to link datasets quickly and conveniently. Confidential data according to use cases are **pseudo-anonymised**, which allows linking data for analysis purposes but not identify at individual or enterprise level.
	Emerging Technologies – AI and ML	SE is adopting smart tools such as artificial intelligence and machine learning to automate business processes. An example is **automatic and self-learning algorithms**, which allow doing data checks, or **virtual assistant named Ilti** , which can independently answer simple and more frequent questions on finding data of statistical activities.
	Tree of Truth	A web application which gives a clear and objective picture of the country health check by comparing current standings vis a vis 135 indicators set out in government strategy.
	Big Data	Estonia adopts new data sources incl. big data, such as data from mobile positioning, card payment centre, store cash register systems, bank accounts, internet posts, social media, speed cameras etc. Statistics Estonia places high importance on constant review **of data architecture due to high volume of unstructured data**. This source of statistics is playing a bigger role with the advent of smart technologies in society. Efforts are required to manage data assets (files, schemas) and services (APIs, interfaces) so as it connects seamlessly to meta information system.
People	**Skills and Capacity building**	Key initiatives include: • Define **skills models** based on Generic Statistical Business Process Model. • Develop **specific training system**/ programmes such as data mining in cooperation with partners (e.g. Center for Big Data Statistics in the Netherlands) and offer data mining services. • **Offers support to organisation** in terms of understanding meta information, methodology and data interpretation. • Run **social awareness campaigns**. • Introduce **data stewards in organisation** for coordinating the activities around data governance.

Rwanda

In line with national development policies including SMART Rwanda Master plan and National Strategy for the Development of Statistics (NSDS), Government of Rwanda implemented a **National Statistical System (NSS)** 2009-2014, which groups of statistical organizations and units for data collection, processing and dissemination of official statistics on behalf of the Government of Rwanda. NSS constitutes of **National Institute of Statistics of Rwanda (NISR[4])** and various State institutions that provide statistical information. NISR is the national statistics body producing official statistics for the country.



Today, Rwanda ranks 41st in the Open Data Inventory 2020 with an overall score of 65. The Open Data Inventory (ODIN) measures how complete a country's statistical offerings are and whether their data meet international standards of openness.

Key Initiatives	Sub components	Description
Standards	**E-GDDS / SDDS**	NSS under the lead of NISR publishes macroeconomic data on the National Summary Data Page (NSDP) as recommended by IMF's enhanced General Data Dissemination System (e-GDDS). Rwanda plans to transition towards subscribing to Special Data Dissemination Standards (**SDDS**) in the near future.
	Open SDG Platform	With the partnership of the ONS, NISR has chosen to report **SDG indicators** using the National Reporting Platform (NRP) as it is easily accessible, with automatically generated visualizations to show progress over time.
Regulation, Policy, Framework	**Data Revolution Policy (DRP)**	NISR will be responsible for implementing the **data revolution policy** alongside other development partners and will be executed in a span of 5 years from 2017-2022. DRP focuses on **building big data and analytics capabilities** to derive insights that contribute to social-economic benefits including informed policy decision making, enhancing transparency and promoting citizen participation, GDP contribution, Monitoring National Development Progress and SDGS, supporting research and development, Business Intelligence, Innovation for data enabled applications among others.
Technology	**Data Portals**	NISR has introduced **web-based data platforms with data modelling capabilities** for specific data types such as microdata, aggregate data and geo-spatial data etc.). This portal provides: • **Interactive dashboard** for users to drill down into charts and graphs • Access to specific data and **metadata** • Application Programme Interface (API) and Web Services for automated data sharing. **SDMX** facilitates access to various web services function.
	Highway Rwanda	This is a back end technology stack to support the Data Portal. It enhance user experience by **visual discovery and advanced analytics** utilizing aggregate data. The dashboard designer facilitates creation of customized dashboards. Data, visualizations (including the maps) could be delivered via email and exported to various file formats including Excel, PDF and HTML.
	Big Data	With high growing demand for data to monitor global 2030 agenda (SDGs), NISR is exploring other source of data to complete official statistics. As such, NISR is working in partnership with UK Bureau of Statistics for implementation of Big Data. Rwanda will be among few countries to explore the use of big data

[4] https://microdata.statistics.gov.rw/index.php/catalog, https://odin.opendatawatch.com/Report/countryProfileUpdated/RWA?year=2020, http://www.devinfo.statistics.gov.rw/di7web/libraries/aspx/Home.aspx, https://rwanda.opendataforafrica.org/

https://www.statistics.gov.rw/

Key Initiatives	Sub components	Description
		for M&E of development programmes (EDPRS2, Vision 2020, and upcoming Vision 2050).
	GeoSpatial Data	Data portal offers statistics in the form of **maps and location data**. Maps can be viewed in native browser environment, downloaded in various formats and shared either through links or embedding in a website or blog.
	NADA	Dispenses **metadata** and **anonymized microdata** of surveys.
People	**Training and Capacity Building**	Ongoing exercise for capacity building including assessing learning needs, Developing Training Plan, Secondments into NISR/NSS and Secondments out of NISR/NSS. A **dedicated team of data scientists** is also being setup to report on DRP to NISR.

Appendix 2: Existing Data Source

Multiple data sources are currently being used within SM for preparation of indicators/publications such as ESI, Digest and historical series, among others.

Key data sources have been categorised as follows:

- **Administrative Sources**, such as Mauritius Revenue Authority (MRA), among others.
- **Surveys and Census.**

A. Administrative Sources

SN	Stakeholders	Information received	Channels	Frequency	Document type	Units
1.	**Mauritius Revenue Authority (MRA)**	• VAT registration and transaction data • Company income tax transaction data	CD (collected by SM)	Yearly	Excel	• CBR • National Accounts
2.	**Corporate Business Registration Department (CBRD)**	Business registration data	Companies and Businesses Registration Integrated System (CBRIS)	Monthly	PDF	CBR
3.	**Civil Status Division**	Vitals (Births, Deaths and Marriages)	Email	Monthly	LST	Demography
4.	**Judiciary Department**	Divorces	Email	Yearly	Excel	Demography
5.	**Ministry of Health and Wellness**	Codification for cause of death	Pen drive (dispatched to SM)	Monthly	IMPS	Demography

B. Surveys and Census

SN	Surveys/ Census	Frequency	Target participants	Channels	Unit using data collected
Census					
1.	Housing and Population Census	Every 10 years	Households	Tablet-based for field data collection (Computer-Assisted Personal Interviewing – CAPI)	Multiple units across SM, such as Demography, etc.
2.	Census of Economic Activity (Large Establishment)	Every 5 years	Large enterprises (More than 10 employees)	Online questionnaire	Multiple units across SM, such as National Accounts and

SN	Surveys/ Census	Frequency	Target participants	Channels	Unit using data collected
					Prices, CBR, etc.
3.	Census of Economic Activity (Small Establishment)		Small enterprises (Less than 10 employees)	Face to Face Interview using questionnaire	National Accounts
4.	Census of Agriculture	Every 10 years	Authorities such as Mauritius Sugar Syndicate, Mauritius Meat Authority, FAREI among others Household and non-household farms (databases of MAIFS, FAREI, Small Farmers Welfare Fund and Housing Census)	Face to Face Interview using questionnaire	Social and Labour Statistics – Agriculture Unit
5.	Census at School	Annual	All Schools	Excel questionnaire	This census is run by Ministry of Education
Surveys					
6.	Continuous Multi-Purpose Household Survey (CMPHS)	Monthly	Primary Sampling Unit	Computer Assisted Telephonic Interview - CATI	• CMPHS
7.	Survey of Employment and Earnings (SEE)	Yearly	Private and public establishments	Questionnaire sent by email	• SBR • Ministry of Labour • Public Finance Unit • National Account
8.	Survey of Employment, Earnings and Hours of Work (SEEHW)	Quarterly	Private and public establishments	Questionnaire sent by email	• SBR • Statistics Unit of Ministry of Industry • National Accounts
9.	Prices – CPI	Monthly	Retail outlets	Price entry Book	• Multiple units across SM, for calculation of indicators, e.g. National Accounts
10.	Prices – PPIA	Monthly/ Weekly	Markets	Tablet – Survey solutions	
11.	Prices – PPIM	Monthly	Manufacturing Companies		
12.	Prices – COPI	Monthly	Retail outlets such as Quincaillerie	Price entry Book	
13.	Prices – EPI	Monthly	Selected export enterprises	Paper Questionnaire	• Multiple units across SM, for

SN	Surveys/ Census	Frequency	Target participants	Channels	Unit using data collected
					calculation of indicators, e.g. National Accounts
14.	Prices – IPI	Monthly	Selected import enterprises	Paper Questionnaire	• Multiple units across SM, for calculation of indicators, e.g. National Accounts
15.	Inbound Tourism	On hold due to COVID_19			
16.	Household Budget	5 Years	Households	Face to Face interview using paper questionnaire	Prices
17.	Living Condition	Adhoc	Households	CAPI	Social Analysis

Appendix 3: Change and Communication Management

Typical Risks and Mitigation Steps

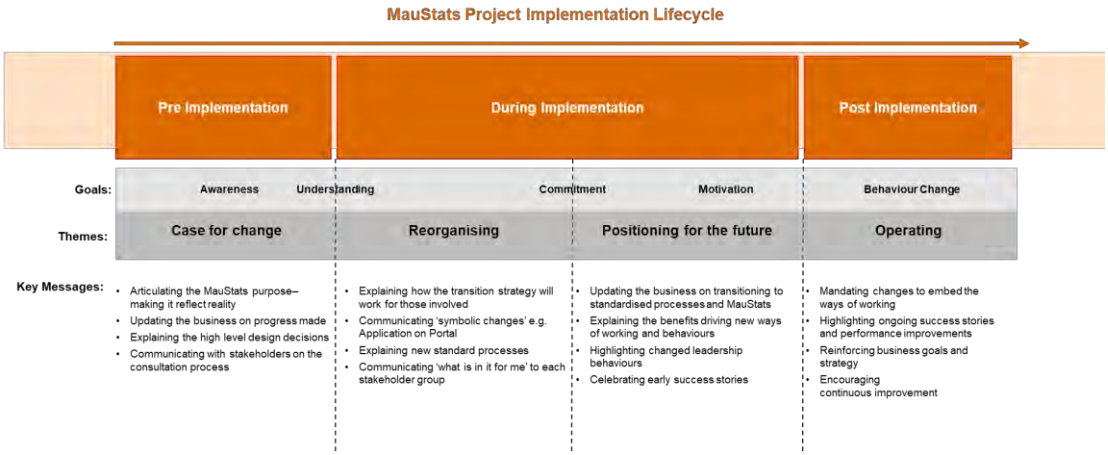
Typical risks that SM needs to consider while developing the change management programme are:

Challenges	Risks / Barriers	Mitigation Steps
Stakeholders buy in	Disengaged stakeholders who do not understand the benefits of MauStats	• Identify and engage stakeholders/functions (such as CISD, CIB, ITSU, etc.) from project conceptualisation. It is important to onboard key stakeholders, especially those having an influence and impact on the project right from the start. • Communicate vision and objectives of SM future operating model. • Define clear roles and responsibilities and expectations from each stakeholder. • Roll out communication messages as per the plan. • Solicit formal/informal feedbacks from stakeholders. • Ensure stakeholders participation in workshops and discussions to get their views and feedbacks.
Business Adoption	Underestimating the transition risk and the impact of change	• Make sure appropriate planning is undertaken from conceptualisation of MauStats onwards and mitigate against potential downstream transition risk. • Support from top management and government to roll out the project. • Empower selected staff/stakeholder groups to be 'champions' of the system.
New ways of working	Resistance to the adoption of new ways of working	• Make sure adequate time is incorporated into the plan to successfully embed new ways of working via communications and training. It is critical in driving the adoption of the new technology and embedding standardisation and change within SM and stakeholders. • Conduct in depth training needs analysis and define capacity-building plan. • Monitor and evaluate the capacity building plan. • Communicate to stakeholders on the new ways of working and the process in place to assist in the transitioning phase.
Culture change required	Culture and behavioural change are not given equal consideration	• Assess what behaviours and ways of working will change as a result of MauStats and what the cultural implications of doing this might be. • Devise mitigation actions to make sure that the change culture is adopted. • Conduct National level awareness campaigns to build trust and confidence in MauStats.
Sustainability	Implementing simple and effective performance measures and rewarding quick wins / successes.	• Define key performance metrics where success is recognised, and quick wins are shared to stakeholders. • Provide incentives for successful adoption example waiving of fees on specific cases or accessing the cadastre free of charge for a limited period of time amongst others.

Implement Change Management Programme

Change and Communication Working group has the responsibility to manage communication plan and update same during project execution. This team must also make sure that the communication messages are clear, the target audience is correct, purpose of the communication message is set and make sure that most effective channel of communication is being used.

The diagram below illustrates key components involved while implementing Change Management Programme pre, during and post implementation of MauStats.



The table below illustrates a sample communication plan which needs to be defined in order to embark on MauStats project.

Target Audience	Key Messages	Purpose	Communication Channel	Frequency
All employees	• Project conceptualisation information • New ways of working • What will be required from the stakeholders along with the roles and responsibilities for this stage? • What are the Go-Live and cut off dates of the project? • What will be the post Go-Live procedures to log and escalate issues? • Who will be the contact person and the person responsible for the tracking of issue resolution? • What are the resources (e.g. Champions) and supporting materials (e.g. User guides) available to help the	Inform employees on the project conceptualisation, key dates such as requirement gathering, training, data migration, UAT and Go-Live dates of the system and the cut over plan to ensure smooth transition during the go-live period. Communicate details on the procedure to adopt when encountering issues and who to contact for resolution.	Emails / Digital / SMS / Website / Press Release / Media Statement / Discussion/ Face to Face	Once Off

Target Audience	Key Messages	Purpose	Communication Channel	Frequency
	users with the system?			
SM Core Project Team	• How far the users are comfortable with the system and the new processes? • What is the coverage of business requirements by the system according to the stakeholders? • What are the challenges faced by the stakeholders / users when using the system? • What are the challenges the users/stakeholder foresee for the Go-Live of the system?	To assess how ready the users are for the new system and any challenges they are experiencing or foresee. To have a feedback on the training and User Acceptance Testing and outcome of Pilot stage.	Email / Discussion / Face-to-face events / Visual Collateral and Feedback session	Regularly
Citizen/Data Users	• What will Citizens be able to do with the new system? • What is the level of access they will have and how much they will be able to do with the MauStats Portal? • What are the resources Citizens will have access to, to guide them in their requests and queries?	To create awareness on the importance of this particular project and the Citizens role and features available.	Press release, Media Statement / Visual Collateral and feedback session / Face-to-Face events	Regularly
Solution Implementer (SI)	• Potential interruption in business • What are the Go-Live dates of the system • How will this Go-Live affect the way user interacts with SM? • What are the changes in specific processes involving direct client interaction?	Inform key stakeholders of the Go-Live dates of the system and how it will affect them. To act as a reminder that the processes will change with the new system.	Emails / Press release, Media Statement	Once Off

Develop a comprehensive Change Management Programme

A comprehensive Change Management Programme is critical to realising success with MauStats. This includes stakeholder analysis, defining a clear and compelling vision for change, comprehensive communications, job / role design, effective metrics and measures and user training.

The key elements to consider while devising the change management programme for MauStats are:

1. Stakeholder Engagement Approach
2. Communication Plan
3. Change and Capacity building
4. Typical Risks and Mitigation Steps

Stakeholder Engagement Approach

Active stakeholder engagement throughout the project execution is critical to assure commitment and thereafter facilitate the change associated with the implementation of MauStats. It also contributes to the change culture and sustainability of the project in the future.

Typical risks associated with limited stakeholder engagement include:

- Limited participation by stakeholders to support project goals and objectives;
- Resistance to adopt new policies, procedures and technology due to a limited view on the overall project impact and benefits;
- Resistance to perform the assigned tasks and activities due to lack of visibility on their roles and responsibilities; and
- Potentially setting the stage for a negative environment for change during project execution.

The table below illustrates the various engagement types that key stakeholders during the implementation of MauStats.

SN	Stakeholder group	Type of engagement	Why Stakeholder Engagement is required?	Communication touchpoints
External				
1	**Data Providers – InfoHighway / APIs**	Work together (inform, consult and collaborate)	• Get buy in and commitment for project success and in the long term. • Commitment and support in key project phases such as interfacing/integration analysis, design, testing and Go Live. • Work in close collaboration with SM project team during project execution. • Be available for meetings and discussion on interfacing touchpoints with SM. • Conduct intensive integration testing with SM project team and provide sign off. • Be ready to sign Memorandum of Understanding with SM.	• Awareness meetings and workshops. • Interfacing working sessions. • Policy and Procedure Change Meetings.
2	**Data Providers – Non APIs (Census, Surveys and others)**			
3	**Data Users**	Keep informed	• Be aware of the project and how they will be impacted in the future. • Facilitate MauStats adoption across citizen and other data users such as Regional and International organisation.	• Adhoc meetings or email communications for specific data users. • Public Campaigns (TV, Billboard, Radio, Social Media, Public Conference etc.). • SM Channels (Website).
4	**Advisors from public agencies (CIB,**	Inform and Consult	• Will form part of PSC members and support in decision taking.	• Project Steering Committee meeting. • Monthly Project Reports.

	CISD, ITSU, MOFED, GOC etc		• Need to keep informed and consulted throughout project execution.	• Policy and Procedure Change Meetings, among others and other adhoc meetings.
Internal				
5	**SM Board of directors**	Keep informed	• Demonstrate Leadership commitment towards the project	• Board Meetings
6	**SM Director**	Inform and Consult	• Demonstrate Leadership commitment towards the project • Key decision maker as Chairperson of Project Steering Committee (PSC) • Address project risks and issues • Change Management Driver	• Project Steering Committee Meetings. • Monthly Project Reports. • Adhoc meetings.
7	**SM Core Project Team (Statistical Services, Corporate Services, DGO)**	Work together (inform, consult and collaborate)	• Ultimate users of MauStats, need their buy-in and commitment for project success. • Actively participate during project execution to achieve project goals and objectives. • Actively participate during project campaigns to encourage adoption of MauStats.	• Communication and meetings with representatives from each department. • Online Surveys. • Online and physical channels (website/notice boards) • Policy and Procedure Change Meetings, among others.

Communication Plan

Once stakeholders have been identified and mapped against the level of influence vis-à-vis impact, a clear communication strategy must be defined to outline the various channels of communication, frequency, type of messages among others.

Communication is one of the most significant pillars for stakeholder engagement and SM must maintain robust communication practices in order to build trust, listen to stakeholders and establish a two-way channel for continuous improvements. The stakeholder engagement and communication plan will provide a roadmap for interventions and communications throughout the entire program in order to:

- Provide a link between the program objectives, stakeholder management and communications planning and delivery;
- Engage a Culture Steering Committee to ensure stakeholder management and communication supports the delivery of the program benefits;
- Maintain consistent workstream communications towards achieving project goals and objectives.
- Show how stakeholders will be involved in the on-going development of subsequent stages of the communication plan.

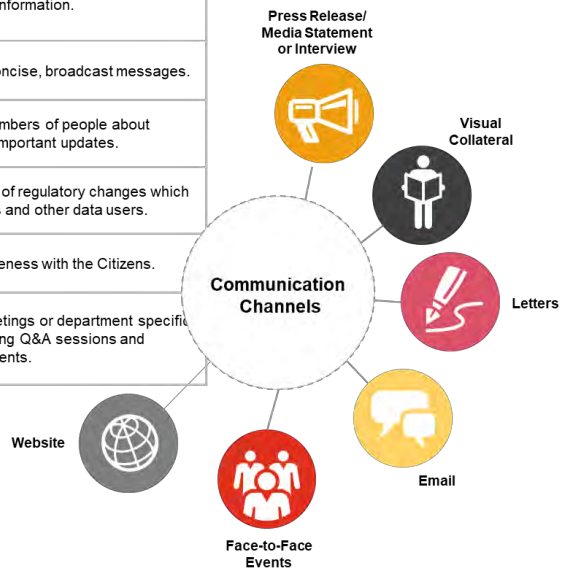
Stakeholder communication requires ownership of communication materials and channels that are used to distribute information. It requires significant effort to determine the channels of engagement, frequency and way of communication with stakeholders. Ownership of Communication is to make sure governance is established and stakeholder communication is an institutional process.

Success measures will also be identified so that the effectiveness of engagement and communication activities can be measured throughout the duration of the program.

The diagram below illustrated the typical communication channels:

Channels of Communication

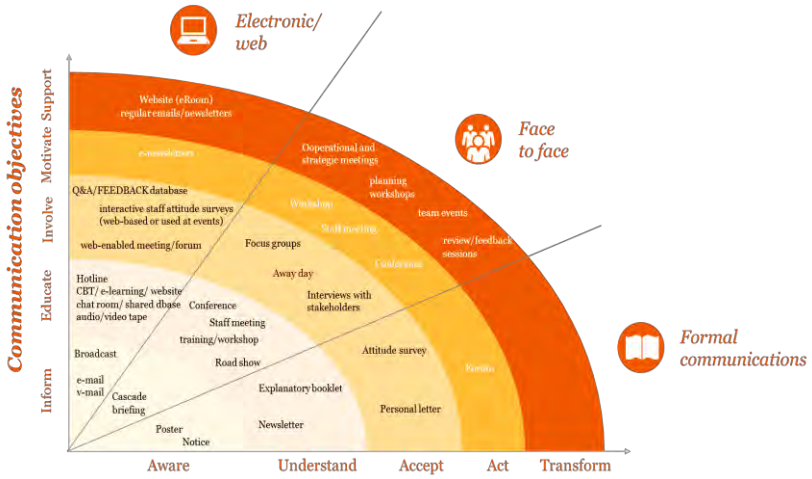
Channels	Description
Press Release/ Media Statement or Interview	For informing broad populations about changes and/or requesting for information.
Visual Collateral	For providing clear, concise, broadcast messages.
Letters	For informing large numbers of people about services, events and important updates.
Email	For formal notification of regulatory changes which may affect the citizens and other data users.
Face-to-Face Events	Best for building awareness with the Citizens.
Website	Best for customer meetings or department specific announcements, holding Q&A sessions and recognising achievements.



Monitor and Evaluate effectiveness of the Programme

In order to measure the effectiveness of the programme, Change Management Team must conduct perception surveys to assess level of change readiness for the project. Formal and Informal feedbacks may be solicited in order to identify any gaps and thus develop a set of mitigation steps to address any potential risk.

The diagram demonstrates a typical change maturity framework based on organization readiness vis a vis the communication objectives and activities that need to be undertaken for successful MauStats.



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