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OPEN ASIA
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OPEN-ASIA: Boosting engagement of HEIs in Open Science in India and Malaysia

OPEN SCIENCE INFRASTRUCTURE DEVELOPMENT PLAN P5-UMS

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University Malaysia Sabah
P5-UMS

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Executive Summary

Universiti Malaysia Sabah (UMS), as the leading public university serving Sabah and northern Borneo, is committed to strengthening its research ecosystem through the adoption and institutionalisation of Open Science principles. Open Science represents a transformative approach that promotes transparency, accessibility, reproducibility, inclusiveness, and collaborative knowledge creation across the entire research lifecycle. Through this initiative, scientific outputs including publications, datasets, methodologies, software, and educational resources can be shared responsibly and equitably to maximise societal and scientific impact.

This Open Science Infrastructure Development Plan has been developed under the framework of the OPEN-ASIA project, funded through the ERASMUS+ Programme (Project Reference No. 101128493), which aims to strengthen higher education institutions' engagement in Open Science practices across India and Malaysia. The plan establishes a strategic institutional roadmap to guide UMS in developing enabling policies, sustainable infrastructure, institutional capabilities, and stakeholder engagement mechanisms that support long-term Open Science implementation.

The plan outlines an integrated approach consisting of governance and policy enhancement, digital infrastructure development, research data management, capacity building programmes, outreach initiatives, and continuous monitoring mechanisms. Through coordinated implementation across university entities, UMS aims to establish an institutional environment where openness and responsible research become embedded in everyday academic and research practices.

The expected outcomes include increased visibility of UMS research outputs, stronger interdisciplinary collaboration, improved compliance with international research standards, enhanced reproducibility of scientific findings, and greater societal impact through broader public access to scientific knowledge.

1. Introduction

Open Science has emerged as a global movement that seeks to transform how scientific knowledge is generated, shared, evaluated, and utilised. It extends beyond open access publishing to encompass open research data, open methodologies, open educational resources, citizen science, and transparent scientific communication. International organisations, including UNESCO and the European Commission, increasingly recognise Open Science as a strategic mechanism to accelerate innovation, improve research quality, and increase public trust in science.

Universiti Malaysia Sabah recognises that the future of higher education and research depends upon the institution's ability to create a more collaborative, transparent, and digitally enabled research environment. Located in one of the world's most biodiverse regions, UMS carries a unique responsibility to generate and disseminate knowledge that contributes not only to local development but also to global scientific advancement.

Open Science provides UMS with an opportunity to strengthen interdisciplinary collaboration across faculties and research institutes while increasing the accessibility and impact of institutional research outputs. By reducing barriers to access and promoting responsible data sharing practices, Open Science can accelerate discovery and encourage more meaningful engagement among researchers, policymakers, industry partners, communities, and society.

This development plan therefore establishes a comprehensive framework for Open Science implementation through strategic investment in policy development, infrastructure enhancement, institutional governance, digital platforms and human capital development.

2. Goals and Objectives

The goal of this Open Science Infrastructure Development Plan is to **establish UMS as a regional leader in Open Science implementation through the development of sustainable institutional capabilities and digital ecosystems**.

Specific objectives include:

Objective 1: Promote Open Access to Research Outputs

- Increase the availability and discoverability of scholarly publications, conference proceedings, reports and educational materials through institutional repositories and open publishing mechanisms.

Objective 2: Strengthen Research Data Sharing and Reuse

- Develop infrastructure and governance mechanisms that enable responsible sharing, preservation, and reuse of research data while ensuring ethical and regulatory compliance.

Objective 3: Enhance Research Transparency and Reproducibility

- Encourage adoption of transparent methodologies, documentation standards, and reproducible research practices throughout the research lifecycle.

Objective 4: Foster Interdisciplinary and Cross-Sector Collaboration

- Facilitate collaboration among faculties, industry, government agencies, international institutions, and local communities.

Objective 5: Build Institutional Capacity for Open Science

- Develop knowledge, competencies, and awareness among researchers, students, and staff through structured training and engagement programmes.

Objective 6: Establish a Sustainable Open Science Culture

- Integrate Open Science principles into institutional processes, incentives, governance structures and strategic planning.

3. Policy Framework

Effective implementation of Open Science requires an enabling governance environment supported by clear institutional policies and operational guidelines. UMS has established foundational policies that support responsible data management and knowledge dissemination.

Existing institutional policies that contribute to Open Science implementation include:

- UMS Data and Information Policy (2019)
- UMS Data Collection Guideline (2019)
- UMS Data Application and Submission Guideline (2019)
- UMS Open Data Guideline (2023)
- UMS Institutional Repository Policy (2022)
- UMS Intellectual Property and Commercialisation Policy (2023)

To further strengthen implementation, UMS proposes additional governance mechanisms:

- Development of an Institutional Open Science Framework.
- Establishment of Open Science governance committees.
- Definition of institutional metadata and interoperability standards.
- Introduction of Open Science compliance indicators.
- Integration of ethical and responsible AI principles into research governance.

The policy framework shall ensure a balanced approach that supports openness while protecting privacy, intellectual property rights, and sensitive information.

4. Infrastructure Components

The successful implementation of Open Science at Universiti Malaysia Sabah requires a robust, interoperable, secure, and sustainable digital infrastructure that supports the complete research lifecycle from project initiation and data generation to dissemination, preservation, and reuse. UMS shall establish a coordinated Open Science infrastructure consisting of four major components.

4.1 Repository and Data Management Platform

UMS shall strengthen and expand institutional repository capabilities to provide centralised access to scholarly outputs, research datasets, learning materials, and institutional knowledge assets.

The repository shall support:

- Research publications and institutional reports
- Research datasets and supplementary materials
- Open educational resources (OER)
- Conference proceedings
- Theses and dissertations
- Software, codes, and digital artefacts

The platform shall adopt international interoperability standards to ensure discoverability and long-term accessibility.

UMS Digital Department shall provide technical administration (centralised infrastructure) while UMS Library and Data Management & Artificial Intelligence Centre (DARTIC) shall coordinate governance, metadata quality, curation and preservation activities.

4.2 Open Access Publishing Support

UMS shall expand institutional mechanisms that support researchers in publishing openly and increasing global visibility.

Support mechanisms include:

- Funding support for article processing charges (where applicable)

- Advisory services on journal selection and publication ethics
- Promotion of institutional publishing initiatives
- Support for preprint and repository deposition
- Publication impact monitoring

Strategic partnerships with publishers, industries, and international institutions shall further strengthen accessibility and dissemination.

4.3 Research Data Infrastructure

The Research Information System (*Sistem Maklumat Pengurusan Penyelidikan* – SMPPI) Research data are recognised as strategic institutional assets.

The existing Research Information System (SMPPI) shall evolve to support:

- Research data storage and management
- FAIR data implementation
- Metadata standardisation
- Persistent identifiers
- Data lifecycle governance
- Controlled access management

Research data infrastructure shall facilitate both openness and responsible stewardship.

4.4 Collaboration and Networking Platforms

Open Science requires collaboration beyond institutional boundaries. UMS shall establish digital and physical engagement platforms including:

- Open Science portal
- Research communities of practice
- Collaborative workspaces
- Stakeholder communication channels
- International Open Science partnerships

These initiatives will strengthen interdisciplinary engagement and improve research impact.

5. Training and Capacity Building

The long-term sustainability of Open Science depends upon institutional readiness and human capability development. UMS shall establish a structured capacity-building framework to cultivate Open Science competencies among researchers, academic staff, postgraduate students, administrators and external stakeholders.

Training themes include:

- Introduction to Open Science
- FAIR Data Principles
- Research Data Management

- Repository and metadata practices
- Open licensing and copyright
- Open-source research tools
- Reproducible research workflows
- Ethical and responsible research practices

Capacity-building initiatives include:

- Annual Open Science Program
  - An annual institutional programme designed to provide practical training and showcase successful implementation cases.
- Postgraduate Integration
  - Embedding Open Science modules into postgraduate curricula.
- Train-the-Trainer Programme
  - Building internal champions across faculties and research centres.

Recognition mechanisms including awards and incentives shall support long-term adoption.

6. Outreach and Community Engagement

Open Science aims not only to transform internal research practices but also to strengthen public participation and societal benefit. UMS shall establish engagement programmes that connect researchers with communities, government agencies, industries, and educational institutions.

Key initiatives include:

6.1 SCIENCE SHOP 2.0

A collaborative platform connecting community challenges with academic expertise.

6.2 Citizen Science Programmes

Opportunities for public participation in scientific activities and knowledge generation.

6.3 Open Science Awareness Campaigns

Public seminars, conferences, exhibitions, and digital outreach.

6.4 Industry and Government Engagement

Joint innovation programmes and knowledge-sharing initiatives. These activities will improve scientific literacy and strengthen trust in research.

7. Evaluation and Monitoring

Continuous evaluation is required to ensure successful implementation and sustainable institutional impact. UMS shall establish an Open Science monitoring framework with measurable indicators.

Key performance indicators include:

- Research Visibility
  - Percentage of open-access publications
  - Repository growth rate
- Data Sharing
  - Number of datasets deposited
  - Dataset reuse statistics
- Capacity Development
  - Number of training sessions
  - Participation rates
- Collaboration
  - External partnerships
  - Interdisciplinary projects
- Institutional Impact
  - Research citation growth
  - Public engagement indicators

Monitoring mechanisms shall include:

- Annual reporting
- Stakeholder feedback
- Strategic review every three to five years

8. Budget and Resource Allocation

Successful implementation requires sustainable investment across multiple dimensions. Investment categories include:

8.1 Infrastructure

Servers, storage systems, repository enhancement, cloud services, cybersecurity.

8.2 Software and Platforms

Repository systems, analytics tools, metadata services, integration capabilities.

8.3 Human Resources

Technical teams, trainers, coordinators, data stewards.

8.5 Training and Outreach

Programme delivery, educational materials, engagement activities.

8.6 Strategic Partnerships

Collaborative funding and international networking. UMS shall explore blended funding approaches including institutional allocation, grants, external partnerships, and international funding opportunities.

9. Timeline and Implementation Plan

The implementation of the Open Science Infrastructure Development Plan shall follow a phased and progressive institutional transformation approach. The roadmap is designed to ensure that governance structures, technological infrastructure, institutional readiness, and stakeholder adoption are developed systematically while maintaining operational sustainability. Implementation is divided into four strategic phases that collectively support the transition from infrastructure establishment to long-term institutionalisation of Open Science practices across Universiti Malaysia Sabah (Refer **Error! Reference source not found.**, **Error! Reference source not found.**).

Phase 1: Foundation and Governance (2024)

Target: Establish institutional readiness by developing governance mechanisms, policy alignment, technical architecture, and implementation structures.

Key Activities:

- Establish Institutional Open Science Committee.
- Review and strengthen existing institutional policies related to Open Science.
- Develop institutional Open Science governance framework.
- Conduct baseline assessment of existing infrastructure and maturity.
- Define repository architecture and interoperability requirements.
- Identify institutional KPIs and monitoring indicators.
- Develop communication and change management plans.

Responsible Units:

- Research Management Centre (RMC) – Lead Governance
- Digital Department – Lead Infrastructure
- DARTIC
- Library

Expected Deliverables:

- Institutional Open Science Governance Framework
- Infrastructure Blueprint Document
- Baseline Assessment Report
- Open Science Policy Enhancement Recommendations
- Implementation Governance Structure

Success Indicators

- Governance committee established
- Baseline assessment completed
- Policy review endorsed
- Technical architecture approved

Phase 2: Deployment and Operationalisation (2025)

Target: Deploy digital infrastructure and operational services to support institutional Open Science practices.

Key Activities:

- Implement repository and data management platforms.
- Strengthen integration with existing institutional systems (SMPPI).
- Configure metadata standards and interoperability mechanisms.
- Establish researcher onboarding procedures.
- Develop institutional user support services.
- Launch Open Science portal and communication channels.
- Pilot data publication and repository services.

Responsible Units:

- RMC - Lead
- Digital Department
- Library
- DARTIC
- Faculties and Research Institutes

Expected Deliverables:

- Operational repository platform
- Integrated research data services
- Institutional Open Science portal
- User manuals and standard operating procedures
- Pilot implementation report

Success Indicators:

- Repository operational
- Initial datasets deposited
- Researcher registration achieved
- Service-level targets met

Phase 3: Institutional Adoption (2026)

Target: Embed Open Science practices into institutional culture and expand participation across academic communities.

Key Activities:

- Conduct institution-wide training programmes.
- Introduce Open Science postgraduate modules.
- Establish Open Science Academy.
- Implement certification and recognition schemes.
- Organise seminars, awareness campaigns, and outreach programmes.
- Expand stakeholder collaboration and partnerships.

Responsible Units:

- Library (Lead)
- RMC
- Digital Department
- DARTIC

- Faculty of Computing and Informatics (FCI)
- Academic Faculties

Expected Deliverables:
- Institutional training framework
- Open Science practitioners
- Academic curriculum integration
- Outreach and engagement reports

Success Indicators:
- Increased researcher participation
- Higher repository utilisation
- Growth in Open Access outputs
- Increased training completion rates

Phase 4: Optimisation and Sustainability (2027 onward)

Target: Achieve institutional maturity and position UMS as a regional leader in Open Science implementation.

Key Activities:
- Conduct impact assessment and performance evaluation.
- Benchmark against international Open Science practices.
- Expand international collaboration and consortium participation.
- Strengthen long-term funding mechanisms.
- Introduce continuous service improvements.
- Scale successful initiatives institution wide.

Responsible Units:
- Research Management Centre (RMC) - Lead
- Library
- Strategic Partners

Expected Deliverables:
- Institutional impact report
- Sustainability framework
- International benchmarking report
- Long-term operational strategy

Success Indicators:
- Increased international visibility
- Higher Open Science adoption rate
- Sustainable funding established
- Recognition as regional Open Science reference institution
- Continuous Monitoring Across All Phases

10. Conclusion

Open Science represents a strategic transformation in how Universiti Malaysia Sabah (UMS) generates, manages, disseminates, and translates scientific knowledge into meaningful societal outcomes. In an increasingly interconnected and data-driven world, higher education institutions are expected not only to produce research excellence but also to ensure that knowledge is accessible, transparent, collaborative, and capable of generating measurable public value. Through this Open Science Infrastructure Development Plan, UMS demonstrates its institutional commitment to building an inclusive, responsible, and future-oriented research ecosystem.

The implementation of Open Science at UMS extends beyond technological deployment or policy compliance. It requires coordinated institutional change involving governance reform, digital infrastructure enhancement, researcher empowerment, cultural transformation, and long-term sustainability planning. By integrating repository services, research data management capabilities, open access publishing support, collaborative platforms, and structured capacity-building initiatives, UMS seeks to establish an environment where openness becomes an integral part of research and innovation practices.

This development plan further recognises that successful Open Science implementation depends on active engagement among internal and external stakeholders including researchers, students, university administrators, industry partners, government agencies, funding bodies, and local communities. Through strengthened collaboration and community participation, UMS aims to increase the relevance, visibility, reproducibility, and societal impact of its research contributions while supporting evidence-informed development within Sabah and beyond.

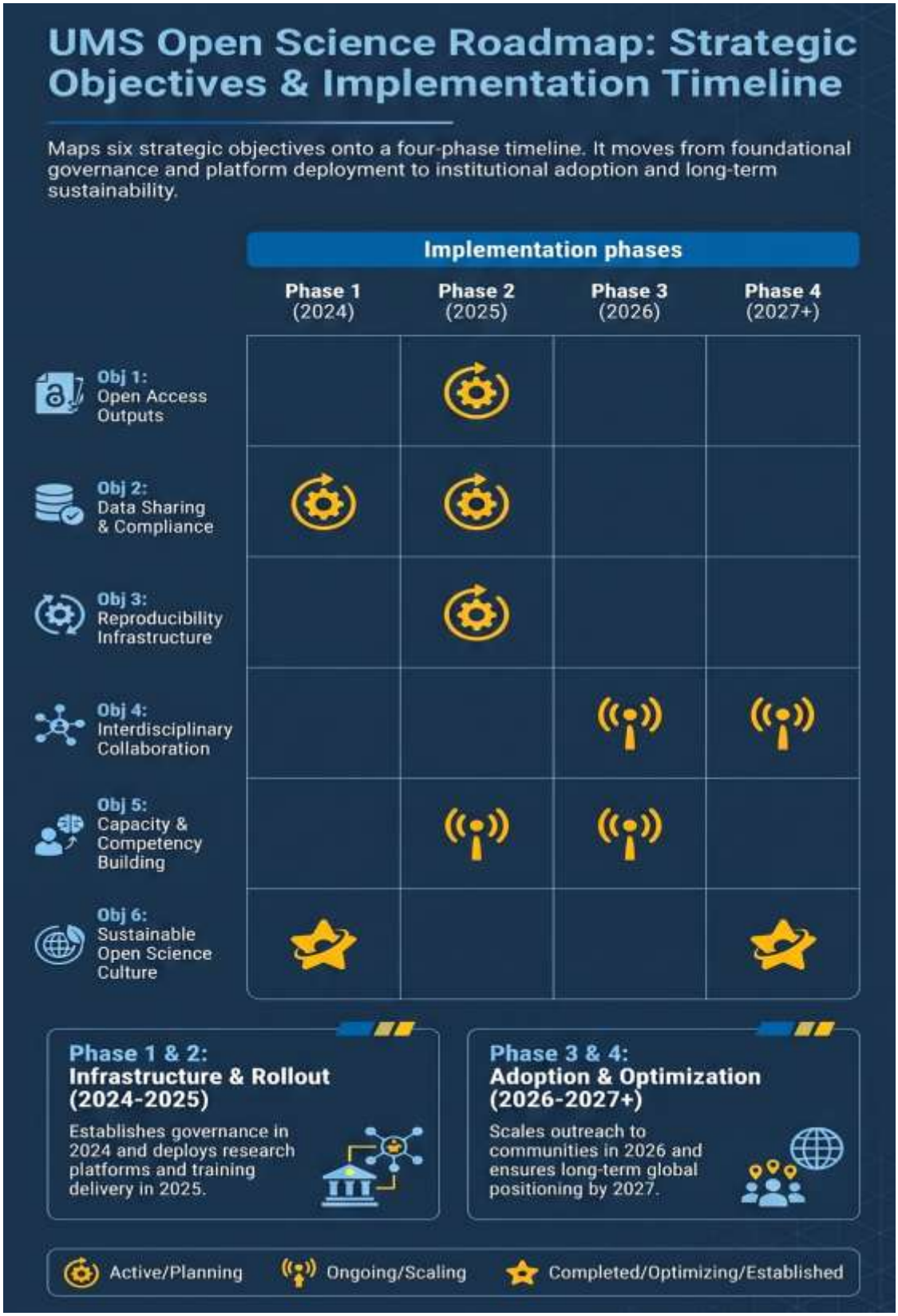
Participation in the OPEN-ASIA initiative under the ERASMUS+ Programme provides UMS with an important platform to accelerate institutional readiness, strengthen international cooperation, and align with emerging global standards and best practices in Open Science. The initiative also positions UMS to contribute actively to regional and international knowledge networks while reinforcing its role as a leading university in northern Borneo.

Ultimately, this Open Science Infrastructure Development Plan serves as a strategic roadmap that guides UMS toward becoming a digitally enabled, collaborative, and globally connected institution. Through sustained commitment, continuous improvement, and collective institutional effort, UMS aspires to establish a resilient Open Science ecosystem that advances research excellence, supports innovation, and delivers lasting benefits to society.

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APPENDIX I: UMS OPEN SCIENCE ROADMAP



APPENDIX II: UMS OPEN SCIENCE ACTION PLAN

STRATEGIC OBJECTIVES	KEY ACTIVITIES	IMPLEMENTATION PHASE/YEAR				DELIVERABLES	SUCCESS INDICATORS	PIC
		1 (2024)	2 (2025)	3 (2026)	4+ (2027+)			
1. Promote Open Access to Research Outputs	Strengthen institutional repository, establish Open Access policy, support OA publishing	✓	✓	✓		Enhanced repository, OA guidelines, publication support programme	≥80% publications deposited in repository; yearly increase in OA outputs	RMC, Digital Dept
2. Facilitate Research Data Sharing and Reuse	Develop FAIR data framework, repository integration, metadata standardisation		✓	✓		Research Data Repository, FAIR Data Guidelines	≥50 datasets deposited annually; FAIR compliance achieved	RMC, Digital Dept, DARTIC, Faculties
3. Enhance Research Transparency and Reproducibility	Develop reproducible research guidelines, promote open-source tools and workflows		✓	✓		Reproducibility Framework, training modules	Increased adoption of open workflows; annual compliance reports	Library, RMC, DARTIC, Faculties
4. Foster Interdisciplinary and Cross-Sector Collaboration	Establish Open Science communities of practice, partnerships, Science Shop 2.0			✓	✓	Collaboration platform, partnership agreements	≥10 active collaborations; increased external participation	RMC, Library, Faculties
5. Build Institutional Capacity for Open Science	Open Science Annual Event, programmes, postgraduate courses		✓	✓		Training modules, certification scheme, academic courses	≥200 participants trained; Open Science course institutionalised	Library, FCI, Faculties
6. Establish Sustainable Open Science Culture and Governance	Establish governance committee, policy reviews, monitoring framework	✓			✓	Governance framework, annual reports, sustainability plan	Annual KPI achievement ›80%; policy compliance maintained	RMC

*Legend: ✓ = Active implementation period, Leads: Research Management Centre (RMC) Research policy implementation, researcher engagement and funding; Library Repository management, Open Access support and capacity building; DARTIC Data governance, FAIR implementation, Open Science technical coordination; Digital Department Infrastructure deployment, system integration and cybersecurity; Faculties Academic adoption, curriculum integration and research implementation