FRAMEWORK DOCUMENTATION

Capability Bridging Framework

A Complete Methodology for Inclusive Public Sector Digital Transformation

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capabilitybridging.org

The Capability Bridging Framework is open. All documentation, tools, and templates are freely available for any organisation to adopt, adapt, and build upon without restriction or licence fee.

1. Introduction

The Capability Bridging Framework provides a structured methodology for designing digital systems that accommodate the full spectrum of stakeholder technical capability without compromising data quality, system integrity, or advancement opportunities.

This document is the complete framework reference. It covers the four integration pathways in full detail, the integration readiness assessment methodology across seven dimensions in two categories, implementation guidance drawn from real-world deployment, the governance approach for managing multi-pathway data integrity, worked examples across four sectors, open source architectural implications, data quality standards per pathway, and monitoring and advancement guidance.

1.1 The Problem This Framework Solves

Public sector digital transformation initiatives consistently encounter the same fundamental challenge: the stakeholders they are designed to serve do not have uniform technical capabilities. Within a single national system, implementers routinely encounter organisations operating sophisticated cloud-based enterprise resource planning systems alongside organisations managing all data in Excel spreadsheets, and others with no digital infrastructure whatsoever.

Traditional implementation approaches respond to this diversity with one of two strategies, both of which are inadequate:

- **Build for the most capable.** Design the system to leverage the full technical potential of advanced stakeholders, accepting that less-capable stakeholders will be excluded or marginalised. This approach delivers sophisticated functionality but wastes public investment by failing to serve the majority.
- **Simplify for everyone.** Constrain the system to a capability level accessible to the least-resourced stakeholders. This approach achieves participation at the cost of utility.

> ***The assumption of uniform technical capability is not merely incorrect. It is a design flaw that has cost governments and development partners billions in failed digital transformation initiatives.***

1.2 The Origin of the Framework

The Capability Bridging Framework did not emerge from a workshop or a theoretical exercise. It emerged from a concrete implementation challenge during the design of The Gambia's Higher Education Management Information System, a World Bank-funded, TOGAF 10-compliant national platform serving the country's entire higher education ecosystem.

Before any technical design work commenced, a multi-day stakeholder consultation brought representatives from across the entire higher education ecosystem into the same room. Institutions described their operational realities to each other for the first time. Some were talking about cloud ERPs and API readiness. Others quietly admitted they managed everything in Excel. A few acknowledged they were still largely paper-based.

Instead of embarrassment, there was relief. Everyone could see the diversity was real, shared, and nobody was alone in their constraints. That collective honesty became the foundation of the framework. A subsequent field assessment across 30 priority institutions confirmed and classified what the consultation revealed, demonstrating 100% integration feasibility across all four pathways within the assessed group.

1.3 Core Principles

- **Permanent pathways, not temporary tiers.** Organisations are not expected or required to advance beyond their current pathway. The framework accommodates permanent diversity. Advancement is supported but never mandated.

- **Identical quality standards across all pathways.** The data quality requirements enforced at Level 1 are enforced equally at Level 4. What differs is the validation mechanism, not the standard.

- **Dignity by design.** The framework treats every stakeholder's operational reality as a valid input to system design, not a problem to be solved or a gap to be filled.

2. The Four Integration Pathways

The Capability Bridging Framework defines four permanent integration pathways. Each pathway accommodates a specific profile of organisational capability while maintaining identical data quality standards. The pathways are not a hierarchy. They are a design accommodation for real-world diversity.

LEVEL 1 | Online Systems Pathway

Profile: Organisations with internet-connected systems capable of real-time data exchange, including cloud-based or web-accessible ERP systems with public IP access.

Integration mechanism: API development enabling real-time, automated data synchronisation. Data flows continuously between the organisation's system and the national platform with immediate validation and error handling.

Key characteristic: Continuous data flow with immediate validation. Any data quality issue is identified and flagged at the point of submission, enabling rapid correction without disrupting the data pipeline.

LEVEL 2 | Local Network Systems Pathway

Profile: Organisations operating ERP or database systems on local networks without public internet accessibility. The system exists and functions but is confined to the organisation's internal network.

Integration mechanism: Scheduled bulk data export and upload, or API development if the organisation chooses to migrate to cloud hosting. Data exports are generated on a defined schedule for upload to the national platform.

Key characteristic: Flexible approach accommodating institutional choice between local operation and cloud migration. Organisations are not forced to migrate to participate. Both options are equally valid pathway choices.

LEVEL 3 | Structured Data Pathway

Profile: Organisations managing data primarily in spreadsheet applications or simple databases. Excel, Access, Google Sheets, and similar tools are the primary data management instruments.

Integration mechanism: Validated template-based bulk upload using standardised formats with built-in validation rules. The organisation completes a structured template file and uploads it on a defined schedule.

Key characteristic: Accessible to organisations without dedicated IT capacity. The validation layer enforces identical data quality standards as higher pathways through template-level rules rather than API-level validation.

LEVEL 4 | Assisted Entry Pathway

Profile: Organisations with minimal or no digital infrastructure, operating primarily on paper-based processes. Staff may have computers but no consistent digital data management practice.

Integration mechanism: User-friendly web portal for direct manual data entry, with bulk upload capability once paper records are digitised. Staff enter data directly into the national platform through a guided interface designed for non-technical users.

Key characteristic: Full participation without prerequisite digital infrastructure. The portal enforces the same validation rules as all other pathways through field-level validation at the point of entry.

2.1 Pathway Classification Decision Tree

Apply the following questions in sequence. Stop at the first match.

1. Does the organisation have a functioning digital system for managing core operational data?
    a. No. Paper-based or no functioning system. → Classify as Level 4.
    b. Yes. Proceed to question 2.
2. Is the organisation's system accessible over the public internet from any location?
    c. No. Confined to office network or specific machines. → Classify as Level 2.
    d. Yes. Proceed to question 3.
3. Is the system a structured database or ERP, or primarily a spreadsheet application?
    e. Primarily spreadsheets. → Classify as Level 3.
    f. Structured database or ERP accessible online. → Classify as Level 1.

Important: A technically capable organisation may rationally choose a lower pathway for economic reasons. The framework accommodates this without penalty. Pathway classification reflects full operational reality, not only technical capability.

3. The Integration Readiness Assessment

Two audiences. One tool. Platform operators use it to design inclusive integration architecture. Individual institutions use it to understand their current digital capability and chart a path to improvement.

The Capability Bridging Framework Assessment serves two distinct purposes. Platform operators and central bodies use it to map ecosystem readiness before designing multi-stakeholder integration architecture. Individual institutions use it to honestly assess where they are digitally, identify what is working and what is not, and get a clear roadmap for strengthening their systems, people, and processes.

Before the assessment begins, the user identifies which context applies to them. This single routing decision changes how results are framed and what the recommended next steps are.

3.1 Assessment Structure

The assessment covers seven dimensions across two categories. Six capability dimensions determine the integration pathway classification. One sustainability dimension assesses the capacity to implement and maintain that pathway independently.

Six capability dimensions assess what the organisation can do technically: systems infrastructure, system accessibility, digital literacy, data management practices, vendor and support relationships, and governance capacity. Together these six dimensions produce the pathway classification.

One sustainability dimension assesses whether the organisation can afford to implement and maintain their pathway independently. This dimension does not affect the pathway classification. It appears as a separate advisory indicator in the results, flagged as green, amber, or red, to inform implementation planning and support decisions.

3.2 The Seven Assessment Dimensions

1 Systems Infrastructure
What operational systems does the organisation currently run? What is the technology platform and how is it hosted? This establishes the baseline of what digital capability exists.

2 System Accessibility (Primary Determinant)
Is the primary system accessible over the public internet, confined to a local network, or operating on standalone devices? This is the primary determinant of Level 1 versus Level 2 classification.

3 Digital Literacy
What is the operational digital capability of the organisation's staff? Can they independently operate digital systems, manage data, and troubleshoot common issues?

4 Data Management Practices
How does the organisation collect, store, maintain, and share data? What formats are used and how consistently are standards applied?

5 Vendor and Support Relationships
Who built or maintains the organisation's systems? Is support active? Vendor dependency is a significant risk factor for integration sustainability.

6 Governance Capacity
Does the organisation have people, processes, and policies in place to maintain data quality? Are there designated data stewards and documented validation procedures?

7 Financial Sustainability (Advisory)
Does the organisation have or can it source the funds required to set up and maintain its integration pathway independently? This dimension does not affect pathway classification. It informs implementation planning and support decisions.

3.3 Assessment Modes

- **Self-assessment.** The organisation completes the assessment independently using the online tool at capabilitybridging.org/assess. Results are generated immediately. Recommended for initial screening and individual organisations.
- **Facilitated assessment.** A trained facilitator conducts structured interviews with senior staff across all seven dimensions. Recommended for ecosystem-wide exercises and where self-assessment may produce unreliable results.

3.4 Using Assessment Results

Assessment results should inform integration design, not determine it mechanically. Consider these factors when finalising pathway assignments:

- **Economic reality.** A Level 1-capable organisation may rationally choose Level 3 because API development exceeds its budget cycle. Accept this without penalty.
- **Planned upgrades.** An organisation planning a system migration within the integration timeline may be classified at its current level but designed for advancement.
- **Hybrid scenarios.** Some organisations may operate different systems for different data categories. A hybrid pathway assignment may be appropriate.
- **Emergency intervention.** Organisations with non-operational systems require system restoration before pathway assignment.
- **Financial sustainability flag.** An amber or red financial sustainability flag signals that implementation support will be required. The platform operator should factor this into resourcing plans before integration design is finalised.

4. Implementation Guidance

The following guidance draws directly from the HEMIS implementation in The Gambia, validated across 30 institutions covering all institutional types across The Gambia's higher education ecosystem.

4.1 Start With the Stakeholder Consultation

Before conducting individual assessments, bring all stakeholders into the same room. A collective consultation does three things individual assessments cannot:

- It surfaces diversity visibly. Institutions hear each other describe their realities, normalising variation and reducing the stigma of lower-pathway classification.
- It builds collective buy-in before classification. Institutions that understand the diversity in the room are more receptive to pathway assignments that reflect it.
- It generates early intelligence. What institutions say about themselves in a group setting often reveals more than structured assessment responses.

4.2 Language Matters More Than Architecture

The single most impactful implementation lesson from HEMIS was linguistic, not technical. When the framework was first presented using the term capability tiers, institutions resisted immediately. Being placed in a tier felt like a public declaration of inadequacy.

The same framework, reframed as integration pathways, achieved substantially higher institutional buy-in. A pathway implies movement, choice, and direction. A tier implies a hierarchy you are stuck in.

> ***This is not a superficial communications observation. It reflects a genuine principle of inclusive design: the framing must honour the dignity of every participant.***

4.3 Governance Is Harder Than Integration

The technical challenge of building four integration pathways was less complex than the governance challenge of maintaining a single authoritative source of truth when data arrives continuously from one stakeholder and monthly from another.

The framework requires explicit governance rules established and agreed before system launch, covering authoritative source designation, time-stamped versioning, and conflict resolution protocols. In the HEMIS implementation, designing these governance rules took longer than the technical integration work.

> ***Get governance agreement from all stakeholders before a single line of integration code is written. Retrospective governance agreement is significantly harder and less reliable than pre-launch agreement.***

4.4 Capability and Choice Are Not the Same

Several institutions assessed as Level 1 capable in the HEMIS ecosystem chose to operate at Level 3 for economic reasons. API development and maintenance carries a cost that some organisations could not absorb within their budget cycles. The framework accommodated this without penalty.

> ***Design the framework to accommodate choice, not just capability. The pathway an organisation chooses reflects their full operational reality. Respect that.***

4.5 Data Quality Is Not Optional

In the HEMIS readiness assessment, every institution assessed across the 30 priority institutions had no formal data quality procedures. Perfect integration architecture still produces unreliable national statistics if source data is poor. The framework must include a data quality layer alongside the integration pathways.

- For Level 1 and 2: data quality is enforced through real-time and scheduled API validation rules.
- For Level 3: data quality is enforced through template validation rules built into the upload structure.
- For Level 4: data quality is enforced through field-level validation in the manual entry portal.

The validation mechanism differs. The standard does not. Every pathway enforces identical data quality requirements.

5. The Governance Approach

Managing data integrity across four different integration mechanisms requires explicit governance rules agreed before system launch. The complete governance templates are available as a companion resource at capabilitybridging.org. This section provides the framework and principles behind each mechanism.

5.1 Authoritative Source Designation

Every data element must have a documented primary source. Before system launch, convene a governance workshop with all stakeholders to assign authoritative source designation for every data element. The designation must specify which pathway or organisation is authoritative, what happens when conflicting data arrives, the process for changing designation if circumstances change, and who has authority to adjudicate disputes.

5.2 Time-Stamped Versioning

Every data submission across all four pathways must be logged with a precise timestamp at receipt, the source identifier, pathway level and submitting organisation, the data period covered, and a version number if the organisation has submitted data for the same period previously. This audit trail enables traceback when data quality issues are identified and provides the evidentiary basis for conflict resolution.

5.3 Conflict Resolution Protocol

Conflicts arise when data for the same entity and period arrives from two different sources with different values. The conflict resolution protocol must define:

4. Conflict detection. How the system identifies and flags conflicting submissions automatically.
5. Routing. Which designated data steward receives the conflict notification and within what timeframe.
6. Resolution criteria. The decision framework referencing the authoritative source designation document.
7. Resolution timeline. Maximum time within which a conflict must be resolved. Recommend no more than five working days.
8. Documentation. How the resolution is recorded against both conflicting submissions in the audit trail.
9. Escalation. What happens if the data steward cannot resolve the conflict within the defined timeframe.

6. Data Quality Standards Per Pathway

Data quality is the most consistently underestimated challenge in multi-pathway integration implementations. This section defines minimum data quality standards for each pathway, the mechanisms for enforcing them, and the approach to building data quality capacity across stakeholder organisations.

6.1 The Data Quality Baseline Challenge

In the HEMIS implementation, every single institution across all 30 assessed had no formal data quality procedures at the time of assessment. No documented validation rules. No quality metrics. No designated data stewards. This is not unusual. It is the norm in resource-constrained public sector environments.

This finding has a direct implication for any multi-pathway integration implementation: the integration architecture must enforce data quality on behalf of organisations that do not yet have the capacity to enforce it themselves. Quality cannot be assumed. It must be built into every pathway mechanism.

6.2 Quality Standards by Pathway

Level 1 — Online Systems Pathway. Real-time validation at the API endpoint. Every data submission is validated against defined business rules before acceptance. Invalid data is rejected with a specific error code and message. The submitting system must resolve and resubmit. No invalid data enters the platform.

Level 2 — Local Network Systems Pathway. Validation at the point of bulk upload. The upload process runs the same validation rules as the Level 1 API. Validation errors are returned to the submitting organisation as a structured error report. The organisation corrects and resubmits before the scheduled deadline.

Level 3 — Structured Data Pathway. Validation built into the template structure. Template files include locked column formats, dropdown validation lists, and conditional formatting that flags errors before submission. The upload process runs a second validation pass. Error reports are returned for correction.

Level 4 — Assisted Entry Pathway. Validation at the field level within the manual entry portal. Required fields are enforced. Format rules are applied on entry. Dropdown selections replace free text where possible to prevent format errors. Portal staff training covers common quality issues.

6.3 The Data Quality Workshop Programme

Data quality cannot be enforced by technology alone. Organisations need to understand what quality means for their data, why it matters for the national platform, and how to maintain it consistently. A data quality workshop programme should be delivered before the first submission cycle across all pathway levels.

- **Workshop for Level 1 and Level 2 organisations.** Focus on API error handling, understanding validation responses, and building internal quality checking processes before submission. Duration: half day.
- **Workshop for Level 3 organisations.** Focus on template completion, validation rules, common errors, and the submission schedule. Duration: full day with hands-on template practice.
- **Workshop for Level 4 organisations.** Focus on portal navigation, data entry standards, paper-to-digital transcription accuracy, and what to do when uncertain. Duration: full day with portal access.

6.4 Minimum Data Quality Standards

The following minimum standards apply across all pathways without exception. These are not targets. They are thresholds below which data cannot be accepted into the national platform:

- All mandatory fields must be populated. No submission with empty mandatory fields is accepted at any pathway level.
- All identifiers must conform to the national standard format. Free-text identifiers are not accepted.
- Date fields must conform to the agreed date format. Ambiguous dates are rejected.
- Numerical fields must fall within defined plausible ranges. Outliers trigger a validation flag for human review.
- Each submission must be uniquely identified with organisation code, data period, and submission timestamp.

7. Monitoring and Advancement

The Capability Bridging Framework accommodates permanent diversity. However, it also supports and encourages advancement for organisations that develop the capacity and the will to move to a higher pathway. This section defines how to monitor pathway performance and how to manage advancement when it occurs.

7.1 Monitoring Framework

Pathway performance should be monitored on a submission-cycle basis. The following indicators apply across all pathways:

- **Submission timeliness.** Did the organisation submit within the agreed schedule? Track the percentage of on-time submissions per organisation per cycle.
- **First-pass validation rate.** What percentage of submissions passed validation without requiring correction and resubmission? A low first-pass rate signals data quality capacity issues.
- **Error frequency and type.** Track the most common validation errors per organisation. Recurring errors signal training needs or systemic data management problems.
- **Conflict frequency.** How often does the organisation's data conflict with another source? High conflict frequency may indicate a data governance problem at the organisation level.
- **Resolution time.** When errors or conflicts are flagged, how long does the organisation take to resolve them? Extended resolution times signal capacity constraints.

7.2 Triggering a Reassessment

A formal reassessment should be triggered when any of the following conditions are met:

- The organisation reports a significant system change, such as migrating from a locally hosted system to a cloud platform.
- The organisation requests advancement to a higher pathway.
- Persistent data quality issues suggest the current pathway mechanism is not working effectively for the organisation.
- The organisation's submission performance falls below the minimum threshold for three consecutive cycles.
- A scheduled periodic review, recommended every two years, identifies changed circumstances.

7.3 The Advancement Process

Advancement from a lower pathway to a higher pathway follows a defined process to ensure the organisation is genuinely ready and the transition does not disrupt data integrity:

10. Advancement request. The organisation formally notifies the platform administrator of its intention to advance and the target pathway.
11. Technical readiness verification. The platform team verifies that the organisation's system meets the technical requirements of the target pathway.
12. Parallel running period. The organisation runs both the current and target pathway simultaneously for a minimum of one submission cycle to verify data consistency.
13. Data quality validation. The platform team confirms that submissions through the new pathway meet the minimum quality standards before cutting over.
14. Cutover. The organisation is officially reclassified to the new pathway. The old pathway access is maintained for one additional cycle as a fallback.
15. Documentation. The advancement is recorded in the pathway classification register with the date, reason, and approving authority.

7.4 Managing Downward Movement

Advancement is not always permanent. An organisation that advances to Level 1 may subsequently face circumstances, such as system failure, budget cuts, or vendor withdrawal, that make the higher pathway unsustainable. The framework accommodates downward movement without stigma.

Downward movement follows the same parallel running and validation process as advancement, with the addition of a support assessment to determine whether the circumstances triggering the change can be addressed before permanent reclassification is required.

8. Open Source Architectural Implications

The Capability Bridging Framework was developed in the context of an open source national platform. The four-pathway architecture has specific implications for how open source systems should be designed, documented, tested, and maintained when stakeholder capability is diverse.

8.1 Modular Microservices Architecture

A monolithic architecture cannot support four integration pathways without accumulating significant technical debt. Each pathway introduces different data formats, validation logic, processing schedules, and error handling requirements. Designing these as a monolith couples unrelated concerns and makes pathway-level changes risky.

The recommended approach is a modular microservices design where each integration pathway is an independent module with its own validation engine, error handling, and submission processing logic. A common data layer enforces the identical quality standards across all four modules. The national platform core consumes clean, validated data regardless of which pathway produced it.

- Each pathway module can be updated, patched, or replaced without affecting other pathways.
- New pathways can be added without modifying existing pathway logic.
- Pathway-specific bugs are isolated and do not cascade across the system.
- Performance optimisation can be applied per pathway based on usage patterns.

8.2 Documentation Strategy

Open source platforms serving diverse stakeholders require documentation that matches stakeholder capability, not the capability of the development team. A single technical documentation set excludes the majority of users.

The documentation strategy should mirror the pathway structure:

- **Level 1 documentation.** API reference documentation including endpoint specifications, authentication requirements, request and response schemas, error codes, and rate limits. Audience: developers.
- **Level 2 documentation.** Bulk upload specifications including file format requirements, scheduling configuration, and error report interpretation. Audience: IT administrators.

- **Level 3 documentation.** Template guides including column definitions, validation rule explanations, common error causes, and step-by-step submission instructions. Audience: data managers.
- **Level 4 documentation.** Portal user guides written in plain language with screenshots, step-by-step instructions, and guidance for non-technical staff. Audience: administrative staff.

8.3 Testing Across All Pathways

Quality assurance must comprehensively cover all four integration pathways, not only the most technically sophisticated. A common failure in open source public sector platforms is test suites that cover API integration thoroughly and manual entry superficially.

- Unit tests must cover validation logic for all four pathways, including edge cases specific to each pathway mechanism.
- Integration tests must verify that data submitted through any pathway produces identical outcomes in the national platform as data submitted through any other pathway for the same entity and period.
- End-to-end tests must include realistic user journeys for each pathway level, including error correction and resubmission flows.
- Regression tests must be run across all pathways when any shared component, such as the validation engine or data model, is modified.

8.4 Community Contribution Tiers

The framework's pathway structure can be applied to open source community contributions as well as data integration. Different contributors engage at different capability levels:

- **Level 1 contributors.** Developers who can build and submit code contributions, API integrations, and architectural improvements through the standard pull request process.
- **Level 2 contributors.** Technical users who can contribute configuration improvements, deployment documentation, and integration examples.
- **Level 3 contributors.** Less technical contributors who can improve user documentation, report bugs with structured templates, and validate template designs.
- **Level 4 contributors.** Non-technical stakeholders who can contribute through structured feedback forms, user testing participation, and use case documentation.

> ***A community that only accepts Level 1 contributions excludes the majority of people who benefit from the software and have the most direct knowledge of how it performs in practice.***

9. Worked Examples

The following worked examples illustrate the Capability Bridging Framework assessment methodology applied across four sectors. Example 1 reflects the anonymised profile of an institution assessed during the HEMIS implementation in The Gambia. Examples 2, 3, and 4 are composite representations of institutional profiles commonly encountered in multi-pathway integration contexts across each sector.

Each example walks through the same process: institutional context, seven-dimension assessment across two categories, pathway classification, implementation notes, and governance considerations. The financial sustainability dimension appears as an advisory indicator in each example, separate from the six capability dimension scores.

WORKED EXAMPLE 1

Example 1

Higher Education | Public University, West Africa (Anonymised)

Institutional Context

A public university serving approximately 4,200 students across three faculties. The institution has an IT department of two staff members and uses a commercially licensed student management system purchased five years ago. The system runs on a server housed in the IT office and is accessible only from campus. The university reports student enrolment data to the national higher education ministry annually using Excel spreadsheets emailed by the registrar's office.

Assessment Scores

Dimension	Score	Finding
Systems Infrastructure	**3 / 4**	Locally installed student management system. Active and functional.
System Accessibility	**3 / 4**	Campus-only access. Not accessible over the public internet.
Digital Literacy	**3 / 4**	IT department capable. General staff intermediate. Data managers basic.
Data Management	**3 / 4**	Structured data in system but Excel exports are inconsistently formatted.
Vendor Relationships	**2 / 4**	Vendor support contract expired. Updates have not been applied in 18 months.

Dimension	Score	Finding
Governance Capacity	**2 / 4**	No formal data quality procedures. Registrar checks data manually before submission.
Financial Sustainability ⚠ Advisory	**AMBER**	No dedicated technology budget. Dependent on annual government allocation. Integration costs require ministerial approval.

Pathway Classification

System Accessibility score of 3 confirms the system is not publicly internet-accessible. Override rule does not apply. Weighted score: 2.75. Classification: Level 2, Local Network Systems Pathway.

Implementation Notes

- The institution should be advised to pursue scheduled bulk export from their student management system as the primary integration mechanism.
- The expired vendor support contract is a sustainability risk. The integration plan should include an assessment of whether the vendor can be re-engaged or whether migration to an open source alternative should be considered.
- The institution's IT department has the capacity to configure and manage the export process with appropriate training.
- Data quality training is required for the registrar's office before the first submission cycle.

Governance Considerations

The institution should be designated as an authoritative source for student enrolment data. A monthly submission schedule is appropriate given the bulk export mechanism. A designated data steward should be formally appointed within the registrar's office with documented responsibility for submission quality and timeliness.

WORKED EXAMPLE 2

Example 2

Healthcare Sector | Real World Sample Application

Institutional Context

A district health office responsible for coordinating health service delivery across 47 health facilities in a rural district. The office manages reporting from three district hospitals, twelve health centres, and thirty-two rural health posts. The district office itself uses a basic database application for aggregating facility reports. The three district hospitals have electronic health record systems. The health centres use paper registers. The rural health posts have no digital infrastructure.

Assessment Scores: District Office

Dimension	Score	Finding
Systems Infrastructure	**2 / 4**	Basic database application on office computers.
System Accessibility	**2 / 4**	Accessible only from district office computers.
Digital Literacy	**2 / 4**	Data officer capable. Reporting staff basic.
Data Management	**2 / 4**	Data aggregated from paper reports. Inconsistent standards across facilities.
Vendor Relationships	**1 / 4**	No vendor. Database built internally by a former staff member.
Governance Capacity	**2 / 4**	Informal reporting protocols exist but are not documented.
Financial Sustainability ⚠ Advisory	**RED**	No technology budget. Fully dependent on platform operator to cover integration and maintenance costs.

District Office classification: Level 3, Structured Data Pathway.

Assessment Scores: District Hospitals (representative sample)

Dimension	Score	Finding
Systems Infrastructure	**4 / 4**	Cloud-based electronic health record system.
System Accessibility	**4 / 4**	Accessible over the internet from any location.
Digital Literacy	**4 / 4**	Dedicated IT support. Clinical informatics officer in post.
Data Management	**3 / 4**	Structured data but reporting extracts require manual formatting.
Vendor Relationships	**4 / 4**	Active vendor support contract with SLA.

Dimension	Score	Finding
Governance Capacity	**3 / 4**	Data governance policy exists but not consistently enforced.
Financial Sustainability ⚠ Advisory	**GREEN**	Budget allocated. Technology investment is part of annual operating plan.

District Hospital classification: Level 1, Online Systems Pathway.

Implementation Notes

- The district health office and its rural health posts require different pathway assignments. The ecosystem within a single district spans all four levels.
- Rural health posts with no digital infrastructure are classified as Level 4 and will use the assisted entry portal, likely facilitated by a district-level data entry officer who aggregates paper registers.
- The health centres fall at Level 3 and will use validated templates completed by the health centre in-charge.
- The internally built database at the district office represents a sustainability risk. Migration to a supported open source database should be planned within the first year.

Governance Considerations

Authoritative source designation is critical in this context. Patient counts may be reported by both the health facility directly and the district office as an aggregate. The facility-level submission must be designated as authoritative for individual facility data. The district office submission should cover only district-level aggregates not captured at facility level. Conflict resolution protocols must account for the reality that district office aggregates may not match the sum of facility-level submissions due to data quality gaps at health post level.

WORKED EXAMPLE 3

Example 3

Municipal Government Sector | Real World Sample Application

Institutional Context

A regional service delivery reporting system covering twelve municipal councils across a southern region. The system collects service delivery performance data including water access, waste management, road maintenance, and social services from all twelve councils for quarterly reporting to the national local government ministry. The councils range from a large urban municipality with 800,000 residents and a dedicated IT department to remote rural councils with three administrative staff and no computers beyond a shared laptop used for email.

Ecosystem Assessment Summary

Dimension	Score	Finding
Urban municipality (2 councils)	**Level 1**	Cloud-based municipal ERP. API-ready with internal IT capacity.
Peri-urban councils (4 councils)	**Level 2**	Locally hosted management systems. IT support via shared contractor.
Semi-rural councils (4 councils)	**Level 3**	Excel-based reporting. Capable administrative staff. No IT department.
Remote rural councils (2 councils)	**Level 4**	Paper-based records only. Shared laptop for email. No digital systems.
Financial Sustainability ⚠ Advisory	**MIXED**	Urban: GREEN, budget allocated. Peri-urban: AMBER, can source via council budget cycle. Rural: RED, fully dependent on platform operator support.

Implementation Notes

- The two urban municipalities should be fast-tracked for API integration given their existing system capability and IT capacity. Their data quality and timeliness will set the benchmark for the ecosystem.
- The four peri-urban councils require vendor engagement to configure scheduled exports. Budget allocation for vendor time must be confirmed before integration design is finalised.
- The four semi-rural councils are the majority use case. Template training and a clear submission schedule are the primary requirements. A regional training workshop covering all four simultaneously is more cost-effective than individual support visits.

- The two remote rural councils require a facilitated entry arrangement. A district government officer should be designated to visit each council quarterly, collect paper records, and enter data into the portal on their behalf.

Governance Considerations

Service delivery indicators such as the percentage of households with water access will be reported by councils at different frequencies depending on their pathway. The Level 1 urban councils may update this figure monthly. The Level 4 rural councils will submit quarterly at best. Authoritative source designation must specify the reporting frequency expectation per council and how interim periods are handled for councils that cannot report monthly. The conflict resolution protocol must address the common situation where a council's self-reported performance figures differ from inspection data collected by a regional oversight team.

WORKED EXAMPLE 4

Example 4

Tax Administration Sector | Real World Sample Application

Institutional Context

A national revenue authority implementing a digital compliance reporting platform to replace paper-based tax filing across all taxpayer categories. The taxpayer base spans multinational corporations with integrated ERP systems filing in real time, medium and large domestic businesses using accounting software, small and micro enterprises using basic spreadsheets or handwritten records, and informal sector operators with no financial records beyond cash transaction memory. The platform must serve all categories with a single national data source while accommodating the extreme capability diversity of the taxpayer base.

Taxpayer Segment Assessment Summary

Dimension	Score	Finding
Multinational corporations	**Level 1**	Integrated ERP systems. Finance teams with technical staff. API filing standard.
Large domestic businesses	**Level 1 / 2**	ERP systems, some cloud-hosted, some locally installed. Accounting staff capable.
Small and medium enterprises	**Level 3**	Accounting software or Excel. Owner-managed. Basic digital literacy.
Micro enterprises	**Level 3 / 4**	Basic spreadsheets or no digital records. Minimal digital literacy.
Informal sector operators	**Level 4**	No financial records. Cash-based transactions only. No digital infrastructure.
Financial Sustainability ⚠ Advisory	**MIXED**	Multinationals and large businesses: GREEN. SMEs: AMBER, cost must be proportionate to filing obligation. Informal sector: RED, platform operator must absorb all facilitation costs.

Implementation Notes

- The tax administration context introduces a unique consideration: the stakes of incorrect data are regulatory and financial, not just statistical. Validation rules must be more stringent than in reporting-only contexts, and error resolution timelines must be defined against legal filing deadlines.
- Informal sector operators at Level 4 will require a facilitated entry model delivered through tax offices, postal agencies, or community-based financial literacy programmes. The portal must be designed for assisted use, not independent use.

- Small and medium enterprises at Level 3 require templates pre-populated with the prior period's data where available, reducing the data entry burden and improving consistency between periods.
- The API integration for multinationals must support the tax authority's audit requirements, including the ability to request historical data extracts and trigger on-demand reconciliation runs.

Governance Considerations

Tax administration presents the most complex authoritative source designation challenge of any sector covered in this documentation. A single taxpayer may have data submitted by themselves through the portal, by their accountant through the API, and by a third party such as a payroll provider through a bulk upload. The authoritative source designation framework must account for delegated submission authority, maintain a complete audit trail of who submitted what and on whose behalf, and define clear rules for how conflicting submissions from different submitters for the same taxpayer and period are resolved. In most tax contexts, the most recently submitted filing is treated as the current position unless the authority initiates an amendment. This rule must be explicitly encoded in the conflict resolution protocol rather than assumed.

10. Applicability Beyond Education

The Capability Bridging Framework was developed in a higher education context but addresses a universal challenge. The four worked examples in Section 9 demonstrate its direct applicability across healthcare, municipal government, and tax administration. Any national or cross-organisational system that must serve stakeholders with unequal technical capabilities faces the same design problem.

> ***If the stakeholders a system must serve do not have uniform technical capabilities, the system's architecture should not assume that they do.***

10.1 Adapting the Framework for New Contexts

The following elements transfer without modification:

- The four pathway structure and the principles of permanent inclusion and identical quality standards.
- The seven-dimension assessment methodology across two categories, with question wording adapted to sector-specific language.
- The governance approach, authoritative source designation, versioning, and conflict resolution.
- The implementation lessons on language, governance complexity, economic reality, and data quality.

The following elements require contextual adaptation:

- The specific data elements and their authoritative source designations, which are sector-specific.
- The validation rules within each pathway, which reflect sector-specific data standards.
- The assessment question wording, which should use sector-appropriate terminology.
- The facilitated entry model for Level 4 organisations, which depends on sector-specific access and support infrastructure.

11. Implementation Checklist

Use this checklist to track progress through a Capability Bridging Framework implementation.

Pre-Design Phase

- Conduct stakeholder consultation before any technical design begins.
- Complete integration readiness assessment across all stakeholders.
- Review assessment results and produce pathway classification for each stakeholder.
- Validate pathway classifications with stakeholders and address disagreements.
- Document final pathway assignments with written acknowledgement from each stakeholder.

Governance Design Phase

- Convene governance workshop with all stakeholders.
- Complete authoritative source designation for every data element.
- Document and agree conflict resolution protocol.
- Establish time-stamped versioning requirements with the technical team.
- Assign designated data stewards for each stakeholder organisation.
- Obtain signed governance agreement from all stakeholders before development begins.

Technical Development Phase

- Build Level 1 API integration layer with real-time validation.
- Build Level 2 bulk upload mechanism with scheduled processing.
- Build Level 3 validated template structure with field-level validation rules.
- Build Level 4 manual entry portal with guided data entry and field validation.
- Implement time-stamped versioning across all four pathways.
- Implement conflict detection and routing to data stewards.
- Test cross-pathway data consistency: same entity, different pathway, same result.

Data Quality Phase

- Deliver data quality workshop for Level 1 and Level 2 organisations.
- Deliver data quality workshop for Level 3 organisations with hands-on template practice.
- Deliver data quality workshop for Level 4 organisations with portal access.
- Establish baseline data quality metrics for each organisation before first submission cycle.

Pre-Launch Phase

- Run pilot submissions from each pathway level and validate data quality enforcement.
- Test conflict resolution protocol with simulated conflicting submissions.
- Confirm all data stewards are assigned, trained, and have portal access.
- Conduct user acceptance testing with representatives from each pathway level.

Post-Launch Monitoring

- Monitor submission timeliness and first-pass validation rate per organisation per cycle.
- Track conflict frequency and resolution time against defined targets.
- Conduct pathway advancement reviews at agreed intervals.
- Update assessment classifications if organisational circumstances change.
- Document implementation lessons for future deployments.

12. References

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