

# Qualifications and Credentials Platform

## Architecture Report

**ACQF**  
African Continental  
Qualifications Framework

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## 2. Executive Summary

The ACQF Qualifications and Credentials Platform (ACQF QCP) is a pivotal initiative under the ACQF-II project designed to harmonise and streamline qualifications across Africa. This document details the architectural framework, user needs, data model, and implementation plan of the ACQF QCP, aiming to enhance transparency, comparability, and recognition of qualifications continent-wide, fostering educational and professional mobility.

### 2.1. Objectives and Functionalities

The ACQF QCP is envisaged as a unifying platform addressing the fragmented qualifications landscape in Africa. It aims to integrate national qualifications into a central repository, facilitating easier regulation, standardisation, and mutual recognition across member states. The platform will support national qualifications authorities, end-users and aid regional and continental integration, promoting the accessibility and portability of qualifications.

### 2.2. User Needs and System Architecture

The platform will cater to diverse user groups, including educational institutions, students, and employers, each with specific roles and requirements:

- Qualifications Curators need secure data management capabilities.
- The general public requires a user-friendly interface to access qualification information.
- Data Users need access to detailed, structured qualification data for analysis.

The proposed system architecture encompasses robust, scalable databases managed at national and continental levels, ensuring data integrity and accessibility. The architecture also includes data system functions like classification, comparison, and visualisation tools to support user interaction with qualification data.

### 2.3. Data Model

The ACQF QCP will utilise the African Learning Model (ALM), which was developed by adapting existing learning models to suit the African context. The data exchange will be facilitated through JSON / JSON-LD formats, ensuring interoperability and compliance with international standards such as Dublin Core and SKOS. Data integrity and validation are managed through SHACL, ensuring that all data meets quality and structural standards.

### 2.4. Implementation Plan

The implementation plan outlines a phased approach to developing and deploying the ACQF QCP:

- **Initial Development Phase:** Establish fundamental software and database functionalities while considering user experience through design workshops.
- **Functionality Enhancement Phase:** Operationalise the system with qualification data, augmenting its primary functionalities.
- **Final Implementation and Rollout:** Achieve a fully operational platform that operates at national and continental levels and supports multiple languages.

### 2.5. Challenges and Solutions

Key issues such as control over data modelling, centralised data editing, and open data policy are identified with potential impacts. Performance constraints, changing requirements, and system scalability are also discussed to ensure the platform's effectiveness and sustainability.

## 3. Introduction

### 3.1. Background

The ACQF was established to streamline and harmonise qualifications across the African continent. Comprehensive information regarding the ACQF's development process and various outputs, such as guidelines, a National Qualifications Framework (NQF) inventory, and a capacity development programme, including tailored training modules for participating countries, is readily accessible on the ACQF website. These resources are designed to support member states in aligning their educational frameworks with the ACQF standards, thus facilitating mutual recognition of qualifications across borders.

The ACQF Policy Document was officially validated and has become operational following its endorsement by the African Union Member States at a conference held at the African Union headquarters in Addis Ababa on 11-13 July 2023. This validation marks the ACQF as an officially recognised policy instrument, initiating its implementation across the continent.

### 3.2. ACQF Qualifications and Credentials Platform (ACQF QCP)

A cornerstone of the ACQF-II project is the ACQF Qualifications and Credentials Platform (ACQF QCP). This platform is set to be a groundbreaking initiative in Africa, offering a user-friendly, interactive digital and visualisation tool. It will provide stakeholders and users from all sectors access to updated, reliable information and data on qualifications and credentials from all participating countries. The platform aims to enhance transparency, comparability, and recognition of qualifications across the continent, thereby fostering educational and professional mobility.

### 3.3. Objectives

This chapter delves into the general objectives, main orientations, and envisioned functionality of the future ACQF QCP. The ACQF QCP aims to serve as a unifying platform that addresses critical issues identified across the African continent's diverse educational and qualifications landscape. These issues include the fragmentation of qualifications systems, the limited availability of updated, quality-assured qualifications information in the public domain, and the integration of international qualifications into existing frameworks. The platform also targets the need to recognise informal and non-traditional learning paths, such as those acquired by migrants and refugees or through informal sector activities.

#### 3.3.1. Main Orientations

The platform is designed to enhance transparency, mutual understanding, and recognition of qualifications across Member States. By providing a central repository of data, it aims to support:

- National qualifications authorities and awarding bodies
- End-users
- Regional and continental integration

#### 3.3.2. Uses and Benefits

The ACQF Qualifications Platform will act as a transparency instrument, providing crucial support to the national frameworks while enhancing regional cooperation on qualification recognition. This contribution

is essential in continental free trade operations, which will likely increase the demand for new skills and more efficient qualification recognition processes.

- **Enhancing quality and regulation:** Registration of qualifications on the platform will improve the quality and regulation of qualifications by making critical information available for recognition purposes, thus offering greater protection for the public and employers.
- **Facilitating mobility and portability:** By promoting the accessibility of reliable information on qualifications, the platform will facilitate the mobility and portability of qualifications, creating opportunities for learning access, transfer, and progression among the nationals of participating countries.
- **Supporting modular and lifelong learning:** The platform will address the growing need for modular skills development and the recognition of prior learning, which are essential for adapting to the digital transformation and sustainability demands in work and learning environments.

The detailed functionalities and the technical architecture designed to meet these objectives will be further explored in the subsequent chapters, focusing on the distinct use cases supported by the platform and the procedural framework developed to ensure its effectiveness and accessibility.

### 3.4. Scope of the Document

Clarify the vision and establish a clear roadmap.

- **Document the user needs and expectations:** Process results of the baseline analysis and the stakeholder's consultation, and leverage the experience gained on similar projects to elicit the requirements, preferences, and challenges of all stakeholders and ensure that the platform meets their needs.
- **Outline the technologies and architectures of the ACQF QCP:** Assess and select suitable technologies and architectural designs that support scalability, security, and interoperability.
- **Produce a technical blueprint for the system:** Create a technical plan that outlines the system's components, data model and integration points.

## 4. User needs analysis

The ACQF QCP is designed to support various initiatives to enhance the management and recognition of educational qualifications across Africa. Our vision of the platform is rooted in the development of the ACQF itself. While Action 6 of the ACQF guidelines directly references the establishment of registers and databases of qualifications, our approach also addresses the following:

- Action 3 (Referencing) by providing a platform for registration of referenced qualifications;
- Action 4 (Validation & Recognition) by providing a credible and reliable data source that supports recognition procedures;
- Action 5 (Quality Assurance) by standardising transparent processes for registering qualifications on NQFs;

- Action 9 (Innovation & Technology) by providing support for new modes of learning and technologies such as micro-credentials;
- Action 10 (Systemic View) by improving the visibility, availability and utility of NQFs.

The ACQF will address the following needs of stakeholders in the region:

### **Support to African Countries in Digitising Their Qualifications Database**

Many countries in Africa have not yet developed qualification databases using structured data; instead, they rely on collections of PDFs. The ACQF QCP will provide them with an easy-to-use tool to collect, centralise, and quality assure this data. This digitisation effort is crucial for modernising educational and professional certification processes, enhancing accessibility transparency, and facilitating the efficient sharing of qualifications data across the continent.

### **Standardising Qualifications Data According to International Best Practices**

The ACQF QCP aims to align data with international best practices by creating a continental data model based on the existing learning models. Using a single continent-wide data model will, for the first time, standardise qualifications data within many participating countries. Additionally, this alignment fosters comparability and compatibility with international frameworks, enhancing the global recognition of African qualifications and supporting the mobility of African students and professionals.

### **Providing Free Access to Continental and National-Level Qualifications Data to the General Public, Educators, and Policymakers**

By offering free access to a comprehensive database of qualifications at both the continental and national levels, the ACQF QCP empowers students, educators, and policymakers. This accessibility aids in informed decision-making regarding education and career planning for students, benchmarking of educational approaches in course design, and generally promotes greater transparency and accountability in the qualifications process.

### **Supporting Academic and Labour Mobility by supporting Recognition of International Qualifications**

The ACQF QCP assists educational and recognition professionals in comparing national qualifications to international counterparts. Doing so allows users to determine the equivalence of international educational achievements to national counterparts or national requirements. This functionality helps integrate African professionals into global markets and attract international talent, fostering economic growth and educational exchange.

### **Creating a Continental Data Space for Skills and Qualifications Data**

By creating a single open data source for information on African qualifications, QCP enables the market to develop new applications (e.g. guidance services, qualification evaluation services), supporting the organic education engagement within the nations.



## 4.1. Approach and Functionalities of a Qualifications Database

This document proposes a centralised architecture (detailed in the chapter "Technological Architecture") where each local authority/country/sector/continental authority is allocated a dedicated **virtual space** within a singular software system. This architecture facilitates qualification authoring for countries without National Qualifications Framework (NQF) databases yet and enables uploading and ingesting national qualification data from existing NQF databases.

Key Advantages	Key Disadvantages
<ul style="list-style-type: none"><li>● <b>Simplicity:</b> This architecture is marked by its straightforward architecture, making it the easiest to maintain and deploy.</li><li>● <b>Resource Efficiency:</b> New member countries can join without the need for significant investment in infrastructure, promoting faster and broader adoption of the ACQF.</li><li>● <b>Data Synchronisation:</b> Qualifications created at the national level can be synchronised with the continental database, ensuring consistency and up-to-date information availability.</li><li>● <b>Centralised Data Storage:</b> Despite being managed locally, central storage of national qualifications facilitates access but requires careful consideration of data sovereignty and privacy concerns.</li></ul>	<ul style="list-style-type: none"><li>● <b>Lack of Data Sovereignty:</b> Data is stored on servers of a continental entity, not in-country. At the same time, a continental entity manages user accounts to access the data at the highest level. This means that a pan-African entity needs to take on these roles with all countries' complete trust and participation.</li><li>● <b>Limited Customisation:</b> ACQF QCP provides only one general-public-facing portal for all countries, which limits the ability to customise the visual representation.</li></ul>

This approach is being proposed in particular due to the **lower onboarding requirements** for countries and because it **significantly improves the speed of deployment** of the system as a whole.

## 4.2. Identification of user groups

This section defines the user groups or stakeholders involved with the ACQF QCP, explaining their roles and interests in the platform.

### 4.2.1. General Public

- **Profile:** Individuals without technical backgrounds, such as students, job seekers, and professionals, seeking information on qualifications.
- Needs:
  - User-friendly interface for easy navigation and search.
  - A straightforward presentation of qualification details.
  - Accessibility features and multilingual support to cater to a diverse audience.

## 4.2.2. Data User

- **Profile:** Technically proficient individuals like data scientists, data journalists, and researchers interested in analysing qualification data.
- Needs:
  - Access to detailed and structured data for analysis.
  - Data export (TTL, JSON) and Linked data access.
  - APIs for programmable data access with comprehensive documentation.

## 4.2.3. Qualification Curator

- **Profile:** Officials responsible for managing qualification records at national and continental levels, such as educational administrators and qualification authorities.
- Needs:
  - Secure and controlled access to the platform for managing records.
  - Intuitive management interface for overseeing qualification records.
  - Features for creating, updating, and deleting records efficiently.

## 4.2.4. Virtual Space Administrator

- **Profile:** Officials holding overall responsibility for managing qualification records at local, national and continental levels, such as educational administrators and qualification authorities.
- Needs:
  - Manage access to qualifications curators in the country databases.
  - Overriding actions of qualifications curators.
  - Audit trails and version control for transparency and accountability.

## 4.2.5. Administrator

- **Profile:** Official responsible for the overall management of the ACQF QCP within the ACQF secretariat or other designated body.
- Needs:
  - Assignment of virtual space administrators
  - Backing up data and ensuring the overall health of the platform
  - Audit trails and version control for transparency and accountability.



## 4.3. User Requirements Listing

User requirements are described below in terms of user stories, with each user story being divided into a set of capabilities required to deliver that story's functionality.

The following user stories list the MUST requirements necessary to deliver the platform. All identified user requirements, including the complete numbering, are listed in Annex 9.4 (in the supplementary document).

### 4.3.1. As a Qualifications Curator, I want to add data from my national qualifications database to the ACQF QCP

Ref	Functionality	Priority
1.1	<b>Import Qualifications from a National Database in JSON or JSON-LD</b> Retrieve a JSON or JSON-LD file containing qualifications data from a national qualifications database formatted according to the ACQF Model for Data Exchange (Section 17) and add that data to the ACQF QCP.	MUST
1.3	<b>Support Qualification Import</b> Support import of data files either via: <ul style="list-style-type: none"><li>• manual upload of data to the platform,</li><li>• by setting up a public API endpoint to which the data can be sent.</li></ul>	MUST
1.4	<b>Enter Qualifications Data directly in UI</b> For qualification curators that do not have qualifications data available in the ACQF Model for Data Exchange, the system should provide a web-based UI to manually enter individual qualifications for their specific country, following the properties/fields of the ACQF Model for Data Exchange.	MUST

### 4.3.2. As a Qualifications Curator, I want to manage, quality assure and publish my data ACQF QCP

Ref	Functionality	Priority
2.1.1	<b>Check for Duplicates</b> <ul style="list-style-type: none"><li>• When data is added via import, the system should check for exact copies of qualification records and discard them from the data addition.</li></ul>	MUST
2.2	<b>Verify Uploaded Data</b> Check that input data complies with the ACQF Model for Data Exchange and throw an error for records that do not.	MUST
2.4	<b>Manage Qualification Status</b> Set the following qualification statuses and roles: <ul style="list-style-type: none"><li>• <b>Draft/Uploading</b> for qualifications where data import/upload/entering has not been completed</li><li>• <b>In Review</b> for qualifications that have not been approved for publication</li><li>• <b>Approved</b> for qualifications that have been approved for publication</li><li>• <b>Published</b> for qualifications that have been published</li></ul>	MUST
2.6	<b>Require User Confirmation for Publication</b>	MUST

	Require users to approve each qualification for publication manually. Provide a functionality to provide this approval in bulk.	
2.8	<b>Add URI &amp; Publication Metadata</b> On publication, each record should be appended with: <ul style="list-style-type: none"> <li>• a URI (which will be dereferenceable to the data contained in the record)</li> <li>• data of the publisher, date of the publication</li> </ul>	MUST
2.9	<b>Immutable Records</b> Once published, all records must be immutable.	MUST
2.13	<b>Multilingual user interface</b> The user interface should be multilingual, supporting, at minimum, English, French and Portuguese.	MUST
2.14	<b>Establish ACQF Namespace</b> A namespace will be required to host permanent URIs that dereference concepts in the data model and all published data.	MUST

### 4.3.3. As an Administrator, I wish to manage permissions and settings at a country level

Ref	Functionality	Priority
3.1	<b>Define Virtual Space Administrators</b> As an administrator, be able to create/delete/edit accounts for virtual space administrators, and associate those virtual space administrators with a specific virtual space.	MUST
3.2	<b>Sandbox Data between countries</b> Ensure that virtual space administrators and all qualifications curators managed by those virtual space administrators can only access and manage unpublished data linked to the country they are associated with. Therefore, a user account (except the administrator) is always connected to only one country.	MUST
3.3	<b>Define Qualification Curators</b> As an administrator or virtual space administrator, create/delete/edit accounts for qualification curators and associate those qualification curators with a specific virtual space.	MUST
3.4	<b>Virtual space Administrator Permissions</b> Virtual space administrators may change the ownership of data in the system and for any data in the system: <ul style="list-style-type: none"> <li>• Create new records</li> <li>• Edit or delete records which have not been published</li> </ul> This only applies to data from the virtual space to which the virtual space administrator is associated.	MUST
3.5	<b>Qualification Curator Permissions</b> Qualification curators can import, change or enter data, and for data which they own: <ul style="list-style-type: none"> <li>• Create new records</li> <li>• Edit or delete records which have not been published</li> </ul> A qualification curator should own any data they upload or enter by default.	MUST

#### 4.3.4. As the General Public, I wish to search, organise and visualise qualifications

Ref	Functionality	Priority
4.1	<b>Search for Qualifications</b> Search for qualifications on a public portal across multiple languages, using a mixture of keyword and semantic search.	MUST
4.2	<b>Filter Qualifications</b> Filter the list of qualifications results based on multiple facets, such as country, region, qualification type, QF level, education sector, etc.	MUST
4.4	<b>View Qualifications</b> On clicking on a qualification, a user should be able to view: <ul style="list-style-type: none"><li>• All available fields</li><li>• In all languages, the qualification data is available in</li><li>• the URI and publication metadata, including any versioning information</li></ul>	MUST
4.6	<b>Multilingual user interface</b> The user interface should be multilingual, supporting, at minimum, English, French and Portuguese.	MUST

#### 4.3.5. As the General Public, I wish to compare qualifications

Ref	Functionality	Priority
5.1	<b>View Similar Qualifications</b> When a qualification is displayed per requirement 4.4, it should also show a list of related qualifications based on a mixture of semantic and keyword searches.	MUST
5.2	<b>Compare Qualifications side-by-side (Default)</b> Visualise two qualifications side-by-side, each field consisting of a row, to allow for manual comparison.	MUST

#### 4.3.6. As a Data User, I wish to retrieve data from the ACQF QCP

Ref	Functionality	Priority
6.1	<b>Search for Qualifications via API</b> Provide the search functionality described in 4.1 as an API (e.g. SPARQL API), returning data in JSON or RDF format.	MUST
6.2	<b>Retrieve Qualification Data via API</b> Fetch all data about a qualification via an API (e.g. SPARQL API) in JSON or RDF format.	MUST

## 5. Technological Architecture

This chapter provides a more detailed insight into the proposed technological framework for the ACQF QCP. It covers the system's architecture, security measures, technology selection for the front-end and back-end, and integration of existing solutions such as Elasticsearch to enhance the platform's capabilities.

### 5.1. Architecture Overview

The ACQF QCP is designed to function as a robust, scalable, and secure system encompassing several key components:

- **Databases and Data Storage:** The architecture includes two main layers of interconnected databases. The first layer consists of national qualifications databases accessible and manageable by relevant national institutions such as qualifications authorities and ministries of education. The second, wider layer is a continental database that links these national databases and includes additional qualifications and credentials that meet international standards of quality and credibility.
- **Interoperability Tools and Functions:** These tools ensure that data across the two layers can interact based on standard protocols and open data, supporting data linkage and synthesis across different educational systems and standards.
- **Data System Functions:** The platform includes data classification, comparison, and visualisation tools. A comprehensive general public visualisation platform is designed to facilitate end users' access to discovery, comparison, and intelligence features.

### 5.2. Security Overview

Security is a paramount concern in the design of ACQF QCP:

- **Authentication and Authorisation:** The platform will manage these critical security aspects internally, without reliance on external services such as Single Sign-On (SSO) solutions. This ensures that control over user access and data security is tightly integrated and tailored to the needs of the ACQF QCP.
- **Data Accessibility:** Access to work-in-progress national qualification data will be restricted to the respective country, ensuring data privacy and sovereignty.

### 5.3. Technology overview

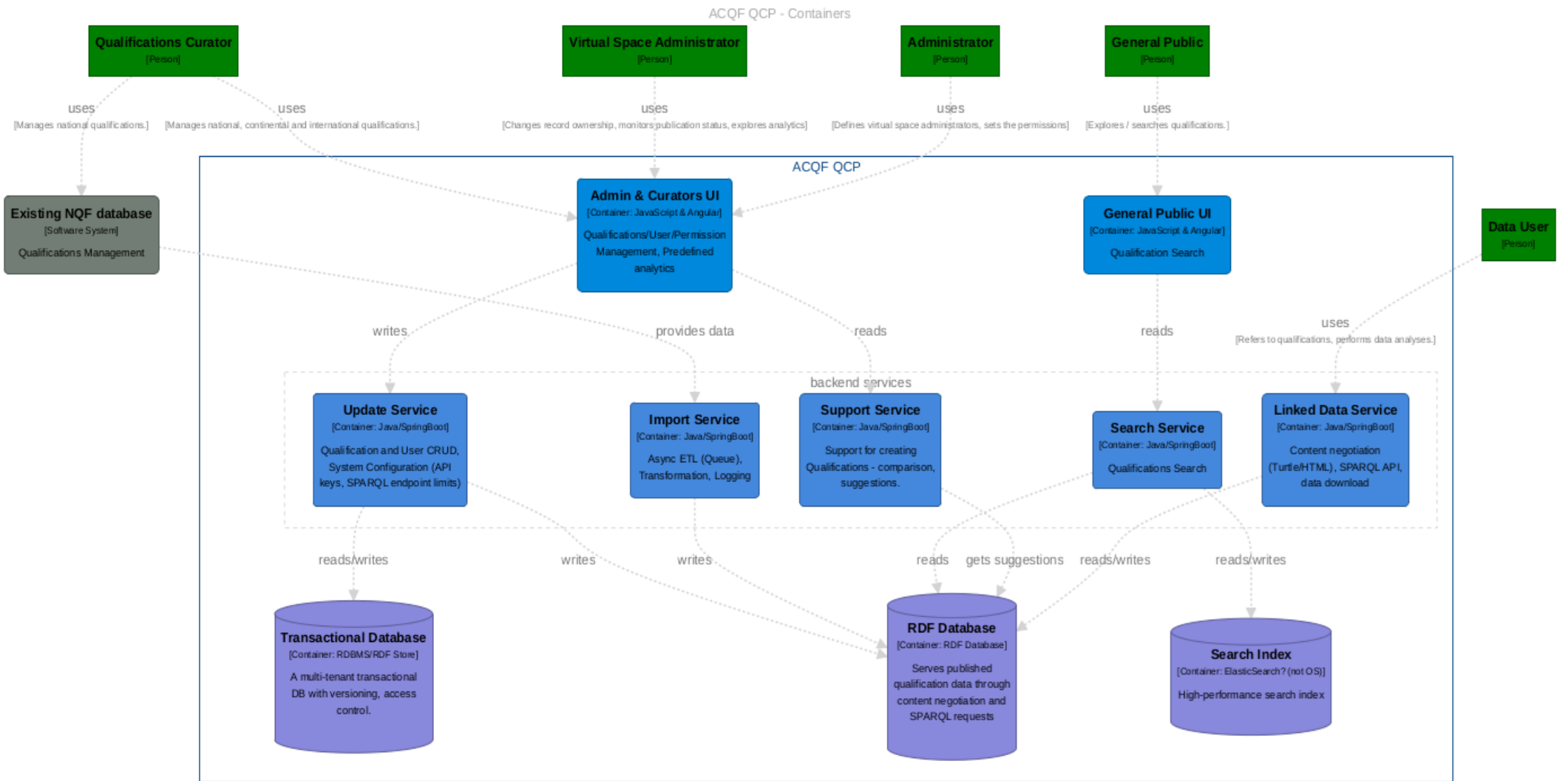
The front-end and back-end technologies have been selected to provide a responsive, user-friendly interface and a robust, efficient back-end:

- **Front-end Technologies:** The interface will be built using modern web development frameworks that ensure a responsive, accessible user experience across various devices and platforms.
- **Back-end Technologies:** The server-side will utilise scalable, secure technologies capable of handling large volumes of data and complex operations. Technologies like Elasticsearch will be employed to enhance the platform's search capabilities.
- **Integration of Existing Good Practices:** Integrating existing libraries and technologies and supporting such actions as the Import Service, Export Service, Search Service, Search Index, and RDF Database will be considered to expedite the development process.

## 5.4. System component Architecture

A centralised architecture is proposed for the ACQF QCP. This approach involves a single software system with a single deployment managed centrally at the continental level. Each member country will be allocated a dedicated virtual space within this centralised system. Countries with existing National Qualifications Framework (NQF) databases can create qualification data in their space or upload them via an Application Programming Interface (API), making the qualification data accessible across the continent.







### 5.4.1. Front-end technologies

- **Angular** is chosen for its robust ecosystem and two-way data binding. It facilitates the development of dynamic, responsive, and accessible user interfaces.
- **HTML5** and **CSS3** are utilised for markup and styling, ensuring compatibility across modern browsers and devices.
- The Curator's UI will be designed purely as a desktop website, while General Public UI will be designed primarily for mobile devices, with the possibility for desktop.
- The UI will be designed to support easy translation into another language using Angular's i18n tools.

### 5.4.2. Back-end technologies

- **Spring Boot & Java** are chosen as a proven technology stack for creating high-performing, scalable back-end services.
- **PostgreSQL** is chosen as a proven open-source relational database, which will serve as the transactional database due to its ACID compliance and robustness. For storing published data and serving them through the SPARQL endpoint, a **GraphDB** (free edition) is suggested, but other RDF database alternatives are possible.
- **ElasticSearch** for indexing and advanced search capabilities is suggested. Yet, although open software, ElasticSearch is not open-source software by definition, another alternative might be considered.

## 5.5. Security Measures and Data Protection

### Authentication and Authorisation

- To access any functionality, beyond exploring non-published qualification data, each user must be properly authenticated.
- Role-based access control (RBAC) will ensure that users have access only to the data and functionality necessary for their role.

### Data security

- All data in transit between the user interfaces and the servers will be encrypted using TLS (Transport Layer Security).
- Sensitive data at rest will be encrypted using strong encryption standards, such as AES-256, to protect against unauthorised access.
- The storage of transactional data will ensure that each country only has access to that country's data and can't access the data of other countries.
- Public analytics and reports will ensure that data are adequately anonymised and do not leak sensitive information.

- Controls will be set up to ensure the accuracy and integrity of data.

#### API security

- API endpoints will be secured (e.g. using JWT) for secure delegation of user authentication and authorisation.
- During the ACQF project execution, the dependent open-source libraries will be monitored for vulnerabilities and regularly updated.

#### UI security

- Client-side validation of user inputs will be implemented to ensure input data integrity before submission to the back-end, reducing unnecessary server load and potential security threats like XSS or injection.

## 6. Data Model

The African Learning Model (ALM) will be developed by leveraging existing learning models (ExisLMs)<sup>1</sup> to adhere to established best practices. Moreover, interoperability between the ExisLMs and ALM data must be guaranteed to facilitate global qualification data exchange. This chapter outlines the assumptions, design principles, structures underpinning the ALM and the proposed common continent-level data specification for qualification data exchange.

### 6.1. Assumptions and Design Principles

The listing below is a set of assumptions and principles that the data models observe:

- **Reuse of Existing Models:** The ALM will maximally reuse the components of existing learning models. This approach ensures that the ACQF QCP can integrate smoothly with global standards while adapting to specific African contexts.
- **Centralised management of identifiers:** Linked Data identifiers (IRIs) will be maintained centrally, with each participating country being assigned a dedicated namespace, such as <https://data.africa/acqfqcp/botswana/> for Botswana. This method facilitates organised and consistent data referencing across the continent.
- **Common Data Specification:** A continent-level application profile for qualification data exchange, referred to as ALM-AP-EX, will be implemented. All countries are expected to conform to this specification without national extensions, promoting uniformity and interoperability.
- **Data Exchange Format:** The proposed data exchange format between the national and continental levels is JSON / JSON-LD. This format allows for creating ordinary JSON documents at the national level, which can be interpreted as RDF for Linked Data purposes at the continental level. Using JSON-LD enables the ACQF QCP to benefit from the robustness of JSON while ensuring semantic richness and connectivity via RDF.

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<sup>1</sup>For example: ELM <https://europa.eu/europass/elm-browser/>

## 6.2. Linked Open Data

ACQF QCP utilises Linked Open Data to enhance the semantic richness and connectivity of the qualifications data. An example of how ACQF linked open data might be structured includes triples such as:

**acqfqcp:1 a elm:Qualification**

where **elm:** refers to <http://data.europa.eu/snb/model/elm/> and **acqfqcp:** is an example prefix for <https://data.africa/acqfqcp/>. This structure illustrates the integration of continental data with broader Learning models, enhancing interoperability and data richness.

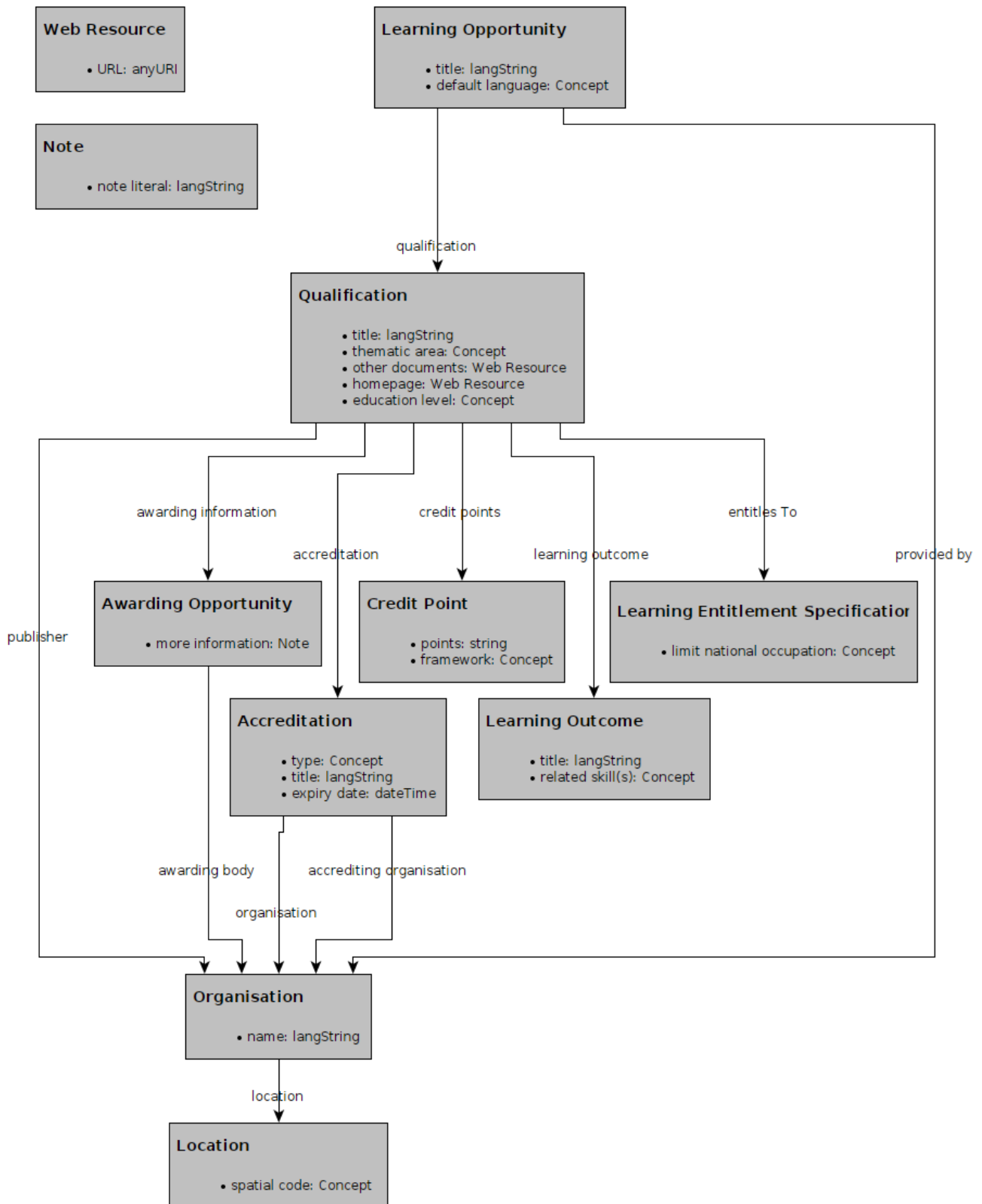
## 6.3. ACQF Model for Data Exchange

The data model used within the project is called the ACQF Model for Data Exchange (ALM-AP-EX), defined using standard interoperability constraint language (specifically SHACL) to enforce data quality and structure standards. It provides a detailed view of how these constraints are applied to manage and validate the data exchanged within the ACQF QCP.

Utilising SHACL, a W3C standard, the ALM-AP-EX ensures that all data shared across the platform meets specific quality and structural requirements. This rigorous approach to data validation supports the integrity and reliability of the qualification information stored within the ACQF QCP.

An overview of required classes and recommended properties is depicted in the following diagram, and more details are described below. The full ALM-AP-EX is described in Annex 8.5, and the mapping to overarching business required properties is located in Annex 8.6 (in the supplementary document).

## 6.4. Model Overview



Class	Property	Expected value	Card.	Description
<b>Qualification</b>	awarding information	Awarding Opportunity	1..*	Refers to an activity related to the awarding of the qualification, such as the country or region where the qualification is awarded, the awarding body and optionally the awarding period now or in the past.
	credit points	CreditPoint	0..*	The credit points assigned to the qualification, following an educational credit system.
	education level	Concept	0..*	An associated level of education within a semantic framework describing education levels.
	entitles to	Learning Entitlement Specification	0..*	Entitlements the owner has received as a result of this achievement.
	accreditation	Accreditation	0..*	The associated accreditation.
	homepage	Web Resource	0..*	The homepage.
	learning outcome	Learning Outcome	1..*	An individual (expected) learning outcome of the qualification.
	publisher	Organisation	1..1	The publisher.
	thematic area	Concept	0..*	The thematic area according to the ISCED-F 2013 Classification. It should be provided using the ISCED-F controlled vocabulary.
	title	string with language	1..*	The title. One value per language is permitted.
other documents	Web Resource	1..*	A public web resource containing additional documentation about the resource, at minimum - Links of the qualification (partly or fully) to Recognition of Prior Learning (RPL, VAE, VNFIL)	
<b>Accreditation</b>	accrediting organisation	Organisation	1..1	The Quality Assuring Authority (i.e., assurer).
	expiry date	dateTime	0..1	The date when the accreditation expires or has expired.
	organisation	Organisation	1..*	The organisation whose activities are being accredited.

<b>Awarding Opportunity</b>	title	string with language	1..*	The title. One value per language is permitted.
	type	Concept	1..1	The type of accreditation. It should be provided using the EDC Controlled List of Accreditation Types.
	awarding body	Organisation	0..*	The awarding body related to this awarding activity (i.e., the organisation that issues the qualification) Only in cases of co-awarding/co-graduation, where a qualification is issued to an individual by two or more organisations, the cardinality is greater than 1.
	more information	Note	0..*	An additional free text note about the resource.
<b>Credit Point</b>	framework	Concept	1..1	The framework used to assign the credit points to the learning specification. It could be provided using the EDC Controlled List of Educational Credit Systems.
	points	string	1..1	The credit points assigned to the learning specification.
<b>Learning Entitlement Specification</b>	limit national occupation	Concept	0..*	An occupation or occupational category. If provided, the value should come from a controlled vocabulary. An Occupation or Occupational Category.
<b>Learning Opportunity</b>	default language	Concept	1..1	The base language of the learning opportunity to be considered authoritative.
	provided by	Organisation	1..*	The organisation providing or directing the learning opportunity. In the case of, e.g., joint qualifications, there may be several organisations directing the learning opportunity.
	qualification	Qualification	1..1	The qualification, including the curricula, of this learning opportunity.
<b>Learning Outcome</b>	title	string with language	1..*	The title. One value per language is permitted.
	title	string with language	1..*	The title. One value per language is permitted.



<b>Location</b>	related skill	Concept	0..*	A link to a related skill or the level of a related skill on a skill framework (except ESCO). It should be provided using a controlled vocabulary.
	more information	Note	0..*	An additional free text note about the resource.
	spatial code	Concept	1..*	A code identifying a spatial scope in which this physical location is located.
<b>Organisation</b>	location	Location	1..*	The location of the organisation.
	name	string with language	1..*	The preferred name of the agent. One value per language is permitted.
<b>Web Resource</b>	URL	any URI	1..1	The public access URL.

## 6.5. Controller Vocabularies

The data model refers to several controlled vocabularies that can be either reused from ExisLMs or newly created for ALM. Note that while reusing an existing code list is a fast and efficient solution, its future extension might need to be requested with the code list publisher. On the other hand, creating custom code lists provides maximal flexibility but requires establishing a maintenance body and related processes.

- Accreditation.type
  - suggested reuse of [EDC Controlled List of Accreditation Types](#)
- Credit Point.framework
  - should be defined and created by ACQF
- Learning Entitlement Specification.limit national occupation
  - suggested reuse of [ESCO Occupations](#)
- Learning Opportunity.default language
  - suggested reuse of [Language Named Authority List](#)
- Learning Outcome.related skill
  - suggested reuse of [ESCO Skill Pillar concept types](#)
- Location.spatial code
  - suggested reuse of [Countries and Territories Authority List](#)

- Qualification.educational level
  - should be defined and maintained by ACQF
    - suggested digitisation of the ACQF itself
    - suggested digitisation of ISCED (2011)
- Qualification.thematic area
  - suggested reuse of the ISCED-F 2013 Classification

## 6.6. International Standards and Compatibility

The ACQF QCP's development is driven by the technical objectives of achieving data interoperability and seamless exchange and recognition of educational achievements across borders. To meet these goals, the data model will align with key international data standards and models critical for effectively managing qualification and credentials data.

**Dublin Core (DCMI):** This foundational framework provides a standard set of metadata elements, such as title, creator, and subject, essential for describing and organising data. Dublin Core's flexibility allows for extensions to meet specific regional needs, enhancing the platform's adaptability to the African educational landscape.

**European Learning Model:** This model provides a comprehensive framework for describing and assessing learning outcomes and qualifications. By incorporating elements such as the Credit Systems and the Qualifications Frameworks, the ACQF-QCP can enhance student mobility and facilitate the transfer and recognition of credits across African educational institutions. This alignment promotes transparency, quality assurance, and mutual recognition, which are vital for fostering mobility and cooperation.

**Friend of a Friend (FOAF):** As an ontology rooted in the Semantic Web, FOAF describes individuals, their relationships, and activities in a machine-readable format. This supports the representation of various stakeholders in the educational sector, including awarding bodies, publishers, and individuals, and enhances networking, collaboration, and community engagement within the educational ecosystem.

**Simple Knowledge Organization System (SKOS):** SKOS offers a standardised model for representing knowledge organisation systems and controlled vocabularies, such as hierarchical taxonomies of qualifications. This facilitates the structuring and management of data, making it easier to index, categorise, and compare credentials across borders. SKOS's support for mapping diverse qualification systems promotes harmonisation and coherence in representing educational achievements.

By embracing these international standards, the ACQF QCP enhances transparency, accessibility, and trust in educational credentials, supporting employability and lifelong learning opportunities for individuals across Africa and beyond. This strategic alignment fosters interoperability and positions the platform to integrate seamlessly with global educational frameworks, enhancing its utility and effectiveness.

## 7. Implementation Plan

This chapter lays out a strategic and operational roadmap for developing and deploying the ACQF QCP. It outlines the subsequent development phases to fully operationalise the QCP, employing a multi-phase approach that addresses both the technological and operational elements of the platform. This approach is tailored to meet the unique needs of ACQF's diverse demographic. This comprehensive blueprint serves as the target roadmap, from establishing an initial development foundation to the eventual handover to African Union stakeholders.

### 7.1. Timeline overview

The structured overview of tasks for delivery is presented as follows:

- **Develop, Test, Launch and Operationalise the ACQF QCP:** Begins with foundational software and user experience design, then enhances functionality with qualification data, culminating in a multilingual, operational platform ready for wide use.
- **Operationalise and Scale the ACQF QCP:** Segments African countries by readiness, providing custom support from initial pilots to full adoption, focusing on system adaptability and effectiveness.
- **Capacity Development and Advocacy:** Boosts engagement through training materials and programs that are key to widespread adoption and effective platform use.
- **Preparation of Handover to African Union Stakeholders:** Develop governance and operational structures for the ACQF QCP, ensuring sustainability, reliability, and scalability for its key role in African education.

The timeline and specific tasks are illustrated in the following figure.

Activities	Tasks	2024				2025				2026			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Launch ACQF QCP	Initial Foundation												
	Functional Database												
	Final Implementation												
Operationalise	Data collection coordination												
	National guidance document												
	System to collect feedback												
	Handbook												
Capacity development	Training manual												
	Training Programme												
	Learners' feedback report												
Hand-over	Protocol for hand-over												

Further chapters delve into detailed descriptions of each outlined activity.

## 7.2. Develop, test, launch and operationalise the ACQF QCP

**Task 1:** Initial Foundation and Prototype; the objective is to establish the fundamental software and database functionalities. Special consideration is given to user experience, emphasising meeting the unique requirements of the African demographic. This will be ascertained through the organisation of design workshops to optimise user experience. The approach at this stage involves initial software development and leverages previous work on the AI project to evaluate capabilities such as natural language processing.

**Task 2:** Stage of Functionality and Feature Enhancement builds on the foundational work from the first task. The aim is to operationalise the system with qualification data while augmenting its primary functionalities. This phase is essential for demonstrating the practical value of a data-driven approach to managing qualifications, which benefits policymakers, educational communities, and learners.

**Task 3:** Final Implementation and Rollout aims for a fully operational platform. It will operate at national and continental levels and support multiple languages. The project operates within a broader ecosystem involving qualifications and credentials, but it aims to contribute to this system rather than construct it in its entirety.

Performance Indicator	Task 1	Task 2	Task 3
Core Functionalities Developed	✓	✓	✓
Database Enhanced		✓	✓
User Experience Refinement		✓	✓
Multi-language Support			✓
Initial National Data Integrated		✓	✓

## 7.3. Operationalise and scale the ACQF QCP

Participating countries will be divided into three groups for implementation:

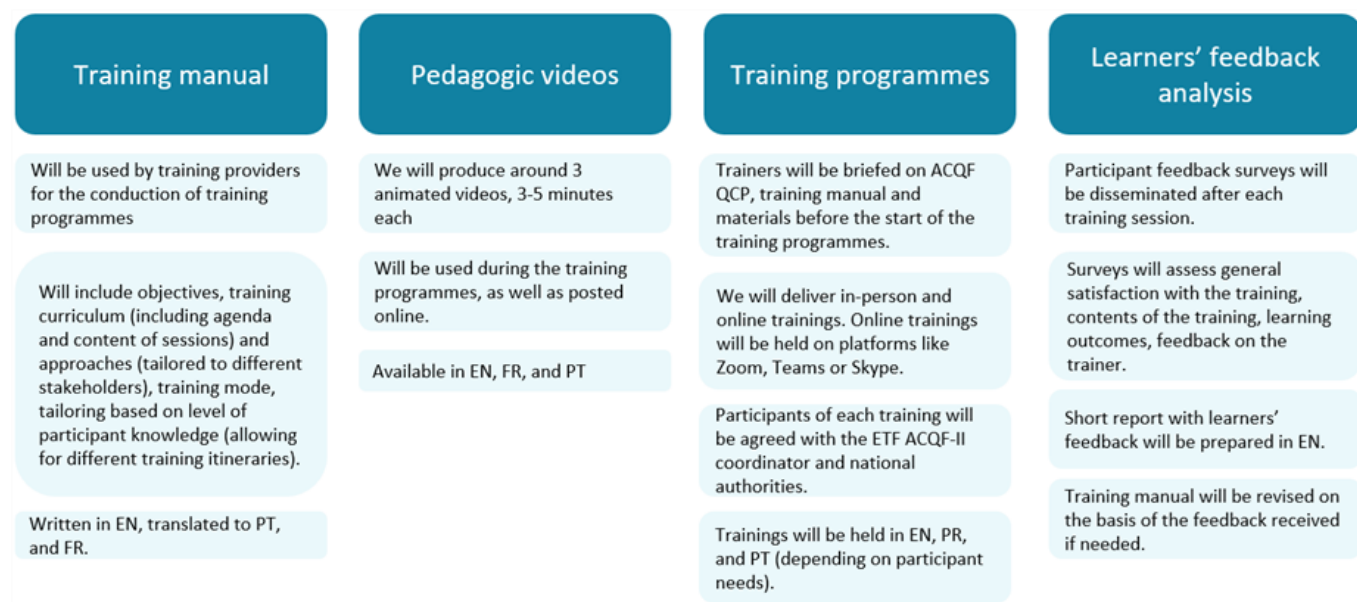
Group	Policy on Qualifications	Qualification Database	Technical Preparations	Involvement
Piloters (2-4 countries)	There are legal and organisational policies on the definition and collection of qualifications.	The collection of qualifications has begun. A database of qualifications with at least several hundred qualifications already exists.	The qualifications database exists as structured data, even if only in Excel.	Development and testing of the qualifications database. The initial focus group will be for refining and improving features before the launch of the mature product.
Early Adopters (3-6 countries)	There is a designated authority for collecting national, regional or sectoral qualifications.	There is a format for a database (defined structure of a qualification). The data collection has begun or is ready to start.	None.	Assisted in establishing procedures for using the ACQF QCP and support in terms of user training and technical support for using the qualifications databases.
Final Adopters (other countries)	Legal and Organisational policies on defining and collecting qualifications are either non-existent or immature.	None.	None.	Organisational and legal capacity building is required to set up the systems and QDBs. Once systems are established, they will be assisted using the ACQF QCP system.

**Scaling and operationalisation of the ACQF QCP will also include central-level actions, including:**

- Establishing procedures for management and governance of the database;
- Setting data quality standards and methods for ensuring compliance with the standards;
- Setting up a user-support desk and establishing processes for delivering this support;
- Introducing technical maintenance schedules and procedures;
- Determining the usage volume of the database from the perspective of data suppliers and data consumers and consequently planning for:
  - Adequate human resources to manage the database
  - Adequate technical infrastructure is needed to collect, host, back up, and serve data.

## 7.4. Capacity development and advocacy

The development, testing and operationalisation of the ACQF QCP will be supported by capacity development and advocacy actions aimed at enhancing the knowledge, understanding and skills of the stakeholders and beneficiaries on all relevant aspects of the functionalities, benefits and consolidation of the ACQF QCP. These activities will primarily include the development of a training manual and pedagogic videos and conducting training programs. At all stages, coordination with the ACQF-II coordinator will be ensured.



## 7.5. Preparation of handover to African Union stakeholders

To successfully hand over the ACQF QCP, we will need to work with the African Union to create a governing and operational structure for the ACQF QCP. Through a process of targeted consultation meetings with the national and regional level stakeholders, as well as potential funders, we will propose the establishment of:

- **overall governance** - responsible for decision-making as to the comprehensive policies of the platform, membership of the platform and future maintenance and development;
- **operational governance** - which is responsible for day to day running of the database, including promotion, quality control, user support and other similar functions;
- **technical governance** - responsible for technical maintenance and upgrades of the platform's infrastructure to ensure high availability, reliability and scalability.

Given the proposed distributed nature of the platform, these structures will need to be mirrored at the level of national qualification databases. To do this, we will (a) propose the ideal governance of national databases and (b) create a quality conformance checklist that outlines the minimum governance requirements a database would need to conform to retain its inclusion in the ACQF database.



## 8. Challenges and Solutions

Non-functional requirements define the qualities or attributes that characterise a system's performance, usability, security, and other aspects. These requirements are critical for ensuring the overall effectiveness and user satisfaction of the ACQF QCP solution. However, compromises in certain areas might need to be found to comply with the resource planning and the project timeline.

Area	Constraints	Impact
<b>Control over data modelling</b>	Reliance on external ontologies means control over ontology structures is limited; only the application profile (AP) is controlled.	Possible limitations in tailoring data structures to specific regional needs, relying on external updates for ontology changes.
<b>Centralised Data Editing</b>	A centralised solution requires that partner countries agree to edit and manage their data directly on a shared platform.	Requires agreement among partner countries to participate in such a manner.
<b>Open Data Policy</b>	Data published on the platform must adhere to open data principles, allowing unrestricted reuse by any party – For example, complying with <a href="https://opendatacharter.org/">https://opendatacharter.org/</a> .	Potential perceived issues with lack of control over data dissemination.
<b>Persistence of Data</b>	Once data is published, it is persistently available due to Linked Open Data (LOD) constraints.	Challenges in data management, including updates and corrections to published data, due to its persistent nature.
<b>User Interface Design</b>	The design focuses on practical usability and a pleasant user interface but offers limited configurability.	Reduced flexibility for users wanting to customise their user experience or interface preferences.
<b>Governance Dependency</b>	Project deliverables depend on feedback and approvals from a steering committee which oversees the governance structure.	Potential delays in project milestones if governance feedback is slow or if significant changes are required.
<b>Technical Familiarity</b>	The data model uses SHACL and RDF, which are less familiar to national implementers than more commonly used standards.	A learning curve for implementers could lead to implementation delays or errors.

<p><b>Changing Requirements</b></p>	<p>New or evolving requirements throughout the project lifecycle can lead to scope changes, affecting timelines and resource allocation.</p>	<p>Increased risk of project delays and scope creep if new requirements arise or existing ones evolve.</p>
<p><b>Performance of Operations</b></p>	<p>Given the data volumes and system capabilities, exports, imports, and other large operations on the platform may require significant time to execute.</p>	<p>Slower system responses during large data operations, affecting user experience and operational efficiency.</p>
<p><b>User Capacity Limits</b></p>	<p>The platform is designed to handle a maximum of 100 concurrent editors and 10,000 users on the General Public portal.</p>	<p>Limitations on user access during peak times could affect data entry and retrieval, impacting overall user satisfaction.</p>