

**DEVELOPING THE AFRICAN CONTINENTAL
QUALIFICATIONS FRAMEWORK (ACQF)**



TRAINING MODULE NINE

09

**INNOVATION AND TECHNOLOGY IN THE
CONTEXT OF QUALIFICATIONS SYSTEMS**



THE AFRICA-EU PARTNERSHIP
LE PARTENARIAT AFRIQUE-UE



This Training Module on innovation and technology in the context of the African Continental Qualifications Framework (ACQF) is elaborated in 2022 within the project AU-EU Skills for Youth Employability/Skills Initiative for Africa, Technical Cooperation – Developing the African Continental Qualifications Framework.

Views and opinions expressed in this publication are the responsibility of the authors and should in no way be attributed to the institutions to which they are affiliated or to the African Union Commission or the project partners (European Union, Federal Ministry of Economic Development and Cooperation, Deutsche Gesellschaft für Internationale Zusammenarbeit, European Training Foundation).

We acknowledge all contributors, institutions and experts who shared views, comments and recommendations during the consultation process, and supported the author in the accomplishment of this mission.

Comments and additional information to be sent to: ecb@etf.europa.eu

The authors of this Training Module are: Kelly Shiohira and Patrick Molokwane

Reviewers and contributors: Eduarda Castel-Branco, Eusebius Juma Mukhwana, Deodonne Kunwufine

March 2022

Table of contents

| | |
|---|-----------|
| Acronyms | 5 |
| 1 General information on the Training Module..... | 6 |
| 1.1 OVERVIEW..... | 6 |
| 2 Overview of Training Module 9 | 8 |
| 2.1 ABSTRACT..... | 8 |
| 2.2 EXPECTED LEARNING OUTCOMES | 8 |
| 2.3 KEY DEFINITIONS | 8 |
| 3 Innovation and Technology in Qualifications Frameworks | 9 |
| 3.1 THE INNOVATION DESIGN CYCLE: HOW INNOVATION HAPPENS | 13 |
| 3.2 INNOVATION READINESS..... | 16 |
| 3.3 INTRODUCTION TO DATABASES..... | 17 |
| <i>The Ethical Management of Data</i> | <i>18</i> |
| <i>Database Types.....</i> | <i>19</i> |
| 4 Innovations in the Development of Qualifications, Frameworks and Standards | 24 |
| 4.1 QUALIFICATIONS PASSPORTS | 25 |
| 4.2 FLEXIBLE CREDENTIAL PATHWAYS..... | 26 |
| <i>Challenges to Flexible Credential Pathways.....</i> | <i>26</i> |
| 4.3 STACKABLE CREDENTIALS..... | 29 |
| 4.4 PERSONALIZED LEARNING PATHWAYS | 30 |
| 4.5 STEALTH ASSESSMENT | 30 |
| 5 Innovations in Comparing and Analysing Qualifications | 31 |
| 6 Innovations in the Registration and Management of Qualifications | 33 |
| 6.1 INTEROPERABILITY..... | 33 |
| 6.2 CREDIT BANKS..... | 35 |
| 7 Innovation and Technology in Credentials and the Recognition of Learning | 37 |
| 7.1 RECOGNITION OF PRIOR LEARNING..... | 37 |
| 7.2 DIGITAL CERTIFICATION AND DIGITAL CREDENTIALS | 39 |
| 7.3 MICRO-CREDENTIALS..... | 40 |
| 7.4 COMPETENCY-BASED ASSESSMENT | 40 |
| 7.5 DIGITAL AND VIRTUAL ASSESSMENTS..... | 43 |
| 8 Innovations in Data Collection and Use | 46 |
| 8.1 AUTOMATED AND ENHANCED LABOUR MARKET INTELLIGENCE..... | 46 |

| | | |
|-----------|--|-----------|
| 8.2 | LEARNING MANAGEMENT SYSTEMS | 48 |
| 8.3 | INNOVATIONS IN MONITORING AND EVALUATION | 49 |
| | <i>Micronarratives</i> | 49 |
| | <i>Data Exhaust</i> | 49 |
| | <i>Data Visualization</i> | 49 |
| 9 | Innovations in Communications | 50 |
| 10 | Summary | 50 |
| 11 | Glossary | 51 |
| 12 | Guidance for trainers and learners | 55 |
| 13 | Assessment | 57 |
| | APPROACH TO ASSESSMENT..... | 57 |
| | ASSESSMENT #1: FLEXIBLE CREDENTIAL PATHWAYS..... | 57 |
| | ASSESSMENT #2: PROJECT AND PRESENTATION (INDIVIDUAL PAIRS) | 58 |
| | REFERENCES AND FURTHER READING..... | 59 |
| | <i>ACQF: 59</i> | |
| | <i>Other: 60</i> | |
| | ANNEX 1: RESPONSES TO ACTIVITY 1..... | 64 |
| | ANNEX 2: RECOGNITION OF PRIOR LEARNING CASE STUDY..... | 69 |

Acronyms

| | |
|---------|--|
| ACQF | African Continental Qualifications Framework |
| ASG-QA | African Standards and Guidelines for Quality Assurance |
| AU | African Union |
| AUC | African Union Commission |
| CEDEFOP | European Centre for the Development of Vocational Training |
| CESA | Continental Education Strategy for Africa |
| EQAVET | European Quality Assurance for vocational education and training |
| ETF | European Training Foundation |
| EU | European Union |
| NQF | National Qualifications Framework |
| QA | Quality Assurance |
| TVET | Technical vocational education and training |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| VET | Vocational Education and Training |

1 General information on the Training Module

The African Continental Qualifications Framework (ACQF) is a policy initiative of the African Union, underpinned by continental cooperation and integration policies ranging from education to free movement of persons and free trade. Development of the ACQF is underway (2019-2022), and includes analysis and research, elaboration of the ACQF policy and Guidelines, networking and stakeholders' outreach and the capacity development programme. The [ACQF website](#) contains information on all components, activities and outputs of the ACQF development project.

1.1 Overview

1. Objective and scope

The package of ten ACQF Training Modules supports the dissemination and application of the ten ACQF Guidelines, and address the same themes relevant in the domain of qualifications and qualifications frameworks. The list of training modules is as follows:

- Training Module 1: Learning Outcomes
- Training Module 2: Level descriptors
- Training Module 3: Referencing national qualifications frameworks or systems to ACQF
- Training Module 4: Validation of learning
- Training Module 5: Quality assurance in the context of ACQF
- Training Module 6: Registers / databases of qualifications
- Training Module 7: Monitoring and evaluation in the context of qualifications frameworks or systems
- Training Module 8: Communication and outreach
- Training Module 9: Innovation and Technology in the context of qualifications frameworks or systems
- Training Module 10: Qualification and qualifications frameworks – the systemic view

This Training Module on Innovation and Technology should be applied in coherence with other ACQF Training Modules. In the era of digitisation and digitalisation across all areas of life including in education, Innovation and Technology cuts across to varying degrees, all the other Training Modules that are part of this project and as such should be used across the others.

The structure of this Training Module is as follows: Part 1 and 2 introduce general information on the training module. Part 3 provides more detail on the rationale for the guideline and benefits of Innovation and Technology in qualifications frameworks. This section engages the argument for innovation and technology, and provides some frameworks for innovation design as well as some key risks and mitigation strategies to consider. Part 4 focuses on databases and database types, and part 5 focuses on innovations to enable flexible credential pathways, exploring some of the topics and examples covered in the technical guideline in detail.

2. Utilisation of the Training Module

The Training Modules are designed for:

- Self-paced learning (individual)
- Teacher / trainer / facilitator directed learning – which may include group learning
- A combination of the above.

The Training Modules are freely accessible in several formats for flexible adaptation to different contexts and to learners' needs and possibilities: as PDF files to download from ACQF Website and disseminate; as digital content accessible via ACQF digital Learning Management System, accessible online or offline, including via an App for Mobile phones.

Interested users (learners, teachers / trainers and organisations) may use the full set of Modules, or focus on just a few.

ACQF Training Modules can be used in a variety of situations, e.g.:

- Ministries and departments dealing with qualifications frameworks development and coordination, especially in early stages of the development process, or when operationalisation starts and more staff, stakeholders and technical resource persons are involved
- Quality councils, quality assurance agencies - for their staff, members and technical resource persons
- Technical projects designing or reviewing national qualifications frameworks with national taskforces and working groups
- Education and training providers, e.g., as optional or regular training modules on the themes and issues related with qualifications frameworks and systems: teacher training institutes, higher education institutions (departments of education), training centres for staff of public sector institutions, training centres of employers' associations and professional bodies, sector skills councils involved in development of qualifications.
- International organisations' training centres and capacity development activities.

3. Concept and structure

The Training Modules

- Are based on the content elaborated in the Technical Guideline, and expand it, exploring the literature, recent research, and experiences.
- Raise questions and issues in debate that could not be expressed in the Technical Guideline
- Provide examples and cases illustrating the main concepts, issues and application of the approaches and methods
- Examples and cases are taken from relevant practices and developments worldwide, with a focus on frameworks and systems with substantial and relevant experience for the different themes.

The Training Modules include

- Reflective questions that could be addressed as an individual or as a group (e.g. workshop group, work group)
- Learning activities that could be addressed as an individual or as a group (e.g. class/lecture group, work group)
- Access to case studies or examples, readings, disparate views (if relevant)
- Assessment tasks

2 Overview of Training Module 9

2.1 Abstract

This training course focuses on innovations and technology in qualifications frameworks. The intended audience is government officials, policy-makers, educationalists, researchers and anyone with an interest in qualifications frameworks and how they can support national development.

Participants in this course will learn about some key innovations related to qualifications frameworks, and how they can interact to support more flexible models of skills recognition.

The first part of the course, section 3, covers some basics of innovation and technology, such as how innovations are designed and why technology is of particular relevance today. As a foundation of technology use in qualifications frameworks, the course then provides an introduction to databases and different database types.

The second part of the course, sections 4 - 9, cover a range of innovations in the development of Qualifications Frameworks, comparing and analysing Qualifications Frameworks, the registration and management of Qualifications Frameworks, credentials and the recognition of learning, data collection and use, and communication. Case studies and reflection questions will guide participants through their learning and direct attention towards the relevance and feasibility in participant's own contexts.

This training module requires no prior experience, but familiarity with qualifications frameworks is recommended.

2.2 Expected learning outcomes

At the end of this Training Module the learner will be able to:

- 1 Understands what databases are and the advantages and disadvantages of different types of databases.
- 2 Defines and discusses key concepts: the innovation design process, ethical use of data, and a range of innovations and technologies implemented in the NQF space.
- 3 Articulates the key requirements for and components of successful flexible credential pathways, and discusses these in own country context.
- 4 Understands the role that competency frameworks, digital assessments, digital credentials and the recognition of prior learning can play in skills development and qualifications
- 5 Explores innovations related to qualifications and reflects on their relevance and implementation in own country context.

2.3 Key definitions

The following key definitions are included here as a key focus for Training Module 9.

Credit means confirmation that a part of a qualification, consisting of a coherent set of learning outcomes has been assessed and validated by a competent authority, according to an agreed standard; credit is awarded by competent authorities when the individual has achieved the defined learning outcomes, evidenced by appropriate assessments and can be expressed in a quantitative value (e.g. credits or credit points) demonstrating the estimated workload an individual typically needs for achieving related learning outcomes.

Source: Council Recommendation of 22 May 2017 on European Qualifications Framework. [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615(01)&from=EN)

National Qualifications System: This includes all aspects of a country's activity that result in the recognition of learning. These systems include the means of developing and operationalising national or regional policy on qualifications, institutional arrangements, QA processes, assessment and awarding processes, skills recognition and other mechanisms that link education and training to the labour market and civil society. Qualifications systems may be more or less integrated and coherent. One feature of a qualifications system may be an explicit framework of qualifications.

Source: OECD 2006

Qualification: Means a formal outcome of an assessment and validation process which is obtained when a competent authority determines that an individual has achieved learning outcomes to given standards.

Source: Council of the European Union (2017)

Means a planned combination of learning outcomes which has a defined purpose or purposes, intended to provide qualifying learners with applied competence and a basis for further learning and which has been assessed in terms of exit level outcomes, registered on the NQF and certified and awarded by a recognised body.

Source: SAQA NQFPedia 2017

Quality assurance: Processes and procedures for ensuring that qualifications, assessment and programme delivery meet certain standards.

Source: Tuck 2007

Validation of non-formal and informal learning: means the process of confirmation by a competent authority that an individual has acquired learning outcomes acquired in non-formal and informal learning settings measured against a relevant standard and consists of the following four distinct phases:

- identification through dialogue of particular experiences of an individual,
- documentation to make visible the individual's experiences,
- a formal assessment of those experiences, and
- certification of the results of the assessment which may lead to a partial or full qualification.

Also known as recognition of prior learning (RPL), is the confirmation by a competent authority that the learning outcomes, that an individual has acquired in non-formal and informal learning settings, has been measured against a relevant standard.

Source: AQCF Thematic Brief 1 2021a, adapted from EQF Recommendation 2017

3 Innovation and Technology in Qualifications Frameworks

Although they have been around for some time in other context, within Africa the construction and use of National and Regional Qualifications Frameworks is itself a new and innovative development (ACQF, 2021). Qualifications frameworks are classification tools. Qualifications are ordered based on a hierarchy of difficulty, in which obtaining a lower-level qualification is a prerequisite for enrolling for a higher level (ibid). Practically, the qualifications framework uses what are called level descriptors which outline at every level what a student is supposed to know in order to be considered competent and gain a qualification. The difficulty and complexity increases progressively with every level as the student advances (SAQA, 2012). Standards guide what students should learn in each course or programme as they move towards qualifications (HCPC, 2017). National, regional and continental qualifications frameworks provide

transparency and a means to compare and reference qualifications within and between countries (Coles, 2017).

As Africa moves towards closer regional economic integration, a common system of recognition of training and qualifications becomes ever more important. As a referencing tool, a Continental Qualifications Framework (CQF) will provide the blueprint to enable credential fluency and the mobility of skilled labour, a crucial part of regional integration and closer economic ties. However, comparisons between qualifications across borders can be labour-intensive, as can ensuring available qualifications and their associated standards align to skills and social demands within each given context, and as always access to formal education and the fair and inclusive recognition of skills remain foregrounded in African education systems.

Innovations, which include but are not limited to technological innovations, provide some responses to the key challenges facing governments in creating and implementing qualifications systems. This section outlines a series of existing and emerging innovations in the development of qualifications, frameworks and standards; comparing and analysing qualifications; the registration and management of qualifications; and credentials and the recognition of learning. Section two also touches on innovations in data collection and use, communication and monitoring and evaluation, to present innovations directly in relation to other ACQF Guidelines.

Much emphasis has been placed on the changing skills needs of labour market. Skills needs are changing in response to a confluence of factors that include digitalization, automation and the integration of AI into business processes, greening and globalization. These developments affect not only the information technology sector but all sectors. For example, if one considers what was required for a clerical position in 1980 versus today, one will see that there is an increased emphasis on computer literacy and productivity software. The pace of particularly technological innovations and the resultant changes to labour markets has been accelerating, and this has two points of relevance for Qualifications Frameworks. First, many scholars argue that education and skilling systems are too slow to adapt and incorporate new skills required by the labour market. Systems must increase their agility in order to respond appropriately and within a reasonable time frame. Secondly, innovations and technological advancements have opened new possibilities. For lifelong learners this includes access to a wide range of digital offerings by companies and education and training institutions through formats such as massive open online courses. At the same time, learning management systems are generating huge amounts of data and information on students, teaching and learning that were never accessible on scale before. And in terms of administration and planning, new types of qualification and qualification pathways are emerging, and the integration of technology has enabled larger amounts of data, faster processing and more reliable analysis. For example, AI can now be leveraged to support functions such as skills mapping and labour market intelligence.

The challenge to governments is twofold. First, how to manage the response to rapidly-shifting skills needs within the education system. It is no longer appropriate or adequate to have a years-long review and revision process for qualifications – by the time the qualification is revised using traditional processes, the revisions may be obsolete. Second, how to leverage new technologies and incorporate other beneficial types of innovations into their existing frameworks and processes, while also maintaining the quality and integrity of the credentials offered by the system.

This Innovation and Technology Guideline and Training module cannot answer these questions. Each country must engage the process of innovation on its own terms and within its own specific set of goals and mandates. However, this training module sets out to provide the information, examples and reflective questions that create one blueprint for how these questions can be engaged.

Over the last few years, many Qualifications Frameworks have gone through a period of review. Some have modernized with the intention of leveraging technological developments and new international or national innovative practices. Granted, part of the upkeep of QFs is to review and update periodically to respond to development such as these, as well as emerging needs in the world of work and the economy at large. This necessitates policy makers and implementers within the space of education and training to anticipate or even at times lead the direction of the economy through adjustments to policies, practices and systems. The introduction of the right legislation and appropriate and relevant innovations and technologies can assist governments and education and training institutions to respond to the needs of the moment.

Additionally, events like the Covid-19 pandemic have shown the world that the future is unpredictable, and preparation for disruptive events is an important part of our reality. While no countries experienced a seamless transition in their learning and hundreds of millions of learners experienced disrupted learning, those without extensive digitalisation efforts or will poor digital penetration were particularly affected.

Digitalisation is seen as a way of using digital technologies to change business models and processes. There is an important distinction between digitisation and digitalisation. Digitisation is simply converting information into a digital format, while digitalisation entails leveraging electronic information to inform new practices or processes. According to the European Investment Bank (EIB), organisations that have embraced digitalisation are more resilient to disruption or external shocks like the Covid-19 pandemic.

The pandemic was a concrete and recent case in which countries with a high degree of innovation and technology readiness were able to more rapidly adapt and introduce innovations such as remote teaching and digital assessments. In many cases, this meant a policy shift and indeed a shift in practice. While in some cases emergency measures will be discarded, in other cases these innovations and technologies are now entrenched within education and training systems, only advancing a trend towards digital and more lifelong learning also supported by changing labour needs.

However, there are also risks to digitalisation which must be considered. For example:

- **Cyber attacks** - as more businesses and institutions are moving operations online, it increases the likelihood of cyber attacks. There are always cyber criminals waiting to pounce on vulnerable systems and hold them for ransom or sell the data to other parties to make money. Personal data is mostly at risk when it comes to this type of security threat. Many countries do not have legislation to deal with technology and this presents challenges especially when dealing with organisations that do not do enough to safeguard this data.
- **Increasing digital inequality** - one of the things that was exposed during the Covid-19 pandemic is the inequalities that exist between and within countries when it comes to access to digital technologies. With the low penetration of technology in Africa, the move towards digitalisation can mean a challenge of access for a large part of the population. In a situation where still a large segment of the population on the continent struggle with basic services such as consistent access to electricity, inequalities that already exist will be exacerbated.
- **Loss of livelihood** - a move towards digitalisation means that a lot of processes will eventually become automated leading to an increased reliance on machines and less on people. This process will lead to a loss of existing jobs and a change in some of the jobs but requiring new skills and adaptation. Potentially this could lead to structural unemployment if it becomes difficult for the current and potential workforce to adapt to the new requirements that arise.

There are mitigation strategies which can counter risks or negative outcomes such as these. The first is *enhanced cybersecurity*. There is a cost to ensuring systems are protected with the latest security measures, but it is well worth the effort to protect national data and individual privacy. Closed networks

are also less susceptible to cyber threats, and can be an option worth considering. One other component which should be carefully considered, however, is security on storage facilities where hardware or servers are stored. For example, buildings which utilize 'smart' technology such as sensor-enhanced climate control may be vulnerable, and valuable data could be controlled by, for example, a hacker resetting the temperature in these facilities to damage equipment.

The second is *access protection and equity measures*. Governments and the processes and policies they promote or establish should consider carefully the equitable distribution of access *and benefits* of technological innovations. For example, while there may be an increased cost to connecting remote or rural populations, the effects of not doing so should be carefully considered. Is this driving migration out of farming areas to more industrial centres which are connected? What is the effect of that in the medium and long term on the national economy and trade portfolios?

A third consideration has to do with *self-sovereign identity*. This is quite simply the idea that individuals should own and control the use of their own data. In the case of qualifications, this would mean a fundamental transformation from how credentials are managed and stored in most contexts. At the moment, universities or other educational institutions maintain and own credential records. If an individual wants a copy of their diploma, they often must pay the institution for a reissue of this record. This is a fundamentally counter-intuitive. If an individual pays and works for a credential or qualification, that record should belong to the individual. The system of university ownership of records has evolved due to trust concerns, in which education institutions are considered more trustworthy than individuals. However, with new technologies such as QVC codes and the blockchain, these credentials and qualifications can be verified by trusted organisations (like universities or governments) but maintained and accessed at will by the individuals who earned them.

DigiLocker: An Initiative towards Self-Sovereign Identity in India

Citizens in India have access to a 'digital wallet' which stores their credentials. These include documents such as drivers licenses, Covid-19 vaccination cards, government assistance cards, voter identification cards and of course academic and vocational qualifications. Accounts are linked to a national identification number, and sign-up is accessed through a web portal. While there is a password and one-time-pin option for sign-up, biometric data in the form of a fingerprint is also accepted for security.

Once an individual signs up for DigiLocker, credentials issued by governments and linked organisations appear or are linked to the individual's digital wallet. Documents uploaded by users on DigiLocker are authenticated by the issuing organizations at the request or with the consent of the individual. In the case of qualifications and credentials, they are now issued with QVC codes. These verified qualifications and other credentials can then be shared with interested parties such as other government departments, employers or other educational institutions at any time and from any place as requested by the individual.

DigiLocker is maintained by the Ministry of Electronics and Information Technology, Government of India under its Digital India initiative.

Finally, upskilling and reskilling are critical components of ensuring a relevant workforce in today's society. Changing skills needs, trends such as digitalisation and greening, and emerging and declining sectors have resulted in a new labour context in which movement between sectors as well as jobs is expected. Employers should be encouraged to continuously invest in the skilling of their workforce, and we will explore later in this course some innovations around assessing, recognizing and storing credentials.

Recommended reading:

Lane-Sellers, J., 2021. Digitalization in Africa, the Risks and Transformation Needed. <https://blogs.lexisnexis.com/fraud-and-identity-in-focus/digitalization-in-africa-the-risks-and-transformation-needed-mdr>

Markevych, K., 2021. Not Just Advantages. What Are the Dangers Behind Digitalisation? <https://razumkov.org.ua/en/articles/not-just-advantages-what-are-the-dangers-behind-digitalisation>

McKinsey Global Institute. 2017. *Jobs Lost, Jobs Gained: What the future of work will mean for jobs, skills, and wages.* <https://www.mckinsey.com/featured-insights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages>



Reflective questions

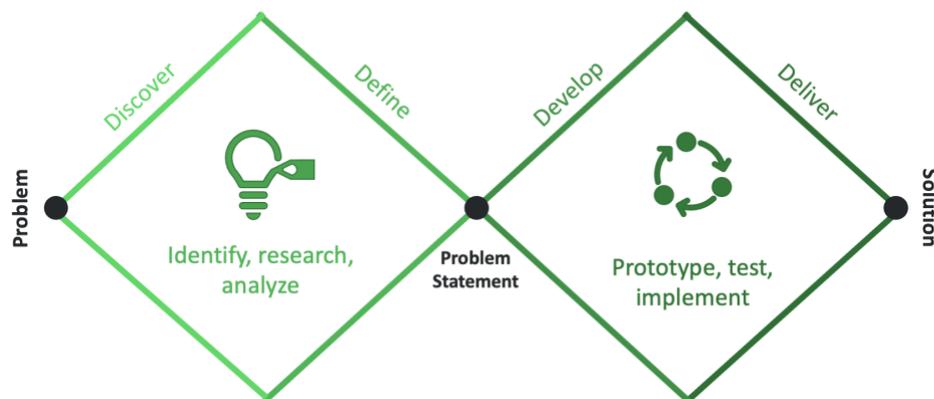
The reflective questions can be undertaken as an individual or as a group discussion.

1. Consider the following statement by McKinsey in the Future of Work Report (2017): “60 percent of occupations have at least 30 percent of constituent work activities that could be automated.”
2. What effect will this have on the labour force in your country?
3. What do you think are the risks for those that do not embrace digitalisation? Consider individuals, businesses and governments.
4. Reflect on the concept of self-sovereign identity. Is this a good idea for your country? Why or why not?

3.1 The Innovation Design Cycle: How Innovation Happens

While there are various models that have been set out to capture the process of innovation design, but they all contain key aspects of problem identification, collaborative design and responsive development and delivery. The process should be supported throughout by research.

One of the most common is the ‘Double Diamond’ approach proposed by the Design Council in 2005. The four stages of the Double Diamond are 1) Discovery; 2) Definition; 3) Design; and 4) Development. It is called the Double Diamond because the process first gathers a lot of information, and then narrows this information into a problem statement. This is the first diamond. The second diamond deals with a second round of information-gathering, which narrows again into a product.



Discovery

A strong process of technology or innovation integration starts with the identification of an area of need. What are the challenges currently faced by the system and its users? The needs should be fully understood before a solution can be found. This means research. Beneficiaries should be a core focus of this research. For example, for an innovation related to a national qualifications framework, beneficiaries likely include employers, educational institutions, government departments and, critically, students and/or lifelong learners. This research can be conducted through targeted calls for expert input, surveys and/or interviews with beneficiaries, and market research activities such as beneficiary or targeted surveys to increase understanding of the problem.

Definition

The information gained through these research exercises should be crystalized into a problem statement. Problem explanations can be a paragraph or even longer, but it is useful to try to create a one-sentence statement that captures the essence of the problem. This one sentence is the problem statement.

Design

Once a need or series of needs is identified and crystalized into a problem statement, research and planning should be conducted to understand a broad range of solutions. These solutions could be solutions in use in other contexts, proposed solutions which have not yet been realized, or a combination of the two. Research at this stage can include brainstorming sessions and exploratory workshops; crowd-sourced solutions gained through social media campaigns, advocacy campaign activities, hackathons, etc; research of available literature on the topic; and/or interviews with other practitioners who may have developed similar innovations.

Once a wide range of proposed solutions are gathered and fully understood, selection must take place. Each solution should be evaluated in terms of relevance, feasibility and ethics.

- Relevance speaks to how well the proposed solution responds to the identified need. Will the problem be fully solved by the solution? Partially solved? Will new problems be created?
- Feasibility speaks to implementation possibility. While at this stage it is not necessary to have all the details fully understood, key questions should be answered. These include: What would this solution require? Do we have or can we attain all the requirements? What are the critical success factors for this solution?
- Ethical considerations include equity, privacy and safety. Will this solution benefit all or only some of the target audience? How can the solution be adapted to ensure equitable access to the solution and its benefits? Does the solution adhere to legal and policy mandates? What risks will the solution expose people to (for example, cyber-security risks) and how can these risks be reduced or eliminated?

At this point a solution may be selected for further development, or all solutions may be rejected. If none of the proposed solutions are determined to be worth further effort, a second round of information-gathering may take place. If this happens, at this point it is useful to re-evaluate the identified need. Is this need accurately phrased? Is it the true need, or just a symptom of a deeper problem? A second point of interest may arise if all of the proposed solutions are determined to be blocked by the same or a similar challenge. If this happens, the challenge identified is likely the true need that needs to be addressed.

If a solution is found which will respond to the identified need, a *prototype* is developed. This could be a paper prototype which outlines the solution, how it will work, who will be involved and what their

responsibilities will be. Or it could be a model of the product which is developed for review but does not have the proposed functionalities or all of the functionalities.

The prototype in whatever form should be reviewed by beneficiaries for input before development begins so that it can be refined to ensure needs of different users are met.

Development

The development phase carries the selected and reviewed solution forward until it can be launched for general use. While this is quite simple to say, there are some complexities that should be observed.

First, development is unlikely to be a linear process in the case of innovations. New complexities will arise as different parts of the solution are tested and put into practice. Plans may need to change to accommodate these developments. An *agile development process* seeks to support by providing short cycles of development and review. Broad goals are broken down into a series of concrete steps or components. A few components are set as a goal for a short period of time. This could be a week, or two weeks, or a month. These periods of time are referred to as sprints. At the end of a sprint, the users of the system all review the work done and give input. This helps to keep the innovation on track towards goals and ensure the launched product will be used by the people who will benefit from it.

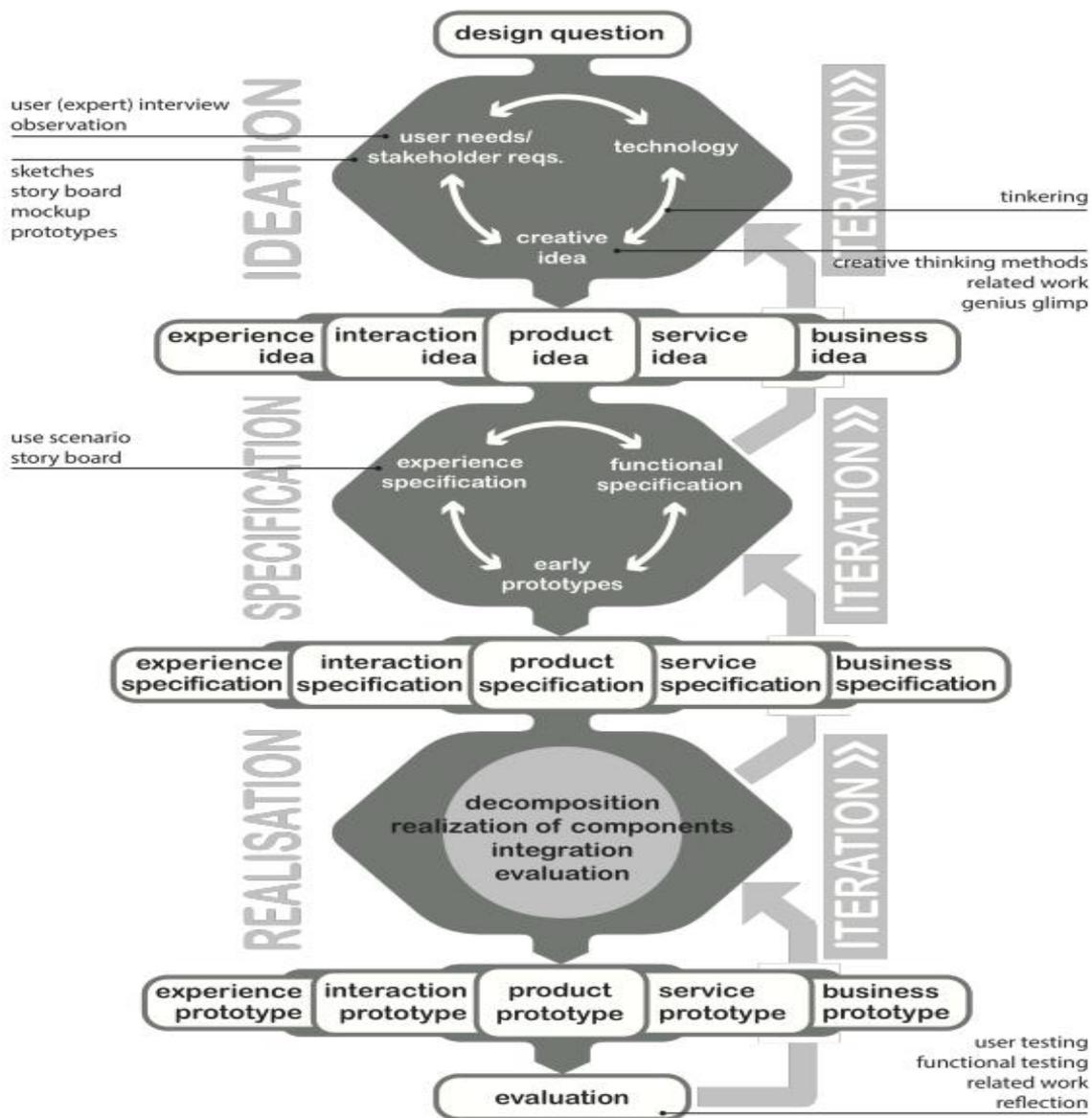
Second, the change management process should not be ignored. Simply developing an innovation is not necessarily enough. *Champions* should be identified among key beneficiary groups and government departments who will push for the integration of the innovation into the everyday routines already established by each organisation or type of organisation. The process of integration should be explicit, with responsibilities for key individuals which are agreed to in advance and promoted over time. Advocacy and/or training campaigns among staff members and targeted groups should be conducted. And finally, where appropriate, policy should be reviewed and adjusted to support the use of the innovation.



Reflective activity

Consider the diagram on the following page, which outlines a proposed Creative Technology Design Process (Mader and Eggink, 2014). There are four phases which are Ideation, Specification, Realisation and Evaluation. In this model, the product is guaranteed by the process of iteration until the desired results are met. Reflect on the following questions:

1. How is this model similar to the 'Double Diamond' model?
2. How is this model different to the 'Double Diamond' model?
3. Which do you prefer, and why?



3.2 Innovation Readiness

Notions of innovation are closely tied to economic growth and development. The UN Economic Commission for Africa (2018) suggests that “for growth to result in economic transformation, it must be knowledge-based and innovation-driven, based on evidence from advanced economies and newly industrialized countries.” In turn, countries must have the necessary criteria in place to enable them to successfully adopt and implement innovations. An assessment of those criteria might provide an indication of a country’s ‘innovation readiness’.

Innovation readiness indicators are useful means of assessing country innovation readiness. While multiple frameworks and indicators have been developed to measure innovation in different countries, industries, and sectors, in general, a country’s innovation readiness level can be assessed across three domains as show in **Figure 1**.

electronically. Databases are a critical component of managing information in today's society, particularly for businesses and governments.

A database is operated by a database management system (DBMS). A database management system (DBMS) is a computerised data keeping system used to control a database. A DBMS serves as an interface between the database and its end users or programs, allowing users to retrieve, update, and manage how the information is organised and optimised, making it an integral part of data management.

Databases are used to solve one of the most fundamental challenges of the information age, storing and accessing large amounts of collected data. Databases allow users to not only store data but also reduce the amount of work necessary to retrieve, check and analyse data. It is easy to share data using a database as the data resides on a centralized system. Through a DBMS, users can query the system easily, data can be locked to prevent users from accidentally deleting or changing data, and a recovery manager will retrieve data in case of system crashes or errors. DBMS also have extra security measures to help protect data.

Databases also play an important role in the reduction of data redundancy within a computer application. Data redundancy is when multiple copies of the same information are stored in more than one place at the same time. A database will eliminate any data redundancy before the data is presented to the end-user, allowing for a cleaner and more accurate analysis with less effort. A database also offers the end-user consistency in its operation, be it in data analysis or updating the data, and also reduces incidences of data errors. Database Management Systems (DBMS) are often independent of any other computer programs and can be accessed by all other applications. And lastly, it is easy for users to access all relevant data in a database through the use of hosts and query languages such as SQL.

As with any innovation or new technology, limitations should be considered as well as the benefits. The fact that limitations exist should not serve to discourage the use of databases, but an awareness of limitations can ensure users have realistic expectations about what can be achieved and what other strategies may need to be used in conjunction with the technology.

One of the key limitations of databases is that they have high start-up costs. Databases are complex, difficult, and time-consuming to design, and building a database from the beginning therefore requires a substantial amount of work. Even if a commercial or existing database, databases also require a substantial amount of hardware and software, and there are also conversions costs to move from a file-based system to a database system. A database needs a moderate to high level of skill to set up, maintain and use. Databases are not designed to be intuitive like spreadsheets, so this expertise is critical to recruit or build within organisations moving to database systems. They may not be suitable for small firms or organisations which do not have large volumes of data. Finally, for commercial database management systems, frequent upgrades usually add new functionality to the systems, but these updates may also at times require hardware upgrades.

The Ethical Management of Data

A large proportion of innovations today leverage technology and more specifically data. While there is promise in the use of artificial intelligence techniques and processes such as automation, the use of individual data in particular needs to be considered carefully. In 2021 the OECD published a set of principles of data ethics (OECD, 2021) for the public sector, driven by an assertion that data use by governments should serve the public interest and deliver public good. The principles are:

1. Manage data with integrity. Officials should ensure trustworthy data management. Officials must not access, share or use data for personal profit or goals that do not serve the public interest, or that undermine human rights.
2. Be aware of and observe relevant government-wide arrangements for trustworthy data access, sharing and use. Officials should be trained on roles and responsibilities, and governments should ensure expertise is available to manage data ethically.
3. Incorporate data ethical considerations into government decision-making. This includes considerations such as government planning, funding, ensuring unbiased sources of data and government contracts related to data.
4. Monitor and retain control over data inputs, particularly for AI systems. Further, public officials should be the decision-makers on issues that require human insight or may have adverse impacts on human rights, democracy or the rule of law.
5. Be specific about the purpose of data use, especially in the case of personal data. Ensure that there is a legitimate reason for collecting and using data. Place the needs of citizens at the centre of data activities. Ensure data is representative and fit for purpose.
6. Define boundaries for data collection, access, sharing and use. In the case of personal data, the minimum amount of data necessary for the defined purpose should be collected.
7. Be clear, inclusive and open. Governments should be transparent about what data is collected, when and how it is collected, and for what purpose. Governments should take steps to ensure data literacy among the population so that they may be educated consumers and understand the implications of data use.
8. Publish open data and source code. Open government data policies support socio-economic benefits, foster citizen engagement and ensure transparency, accountability, and public scrutiny of governments' decisions and policy outcomes.
9. Broaden individuals' and collectives' control over their data. Individuals and communities should have decision-making power and agency over their data, including to freely give or withdraw content to its use. This links to the principles of self-sovereign identity.



Reflective questions

The reflective questions can be undertaken as an individual or as a group discussion.

1. Reflect on the nine principles of ethical data governance outlined by the OECD. What steps does your government take in the ethical management of data? What further steps should be taken?

Database Types

There are different types of databases that exist for different functions, and which database an organisation chooses is dependent on their needs. However, there are two main types of databases: relational and non-relational.

- **Relational databases** are widely used as they are easy to manage. Items in a relational database are organised as a set of tables with columns and rows (see the figure below). Relational database technology provides the most efficient and flexible way to access structured information. A database management system (DBMS), the software which controls the storage, retrieval, deletion, security, and integrity of data within a database, is required to manage the database.

| | Employee | Photos | Position | Manager | Subordinates |
|----|------------|---|-------------------------|-----------|--------------------------------|
| 1 | Asparagus |  | Director of Engineering | Lucy Fur | Henrietta Bumblepuss |
| 2 | Bumblepuss |  | Engineering Team | Asparagus | |
| 3 | Henrietta |  | Engineering Team | Asparagus | |
| 4 | Hot Sauce |  | Director of Sales | Lucy Fur | Pippi |
| 5 | Jiji |  | CFO | Lucy Fur | |
| 6 | Leo |  | Marketing Team | Miu Miu | |
| 7 | Lucy Fur |  | CEO | | Asparagus Bumblepuss Henrietta |
| 8 | Miu Miu |  | Director of Marketing | Lucy Fur | Poseidon Leo |
| 9 | Pippi |  | Sales Team | Hot Sauce | |
| 10 | Poseidon |  | Marketing Team | Miu Miu | |
| + | | | | | |

Figure 2: A one-to-many relationship in a relational database (source: <https://support.airtable.com/hc/en-us/articles/218734758>)

- **Non-relational databases** were developed in contrast to relational databases. In this case, data does not have to be structured into tables but can take other forms like graphs, videos, photographs, documents and so forth. NoSQL and MongoDB are examples of non-relational databases. For non-relational databases, a NoSQL supported server e.g. Redis Server, Memcached Database Server or Oracle NoSQL would be required.

In addition to being relational or non-relational, databases can also have different categories of features.

Centralised, distributed and cloud databases

- A *centralised database* is a type of database that is stored, located as well as maintained at a single location only. The advantages of this type of database are the following: since all data is stored at a single location, it is easier to access and coordinate it; the centralised database has very minimal data redundancy since all data is stored in a single place; and it is cheaper in comparison to all other databases available. An example of this is a mainframe computer. A mainframe computer and Local Area Network (LAN) or Wide Area Network (WAN) are required for this type of database.
- A *distributed database* is a collection of multiple interconnected databases, which are spread physically across various locations that communicate via a computer network, useful for organisations with multiple offices or branches and closed networks. This database can be easily expanded as data is already spread across different physical locations. A distributed database can easily be accessed from different networks, and it is more secure in comparison to a centralised database. Client-server architecture which defines specialised services with specific functionalities (e.g., printer server, mail server, file server, etc) is required. These servers are then connected to a network of clients that can access these servers.
- A *cloud database* is designed for a virtual environment and can be accessed via the internet from a cloud database service provider. Some of the benefits of a cloud-based system are that they are faster; cost saving as it eliminates the need to own data centres and staff to manage it; and scalability. OpenStack is an example of a cloud-based and open-source database. These databases are typically built using a cloud provider such as Windows Azure, Amazon SimpleDB, or Google Cloud SQL. They can be accessed via any device which connects to the internet.

Open-source and commercial databases

- An *open-source database* allows users to create a system based on their unique requirements and business needs. Open-source databases are free and therefore cost-effective. They can also be shared. The source code of these databases can be modified to match any user preference. The main drawback of this type of database is that it provides limited technical support so requires in-house expertise to develop and maintain as well as to utilize the database.
- *Commercial or closed-source databases* are proprietary software where the source code cannot be accessed, modified, distributed, or reused. Closed source databases have some advantages that make them attractive to organisations. They provide guaranteed technical support; are designed for use with low-cost commodity hardware; and massive volumes of data are easily handled by NoSQL databases. The main disadvantage is the cost incurred.

Operational databases

- *Operational databases* are common in organisations as they store payroll records, customer information and employee data. With operational databases, records can be added, removed and modified in real time. Some notable advantages that can be listed are: They do not use batch processing, so records can be added, removed and modified in real time; these systems are greatly versatile and accommodate distributed systems like NoSQL, SQL, New SQL databases; and these systems are highly available, fault-tolerant and highly scalable. A disadvantage is that they usually have a learning curve which requires training in managing such databases, which can increase overhead expenses.

Some critical considerations when choosing a database include:

- **Size:** Always consider the volume of data that we need to retrieve and store as critical application data in a database. The processing speed of software applications may be affected if the database chosen is not good enough to handle the amount of data.
- **Speed and Scalability:** Some databases are designed to optimise read-heavy applications, whereas others are designed to support write-heavy solutions.
- **Structure:** Data has diverse formats. Before selecting a database consider the data structure for storing and retrieving data sets and information.
- **Safety and Security:** Check the level of security that a database provides for the data stored in it.

Recommended reading:

Kholod, S.V., 2021. Performance comparison for different types of databases. <https://er.ucu.edu.ua/handle/1/2878>

For more information on database management systems: <https://www.ibm.com/docs/en/zos-basic-skills?topic=zos-what-is-database-management-system>

For more pros and cons of databases see: <https://prosancons.com/computer/pros-cons-databases/>



Reflective questions

The reflective questions can be undertaken as an individual or as a group discussion.

2. List the pros and cons of databases.
3. What should organisations consider when they are choosing a database that would best suit their needs?

Activity 1: Database Types (Individual or Group work)

Fill in the missing information under the headings in the table below by using the information in this manual.

| Databases | Description | Examples | Requirements | Advantages | Disadvantages |
|------------------------------------|--------------------|-----------------|---------------------|-------------------|----------------------|
| Centralised | | | | | |
| Distributed | | | | | |
| Cloud | | | | | |
| <u>Open-source</u> | | | | | |

| | | | | | |
|-----------------------------------|--|--|--|--|--|
| Commercial or closed source | | | | | |
| Non-relational databases | | | | | |
| Relational | | | | | |
| Operational | | | | | |

4 Innovations in the Development of Qualifications, Frameworks and Standards

Globally, demand for higher education has risen dramatically since 1970, with an increase in the tertiary gross enrolment ratio from 10% in 1970 to nearly 40% in 2018 (UNESCO, 2018a). Further, the increasing enrolment trend is steeper after the year 2000, meaning the pace of the increase has been growing in recent decades. In addition, there is growth in the percentage of non-traditional higher education learners, particularly older students. Currently, up to 25% of tertiary students are over the age of 25 in a number of European countries (Martin and Godonoga, 2020). These trends are emerging in response to a number of factors, including digitalization, increased access to devices, the proliferation of online or remote tertiary offerings, the increasing demand for high skill workers, changing skills needs, the mechanization of industries such as manufacturing, etc. These global trends do not show any sign of slowing.

In most countries, tertiary education is no longer accessible only to a small number of higher income students, but is generally available at least to the upper and middle class. However, when only low-income countries are considered, there has been relatively little change in the gross enrolment ratio of students in tertiary education, indicating that these trends are not yet taking place. Figure 1 shows the gross enrolment ratio of tertiary education, by country income level. Low-income countries are the green line at the bottom of the chart.

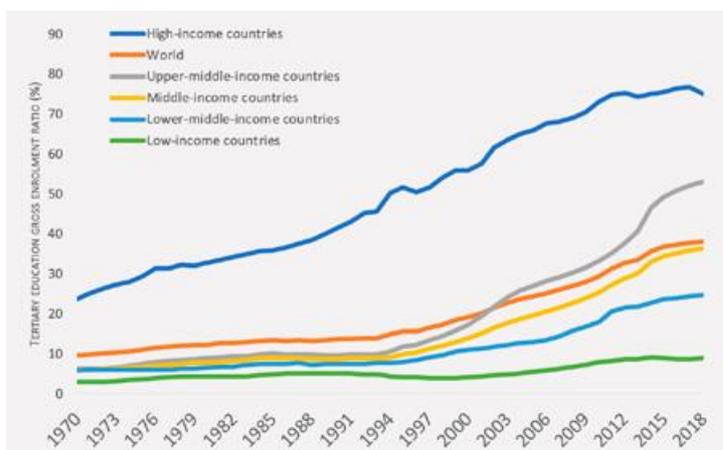


Figure 3: Tertiary education gross enrolment ratio, 1970 – 2018

Source: Martin and Godonoga, 2020

This means that low-income countries are not only poorly positioned to participate in the global economy today, but also that they are unlikely to be able to fill future skills needs.



Reflective question and discussion

Low-income countries have a comparatively low tertiary enrolment ratio. Further, this ratio is not increasing as quickly as in other countries. What do you think are the root causes of this low tertiary enrolment ratio?

Some causes could be:

- Families and citizens have low incomes, and are not able to afford to send their children to tertiary education.



Reflective question and discussion

- There are few scholarship or bursary opportunities.
- There is poor career guidance, so students do not know what opportunities are available.
- Few industries operate in the country, or industries that operate require a lot of low-skill labour, such as agriculture.
- They do not have systems and skills in place to allow students to take advantage of new opportunities such as distance or international learning. For example, international or online credentials are not recognized in the country.
- Poor digital penetration in the country. Many people do not have access to devices or connectivity.

4.1 Qualifications Passports

The increasing number of migrants and displaced persons in the world do not always have access to either paper documents or to the institutions that issued them, raising challenges in verification of qualifications. Further, qualifications may not be recognized across country borders. This results in lost skills absorption opportunities in host countries and lost social and economic opportunities for refugees and migrants.

A qualifications passport maps and presents the available information about education levels of refugees and migrants through a combination of document analysis, structured interviews by credential evaluators and/or authorized assessments. The qualifications passport is not a travel document or a substitute for formal qualifications or recognition, but can be leveraged by migrants for entry into work or further education as they pursue avenues to access their existing qualifications. Qualifications passports developed so far are valid for a limited time, generally 3 - 5 years.

A qualifications passport system works with nationally-regulated qualifications and can be an adjunct to formal skilling and qualifications pathways in countries with high numbers of migrants and refugees, providing opportunities to more rapidly absorb the available labour these populations provide to host countries. In order for a qualifications passport to be effective, host countries must have legal structures which allow migrants to work or study as well as experienced credential evaluators.

Recommended reading and further exploration:

The European Qualifications Passport of Refugees (Council of Europe), which has been tested in nine countries (is a standardised document that details the qualifications a refugee has, following an assessment that is based on available information and although it does not constitute formal recognition, it does provide useful information)

- Linked resource (pdf): [Sample and template for a Qualifications Passport](#)
- Linked resource (web page): [Nokut's Recognition Procedure for Persons without Verifiable Documentation](#)

The UNESCO Qualifications Passport for Refugees and Vulnerable Migrants which draws on the methodology of the European Qualifications Passport of Refugees



Reflective questions and discussion

Watch the following video and respond to the reflection questions:

Testimonials from Qualifications Passport participants in Zambia

The reflective questions can be undertaken as an individual or as a group discussion.

1. What are the advantages outlined to qualifications passports?
2. What are limitations or challenges to qualifications passports?

4.2 Flexible Credential Pathways

Flexible credential pathways offer opportunities for individuals to participate in education in non-traditional education pathways. Rapidly changing skills needs, access to educational technologies such as MOOCs and micro-credentials and increasingly diversified provision of skills and training programmes all speak to the need for flexible formal education systems which can respond to the demands of youth and lifelong learners alike. Particularly in contexts in which poverty and/or high rates of internal migration, the creation of flexible learning pathways can improve participation and completion rates.

Flexible learning pathways incorporate RPL, credit transfer, and flexible teaching and learning options such as electives or 'flex time' to pursue individual projects to support lifelong learning. They provide multiple entry points to and progression routes between institutions, courses and/or education levels, allow students to 'step in and step out' of studies and learn at their own pace.

The concept of flexible learning pathways is particularly useful in countries with a large number of low-income residents who would like to participate in tertiary education. These individuals may find themselves able to periodically afford tuition, but transitioning between education, employment and NEET status many times in their youth. They may also attend many different institutions, or utilize available alternative pathways such as apprenticeships. Flexible credential pathways ideally create opportunities for these individuals to leverage their learning across these different institutions or contexts towards qualifications, and for entry into other institutions.

Challenges to Flexible Credential Pathways

A number of factors which contribute to difficulties in creating flexible credential pathways were identified by IIEP-UNESCO (2021). The challenges noted by this paper are outlined in this section.

The first challenge identified was the lack of an overarching framework to support flexible learning pathways. Often, whether credentials or credits are accepted between institutions is decided by institutions or situationally. This is particularly true in countries with highly decentralized governance and/or high levels institutional autonomy in which central governments play a limited role in decision-making.

Ideally, an overarching framework would be developed nationally to support flexible learning pathways. This must include policies, funding for training and implementation oversight, and incentives for the establishment of credit-transfer pathways between institutions. It is particularly important for countries which are developing strong non-university sectors to consider from the onset the articulation between these differentiated systems.

The complexity of this is compounded by administrative and structural fragmentation. In many countries, different ministries and government organizations are responsible for different parts of higher education. For example, sub-systems may exist to manage different streams or tracks, such as general, technical and vocational, and academic. There may be different ministries or subsystems responsible for primary, secondary and post-secondary education. Complexity is also created by layers of administration levels, for

example national and provincial levels. Fragmentation is also reflected in the way education systems are organized. The segmentation of education and training systems can create silos and barriers to students in progressing to higher-level programmes or transferring between programmes or fields of study (CEDEFOP, 2012), and close coordination and cooperation are essential for flexible pathways (IIEP-UNESCO, 2021).

Competition between institutions can also be a challenge, as flexible learning pathways require collaboration between post-secondary institutions. Recent trends towards performance-based funding, research excellence initiatives, ranking systems and minimizing the focus on inputs and activities in favour of outputs and performance have created increased competition in the public education sector, creating barriers to student mobility. Market-driven environments create pressure for 'differentiation' as universities compete for students, further limiting collaboration and exacerbating differences that exist between programmes such as admission requirements, curriculum content and assessment procedures (IIEP-UNESCO, 2021).

Ultimately, for flexible learning to be successful, institutions must adapt their practices and provision to the needs of transfer students, particularly for those transitioning between technical and vocational and academic programmes. Technical and vocational programmes by definition are practical in nature, while academic programmes tend to be more theory-based. Students need to be supported through the shift in focus, for example through career guidance initiatives and academic support programmes. Attention should also be paid to the shift in study culture, for example the codes of conduct expected of students and study methodologies, which can differ widely between types of institutions. The success of transfer students should be seen as a joint responsibility of both institutions.

Further, universities often need incentivising to accept credits from technical and vocational education or private providers due to the low image academics assign to the quality of these educational options. While work always needs to be done to advance the quality, image and status of TVET, these challenges can be navigated through the establishment of nationally-applicable standards and competency-based or other types of assessment, which can provide assurance to institutions about the quality of graduates. Transparency is another measure, as academics do not always understand the detail of what is included in TVET education.

Examples: Singapore articulation framework

The Singapore post-primary education system has five streams and multiple pathways of articulation. The system is complex, flexible, highly articulated, and effective. 96.7% of students complete secondary school education, which is diversified into both academic streams and technical and vocational courses. As of 2019, the gross enrolment rates for tertiary education in Singapore were over 91%, while the world average was just below 40% (World Bank, 2021).

Singapore has a highly centralized education system. Primary, secondary and tertiary education is primarily supported by the state and the state plays a leading role in developing, implementing and funding the system. The Ministry of Education oversees all levels of education from age 4 to lifelong learning, allocates funding for all schools, sets course syllabi and national examinations, oversees teacher credentialing, manages the teacher and principal evaluation and promotion system, and hires and assigns principals and teachers to schools. There are also different agencies which support areas such as teacher training, assessments and technical and vocational education operating within the ministry framework (NCEE, n.d.).

Six years of compulsory primary school culminate in the Primary School Leaving Examination. Following this, students take between four and six years of secondary school, and one to three years of post-

secondary school. Secondary school in Singapore is categorised into three streams: Express, Normal (Academic) and Normal (Technical). The same course of study is offered by all three, but the Express stream is accelerated and the Normal (Technical) stream offers more applied work. Currently, Singapore is developing a system in which students can take accelerated or technical options for different subjects, called 'subject-based banding'.

The Express stream takes up to four years to complete, while the Normal streams take up to six. Following these courses, students take General Certificate of Education examinations and may enrol for an additional two years as part of the integrated programme to prepare for university through A-level courses. They may also enter junior colleges, where students are equipped with skills and knowledge required for university education, enter polytechnics for three-year diploma courses, or attend 1-2 year preparatory courses at Institutes of Technical Education (ITE). Graduates from ITE can attend polytechnics or universities; polytechnic graduates can enter universities; and junior college graduates may continue on to study at a university or a polytechnic. The pathways of articulation are demonstrated in Figure 4.

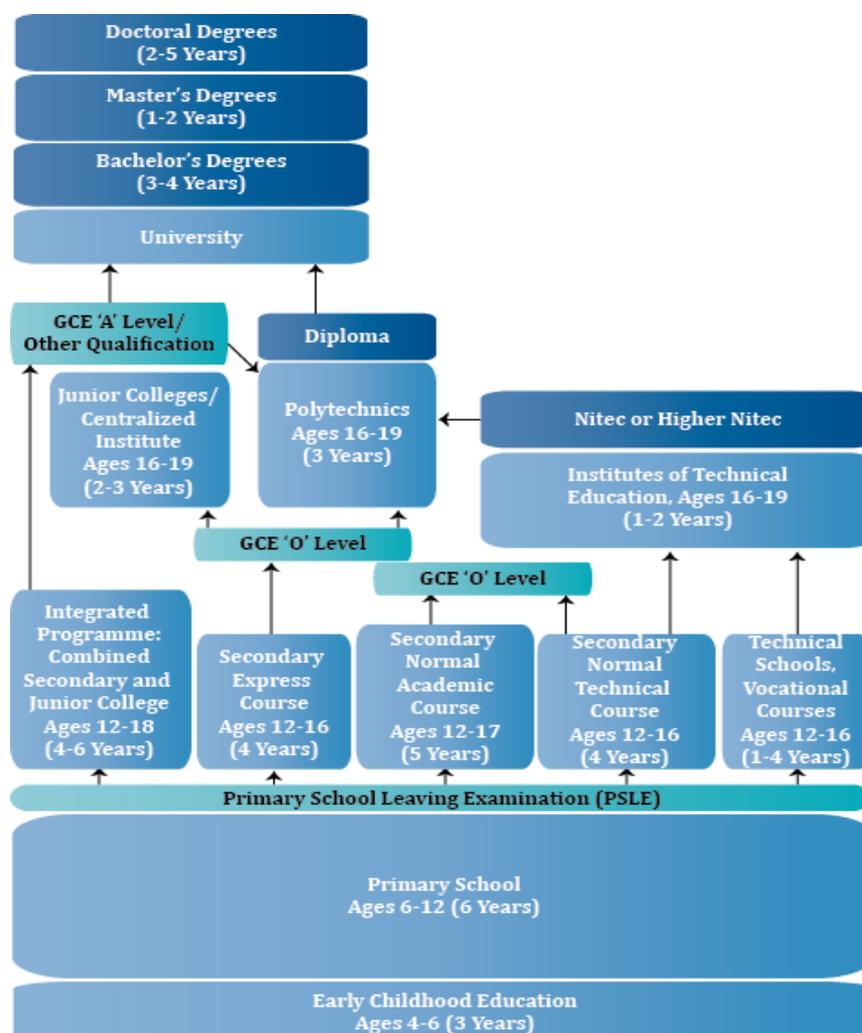


Figure 4: The Structure of Singapore's Education System (Source: <https://ncee.org/>)

Of particular interest is the early tracking of students, who can enter technical and vocational courses as early as 12 years old. Some systems discourage this early tracking. For example, CEDEFOP (2012) notes that early allocation to different tracks can limit student choices and access to more advanced levels of education later on. However, Singapore is an example of a country which has pursued this route. In Singapore, junior colleges are the most direct path to university study, with 70% of junior

college graduates going on to attend university. However, 30% of polytechnic graduates do go on to study in universities. In particular, the Singapore University of Technology was established in 2009 particularly with degree programmes aligned to the diploma courses in polytechnics, and 90% of admitted students to this particular university previously studied at a polytechnic (Davies, 2021).

A few lessons can be learned from Singapore about early tracking. First, a well-articulated and flexible national framework should be developed which enables advancement between all levels of education, on reasonable timelines. Second, the quality of education at each level must enable the progressions laid out in the framework. Assessment is a critical step in ensuring learning outcomes are sufficient to enable participation in the next level of education. Third, a concentrated effort is advisable to ensure alignment between qualifications programmes at different levels of education. This is seen in the establishment of the Singapore University of Technology as a university with degree programmes that specifically leverage diploma knowledge gained in polytechnics.

Recommended reading:

Major, L., Francis, G. & Tsapali, M. 2020. The effectiveness of technology-supported personalised learning in low-and middle-income countries: A meta-analysis. *British Journal of Educational Technology*, 2021; 00:1–30. <https://bera-journals.onlinelibrary.wiley.com/doi/10.1111/bjet.13116?af=R>

IIEP-UNESCO. 2020. *SDG 4 - Policies for flexible learning pathways in higher education: taking stock of good practices internationally*. Paris: UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000372817>

UNESCO. 2018. *Digital credentialing: implications for the recognition of learning across borders*. Paris: UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000264428>



Reflective questions and discussion

The reflective questions can be undertaken as an individual or as a group discussion.

3. What are three key enabling factors of flexible learning pathways outlined by IIEP-UNESCO 2021?
4. What are the key lessons from the Singapore experience?
5. What do you think the barriers to a flexible learning pathway are likely to be in your country context? How could these barriers be overcome?

4.3 Stackable Credentials

Structured qualification and degree programmes rarely allow students to obtain ‘partial’ qualifications for credits or modules completed. This has led to many students ‘losing credits’, particularly when they transition multiple times between education and work or unemployment, a situation often caused by a lack of finance or personal challenges.

Stackable credentials are systems in which classes taken in one or more programmes ‘stack’ like bricks towards a qualification. Students receive credit for learning completed and can use it for job market access even if they have not fully completed a degree. Advantages are that students can pursue higher degrees with lower initial investment, pursue learning at their own pace without losing any credit, and can pursue work experience after completing only part of a qualification. Stackable credentials also offer pathways to

continuing education or lifelong learning. Stackable credentials should have a labour market value, distinct from a full qualification.

A coherent framework within which to incorporate short-term credentials into degrees is required, with defined components, stacking criteria and rules and regulations guiding the recognition of stackable credentials at institutional and national levels, to avoid confusion between stackable and traditional qualifications. Frameworks must aim to incorporate stackable credentials into existing NQFs against generic level descriptors and learning outcomes. In addition, strong career guidance and associated processes such as guided learning pathways or career maps.

Recommended reading:

The following paper reviews recent evidence on the labour market returns to credit accumulation, certificates, and associate degrees from community colleges:

Bailey, T., and Belfield, C. 2017. Stackable Credentials: Awards for the Future? Community College Research Center, New York. <https://ccrc.tc.columbia.edu/media/k2/attachments/stackable-credentials-awards-for-future.pdf>

4.4 Personalized Learning Pathways

As the skills needs of labour markets diversify and the demand grows for ‘soft skills’, there is a greater need for more flexibility and student agency in learning, which can contribute to both skills and metaskills such as ‘learning to learn’, an important consideration in lifelong learning.

Personalised learning allows flexibility and student agency in education and can also leverage self-paced formal and non-formal learning experiences such as micro-credentials. It can be used as part of flexible learning pathways and/or stackable credentials as well as to identify and fill skills gaps for the recognition of prior learning. When integrated into qualifications frameworks, personalized learning supports lifelong learning and improves credential fluency. Different aspects of learning can be personalized, for example the learning aims, approach, content, pathways and/or learning pace.

Personalised learning addresses student agency, providing choices in what, how, when and where students learn. Personalized learning can take place in both traditional and technology-enabled classrooms, and some AI algorithms are designed to support personalized learning. Personalized learning can include elements of mentorship, project-based learning and self-assessment.

Personalized learning can also be enhanced by technology. For example, intelligent tutoring systems use AI algorithms based on inputs such as student time on task and error analysis to determine learning content and pace, while an increasing range of online courses are available for self-paced learning and award anything from badges for discrete skills to complete university degrees.

Recommended Reading:

Holmes, W., Anastopoulou S., Schaumburg, H. & Mavrikis, M. (2018). *Technology-enhanced personalised learning: untangling the evidence*. Stuttgart: Robert Bosch Stiftung. https://www.bosch-stiftung.de/sites/default/files/publications/pdf/2018-08/Study_Technology-enhanced%20Personalised%20Learning.pdf

4.5 Stealth Assessment

Traditional forms of assessments are unable to effectively assess the complex competencies required for dealing with 21st century problems, including the learner's ability to think systemically, creatively, and critically, and to develop persistence, self-efficacy, openness, and teamwork. Stealth assessment addresses this gap through an approach to performance-based assessments in which assessment takes place using information gathered from individuals during the course of regular activities.

The aim of stealth assessment is to blur the line between learning and assessment while remaining reliable and accurate. Stealth assessment can contribute to reduced test anxiety, the promotion of continuous assessment, and the use of assessment to measure a range of transversal competences or 'soft skills'. In addition to keeping learning fun and anxiety-free, stealth-based assessments can assess multiple, complex applications of various skills and competencies. Stealth assessment works well with technology-based educational delivery and especially game-based learning, as data can be gathered from individual students as they interact with the technology without requiring individual teacher time. However, the principles of stealth assessment can also be applied to competency-based assessment.

'Engage' is one example of stealth assessment. Engage is a game-based learning environment designed for middle school kids from 11 – 13 years of age with the aim of introducing computational thinking skills, including abstraction and algorithmic thinking through problem solving and programming in preparation for computer science in high school (Akram, Min, Wiebe, Mott, Boyer and Lester, 2018).

Recommended reading:

Akram, B., Min, W., Wiebe, E., Mott, B., Boyer, K.E. and Lester, J., 2018, July. Improving stealth assessment in game-based learning with LSTM-based analytics. In *International Conference on Educational Data Mining*. <https://par.nsf.gov/servlets/purl/10100664>

Shute, V. and Ventura, M. 2013. *Stealth Assessment: Measuring and Supporting Learning in Video Games*. Cambridge, USA: MIT Press. Available for purchase at: <https://mitpress.mit.edu/books/stealth-assessment>

5 Innovations in Comparing and Analysing Qualifications

The recognition of all forms of learning (formal, non-formal and informal) is a central feature of qualifications systems and frameworks. Qualifications systems and frameworks make it possible for learning that is not formal (i.e., it may be non-formal [structured learning, but lies outside the qualifications system] and/or informal [unstructured, resulting from daily activities]) to be recognised. Innovations in the area of comparing and analysing qualifications could augment work in other areas, such as stackable and flexible credential frameworks and the recognition of prior learning. In turn, processes of comparing and analysing qualifications could leverage innovations such as digital and virtual assessments and interoperability.

Of all the areas of potential innovation around qualifications, frameworks and standards, comparing and analysing qualifications is one of the most important and yet the least actioned to date. Much of the research and development in this area is still at the exploratory phase. This despite the fact that innovations in this area could provide huge benefits to governments, education and training institutions, employers and citizens by shortening the review process, ensuring more relevant coursework and improving the mobility of skilled labour between countries. As the need for comparing qualifications and qualifications frameworks increases, and integration of frameworks deepens through regional QFs and credit transfer and sharing agreements, so too will the need for quick, accurate, and up-to-date comparisons to facilitate

mobility and portability. Current methods of comparison are labour-intensive and highly dependent on expert human input.

The new concept of credential fluency attempts to provide a more futuristic view of this increasingly seamless interrelationships between the recognition of formal, non-formal and informal lifelong learning made possible through a user-centric approach, digital forms of recognition, improved data interoperability, and closer alignment between learning and the world of work. Credential fluency can assist policymakers and practitioners to develop more inclusive systems of recognition, and potentially also new forms of RPL. However, it will be important to link the notion to new forms digital platforms and take care to avoid proprietary systems that could potentially lock countries into expensive solutions that may not be sustainable in the long run.

One other innovation in this area is the use of automation, machine learning and artificial intelligence (AI) for the future of taxonomy mapping, credit transfer, skills matching, qualifications comparisons, and verification processes. These technologies could improve the accuracy and quality of many of the elements involved in creating and maintaining qualifications frameworks, while reducing the time and effort required to do so. AI is already used within the higher education space for a number of tasks to improve services. This ranges from chatbots that students can interact with for general information on specific areas of need like admissions and course information, including for marketing to prospective students (Zeide, 2019). The figure below shows some of the other ways AI has been used in higher education.



Figure 1 AI applications in higher education (Zeide, 2019)

While still in development, the use of AI and Machine Learning to assist in the mapping, comparison, alignment, and classification of qualifications across national and regional qualifications frameworks is promising, and could allow for faster, more accurate and reliable cross-country comparisons in future, facilitating the easier alignment or realignment of curricula and frameworks to the needs of the labour market and society, and further enabling labour migration. The success of these innovations depends upon the availability of structured data, the availability of computer processing power, and adherence to a common semantic framework or translation mechanism (such as an agreed taxonomy).

The ACQF project includes the piloting of a semi-automated process to match learning outcomes of qualifications. The first pilot project linked learning outcomes of registered qualifications from Cameroon, Cape Verde, Kenya, Mozambique and South Africa to the European Skills, Competences, Qualifications and Occupations (ESCO) taxonomy.

Recommended reading:

6 Innovations in the Registration and Management of Qualifications

6.1 Interoperability

A range of organizations may be involved in qualification and credentials, including industry certifying bodies, education departments, higher education institutions, TVETs and - increasingly - online providers. Each generates data, for example records of qualifications or courses, which could potentially be leveraged by other organizations, but this cooperation is often blocked due to mis-alignment in digitization, structure of data, terminologies used and methods of exchange.

Interoperability of data systems holds enormous potential for national and regional qualifications frameworks in terms of data capture, processing, and analysis, for maintaining and updating the QFs, while the ability to access and utilise data from partner organisations could support a number of other processes such as credit transfer, RPL processes, verification, while generating data for labour market intelligence and other skills and labour market planning activities.

There are different levels of interoperability, and different frameworks for those levels, but one of the most useful was developed at the Berkman Klein Center for Internet and Society at Harvard University. This framework outlines six levels of interoperability: Technical infrastructure; data; formats and levels; organizational practices; institutions, law and policy; and human.



The first three levels deal with standardisation, while later levels deal with organisational, social and individual processes and values.

One of the most important things to know about the standardization levels of interoperability is that ‘interoperability’ is a new label for something technology has always had to achieve. A good way to

understand it is through an analogy to writing, one of the most fundamental innovations of humankind in terms of information exchange.

Technical interoperability deals with the physical things we need and the process of exchange. In the case of writing, this would be a pen and paper and the mail system we use to exchange letters. In computer systems, this is the hardware, cables and servers we use to store and exchange information.

The next level deals with data standards, or set ways of structuring information. This is like the language we write our letter in. You are able to read this because we are using a shared language. If the language of the guideline suddenly changed to a language you don't know, our ability to communicate would fall apart. Computers work the same way – they must 'speak the same language' when it comes to data.

And finally, a third level deals with 'semantics' or 'semantic interoperability'. This level deals with the meaning of the information exchanged. In the writing analogy, this would be equivalent to the grammar and punctuation of our sentences and the words we use. If I use question marks where I should use exclamation marks, or use made-up words or suddenly change the meaning of words you know, the information I am trying to convey is complicated or even lost. As essentially rule-based systems, computers are even more limited in this way.

Once these fundamentals of technical, data and semantic interoperability are in place, information can be exchanged between organizations, aggregated, and/or used in new ways. Coherent structures and processes for data collection, storage, management and exchange allow the free flow of information between government departments and between governance structures and the organizations and individuals they interact with. In interoperable systems, students can seamlessly use credentials from one system in another, and government agencies can easily view trends and make decisions using labour market and education data gathered from a range of sources.

Interoperability relies heavily on the digitization of data. Systems which are still largely recording and transmitting information using paper-based methods and/or unstructured data records such as those commonly found in PDF or word processing must first digitize their records and systems. Expertise in developing and interpreting data standards is also required. This expertise may be developed within government (e.g., standards bodies) or contracted. The development of national protocols for data collection, capture and exchange are also required, together with associated training widely throughout educational institutions and certification boards.

Recommended reading:

Shiohira, K. and Dale-Jones, B. 2019. *Interoperable Data Ecosystems: An International Review to Inform a South African Innovation*. JET Education Services. Pp 22 – 46.

<https://www.jet.org.za/resources/interoperable-data-ecosystems.pdf>



Activity (individual or group)

The Cedefop Skills and Labour Market dashboards are based on the interoperability of different databases and data sources including surveys, internet data and official statistics. This platform offers the following tools: European Skills Index, Matching skills, Skills Forecast, Skills intelligence and Skills-OVATE. The latter is an innovative and interactive platform, based on data collected from online sources of job advertisements, analysed, classified and visualised using AI-aided technology.



Activity (individual or group)

This is an example which shows some of the things that can be achieved through interoperability and the advantages to qualifications and associated processes.

Click on the following links to explore some of the dashboards and uses of data currently undertaken by Cedefop.

<https://www.cedefop.europa.eu/en/tools/european-skills-index> shows the performance of countries against a benchmark, using data drawn from international sources

<https://www.cedefop.europa.eu/en/tools/skills-intelligence/digital-skills-use?year=2019#1> shows the percent of individuals per country with above-basic digital skills

<https://www.cedefop.europa.eu/en/tools/skills-online-vacancies> shows a new method of labour market intelligence gathering using aggregated data from online job adverts.

Many other dashboards are available at <https://www.cedefop.europa.eu/en/tools/skills-intelligence> should you wish to explore further.



Reflective questions and discussion

The reflective questions can be undertaken as an individual or as a group discussion.

1. What are the benefits to interoperable data ecosystems?
2. How can interoperable data assist in your own country context?

6.2 Credit Banks

Credit banks are systems for recognising and certifying prior learning and granting credits, credit accumulation by 'housing' records of learner's records and achieved credits, and facilitating the transfer of credits between institutions. A credit bank system strengthens the articulation pathways between institutions and course offerings, enabling lifelong learning and improved labour mobility. In particular, credit banks are sometimes used as an effective means of enabling credit transfer between technical and vocational education and higher education institutions. They also facilitate the integration of non-formal learning into more traditional educational offerings. Finally, they enable recognition of lifelong learning.

In these systems, credits are awarded, recognised, transferred, and allocated according to existing national and regional qualifications frameworks. Therefore, a qualifications framework must be in place.

In order for a credit bank to be operational in a country, there must be mutual recognition of credit banks and their functions by organisations operating in the credit bank's national or regional education system. In other words, credits recognized by the credit bank must also be recognized by education and training institutions as well as employers.

A second requirement is a platform for storing learner records. The ability to aggregate, store, and transfer credits must have the necessary legislative backing and be subject to relevant rules and regulations for each context.

Example: Shanghai Open University's Shanghai Academic Credit Transfer and Accumulation Bank for Lifelong Education (SHCB)

Shanghai Open University is in the process of transitioning from a radio and TV university to support a more primary role in the lifelong learning of Shanghai residents. One of the measures outlined by the National Medium and Long-term Educational Reform and Development Plan (2010 – 2020) to support lifelong learning is the establishment of credit banks. The SHCB is funded by Shanghai Municipal Education Commission, which covers the costs of staff, administration, an information platform, the participation of expert teams and research.

The SHCB was first established in 2002 in order to address the needs of a large number of internal migrants to the Shanghai area as well as a growing elderly population. The SHCB promotes the exchange of credits between linked education and training institutions as well as the incorporation of non-academic learning, such as informal and non-formal learning. The SHCB is responsible for the recognition and certification of prior learning, the accumulation of credits earned through various means, and the transfer of credits between institutions. In total, more than 2,000 courses, degree certificates, non-degree certificates and leisure courses are recognized by the SHCB.

The SHCB operates with branch offices and an online portfolio. Participating institutions report the credits accumulated by students to branch offices, and students can also open accounts and submit learning experiences for review online or in person. National identity cards are linked to these accounts. Credits submitted by individuals are reviewed by a managing committee which receives advice from subject expert committees. If approved, they are added to the individual's portfolio.

Lessons learned from the experience of the SHCB include the reluctance of higher education institutions to participate. These institutions undervalue credit transfer systems and incentives are required to encourage these institutions to participate. Further, an explicit policy must guide the accumulation of different types of credits, such as academic, vocational and leisure. Challenges also arise when there is a not a standard definition of 'credit' or conflation between time and credit in some institutions.

Further Reading:

Li et al. 2013. The establishment of academic credit accumulation and transfer system: A case study of Shanghai Academic Credit Transfer and Accumulation Bank for Lifelong Education. <https://www.researchgate.net/publication/306045380> The establishment of academic credit accumulation and transfer system A case study of Shanghai Academic Credit Transfer and Accumulation Bank for Lifelong Education

SADC HAQAA Group. 2017. *Draft SADC Guidelines for Credit Accumulation and Transfer*. <https://saqan.org/sites/default/files/members/1/paper/DRAFT%20SADC%20GUIDELINES%20FOR%20CREDIT%20ACCUMULATION%20AND%20TRANSFER-1680784497.pdf>



Reflective questions and discussion

The reflective questions can be undertaken as an individual or as a group discussion.

3. What are three purposes of a credit bank?
4. What are two difficulties a country may face in setting up a credit bank?



Reflective questions and discussion

5. What credit bank or other credit accumulation systems are you aware of? How do these systems work?

7 Innovation and Technology in Credentials and the Recognition of Learning

7.1 Recognition of Prior Learning

Another key element of flexible learning pathways involves the Recognition of Prior Learning (RPL). RPL is a process of identifying, documenting, assessing and certifying formal, non-formal and informal learning outcomes against the standards used in formal education and training. RPL is not limited to assessment only. RPL can serve as a way to absorb talent into the education and training system from various pathways, including those outside the formal education system such as those in the informal sector, and can also tap into displaced and/or migrant labour supply in some countries. While there are not too many studies on the impact of RPL, one recent impact study in Bangladesh found that people who received an RPL certificate were significantly more likely to be employed than those without a certificate. Women especially benefitted from an RPL certificate (Nakata et al, 2021).

A strong system of RPL has various features. First, strong systems of RPL are integrated into national structures such as a flexible learning pathway and national standards. Second, they consider a diverse range of evidence and assessments are transparent and rigorous. These assessments should not be open to personal prejudice or favouritism, and should be applied equally to everyone. They should also measure actual skills and competencies, where possible through concrete demonstration of competence. Finally, these systems should cater for formal, non-formal and informal learning and provide equivalent credits or qualifications for demonstrated skills (Aggarwal, 2015).

In a recent survey, the ACQF found that all respondents (n = 11) offered RPL, with most recognizing informal, non-formal and formal learning through RPL practices. Of these countries, four offered tertiary qualifications purely through RPL, with a further three currently in the process of developing a system to award qualifications through RPL. Further, the ACQF network in 2022 hosted a series of three webinars specifically focused on RPL. One case study highlighted was that of Zambia.

RPL Example: Zambia

The Zambian education governance system is divided into three subsectors, representing general education, TVET and academic tertiary study. The Zambian Qualifications Authority is mandated to develop the National Policy and Guidelines on RPL, and RPL is most commonly used in the TVET sector to recognize informal and non-formal learning. However, it is also used to apply credit transfer in both TVETs and higher education institutions. The major sectors employing RPL in Zambia are mining, agriculture, tourism and water and sanitation. In total, 2300 RPL certificates have been issued since 2017 based on RPL.

The Technical and Vocational Education and Training Authority (TVETA) manages the process of RPL in TVETs. A candidate can present themselves to any institution registered by TVETA that is recognized to

provide training in the programme or skill the candidate is requesting RPL for. The institution facilitates a registration process with TVETA, who then assigns an assessor to conduct the final assessment of the candidate and validate the results. Assessments may include interviews; assignments, tasks and/or projects; demonstrations of skill; validation of prior certificates or qualifications; and/or verification of a portfolio of evidence. TVETA assures the quality of the process and outcomes through ensuring adherence to RPL guidelines, ensuring the registration of training institutions, ensuring the accreditation of assessors, and the triangulation of evidence from multiple sources.

RPL is premised on an understanding that all skills matter, whether or not they are obtained in a formal education system. Because of this, it is particularly well-suited to countries with a large informal sector. Workers trained primarily through experience in the informal sector can access new opportunities through certificates and qualifications obtained by RPL. Further, RPL systems can help decrease the cost of education even for those who do not achieve a qualification outright. In several countries, RPL is linked to a personalized learning pathway which targets only those skills needed to achieve a full qualification (UNESCO-UNEVOC, 2020). For example, in Trinidad and Tobago RPL is linked to competency-based assessment. Candidates can achieve a full qualification based on RPL, or be directed to specific modules which will provide training in the competency areas for which they fell short of the required achievement.

Recommended reading:

Cedefop. N.D. *Validation of Informal and Non-formal Learning*. A collection of linked resources is available at: <https://www.cedefop.europa.eu/en/projects/validation-non-formal-and-informal-learning>

ILO. 2018. *Recognition of Prior Learning: Learning Package*. Geneva, Switzerland: ILO. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_626246.pdf

Nakata, S., Sharma, U., Rahman, T., Rahman, M. & Aziz, M. 2021. Effects of Recognition of Prior Learning on Job Market Outcomes: Impact Evaluation in Bangladesh. The World Bank. <https://openknowledge.worldbank.org/bitstream/handle/10986/35522/Effects-of-Recognition-of-Prior-Learning-on-Job-Market-Outcomes-Impact-Evaluation-in-Bangladesh.pdf?sequence=1>

Shaketange, L. 2018. Challenges and Opportunities for Implementing Recognition of Prior Learning at the University of Namibia. *Creative Education*, 9(13). <https://www.scirp.org/journal/paperinformation.aspx?paperid=88071>

Note further study on RPL can be found in the training manual for Module 10, and a case study from the Module 10 training manual is included as Appendix 2.



Reflective questions and discussion

The reflective questions can be undertaken as an individual or as a group discussion.

1. What is RPL and how can it contribute to flexible learning pathways?
2. How can CBA processes contribute to RPL?
3. What is the approach to RPL in your country context?



Activity (individual)

Click the following link to access the Bertelsmann Stiftung vocational career experience assessment. Explore the portal and try one of the assessments.

<https://meine-berufserfahrung.de/overview.php?action=globalist>



Reflective questions and discussion (group)

1. What challenges does a self-assessment portal such as this one solve?
2. How easy was the process of self-assessment? What was difficult about it?
3. Would an innovation like this be appropriate to your context? Why or why not?

7.2 Digital Certification and Digital Credentials

Accessibility has become a very important factor in an increasingly digital society, and in many sectors paper records have been replaced with digital alternatives. However, in many education contexts paper records are still the norm. This method of keeping records is outdated and can be disadvantageous for populations that live in precarious conditions such as areas prone to natural disasters or political instability. If a disaster strikes or one has to leave home abruptly, these records can be costly to replace, or simply lost.

Digital credentials are digital forms of any kind of credential or certification, and include formal and non-formal learning, macro and micro-credentials. Digital credentials can include things like licenses, certifications, season tickets and of course qualifications. Digital credentials are widely used in the online learning space. Digital certification and digital credentialing will allow for improved and more secure transfer of information between institutions, government, and employers, and support the digitalisation of activities linked to NQFs and RQFs including credit transfer, verification, and quality assurance of qualifications and other credentials.

Digital credentials offer a greater degree of security and flexibility in the ways that people access control, and share their educational credentials, including across borders and between institutions. Digital credentials are a safe, secure and reliable means of sharing and verifying an individual's credentials, and alternative digital credentials such as e-portfolios facilitate lifelong learning for career development.

There are different methods of digital certification, with badges being prominent. A digital badge is a visual symbol of accomplishment, usually taking the form of a visual seal or certificate. The most common form of digital credential is an *open badge*. An Open Badge is a specialized type of digital badge that contains verifiable metadata about achievements according to a common data format (a data standard – see the section on interoperability). The fact that a common standard is used enables these Open Badges to be combined by an individual and shared, and for them to be verified by any compatible system. Open Badges are therefore trusted credentials.

Recommended Reading:

Raviaoli, S. and Ferrel, G. 2021. *Know where your towel is: other competencies can be demonstrated through digital credentials*. France: IMS Global Learning Consortium
https://www.eunis.org/eunis2021/wp-content/uploads/sites/18/2021/05/EUNIS_2021_paper_42.pdf

Chakroun, B. and Keevy, J. 2018. *Digital Credentialling: Implications for the Recognition of Learning Across Borders*. Paris: UNESCO <https://unesdoc.unesco.org/ark:/48223/pf0000264428>

7.3 Micro-Credentials

Rapid innovation cycles and advanced systems of knowledge distribution contribute to the need for individuals to continuously update their knowledge and skills through lifelong learning. This lends itself to demand for short-term flexible learning opportunities.

A micro-credential is a proof of the learning outcomes that a learner has acquired following a short learning experience and the proof is contained in a certified document that lists the name of the holder, and, where applicable, the qualifications framework level and the credits gained (EU Commission, 2020). The debate is still ongoing on whether they form a part of formal or non-formal learning. A micro-credential can refer to both i) the learning activity that leads to a credential and ii) a certification. These can be formal or semi-formal accreditations, and can be stackable towards a larger qualification. The inclusion of micro-credentials in qualifications frameworks is in the early stages, but are important considerations for the comparison of qualifications, articulation, stackable credentials and flexible learning pathways.

Micro-credentials are one method through which people embrace lifelong learning. By integrating micro-credentials and their learning outcomes into NQFs (for example through stackable credential framework), they can be used to make access to learning more equitable and more affordable.

In order for micro-credentials to be effective, a common or shared understanding of micro-credentials and how those will translate into existing qualifications frameworks must be developed. In addition, a micro-credentialing framework detailing the rules and criteria for micro-credentials, underwritten by a national qualifications authority with alignment to existing national and regional qualifications and standards, is required particularly for micro-credentials to be integrated into stackable credentials methodologies or flexible credential pathways.

Recommended Reading:

European Union. 2020. *A European Approach to Micro-Credentials: Output of the Micro-Credentials higher Education Consultation Group*. European Commission <https://education.ec.europa.eu/sites/default/files/document-library-docs/european-approach-micro-credentials-higher-education-consultation-group-output-final-report.pdf>

Note micro-credentials are covered in more detail in Training Module 10.

7.4 Competency-Based Assessment

Assessment is a building block of the academic system where proof of understanding and competence from a student is a prerequisite for the awarding of a qualification by way of a certificate of completion. This of course serves to certify that a student has met the requirements for the qualification and can now enter the workplace to start a career in their chosen field of study. The way assessments have been carried out has been characterised by standardisation where all students take the same assessment based on predetermined criteria with a threshold of what percentage would denote a pass and anything below being a fail. Assessment is a structured process with steps to be followed to achieve its objectives. There are four steps in the assessment process:

1. Clearly define and identify the learning outcomes;

2. Select appropriate assessment measures and assess the learning outcomes;
3. Analyse the results of the outcomes assessed; and
4. Adjust or improve programs following the results of the learning outcomes assessed.

The system was well designed for an industrial era which is receding and making way for a new economy. This is the knowledge economy characterised by digitisation and digitalisation. In this now emerging educational system, assessment is viewed differently where it takes a more individualistic stance in some cases allowing student to progress at their own pace, and this is seen more in assessments that allow students to progress based on their scores and offer multiple tries for a student to get it right before proceeding to the next stage. This also allows for that instant feedback that encourage and motivate progression (Ifenthaler, Eseryel, Ge, Ke., Warren, Loh & Clark, 2012).

Since the 1970s, education systems have been shifting from a content focus towards competence-based education (CBE) and competency-based assessment (CBA). CBE proponents suggest that this form of education is linked to improved career readiness, the alignment between educational courses and industry expectations, student-centred and self-paced learning, and better learning outcomes.

CBE is underpinned by a defined set of goals aligned to both industry and academic standards (Johnstone & Leasure, 2015). Standards can be created by industry, governments, and/or individual institutions, but a common approach is to leverage the standards of industry bodies into national qualification levels and qualification requirements (Boeher, 2017). International educational standards frameworks or existing frameworks in other countries are another source of input.

CBE frameworks are now the dominant form of education frameworks advocated globally (Tan et al, 2017), and are in use in all types of development contexts. Examples of CBE frameworks in use in lower- and middle-income countries include Cameroon, Egypt, Ghana, Kenya, the Philippines, Malawi, Uganda and Rwanda (Nsengimana 2020; TESDA 2020; TVET/CDACC 2020).

As can be seen in the example from Singapore, although they are not the only factor, assessments are a key part of the progression plans and system differentiations. Well-designed assessments help students understand their strengths and weaknesses, and help teachers and the system target remedial action.

Competency-based assessments (CBA) are designed to measure a student's skills, abilities, attitudes, values and performance in an occupational context against the defined set of competence standards that define CBE. The emphasis is on learning outcomes and meeting labour market demands.

Underpinning CBA is a belief that all types of competencies – skills, knowledge, attitudes and values – are not static attributes but can be developed over time, and further that they can be influenced by education and training. This includes not only skills such as reading and writing but also 'meta-skills' such as 'learning to learn' or 'problem-solving', and transversal skills that can be applied in any job or life situation, such as collaboration, flexibility and, increasingly, a knowledge of ICT and basic computer software like word and spreadsheets. Competences which must therefore be accounted for include *what* a person must know and be able to do for their specific field, the processes they will use to accomplish the task – in other words, *how* they will accomplish these tasks and their general ways of working, as well as the foundations for improving themselves over time. For example, learning to learn is a skill that students must also develop, together with an appreciation for lifelong learning. *Transversal* skills are also an important part of competencies, including aspects such as communication

Once the complete set of standards, including both technical skills and knowledge and transversal and metaskills is developed, this can be elaborated into a competency framework. A competency framework outlines domains and specific activities under each domain, and CBA is implemented within this framework.

A weakness of CBA is a tendency towards 'tick-box' or checklist criteria, with only yes-no responses or tick marks for completion of specific tasks. CBA should incorporate different types of data. For example, quantitative data such as assessment scores, progression ratings or grades *and* qualitative data such as performance or project reviews, portfolios of evidence and so forth. Feedback is also an important part of the CBA cycle. Feedback should tell students how they achieved, clarify the assessment criteria and learning objectives of each task, outline areas of strength, and provide students information on both *what* they should improve and also *how that improvement might be pursued*. Ultimately, CBA should lead to a plan of action towards the achievement of all learning outcomes in the competency framework.

Example: The Human Resources Development Service of Korea: Competency Assessment
<https://www.hrdkorea.or.kr/ENG/3/1>

The purpose of competency assessment in the Republic of Korea is to create access points to different national qualifications, to develop worker competencies by operating national qualifications tests, to raise the social standing of the skilled and professional workforce and contribute to the development of the national economy.

A competency assessment system has been established which operates national qualifications tests on-demand at industrial sites. Individuals can pursue qualifications through four different channels:

- National Technical Qualifications prescribed by the National Technical Qualifications Act, mainly in technology and skills related to industries and service sectors.
- National Professional Qualifications typically for professional services such as law and tax accounting, established and operated by the need of relevant ministries, generally with licensing tests.
- Course-Based National Technical Qualifications for those who complete a certain level of National Competency Standards-based education/training and pass internal/external assessment.
- Work-Based Learning Dual System Qualifications for those who participate in the work-based learning dual system, with a fair and systematic evaluation of job competency.

Recommended reading:

Kusaka, S. 2019. Issue analysis of competency-based mathematics curriculum design in African countries: A case study of Mozambique's primary mathematics education. *Journal of Education and Learning*, Vol. 9, No. 1. <https://doi.org/10.5539/jel.v9n1p41>

Rahman, M. M., & Qudrat-E-Khuda, M. 2017. A Study on Introducing Competency Based Training and Assessment in Technical and Vocational Education and Training Institutions in Bangladesh: Issues and Challenges. <http://bv-f.org/VOL-17/03.%20BV%20Final.pdf>

Rauner, F., Heinemann, L., Maurer, A. & Haasler, B. 2013. Competence Development and Assessment in TVET (COMET): Theoretical Framework and Empirical Results. Springer: Netherlands

World Bank. 2020. *Competency Standards as a Tool for Human Capital Development: Assessment of Their Development and Introduction into TVET and Certification in Indonesia*. <https://elibrary.worldbank.org/doi/abs/10.1596/33558>

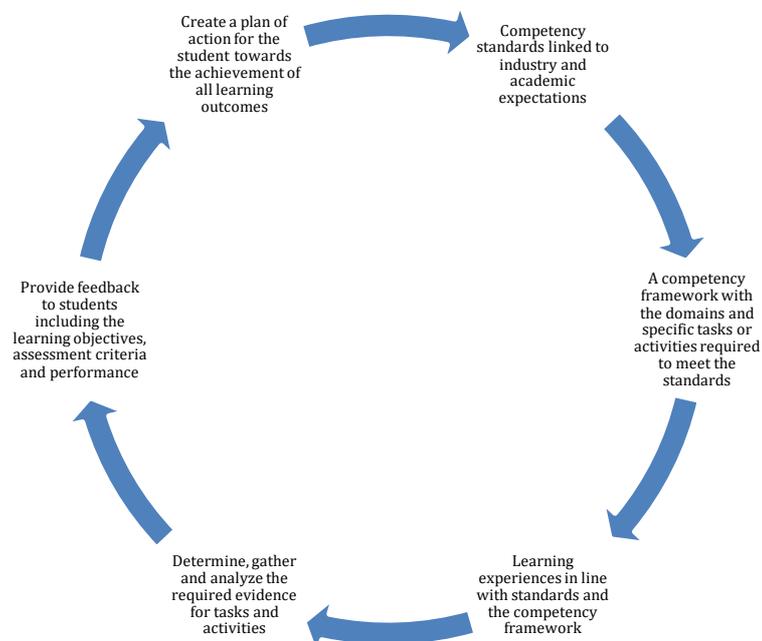


Activity (individual)

Consider the following six aspects of competency-based assessment. Create a diagram, either on paper or using computer software, which puts them in order.

- Competency standards linked to industry and academic expectations
- Create a plan of action for the student towards the achievement of all learning outcomes
- Determine, gather and analyze the required evidence for tasks and activities
- A competency framework with the domains and specific tasks or activities required to meet the standards
- Learning experiences in line with standards and the competency framework
- Provide feedback to students including the learning objectives, assessment criteria and performance

Sample answer:



Reflective questions and discussion

The reflective questions can be undertaken as an individual or as a group discussion.

1. What is your definition of competency-based assessment?
2. What challenges to CBA are or would be faced in your context? How could these be overcome?

7.5 Digital and Virtual assessments

Particularly during the COVID-19 pandemic, a strong trend towards digital, virtual and remote assessments is developing. Some common types of virtual assessments are:

- **Online quizzes** come in different formats like multiple-choice, fill-in-the-blank, and hotspot. They are convenient as they can be short and easy to assess. They are flexible, and some teachers provide an ungraded quiz before learning as a baseline for the course and the actual quiz.
- **Drag-and-drop activities** are also versatile and often used to test the ability to link information or solve practical problems. Both text and images can be used to make assessments more challenging and gauge whether students can apply knowledge in real life situations.
- **Online interviews** through video conferencing can be incorporated into the teaching and learning experience. Interviews can engage students and provide immediate feedback, and can be done individually or in small groups to assess a wide range of skills. They are particularly well-suited to tests of language proficiency.
- **Gamification** or game-type activities usually involve a number of challenges, levels, and/or awards that encourage student engagement and can lessen test anxiety. One common methodology of gamification is to include a time limit to create a race.

One advantage to digital assessments is that they give instant feedback. Students know how they did immediately and can then be advised to move on to the next section or try again. Digital assessments can also feed into new types of AI-driven learning management systems. For example, in Azerbaijan assessments are one component of the distance education system rolled out during the COVID-19 pandemic, and, together with engagement and assignment information, feed into early warning systems for drop-out as well as remedial plans.

Although TVET training is highly practical and digital assessment may not seem like a good fit, digital and remote assessments can assist with some challenges often faced in the TVET sector. For example, one of the challenges in some sectors is a limited number of qualified assessors, often who are highly concentrated in urban areas. For large countries or those without robust transportation systems, this can result in a long wait for qualified assessors to become available in some fields, especially for technical and vocational training. To assist with this challenge in India, remote assessments using video and online tests contribute to efficiencies and assist with timely CBA. Students are recorded performing tasks, and the recordings are evaluated by trained assessors. Meanwhile, in the hospitality sector in the CARICOM region, students engage in role-plays via video conferencing or even phone calls to complete the practical aspects of their assessments.

In addition, virtual reality or augmented reality software has been developed which can provide back-end analytics and feedback for occupations such as painting and carpentry. In the process, this software collects detailed information for assessment in new ways – for example measuring the exact angle of brush strokes or the pressure applied. Virtual reality is not limited to the TVET sector, either. TLE TeachLivETM provides initial teacher education through a virtual simulation environment that provides automated feedback on items such as the percent of teacher and student talk time and the number of open-ended questions asked. This software is currently in use in a number of universities as part of their initial teacher education offerings.

However, as useful as these measures are for assessment the Covid-19 pandemic has also shown that the practical components of training for many professions cannot be digitized. Technology cannot replace practical components of skilling programmes which require face-to-face interaction or specialized equipment. However realistic the virtual world may seem, for example, one would not certify a veterinarian who had never touched an animal, a surgeon who had never been in an operating room, or a hairdresser who only had experience with styling software and no real hair. And in other cases, training remotely or at home could be unsafe for those in training to be engineers, welders, or scientists.

Recommended reading:

UNESCO-UNEVOC. 2021. *TVET delivery: Providing innovative solutions - Volume 3*.
https://www.academia.edu/63438668/TVET_delivery_Providing_innovative_solutions_Volume_3

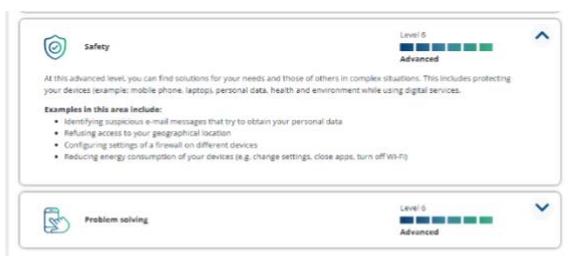


Activity (individual)

Follow the link below and try out the 'test your digital skills':

<https://europa.eu/europass/digitalskills/screen/home?referrer=epass&route=%2Fen>

Take the digital skills assessment and explore the results and the 'learning map'.



Learning roadmap



Choose a learning goal and explore tips and suggestions to take your digital skills to the next level.

[Discover more](#)



Reflective questions and discussion (group)

1. What did you learn about yourself from the assessment?
2. What did you like about the virtual assessment?
3. What would you change about the virtual assessment?
4. If you were to create a virtual assessment for citizens in your country, what skills would you recommend be tested?



Activity (individual)

Different types of platforms have been created to facilitate virtual assessments. Click through the links to explore the following platforms. Try to create an assessment of one or two questions using each one.

- [iSpring Suite](#) - is a comprehensive eLearning toolkit. It gives an array of tools to conduct interactive quizzes, surveys, and dialogue simulations for student assessment, as well as providing the ability to create PowerPoint-based courses, video tutorials, interactions and flipbooks.
- [Mentimeter](#) – this platform can be used to create interactive presentations. The software offers 13 interactive question types including word clouds and quizzes, and allows a group to engage



Activity (individual)

with the presentation and responses in real time. This tool allows instant feedback which can enrich discussions, and has an export function to pdf and Excel. It is particularly suited to competitive quizzes.

- [Google Forms](#) - is a platform that can be used to create surveys and graded quizzes. It gives a wide range of options from multiple choice, ranking, and free response questions. It also allows for the use of images and video within the platform.



Reflective questions and discussion (group)

1. Which platform do you think is best suited for digital assessments? Why?
2. Which platform do you think is the least suited for digital assessments? Why?
3. What are three advantages and three disadvantages to digital assessments over traditional assessments?

8 Innovations in Data Collection and Use

Traditional qualitative and quantitative studies are often time-consuming and costly to carry out, and data can rapidly become dated and less reliable the longer the gap between data collection and publication. Innovative data collection methods can be used to collect both 'historical' and real-time data, allowing for practical applications, and richer problem-solving and analysis.

Scraping and crowd-sourcing two examples of innovative data collection used to expand the types and sources of data available to policy-makers and education researchers. Scraping extracts data such as daily changes in stock prices or new listings on job listing websites and stores it for later analysis. Scraping has manual and/or through automated processes. Crowdsourcing collects data from a large number of people, usually voluntarily and free of charge.

Examples:

- Scraping has been used to collect comparative product information and for gathering labour market information from online sources.
- Crowdsourcing has been used to audit election processes in Honduras, track the COVID-19 outbreak and to label data for natural language processing.

Recommended Reading:

Zhao B. (2017) Web Scraping. In: Schintler L., McNeely C. (eds) Encyclopedia of Big Data. Springer, Cham. https://doi.org/10.1007/978-3-319-32001-4_483-1

8.1 Automated and Enhanced Labour Market Intelligence

Traditional methods of labour market intelligence gathering have a significant delay of months or even years between the reporting and analysis of labour market needs. Big data analytics are increasingly being used to provide real-time information about the skills needs and demands of employers. These innovative methods feed into labour market intelligence systems to support skills matching and skills anticipation and inform the development and revision of qualifications and qualifications frameworks.

The integration of automated skills matching processes into labour market intelligence provides real-time information on labour market needs and accurate trends over time through scraping and analysing secondary data sources such as job postings. This data can be harnessed to better understand changes in the labour market, indicate which skills and competencies are in demand, and potentially indicate how curricula can be revised to better reflect that demand.

Recommended Reading:

The European Training Foundation. *Big Data for Labour Market Intelligence: An Introductory Guide*. <https://www.etf.europa.eu/en/publications-and-resources/publications/big-data-labour-market-intelligence-introductory-guide>

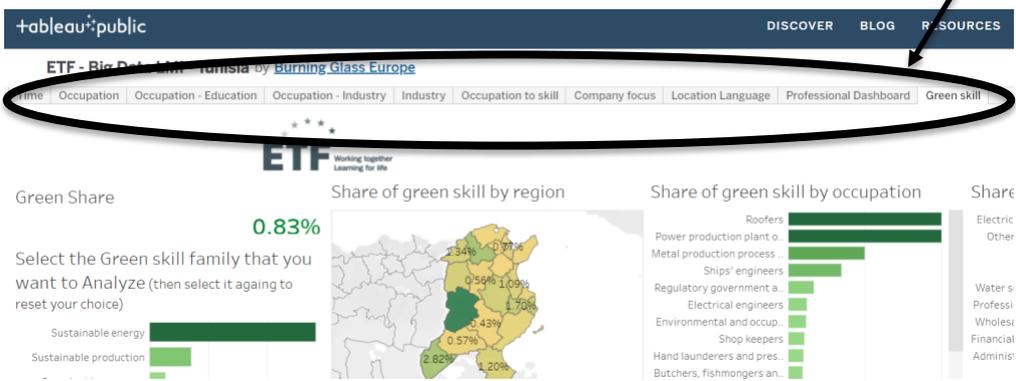
A series of online training programmes are also available at: https://www.youtube.com/playlist?list=PLEKEwOFeOWc6TGf3Bic004_wKrz3tY5ng

 **Activity (individual, pair or group)**

Based on data collected from internet sources (online job advertisements). Currently three data systems and dashboards have been established and maintained: Tunisia, Ukraine and Georgia. The data dashboards provide real-time and granular data on demand for occupations, skills-knowledge and attitudes, industries, sectors.

The following link displays a ‘Green Skills’ dashboard for Tunisia. Across the top are different dashboards (see the figure below). With a partner, explore the dashboards and answer the following questions:

<https://public.tableau.com/app/profile/tabulaex/viz/ETF-BigDataLMI-Tunisia/Time>



Questions:

1. Which region of Tunisia has the highest share of green skills?
2. Which occupations are most likely to require green skills?
3. Which occupations are in the highest demand in Tunisia? (hint, check the ‘occupations-industry’ tab)
4. Do you think the supply of skills matches the demand for skills? Why or why not? (hint, check the ‘Occupations – Industry’ and ‘Occupations – Education’ tabs)



Reflective questions and discussion

The reflective questions can be undertaken as an individual or as a group discussion.

1. How easy was it to navigate the dashboards?
2. What information were you able to gather or visualize that you may not have access to in your own country?
3. What are the pros and cons of a data scraping and big data analysis approach to skills supply and demand? What resources might be required?

8.2 Learning Management Systems

Learning management systems provide users with digital methods of classroom administration, delivery of educational programmes and documenting learning records. Increasingly, Learning Management Systems are being used to organise digital course materials, monitor student progress, conduct skills needs and other assessments, house learner portfolios, collect data on skills needs and shortages, and provide tailored training, self-paced, and open educational content to users.

They are often accompanied by learning analytics and insights on student performance and risk factors, which can be used as a basis for personalized learning pathways. They also provide opportunities for stealth assessment and flexible learning. User data generated on LMSs could also be fed into larger skills planning and anticipation activities.

To utilize learning management systems, the right expertise, financial and infrastructure resources and technical support is required. LMS systems also require course content and knowledgeable facilitators.

In addition to regular use in classrooms, a wide range of LMS systems are visible today through online learning platforms which offer a range of learning pathways, recommended courses and personalized learning pathways. Examples include Coursera, EdX, IBM Skillsbuild, the Open University Portal and many other examples, such as:

- The ManpowerGroup developed FuturSkill (French) which provides ICT-related training and match people to ICT-related work opportunities.
- LMSs such as OpenLMS's Personalized Learning Designer also incorporate personalised learning.



Activity - homework (individual)

The Open University has a learning management system with a wide range of free courses. Enrol in a course of your choice, selecting from:

<https://www.open.edu/openlearn/free-courses/full-catalogue>

Or, as a default, the following course on 'learning how to learn':



Activity - homework (individual)

<https://www.open.edu/openlearn/education-development/learning-how-learn/content-section-0?active-tab=description-tab>

Reflect on the experience of online learning with the group. What are the strengths and weaknesses of online learning? Were you able to earn a digital badge?

8.3 Innovations in Monitoring and Evaluation

Micronarratives

A form of data collection and analysis using individual stories to understand emergent issues in times of uncertainty. It combines quantitative and qualitative methodologies, dealing with both numbers and text, and is implemented through technology such as SenseMakerTM, which aims to allow researchers and policy-makers to find patterns in the narratives of diverse populations.

Micro-narratives can support policy-makers, researchers and implementers of NQF and RQFs to better understand citizen perceptions of qualifications, qualification types, government implementation and skilling needs.

The UNDP Ukraine recently used micronarratives to investigate trends in views on the COVID-19 pandemic, and micronarratives have been used to investigate reception to government services.

Data Exhaust

Data exhaust is an unintentionally produced type of big data that results from normal internet browsing and other activities. Data exhaust can take the form of web search results, online purchases, cookies, or location data. This type of data is referred to as 'found data', and can be passively collected and used in conjunction with other types of data to make inferences about human behaviours. It is widely used in targeted advertising.

Data exhaust can inform aspects such as effective government communication channels and provide information about populations and job-seekers.

Data Visualization

Data visualization is the graphic representation of the results of data analysis. Data visualization can range from a simple pie chart or bar graph in a report, to an interactive digital dashboard utilising real-time data from multiple sources. Data visualization allows the demonstration of underlying patterns and trends, particularly for audiences that may lack data science or statistical expertise.

Through data visualization, large and complex datasets and their analysis are accessible to a wide audience, and can be used by the general public and policy-makers for planning and reporting processes.

The [Google Data Studio](#) is one data visualization tool – it is an online tool for converting data into customizable informative reports and dashboards introduced in 2016 as part of the enterprise Google Analytics 360 suite and has a free version for individuals and small teams.

Further Reading:

<https://www.ua.undp.org/content/ukraine/en/home/blog/2020/having-a-say--micronarratives-on-rebuilding-society-after-the-pa.html>

Boyles, J. 2018. *Data Visualization*. In: Schintler L., McNeely C. (eds) *Encyclopedia of Big Data*. Springer, Cham. https://doi.org/10.1007/978-3-319-32001-4_62-1

O’Leary D.E., Storey V.C. (2017) *Data Exhaust*. In: Schintler L., McNeely C. (eds) *Encyclopedia of Big Data*. Springer, Cham. https://doi.org/10.1007/978-3-319-32001-4_303-1

9 Innovations in Communications

Social media are a wide variety of web-based services that allow people to chat, create and share user-generated content and join online communities such as through blogs, wikis, social networking sites and media sharing sites. The volume of communication through social media makes it a valuable tool for sharing and receiving information, for communicating in real-time, and for participating in educational and professional communities.

Social media can be used to raise critical awareness amongst the general public about the existence of QFs, their uses, and related activities such as credit transfer schemes, RPL, and different kinds of credentialing. Social media has enormous potential for increasing awareness and information access that underpins principles of equity and lifelong learning in education. Higher education institutions, think-tanks, non-profits, government departments and other organisations have embraced social media and use it for showcasing research, sharing learning content and introducing products and services.

To leverage social media, appropriate accounts must be established linked to the organisation, and a social media management and content plan developed. The appropriate expertise is also required.

Example:

- Stanford University through its [YouTube channel](#) makes lectures freely available to the public (Recorded lectures by some of the best lecturers in the world are published here where anyone with interest and internet can gain access to the information they share that some people pay a lot of money for, for free).

Recommended Reading:

Mickoleit, A. (2014), "Social Media Use by Governments: A Policy Primer to Discuss Trends, Identify Policy Opportunities and Guide Decision Makers", *OECD Working Papers on Public Governance*, No. 26, OECD Publishing, Paris, <https://doi.org/10.1787/5jxrcmghmk0s-en>

10 Summary

There is no end to study on innovations and technology. New innovations and new technologies are constantly entering our lives or brought in for consideration. And with new technologies also brings new points of access and new possibilities for further integration.

This training course has sought to provide an introduction to the world of innovation and technology. Although there are many other innovations which are relevant to NQFs and the ACQF, this module provides participants with opportunities to explore just a few modern innovations. The technical guideline for the Innovation and Technology area provides links and short explanations of many more which participants may wish to explore further.

In addition to experiential learning of some new technologies, this training course has sought to provide the information and introduction to the processes used in innovation. We hope that participants find opportunities to use these processes within their own context to adapt, adopt, modify or create new innovations.

Please take a moment to reflect on the learning outcomes for this module. What are the next steps you might like to take for further learning in each area?

- 1 Understands what databases are and the advantages and disadvantages of different types of databases.
- 2 Defines and discusses key concepts: the innovation design process, ethical use of data, and a range of innovations and technologies implemented in the NQF space.
- 3 Articulates the key requirements for and components of successful flexible credential pathways, and discusses these in own country context.
- 4 Understands the role that competency frameworks, digital assessments, digital credentials and the recognition of prior learning can play in skills development and qualifications
- 5 Explores innovations related to qualifications and reflects on their relevance and implementation in own country context.

11 Glossary

African Continental Qualifications Framework: The ACQF is a policy initiative of the African Union and its development process is underway (2019-2022). The current vision for the ACQF is: to enhance comparability, quality and transparency of qualifications from all sub-sectors and levels of education and training; facilitate recognition of diplomas and certificates; work in cooperation and complementarity with national and regional qualifications frameworks; promote cooperation and alignment between qualifications frameworks (national and regional) in Africa and worldwide.

Source: ACQF Thematic Brief 1 2021a

Basic education: Education and training that takes place in primary and secondary schools, as well as in adult education and training centres. Also known as general education.

Source: ACQF Thematic Brief 1 2021a, adapted from SAQA NQFPedia 2017

Autonomy and responsibility domain means the context in which knowledge and skills are applied autonomously and with responsibility; this learning domain refers to the amount of independence required to solve problems and complete tasks including decision-making and responsibility for self and others.

**NEW Level descriptor guideline*

Competence: The proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development.

Source: Council Recommendation of 22 May 2017 on European Qualifications Framework. [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615(01)&from=EN)

Credit means confirmation that a part of a qualification, consisting of a coherent set of learning outcomes has been assessed and validated by a competent authority, according to an agreed standard; credit is awarded by competent authorities when the individual has achieved the defined learning outcomes, evidenced by appropriate assessments and can be expressed in a quantitative value (e.g. credits or credit points) demonstrating the estimated workload an individual typically needs for achieving related learning outcomes.

Source: Council Recommendation of 22 May 2017 on European Qualifications Framework. [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615(01)&from=EN)

Credit systems means transparency tool for facilitating the recognition of credit(s). These systems can comprise, inter alia, equivalences, exemptions, units/modules that can be accumulated and transferred, the autonomy of providers who can individualise pathways, and the validation of non-formal and informal learning.

Source: Council Recommendation of 22 May 2017 on European Qualifications Framework. [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615(01)&from=EN)

Credit transfer means the process of allowing individuals who have accumulated credit in one context to have it valued and recognised in another context.

Source: Council Recommendation of 22 May 2017 on European Qualifications Framework. [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615(01)&from=EN)

Domain means a category of learning. It can be structured into sub-domains.

** NEW Level descriptor guideline*

Formal learning: Learning that occurs in an organised and structured environment (in an education or training institution or on the job) and is explicitly designated as learning (in terms of objectives, time or resources). Formal learning is intentional from the learner's point of view. It typically leads to validation and certification.

Source: Cedefop Glossary 2014

General education (primary and secondary education): See basic education.

Higher education:

- All programmes of study, or sets of courses of study, training, or training for research at the post-secondary level which are recognized by the relevant authorities of a State Party as belonging to its higher education system.

Addis Convention,

- Tertiary education that is of a higher academic level than secondary education, usually requiring a minimum level of admission and successful completion of secondary education.

Thematic brief 1

Informal learning: Learning resulting from daily activities related to work, family or leisure. It is not organised or structured in terms of objectives, time or learning support. Informal learning in most cases is unintentional from the learner's perspective. It typically does not lead to certification.

Source: Cedefop Glossary 2014

Knowledge domain means the various kinds of knowledge such as facts, principles, theories and practices; knowledge can be theoretical or factual.

**NEW Level descriptor guideline*

Learning outcomes: Statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence.

Source: Council of the European Union (2017)

Level: One of the series of levels of learning achievement according to which an NQF or RQF is organised. Levels are typically arranged in ascending order, from lowest to highest, depending on the number of levels in the NQF or RQF.

**NEW Referencing guideline*

Level descriptor: A statement describing learning achievement at a particular level of the National Qualifications Framework (NQF) that provides a broad indication of the types of learning outcomes that are appropriate to a qualification at that level.

Source: Adjusted from SAQA NQFPedia 2017

Lifelong learning: All learning activity undertaken throughout life, which results in improving knowledge, knowhow, skills, competences and/or qualifications for personal, social and/or professional reasons.

Source: [Cedefop Glossary 2014](#)

National Qualifications Framework: A policy and instrument for the development and classification of qualifications according to a set of criteria for specified levels of learning achieved, which aims at integrating and coordinating national qualifications subsystems and improve the transparency, access, progression and quality of qualifications in relation to the labour market and civil society.

Source: Council Recommendation of 22 May 2017 on European Qualifications Framework. [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615(01)&from=EN)

National Qualifications System: This includes all aspects of a country's activity that result in the recognition of learning. These systems include the means of developing and operationalising national or regional policy on qualifications, institutional arrangements, QA processes, assessment and awarding processes, skills recognition and other mechanisms that link education and training to the labour market and civil society. Qualifications systems may be more or less integrated and coherent. One feature of a qualifications system may be an explicit framework of qualifications.

Source: OECD 2006

Non-formal learning: Learning which is embedded in planned activities not explicitly designated as learning (in terms of learning objectives, learning time or learning support). Non-formal learning is intentional from the learner's point of view.

Source: [Cedefop Glossary 2014](#)

Qualification: Means a formal outcome of an assessment and validation process which is obtained when a competent authority determines that an individual has achieved learning outcomes to given standards.

Source: Council of the European Union (2017)

Means a planned combination of learning outcomes which has a defined purpose or purposes, intended to provide qualifying learners with applied competence and a basis for further learning and which has been assessed in terms of exit level outcomes, registered on the NQF and certified and awarded by a recognised body.

Source: SAQA NQFPedia 2017

Qualifications Frameworks: Systems for classification, registration, publication and articulation of quality assured qualifications.

Source: Addis Convention, UNESCO 2014

Quality assurance: Processes and procedures for ensuring that qualifications, assessment and programme delivery meet certain standards.

Source: Tuck 2007

Recognition of foreign qualifications: A formal acknowledgement by a competent authority of a party of the value of a foreign education qualification or a validated training.

Source: Addis Convention, UNESCO 2014

Referencing: A methodology used to compare national qualifications frameworks/ qualifications levels with an overarching framework. Through a structured referencing process, a national multi-stakeholder body of experts references (defines and establishes the relationship/ link) the NQF/ NQS levels and the levels and quality assurance of a Regional Qualifications Framework. (DEFINITION IN DISCUSSION)

**NEW Referencing guideline*

Regional Qualifications Framework: A broad structure of levels of learning outcomes that is agreed by countries in a geographical region. A means of enabling one national framework of qualifications to relate to another and, subsequently, for a qualification in one country to be compared to a qualification from another country.

Source: ASEAN Qualifications Reference Framework 2015

“Skills” domain: ‘Skills’ means the ability to apply knowledge and use know-how to complete tasks and solve problems. Skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).

Thematic brief 1

Stakeholder: A person or organisation with an interest or concern in something. In vocational education and training, stakeholders include government, providers of training, industry, clients and the community.

Source: TESDA Philippines,

<https://www.tesda.gov.ph/uploads/File/RelatedTvetInfo/The%20TVET%20Glossary%20of%20Terms,%204th%20Edition.pdf>

Sub-domain means a sub-category of any of domain of learning.

**NEW Level descriptor guideline*

Technical vocational education and training (TVET): TVET, as a part of lifelong learning, can take place at secondary, post-secondary and tertiary levels and includes work-based learning and continuing training and professional development, which may lead to qualifications. TVET also includes a wide range of skills development opportunities attuned to national and local contexts. Learning to learn, the development of literacy and numeracy skills, transversal skills and citizenship skills are integral components of TVET.

Source: AQCF Thematic Brief 1 2021a, original source, UNESCO 2015

<https://unesdoc.unesco.org/ark:/48223/pf0000234137>

Validation of non-formal and informal learning: means the process of confirmation by a competent authority that an individual has acquired learning outcomes acquired in non-formal and informal learning settings measured against a relevant standard and consists of the following four distinct phases:

- identification through dialogue of particular experiences of an individual,
- documentation to make visible the individual’s experiences,
- a formal assessment of those experiences, and
- certification of the results of the assessment which may lead to a partial or full qualification.

Also known as recognition of prior learning (RPL), is the confirmation by a competent authority that the learning outcomes, that an individual has acquired in non-formal and informal learning settings, has been measured against a relevant standard.

Source: AQCF Thematic Brief 1 2021a, adapted from EQF Recommendation 2017

12 Guidance for trainers and learners

At the end of this Training Module the learner will be able to:

- 1 Understands what databases are and the advantages and disadvantages of different types of databases.
- 2 Defines and discusses key innovations and their roles in qualifications frameworks, namely: flexible credential pathways, competency-based assessment, recognition of prior learning, and credit banks.
- 3 Articulates the key requirements for and components of successful flexible credential pathways, and discusses these in own country context.
- 4 Understands the role that competency frameworks, digital assessments and the recognition of prior learning can play in skills development and qualifications
- 5 Explores innovations related to qualifications and reflects on their relevance and implementation in own country context.

The following guidance is provided to trainers and learners in terms of the demands of the learning programme.

| Area of guidance | Notes |
|--------------------------------------|--|
| Recommended Pre-requisite | <p>There are no pre-requisites to undertake this Training Module. However, given the technical nature of the material, learners should have the following background:</p> <ul style="list-style-type: none"> - General knowledge and understanding of qualifications and qualifications frameworks - Practical experience (for example, in organisations dealing with NQFs, qualifications) is recommended |
| Notional time to complete the module | <p>The Training Module scopes a range of information pertaining to innovations and technologies in education. There is some amount of reading but the focus wherever possible is on experiential learning.</p> <p>It is anticipated that if this Training Module is undertaken on an individual basis or as a group, it should take approximate 8 hours of learning and 8 hours of assessment:</p> <ul style="list-style-type: none"> - Reading: 4 hours - Face-to-face: 4 hours - Assessment: 8 hours <p>Additional 'recommended reading' is provided for each section. Trainers may divide these readings between participants for additional depth, noting that each additional resource included adds roughly one hour to the course.</p> |
| Materials | <p>There are associated links needed during the module which are provided in the text of the different activities. Accounts may need to be created for access to some of the innovations, but all have free versions so there is no cost associated with the course requirements.</p> <p>The associated external links are:</p> <p>https://europa.eu/europass/digitalskills/screen/home?referrer=epass&route=%2Fen</p> |

| Area of guidance | Notes |
|------------------|---|
| | <p>https://meine-berufserfahrung.de/overview.php?action=globalist</p> <p>https://www.ispringsolutions.com/ispring-suite</p> <p>https://www.mentimeter.com/</p> <p>https://docs.google.com/forms/u/0/?tgif=d</p> <p>Assessment #1 requires the learner to access a NQF document of a country of their choice. Links are:</p> <p>http://www.iiep.unesco.org/en/publication/flexible-learning-pathways-british-higher-education</p> <p>http://www.iiep.unesco.org/en/publication/flexible-learning-pathways-chilean-higher-education</p> <p>http://www.iiep.unesco.org/en/publication/flexible-learning-pathways-finnish-higher-education</p> <p>http://www.iiep.unesco.org/en/publication/flexible-learning-pathways-indian-higher-education</p> <p>http://www.iiep.unesco.org/en/publication/flexible-learning-pathways-jamaican-higher-education</p> <p>http://www.iiep.unesco.org/en/publication/flexible-learning-pathways-malaysian-higher-education</p> <p>http://www.iiep.unesco.org/en/publication/flexible-learning-pathways-south-african-higher-education</p> <p>Assessment #2 requires the participant to work in a pair to design or redesign a Flexible Credential Pathway. To do so they will need to access the knowledge laid out in different sections of this course. While collaborative software such as google slides is suggested, this presentation can also be created offline on powerpoint. Pairs should be established by country of origin where possible.</p> |
| Organisation | <p>If delivered within a group it is suggested that groups be restricted to about 3 people to encourage participation of each member. It is suggested that each group, for each task, allocates a note taker and speaker. Views should be shared across all groups and prompt further discussion and revelations.</p> |
| Assessment | <p>The first assessment task is undertaken individually, while the second task is undertaken as pair work. At the trainers discretion, groups of 3 or 4 may also be employed. Grading is done by peer review for both assessment tasks.</p> <p>If the Training Programme becomes a part of an accredited component (e.g. module, subject) then the assessments may need to be adjusted to ensure that individual performance can be demonstrated.</p> |

13 Assessment

Approach to assessment

The assessments have been developed to enable an individual or a group to complete the tasks. There are three assessments focussing on:

1. NQF coherence and logic
2. NQF linkages to quality assurance
3. Consideration of stages in the recognition of prior learning, based on a case study.

Assessment tasks 1 and 2 require the individual or group access to an NQF that they are familiar with and also its associated quality assurance arrangements within and across education sectors.

Assessment #1: Flexible Credential Pathways

Choose one of the following case studies to read (when working in a group, case studies can be divided between participants).

[Britain](#)

[Chile](#)

[Finland](#)

[India](#)

[Jamaica](#)

[Malaysia](#)

[South Africa](#)

Write a reflection on the case study. The reflection should be between 1000 and 1500 words, and focus on the following:

- Summarizing the areas of interest, considering questions such as:
 - a. What are the main approaches and challenges in articulation or credential pathways?
 - b. What funding strategies are used or planned?
 - c. What assessment strategies are used or planned?
 - d. What are successes and challenges in the recognition of prior learning?
 - e. What are successes and challenges in credit accumulation and transfer?
- Learnings from the case study that could be applied to your own country context.

Each reflection will be evaluated by two other participants, using the following criteria:

- Clarity, or the extent to which the reflection explains the case study clearly to one who has not read it
- Relevance, or the extent to which the reflection addresses the main areas of interest outlined
- Logical coherence, or the extent to which the reflection draws relevant conclusions and explains how these apply to their own context

Assessment #2: Project and presentation (individual pairs)

The following assessment may be completed as an individual or in pairs.

Prepare a 10-20 minute presentation of 6 – 8 slides using collaborative software (for example Google Slides or a similar software). Your presentation should consider the following questions:

- What are the features of your flexible credential pathway?
- What would you include in your design?
- What are key challenges that would have to be overcome in your context?
- Which stakeholders would have to contribute? What would they contribute?

For those from countries which already have flexible credential pathways, describe the design and features, successes and challenges, and how you would improve the existing system.

The criteria for evaluation of the presentation will be: clarity (whether the presentation and its logic are clear), relevance (whether topics specified are addressed or not), application of knowledge (whether the information learned in this course is applied or not), and design (how attractive the presentation is).

The final component is a digital assessment on your presentation for the audience. Using one of the software products introduced in this course or any other software of your choosing, prepare a 3-question digital assessment to test the audience knowledge of your presentation.

The following rubric should be used by the observers or other participants to score each presentation.

| CRITERIA | Score from 1 to 5 (1 = low, 5 = best) | Comments |
|--|--|----------|
| clarity (whether the presentation and its logic are clear) | | |
| relevance (whether topics specified are addressed or not) | | |
| application of knowledge (whether the information learned in this course is applied or not) | | |
| design (how attractive the presentation is) | | |
| Overall comments and reflections | | |

References and further reading

ACQF:

ACQF. 2021a. ACQF Capacity Development Programme. Thematic Brief 1. Concepts and definitions on qualifications and qualifications frameworks. Author: Castel-Branco, E. <https://acqf.africa/capacity-development-programme/thematic-briefs/acqf-thematic-brief-1-concepts-and-definitions>

ACQF 2021b. ACQF Capacity Development Programme. Thematic Brief 2. Competences' Frameworks. Author: Castel-Branco, E.

ACQF. 2021c. ACQF Capacity Development Programme. Thematic Brief 3.1. Level descriptors in qualifications frameworks. Overview from 24 African Qualifications Frameworks. Author: Castel-Branco, E. <https://acqf.africa/capacity-development-programme/thematic-briefs/acqf-thematic-brief-3-1-level-descriptors>

ACQF. 2021d. ACQF Capacity Development Programme. Thematic brief 4.1. Regional qualifications frameworks (RQF) – 3 case studies: SADCQF, ASEAN QRF, EQF. Author: Castel-Branco, E. <https://acqf.africa/capacity-development-programme/thematic-briefs/acqf-thematic-brief-4-1-regional-qualifications-frameworks-rqf>

ACQF. 2021e. ACQF Capacity Development Programme. Thematic Brief 6.1. Quality assurance for Technical Vocational-Education and Training (TVET). Overview of approaches or regional/ international organisations. Author: Castel-Branco, E. <https://acqf.africa/capacity-development-programme/thematic-briefs/acqf-thematic-brief-6-1-tvet-quality-assurance>

ACQF 2021f. ACQF Capacity Development Programme. Thematic Brief 11. Governance and management of NQFs. Author: Mukhwana, E. J.

ACQF. 2021g. Towards the African Continental Qualifications Framework – Mapping report. AU-EU Skills for Youth Employability Programme – SIFA Technical Cooperation. Authors: J. Keevy, A. Bateman, E. Castel-Branco, L. Mavimbela, J. Adotevi, L. Sutherland, R. Matlala, U. Kyari and T. Sibiyi. <https://acqf.africa/resources/mapping-study/acqf-mapping-report-comprehensive>

ACQF. 2021h. Towards the African Continental Qualifications Framework – Synthesis. AU-EU Skills for Youth Employability Programme – SIFA Technical Cooperation. Authors: J. Keevy, A. Bateman, E. Castel-Branco, L. Mavimbela, J. Adotevi, L. Sutherland, and R. Matlala. <https://acqf.africa/resources/mapping-study/acqf-mapping-report-synthesis>

ACQF. 2021i. Feasibility report. Rationale, scenarios and plan. Authors: E. Castel-Branco. E. Mukhwana et al. <https://acqf.africa/resources/policy-guidelines/feasibility-study>

ACQF. 2022. Guideline 10: Qualifications and NQFs (or NQs): A systemic view. Author: Bateman. A. (forthcoming).

ACQF. 2022b. ACQF Capacity Development Programme. Thematic Brief 8. National Qualifications Frameworks in a changing world. Author: Castel-Branco, E. (forthcoming)

ACQF. 2022c. ACQF Capacity Development Programme. Thematic Brief 9. Competence-based training. Author: Castel-Branco, E. (forthcoming)

ACQF. 2022d. ACQF Capacity Development Programme. Thematic Brief 10. ACQF level descriptors – story of the development journey. Author: Jaftha, C. (forthcoming)

Other:

African Standards and Guidelines for Quality Assurance in Higher Education (ASG-QA). <https://haqaa2.obsglob.org/african-standards-and-guidelines-for-quality-assurance-in-higher-education-asg-qa/>

African Union. 2015. Continental Education Strategy for Africa 2016-2025. https://au.int/sites/default/files/documents/29958-doc-cesa_-_english-v9.pdf

African Union. 2019. Plan of Action for the African Decade for Technical, Professional, Entrepreneurial Training and Youth (2019-2028). <https://edu-au.org/resources/category/42-plan-of-action-for-the-african-decade-for-technical-professional-entrepreneurial-training-and-youth-employment>

Akram, B., Min, W., Wiebe, E., Mott, B., Boyer, K.E. and Lester, J., 2018, July. Improving stealth assessment in game-based learning with LSTM-based analytics. In *International Conference on Educational Data Mining*.

Antikainen, M., Uusitalo, T. and Kivikytö-Reponen, P., 2018. Digitalisation as an enabler of circular economy. *Procedia Cirp*, 73, pp.45-49. <https://doi.org/10.1016/j.procir.2018.04.027>

Australian Government – Department of Education, Skills, and Employment. 2021. National Micro-Credentials Framework. <https://www.dese.gov.au/download/13591/national-microcredentials-framework/26500/document/pdf>

Davies, S. 2021. askST: Is there a quota on university places for polytechnic graduates? The Straits Times. Available at: <https://www.straitstimes.com/singapore/parenting-education/askst-is-there-a-quota-on-university-places-for-polytechnic-graduates> (Accessed 7 March 2021.)

European Commission. A European Approach to micro-credentials. Website and resources: <https://education.ec.europa.eu/levels/higher-education/european-approach-to-micro-credentials>

European Commission 2021, Proposal for a COUNCIL RECOMMENDATION on a European approach to micro-credentials for lifelong learning and employability. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0770>

European Investment Bank, 2021. Digitalisation In Europe 2020-2021: Evidence from the EIB Investment Survey. EIB. https://www.eib.org/attachments/efs/digitalisation_in_europe_2020_2021_en.pdf

Hizir, Z., 2021. Digital transformation: upskilling and empowering your staff for the automated age. <https://www.hrzone.com/lead/future/digital-transformation-upskilling-and-empowering-your-staff-for-the-automated-age> (Accessed 08/03/2021).

ILO. 2017. *Using technology to link skills with jobs and migration: Assessment of the pilot project and presentation of a working model*. Geneva, Switzerland. ILO. https://www.ilo.org/wcmsp5/groups/public/--asia/--ro-bangkok/--sro-new_delhi/documents/publication/wcms_769850.pdf

ILO. 2018. *Recognition of Prior Learning: Learning Package*. Geneva, Switzerland: ILO. https://www.ilo.org/wcmsp5/groups/public/--ed_emp/--ifp_skills/documents/publication/wcms_626246.pdf

ILO. 2019. ILO Centenary Declaration for the Future of Work Adopted by the Conference at its 108th Session, Geneva, 21 June 2019. <https://www.ilo.org/global/about-the-ilo/mission-and-objectives/centenary-declaration/lang--tr/index.htm>

Ismail, M., Sa'adan, N., Samsudin, M., Hamzah, N., Razali, N. & Ismail, I. 2018. Implementation of The Gamification Concept Using KAHOOT! Among TVET Students: An Observation. *Journal of Physics: Conference Series* 1140.

Jogani, A., 2019. Business digitalization risk & change management. <https://www.wegalvanize.com/risk/business-digitalization-risk/> (Accessed 07/03/2021).

Kholod, S.V., 2021. Performance comparison for different types of databases. <https://er.ucu.edu.ua/handle/1/2878>

Lane-Sellers, J., 2021. Digitalization in Africa, the Risks and Transformation Needed. <https://blogs.lexisnexis.com/fraud-and-identity-in-focus/digitalization-in-africa-the-risks-and-transformation-needed-mdr/> (Accessed 07/03/2021).

Keevy, J., Rein, V., Chakroun, B. & Foster, L. 2019. 'Credentialing in the 21st century: Looking beyond the event horizon'. In: *Oswald, F., Behrend, T. & Foster, L. (eds), Workforce readiness and the future of work. New York: Routledge.*

Kusaka, S. 2019. Issue analysis of competency-based mathematics curriculum design in African countries: A case study of Mozambique's primary mathematics education. *Journal of Education and Learning*, Vol. 9, No. 1. <https://doi.org/10.5539/jel.v9n1p41>

Mader, A. and Eggink, W., 2014. A design process for creative technology. In DS 78: Proceedings of the 16th International conference on Engineering and Product Design Education (E&PDE14), Design Education and Human Technology Relations, University of Twente, The Netherlands, 04-05.09. 2014.

Major, L., Francis, G. & Tsapali, M. 2020. The effectiveness of technology-supported personalised learning in low-and middle-income countries: A meta-analysis. *British Journal of Educational Technology*, 2021; 00:1–30. <https://bera-journals.onlinelibrary.wiley.com/doi/10.1111/bjet.13116?af=R>

Markevych, K., 2021. Not Just Advantages. What Are the Dangers Behind Digitalisation? <https://razumkov.org.ua/en/articles/not-just-advantages-what-are-the-dangers-behind-digitalisation> (Accessed 07/03/2021).

Maurer, M. 2019. The challenges of expanding recognition of prior learning (RPL) in a collectively organised skill formation system: the case of Switzerland, *Journal of Education and Work*, 32:8, 665-677, DOI: 10.1080/13639080.2019.1694141.

McKinsey Global Institute. 2017. *Jobs Lost, Jobs Gained: What the future of work will mean for jobs, skills, and wages.* <https://www.mckinsey.com/featured-insights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages>

Merino, P., Ruipérez-Valiente, J., Moreno, J. & Delgado-Kloos, C. 2015. Assessment Activities in Massive Open On-Line Courses: Assessment Activities in MOOCs.

Mothokoa, N. & Maritz, J. 2018. Recognition of prior learning candidates' experiences in a nurse training programme. *Health SA Gesondheid* (Online), 23. http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S2071-97362018000100005

- Mukhtar, M. and Ahmad, J. 2015. Assessment for Learning: Practice in TVET. *Procedia - Social and Behavioral Sciences* 204. 119 – 126
- Muñoz, D. & Araya, D. 2017. The challenges of competence-based assessment in the educational field. *Educ. Pesqui.*, São Paulo, v. 43, n. 4, p. 1073-1086.
- Nakata, S., Sharma, U., Rahman, T., Rahman, M. & Aziz, M. 2021. *Effects of Recognition of Prior Learning on Job Market Outcomes: Impact Evaluation in Bangladesh*. The World Bank.
- NCEE (National Centre on Education and the Economy). (n.d.). Singapore: Learning Systems. Retrieved from <https://ncee.org/what-we-do/center-on-international-education-benchmarking/top-performing-countries/singapore-overview-2/singapore-learning-systems/> on 28 September 2020.
- OECD. 2020. OECD Future of Education and Skills 2030. Conceptual learning framework. Paris: OECD.
- OECD, 2021. Quality and value of micro-credentials in higher education. https://www.oecd-ilibrary.org/education/quality-and-value-of-micro-credentials-in-higher-education_9c4ad26d-en
- Oliver, B., 2021. Presentation at UNESCO Conference: A conversation starter: Towards a common definition of micro-credentials. <https://en.unesco.org/news/defining-micro-credentials-opportunities-and-challenges-shaping-educational-landscape>
- Oliver, B. & Keevy, J. 2021. Credit and recognition in a more interoperable global context. Implications for data privacy, certification and the recognition of prior learning. In *Turnbull, W. & Woolf, H. 2021. Widening Access to Higher Education in the UK: Developments and Approaches Using Credit Accumulation and Transfer, First Edition. Forthcoming: Open University Press.*
- Papier, J. 2012. The notion of ‘vocational pedagogy’ and implications for the training of vocational teachers – examining the field. *International Journal of Education*, Vol. 6(2), pp. 87-96.
- Rahman, M. M., & Qudrat-E-Khuda, M. 2017. A Study on Introducing Competency Based Training and Assessment in Technical and Vocational Education and Training Institutions in Bangladesh: Issues and Challenges. <http://bv-f.org/VOL-17/03.%20BV%20Final.pdf>
- Rauner, F., Heinemann, L., Maurer, A. & Haasler, B. 2013. *Competence Development and Assessment in TVET (COMET): Theoretical Framework and Empirical Results*. Springer: Netherlands
- Renn, O., Beier, G. and Schweizer, P.J., 2021. The opportunities and risks of digitalisation for sustainable development: a systemic perspective. *GAIA-Ecological Perspectives for Science and Society*, 30(1), pp.23-28.
https://www.researchgate.net/publication/350494384_The_opportunities_and_risks_of_digitalisation_for_sustainable_development_a_systemic_perspective
- Shaketange, L. 2018. Challenges and Opportunities for Implementing Recognition of Prior Learning at the University of Namibia. *Creative Education*, 9(13).
<https://www.scirp.org/journal/paperinformation.aspx?paperid=88071>
- Shiohira, K., 2021. Understanding the Impact of Artificial Intelligence on Skills Development. *Education 2030*. UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. <https://eric.ed.gov/?id=ED612439>
- Singh, M. 2015. *Global perspectives on recognising non-formal and informal learning: Why recognition matters*. New York: Springer.
- Souto-Otero, M. 2021. Validation of non-formal and informal learning in formal education: Covert and overt. *European Journal of Education*, 00, 1–15. <https://doi.org/10.1111/ejed.12464>.

TVET Curriculum Development Assessment and Certification Council (TVET/CDACC). 2020. Guidelines on Competency Based Assessment. TVET/CDACC: Nairobi

UNESCO Institute for Lifelong Learning. 2020. *Embracing a culture of lifelong learning: Contribution to the Futures of Education initiative*. Hamburg: UIL. <https://uil.unesco.org/lifelong-learning/new-visionlifelong-learning-and-world-worth-living>

UNESCO. 2020. Guidelines on implementing qualifications frameworks in Asia and the Pacific at subject level: educational studies and cultural heritage management. UNESCO. France. <http://hdl.voced.edu.au/10707/554241>

UNESCO. 2022. K-12 AI curricula: a mapping of government-endorsed AI curricula. UNESCO, France. <https://unesdoc.unesco.org/ark:/48223/pf0000380602>

UNESCO-UNEVOC. 2019. *UNESCO-UNEVOC trends mapping: Innovation in TVET*. UNESCO & UNEVOC. https://unevoc.unesco.org/pub/tm_innovation.pdf

UNESCO-UNEVOC. 2021. Bridging Innovation and Learning in TVET. New Qualifications and Competencies in TVET, Volume 3, Micro-Level. Forthcoming UNEVOC.

Valenduc, G. and Vendramin, P., 2017. Digitalisation, between disruption and evolution. *Transfer: European Review of Labour and Research*, 23(2), pp.121-134. <https://doi.org/10.1177/1024258917701379>

Van der Schaaf, M., Donkers, J., Slof, B., Moonen van Loon, J., van Tartwijk, J., Driessen, E., Badii, A., Serbana, O. & Cate, O. 2017. Improving workplace-based assessment and feedback by an E-portfolio enhanced with learning analytics. *Education Technology Research and Development* 65. 359 – 380 <https://doi.org/10.1007/s11423-016-9496-8>

Werquin, P. 2010. *Recognising Non-Formal and Informal Learning: Outcomes, Policies and Practices*. Paris: OECD. https://books.google.nl/books/about/Recognising_Non_Formal_and_Informal_Lear.html?id=WxnWAgAAQBAJ&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q&f=false

World Bank. 2020. *Competency Standards as a Tool for Human Capital Development: Assessment of Their Development and Introduction into TVET and Certification in Indonesia*. <https://elibrary.worldbank.org/doi/abs/10.1596/33558>

World Bank. 2021. School enrolment, tertiary (% gross). Available at: <https://data.worldbank.org/indicator/SE.TER.ENRR> (Accessed 7 March 2022.)

World Health Organisation. 2021. Developing WHO Academy's Framework for Recognizing Learning Achievement and the Awarding of Credentials. Delphi Survey Invitation. <https://www.who.int/news-room/articles-detail/delphi-survey-invitation-who-academy>

Yusoff, A., Salam, S., Mohamad, S. & Daud, R. 2017. Gamification Element Through Massive Open Online Courses in TVET: An Analysis Using Analytic Hierarchy Process. *Advanced Science Letters*. 23. [8713-8717. 10.1166/asl.2017.9956](https://doi.org/10.1166/asl.2017.9956).

Zeide, E., 2019. Artificial intelligence in higher education: Applications, promise and perils, and ethical questions. *Educause Review*, 54(3), pp.31-39. <https://er.educause.edu/articles/2019/8/artificial-intelligence-in-higher-education-applications-promise-and-perils-and-ethical-questions>

Annex 1: Responses to Activity 1

| Databases | Description | Requirements | Advantages | Disadvantages |
|-------------|--|--|--|---|
| Centralised | A centralised database is basically a type of database that is stored, located as well as maintained at a single location only. | Mainframe computer and Local Area Network (LAN) or Wide Area Network (WAN). | <ul style="list-style-type: none"> • Data is stored at a single location only so is easier to access and coordinate data. • Minimal data redundancy • Lower cost than other types | <ul style="list-style-type: none"> • Higher data traffic • If any kind of system failure occurs at the centralised system then the entire data will be destroyed |
| Distributed | A distributed database is a collection of multiple interconnected databases, which are spread physically across various locations that communicate via a computer network. For organisations with multiple offices/branches. Useful for closed networks. | Client-server architecture - the principle idea of this architecture is to define specialised servers with specific functionalities such as: printer server, mail server, file server, etc. these servers are connected to a network of clients that can access the services of these servers. | <ul style="list-style-type: none"> • This database can be easily expanded as data is already spread across different physical locations. • The distributed database can easily be accessed from different networks. • This database is more secure in comparison to a centralised database. | <ul style="list-style-type: none"> • This database is very costly and it is difficult to maintain because of its complexity. • In this database, it is difficult to provide a uniform view to users since it is spread across different physical locations. |

| | | | | |
|-----------------------------|--|--|--|--|
| Cloud | A cloud database is designed for a virtualized computer environment and can be accessed via the internet from the cloud database service provider and is deliverable to the users when they demand it. | <p>Typically built using a cloud provider (Windows Azure, Amazon SimpleDB, or Google Cloud SQL); Individuals can create via Microsoft Access web apps.</p> <p>Can be accessed via computer through the internet, or a user using a mobile phone can access the cloud database via 3G or 4G services.</p> | <ul style="list-style-type: none"> ● Fast ● Cost savings as it eliminates the need to own data centres and staff to manage it ● Scalable ● Can access the information from anywhere | <ul style="list-style-type: none"> ● Pay-per-transfer model ● No control over the servers, software and security where your data is stored ● The data you have hosted on the cloud database is totally dependent on the service provider ● It is very difficult to transfer so much data to a computer ● Data is to be fetched via the internet, so if the server is down access can be lost. |
| Open-source | An open source database allows users to create a system based on their unique requirements and business needs. | A database management system (DBMS). | <ul style="list-style-type: none"> ● It is free and can be shared. ● The source code can be modified to match any user preference. ● Cost effective. ● Better quality source code. ● More secure. | <ul style="list-style-type: none"> ● It provides limited technical support. |

| | | | | |
|-----------------------------|---|--|--|---|
| Commercial or closed source | Closed source databases are proprietary software where the source code cannot be accessed, modified, distributed, or reused. | Customer Relationship Management (CRM) system. | <ul style="list-style-type: none"> ● It provides guaranteed technical support. | <ul style="list-style-type: none"> ● They are premium and are not free like open source databases. |
| Non-relational databases | Unlike relational databases, non-relational databases store data in any format. Data is not required to be formed into a table, instead, it could be anything from document to graph. | NoSQL supported server e.g. Redis Server, Memcached Database Server or Oracle NoSQL. | <ul style="list-style-type: none"> ● Elastic scalability: These databases are designed for use with low-cost commodity hardware. ● Big Data Applications: Massive volumes of data are easily handled by NoSQL databases. ● Can be easily installed in cheap commodity hardware clusters as transaction and data volumes increase. | <ul style="list-style-type: none"> ● NoSQL databases don't have the reliability functions which Relational Databases have. ● NoSQL is not compatible (at all) with SQL. ● NoSQL is very new compared to Relational Databases, which means that they are far less stable and may have a lot less functionalities. |
| Relational | The most common database which stored data in tables. Different tables are then connected to the others through unique key fields. | A database management system (DBMS) - the software which controls the storage, retrieval, deletion, security, and integrity of data within a database. | <ul style="list-style-type: none"> ● The simplest model, as it does not require any complex structuring or querying processes. ● Provides data accuracy. ● Gives easy access to data. | <ul style="list-style-type: none"> ● The underlying cost involved in a relational database is quite expensive. ● Performance of the relational database depends on the number of |

| | | | | |
|-------------|---|------------------|--|--|
| | | | <ul style="list-style-type: none"> ● Sturdy Data entries and legitimacy validations ensure data integrity. ● Possesses qualities for levelling up, expanding for bigger lengths, as it is endowed with a bendable structure to accommodate the constantly shifting requirements. ● Known for high security. ● Feasible for Future Modifications. | <p>tables and more makes it slow.</p> <ul style="list-style-type: none"> ● Requires a tremendous amount of physical memory since it is with rows and columns. ● Risk of information loss when it is transferred between systems. ● Structure limitations because the fields that are present on a relational database are with limitations. |
| Operational | Common in organisations as they store payroll records, customer information and employee data. With operational databases, records can be added, removed and modified in real time. | Operational DBMS | <ul style="list-style-type: none"> ● Records can be added, removed and modified in real time. ● Versatile and accommodate distributed systems like NoSQL, SQL, New SQL Databases. ● These systems are highly available, fault-tolerant and highly scalable as discussed. ● Secure as they offer built-in support for encryption, | <ul style="list-style-type: none"> ● Steep learning curve that increases the overheads expenses. ● The installation process of such an operational database system requires time and effort ● Stored in a remote location having overall control could be difficult. |

| | | | | |
|--|--|--|---|--|
| | | | auditing, and protection from cyber. | |
|--|--|--|---|--|

Annex 2: Recognition of prior learning case study

The following case study is included in the training manual for Module 10, and is an extract from *Recognition of prior learning gives us wings* (ACQF 2022, Author Eduarda Castel-Branco). Source: <https://acqf.africa/resources/recognition-of-prior-learning/recognition-of-prior-learning-gives-us-wings>

Kenya¹

The [Kenya National Qualifications Authority \(KNQA\)](#) was established in 2015 as set out in the [Kenya National Qualifications Framework \(KNQF\) act no. 22 of 2014](#).

[KNQF Regulations, 2018](#) stipulate the regulations concerning all domains of the NQF (certification; recognition, equation and approval of foreign qualifications and RPL; structure of the NQF – national qualifications assessment systems, national database. Levels, volume of learning, accumulation of credits towards qualifications, transfer of credits, award of qualifications).

Through the KNQA, the Kenya Government has published in June 2021, the '[Recognition of Prior Learning Policy Framework](#)' and the '[Guidelines for Implementation of Recognition of Prior Learning in Kenya](#)'. This is in line with the KNQF Act No.22 of 2014, which promotes RPL in the following sections of the law;

- Section 4(c): Mandates KNQA to develop a system of competence, life-long learning and attainment of national qualifications;
- Section 8(1)(k): Provides for the recognition of attainment of competencies including skills, knowledge, attitudes & values - regardless of where and how individuals acquired them.

A pilot phase to test the new RPL Guidelines started in 2021 with focus on qualifications for occupation in three areas: textiles, car mechanics and welding. Candidates are mostly workers from the informal sector (JUA KALI). Qualified informal sector workers, artisans, small businesses will have improved opportunities to enter and participate in the formal economy.

The RPL policy

- Aims at providing a coordinated framework for implementing all RPL related activities in Kenya;
- Integrates RPL into the existing legal and policy frameworks in the education, training and employment sectors;
- Aligns RPL activities to the Kenya National Qualifications Framework (KNQF);
- Spells out the objectives, expected outcomes and Quality assurance mechanisms for carrying out RPL in Kenya;
- Defines the various institutional frameworks and their specific roles in the RPL process;
- Outlines the process of carrying out RPL in Kenya
- Promote access, employability, mobility, progression and fair chances to the disadvantaged, discouraged and traditionally marginalized groups;
- Enables the national coordination of RPL focusing on integrating RPL into existing Educational, Training and employment policies and legal frameworks;
- Supports expanded acceptance of workers that have been trained in various ways including use of RPL especially by employers; and encourages employees to further their careers using RPL', and training institutions to recognize and admit students that would like to use RPL to further their studies;

¹ Acknowledgements to Dr Eusebius Juma Mukhwana. for drafting the section on RPL Kenya

- To develop human and technological capacity to implement and manage RPL in the country;
- Support the implementation of the Credit Accumulation and Transfer system (KCATS) in Kenya;
- To support Internationalization of Kenyan Qualifications and facilitate mobility of Kenyans who would like to go and work in other countries;

The RPL ecosystem system in Kenya identifies four sectors of the education and training system where RPL can be practiced and implemented:

- The Basic Sector;
- The industrial sector (workers in employment);
- The Technical, Vocational, Education and Training (TVET) sector;
- The University sectors.

How Does RPL Work?

RPL practitioners work with candidates to ensure that:

- Skills and competencies are assessed
- Discuss the candidates' goals are help them choose the right qualification that matches the skills for recognition of prior learning (RPL) and explain the actions and steps needed to achieve the goals;
- Portfolio of Evidence
 - o Gather evidence such as: current resume, reference letters, work examples/samples, photos/videos, certificates and transcripts and overseas qualifications and learning experiences;
- Skills and competencies Check
 - o Once RPL assessors have gone through your portfolio, they will call you in for a competency conversation and a practical observation, if required;
- Qualified/ Issuance of Certificate
 - o If candidates found to be competent and meet the standards set for the level that has been assessed, then they are certified competent and issued with a certificate;
 - o All certificates are nationally recognized and issued by a Qualifications Awarding Institution (which must be accredited by the KNQA);
 - o The Assessor may also find the candidate not competent or recommend refresher training for help meeting the standards set;
- Are candidates satisfied with RPL Process?
 - o If not satisfied with the outcome of the assessment there is the right of appeal!
 - o In which case candidates are entitled to one more assessment (at their cost).

What are the benefits of RPL

- RPL for credit transfer or harmonization (national and foreign credits);
- RPL for recognition of experiential learning;
- RPL for upgrading of skills or qualifications; and
- Regulatory requirements of some sectors in terms of employing qualified persons.

Who qualifies to assess and award RPL Certificates?

Within the Kenyan Context, the following institutions qualify to assess candidates and award an RPL certificate:

- Any institution recognized or accredited in accordance with KNQF Act. By the KNQA as a qualification awarding institution (this could be a basic, TVET, industrial and University sector examination body/institution);

- A university accredited in accordance with the Universities Act (No. 42 of 2012);
- National Polytechnics with a legal Notice;

Example of RPL assessment tool used in Kenya

| KNQF level | Portfolio of evidence | Minimum requirements |
|------------|--|--|
| 2 | Samples of work / photos / video / audio files The materials or tools used by the candidate at work Referees | Compulsory Samples of work Accept any three |
| 3 | Samples of work / photos / video / audio files The materials or tools used by the candidate at work Referees Roster and time sheet | Compulsory Samples of work Accept any three |
| 4 | Samples of work / photos / video / audio files The materials or tools used by the candidate at work Referees Roster and time sheet Logbooks and other records of performance Curriculum vitae of resume | Compulsory Samples of work Accept any three |
| 5 | Samples of work / photos / video / audio files The materials or tools used by the candidate at work Referees Roster and time sheet Logbooks and other records of performance Budgets of work done Workplace training records Curriculum vitae of resume | Compulsory: <ul style="list-style-type: none"> - Samples of work - Curriculum vitae Accept any five |

The RPL Assessment process

RPL assessment processes and procedures may consist of the following stages:

- a. Counselling and facilitation;
- b. Establishing the purpose of the assessment;
- c. Identifying the evidence required;
- d. Using appropriate evidence gathering methods;
- e. Interpreting evidence and making a judgement;
- f. Recording the outcome;
- g. Reporting to key stakeholders;

- h. Successful candidate issued with Certificate;
 - i. Appeal process.
-