

Deliverable 4.2

Maker Passports & Prototype

Due date of deliverable: 30/11/2024

Actual submission date: 30/11/2024

Start date of project: 01/02/2022 Duration (36 Months)

Dissemination Level: Public ✓



DELIVERABLE

Work Package	WP4 – Distributed Manufacturing Network
Deliverable	Deliverable D4.2 Skills – Maker Passports & Prototype
Document Name	Maker Passports & Prototype
Due Date	M34: 11 November 2024
Submission Date	M34: 11 November 2024
Dissemination Level	<input checked="" type="checkbox"/> P – Public <input type="checkbox"/> CO – Confidential
Deliverable Lead	Internet of Production (IOP)
Author(s)	Sarah Hutton; sarah.hutton@internetofproduction.org
Contributor(s)	Jessica Nguema; jessica.nguema@internetofproduction.org , Max Wardeh; max.wardeh@internetofproduction.org , Andrew Lamb; andrew.lamb@internetofproduction.org
Point of Contact	Barbara Kieslinger (kieslinger@zsi.at)
Reviewers	Teresa Schaefer; schaefer@zsi.at
Status	<input type="checkbox"/> Plan <input type="checkbox"/> Draft <input type="checkbox"/> Working <input checked="" type="checkbox"/> Final <input type="checkbox"/> Approved
Abstract (for public dissemination only)	This document describes the research and development of a digital “Maker Passport” prototype, based on the People and Skills Specification, for makers to show their skills and experience levels to participate in distributed production, and to find other peers skilled.
Keywords	Mutual recognition, skills, certifications, open source, open badging, micro-credentialing

The information, documentation and figures in this deliverable are written by the mAKE project consortium under EC grant agreement number 101016858 and do not necessarily reflect the views of the European Commission. The European Commission is not liable for any use that may be made of the information contained herein.



Document History

Version	Date	Comment
001	07 10 2024	First structure and outline
002	08 11 2024	Main content added to all sections
003	26 11 2024	Peer review and detailed feedback on overall structure and specific content
004	28 11 2024	Integration of peer review comments
1.00	29 11 2024	Final editing

List of Figures

No	Description	
01	Where the People and Skills Standard Intersects with the mAKE Project	11
02	NYU Makerspace training programme interface	16
03	Makerbook global mapping interface categories highlight	18
04	#ASKnet LEAD Community profile directory	21
05	Credentialing workflow of a digital maker passport	22
06	Certificate creation, p1	23
07	H FabLab (REFFAO) education attestation	24
08	Attestation creation and file text validation	25
09	Certificate creation, p2	26
10	Certificate issuance, p1	27
11	Certificate issuance, p2	27



12	Workflow options for low-to-no bandwidth areas	28
13	Canvas Badges login page (EU)	30
14	Canvas Badges login page (EU)	30
15	Creation of a badge, category 1 – orientation	31
16	Creation of a badge, category 2 – specific skill(s)	32
17	Linking awards to specified users	33
18	Participatory action research cycles (Cornish et al., 2023)	34
19	People and Skills/Maker Passport Prototype Sign Up	37
20	Maker Passport WhatsApp signup form	38
21	ReFFAO makerspace network	40
22	#ASKnet community platform of makers	41
23	kee development specifications, established by nolash	44
24	An automation process for data collection, scrub, and depository to open repository	45

List of Pictures

No	Description	
01	Maker expertise shared during a workshop in the I.O.Me Innovation Labs , a humanitarian fabrication lab in Kenya and one of the sites which tested the People and Skills Specification.	15
02	WRK107: Advanced Bench Saws is a safety training required prior to using any Sawtop Industrial Table Saw in the Innovation Wyrkshop at the University of Wyoming.	20
03	Quality inspection on produced 3D writing aids, run at FabLab Winam, in Kisumu, Kenya (Oct. 2023)	36



List of Abbreviations

CA	Consortium Agreement
CNC	Computer numerical control
DIH	Digital Innovation Hub
DI	Digital Innovation
DIY	Do-It-Yourself
DMP	Data Management Plan
GDPR	General Data Protection Regulations
IMA	Innovative Manufacturing in Africa
IOP	Internet of Production
NYU	New York University
JSON	JavaScript Object Notation
ORDP	Open Research Data Pilot
OKH	Open Know-How
OKW	Open Know-Where
PMB	Project Management Board
PSS	People and Skills Specification
RDF	Resource Description Framework
QR	Quick Response
REFFAO	Réseau Francophone des FabLabs d’Afrique de l’Ouest
RISA	Research and Innovation Systems for Africa
R&I	Research & Innovation
STEM	Science, Technology, Engineering, and Mathematics



SWOT	Strengths, Weaknesses, Opportunities, Threats
TRL	Technical Readiness Level
TTL	Time-to-Live
TVET	Technical and Vocational Education and Training
WP	Work Package
URL	Uniform Resource Locator
XML	Extensible Markup Language



TABLE OF CONTENTS

Executive Summary	8
Objective 1: Prototype of a maker passport system (M18)	8
Objective 2: A maker passport with community-based authentication	8
Introduction	9
What is included in this document?	9
1. Conceptualizing the Maker Passport	10
1.1. Why maker passports are needed / what problem(s) it solves	10
1.2. Maker passport project network, scoping, and timeline	11
1.3. Developing the People and Skills Specification	13
1.4. A framework for equitable access and data sovereignty	14
Passport holder (maker) identity	14
Passport holder (maker) credentials	14
1.5. Research methodology: Iterative data gathering and assessment	16
2. How the Maker Passport Works: Concept	17
2.1. What do makers need to prove as part of the digital maker passport?	17
2.2. How categories show up in preexisting use cases	21
2.3. Turning skills attestations into certificates	23
2.4. Passport method 1: Community-based authentication	24
Creation of a certificate	24
Issuing a certificate	27
Verifying the certificate owner	29
Storing the assets	29
Flexible input methods	29
2.5. Passport method 2: Badging for pre-existing systems	30
Establishing Issuer	31
Badge Creation	32
Linking credentials (awards) to specified users	33
Storing assets	35
3. Proof of Concept and Next Steps	35
3.1. Continued support and development to achieve proof of practice	35
Use Case: Maker Passport in Distributed Manufacturing	35
Use Case Partnerships in Process: Makerspace networks	39
4. Output Matrix and Risk Assessment	42



4.1. Risks identified by mAkE associated with this work package	42
4.2. Progress	43
5. Recommendations	44
5.1. Continuation of the work	44
Continue Development and testing of the community-based authentication process	44
Establish additional use case partnerships for testing: Asknet and IMA	45
Iterative data gathering and assessment	45
Resources	46
Appendix	48



Executive Summary

Objective 1: Prototype of a maker passport system (M18)

Building on the beta version of an initial standard for mutual recognition of maker skills (M12), *Mutual Recognition and Data Standard for Digital Innovation Hubs (DIH)*, creating Maker Passports and Prototype (M18), in alignment with the remit of D4.2 SKILLS – Maker Passports, which is funded by the European Union's Horizon 2020 programme under grant agreement No. 101016858.

A use case for this work will be for its immediate application to the open system infrastructure developed as part of the pan-African mAKE project. Participating makers who are issued a digital Maker Passport will have a way to communicate experience and skill levels automatically for ease of navigation through the ecosystem (estimate of 500+ instances) of Digital Innovation Hubs (DIHs).

Preliminary research and iterative testing shows that makers are still unsure of the utility of a maker passport for a larger ecosystem. There are many implications regarding mobility between maker nodes, including travel costs, potential visa/documentation issues, and cultural translation, on which we expand in Section 5: Recommendations.

Objective 2: A maker passport with community-based authentication

Leveraging the People and Skills Specification (PSS), we specify a mechanism for the verification of passport holders (makers) by authorised issuers (makerspaces/makerspace leaders). The methods for information exchange and outputs are designed to allow for community users to maintain platform agnostic sovereignty and not be tied to any specific badging system should they not choose to do so.

The community-based authentication method for issuance of credentials can additionally be used offline for areas that may experience low to no bandwidth or intermittent loss of access to the internet. With a handheld device (smartphone or pine/Linux handheld) or a digital camera that is capable of scanning a QR code, any credential/attestation can be authorised and saved as a local file.



Introduction

What is included in this document?

This document presents the scoping, project timeline, and evaluation of the Maker Passport, developed in WP4 of the mAKE project. It contains the following components:

Introduction

Maker Passport Project Scope and Timeline

Includes vision, goals, and success criteria for broader project and work package

Research Methodology

Includes methodology, timeline for information gathering and data analysis, bias, ethics

Work Package Success Criteria

Introduces the results from the working sessions with the work package leaders. These sessions focused on the work package specific activities and how evidence for successful achievement and impact can be collected for each of the activities.

Evaluation Instruments

Presents the main quantitative and qualitative evaluation instruments we aim to apply to collect the data required to fill the indicator framework. Semi-structured interview questions, workshop framework, consent form.

Outlook

Presents the upcoming activities of the evaluation and impact assessment work package.

References

Appendix



1. Conceptualizing the Maker Passport

1.1. Why maker passports are needed / what problem(s) it solves

When it comes to producing physical goods in makerspaces, fab labs, and other manufacturing facilities, the right materials, machinery, and spaces to support production are all needed to get the job done. There are many ways to ensure that the physical resources are available for producing items; looking to resources such as the Internet of Production's growing [World Map of Manufacturing](#) to see if certain facilities and machinery are available nearby, or looking to local inventories for a listing of tools and materials addresses the *physical* components of how something gets made – but what about the skills and knowledge needed?

Sometimes it can be difficult to find the expert needed to manage the production process, especially for complex production or products that are in a testing phase or are not produced regularly in a facility. With the People and Skills Specification (PSS) there is now assurance that the experienced makers to support production can be located and matched with the right project at the right time.

The central goal of this work is to create a shared understanding of the explicit, implicit, tacit, and procedural knowledge necessary for individual makers to participate in and easily navigate a distributed manufacturing ecosystem. This navigation will be enabled by using a digital maker passport, the criteria for which were defined as a part of the deliverable 4.1, [Mutual Recognition Standard](#).

Participating makers who are issued a digital Maker Passport will have a way to communicate experience and skill levels automatically for ease of navigation through the ecosystem (estimate of 500+ instances) of Digital Innovation Hubs (DIHs) throughout the mAkE consortium ecosystem.

Preliminary research shows that makers are still unsure of the utility of a maker passport for a larger ecosystem, and there are many implications regarding mobility between maker nodes, including travel costs, potential visa/documentation issues, and cultural translation.



1.2. Maker passport project network, scoping, and timeline



Where the People and Skills Standards Integrates with mAKE



Fig 01: Where the People and Skills Standard Intersects with the mAKE Project

This work package aims at fostering distributed manufacturing across the mAKE network by developing and providing the infrastructures that help sharing 1) skills, 2) machinery and 3) contracts between DIHs and makerspaces.

The main stakeholders of this work package are DIHs and makerspaces as beneficiaries of the developed infrastructure, who will not only participate in testing and refining the developments but also showing first proofs of concept by using the maker passports, the mapping of machinery and the contracting systems. Additionally, we aim to reach out to other initiatives, such as Fablabs.io and Hackaday, for the creation of the infrastructure as well as the dissemination of the outputs of this work package. The main activities of this workpackage, together with the expected outputs and outcomes, as well as potential means of data gathering for the evaluation purpose can be seen in the following table.



WP4 planned activities	Expected outputs and outcomes	Measures / Indicators	Means of evaluation data gathering
<p>Developing mutual recognition open standard and Maker Passports for the mutual recognition of makers' skills</p> <p>T.4.1.1 desk research to identify existing initiatives, skills taxonomies and training programmes that cover maker skills</p> <p>T.4.1.2 conduct interviews of leaders in this field</p> <p>T.4.1.3 analyse results and synthesize an initial standard for mutual recognition of skills</p> <p>T.4.1.4 create a working group</p> <p>T.4.1.5 co-create an initial standard for beta testing</p> <p>T.4.1.6 implement a Maker Passport prototype system for proof of concept</p> <p>T.4.1.7 confirm the data standard with the voluntary working group</p> <p>T.4.1.8 support adoption of the standard into the systems of the partners within the project</p> <p>T.4.1.9 promote the standard internally and externally</p> <p>T.4.1.10 hand over the standard to the Internet of Production Alliance</p>	<p>Output: Beta version of an initial standard for mutual recognition of maker skills (M12)</p> <p>Prototype of a Maker Passport System (M18)</p> <p>Outcomes: Improves demonstration of skills and experience levels of participating makers</p> <p>Facilitated search for peers to scale up production and fill skills gaps</p> <p>Facilitated search for mentors</p>	<p>500 references to Open Standards (PSS)</p> <p>50 Open Standards adopted</p> <p>Around 150 people using the new Open Data Standard (PSS) for maker skills (Maker Passport)</p> <p>Feedback of makers related to the usefulness and applicability of the maker passport</p>	<p>Access statistics and social media statistics</p> <p>Impact interviews with makerspaces, which were involved in the beta-testing of the PSS/Maker Passport</p> <p>Impact interviews with makerspaces about the PSS/Maker Passport influencing the quality at the end of the project</p> <p>Interview or focus group discussions with makerspaces who did not follow up using the Maker Passport</p> <p>Internal reports</p>



The risks identified by mAKE associated with this work package are:

- It might be difficult to find interested experts who are willing to participate in the working group to develop the Open Standard for skill recognition
- Another risk is that we do not get a high number of makers involved in testing the maker passports
- It might be difficult to find makerspaces and DIHs who are ready to document their machinery and test the mapping of machinery and the digital contracting system
- The challenge will be to identify “real” use cases or orders for the testing of the digital contracting system (such as a Kickstarter campaign, a simple donation or a ministry placing an order)

1.3. Developing the People and Skills Specification

The central focus of the People and Skills Specification (PSS) is to create a shared understanding of the explicit, implicit, tacit, and procedural knowledge necessary for individuals to make things. This specification is also intentionally designed to provide a framework for sharing those skills and experiences with potential employers, fellow makers, and educational institutions via the Open Badge System Framework; this specification can also be used as a stand-alone, should an open badging system not be an option.

Building on [Open Know-How](#) (OKH) and [Open Know-Where](#) (OKW), which address *how* we share knowledge for making things, and *where* things can be made, the PSS addresses the third critical component of knowledge-sharing for the reproducibility of items – *who* can provide the expertise for making things. This is done with a focus on the experience and skills necessary for production, and how those skills and experiences can be shared. By establishing a shared understanding and vocabulary surrounding the production of goods, we have the potential to open up networked conversations between experts in digital and physical fabrication.

PSS provides the potential for broadening a global network of experts, helping place the possibility of product prototyping into the hands of community members, which means increased potential for rapid collaboration, and increased overall quality of the products being produced. Increased recognition of expertise and awareness of who has this expertise also means that products being made are manufactured with fresh community knowledge and skill, which means better products for our society.

The People and Skills Specification provides potential for community, business, and individual empowerment. The increasingly diverse engineering talent that will now have the potential to recognize local, specialized knowledge, will appeal to industry and larger manufacturing companies, which supports individual makers seeking industry jobs. Centering this understanding locally and culturally in the communities that the mAKE project supports is **critical**. Many community voices were included in the



development of the PSS, using multiple research methods, and drawing from a wealth of global maker expertise.

1.4. A framework for equitable access and data sovereignty

The PSS provides a framework for creating an individual record of experiences, skills, and relevant training and certificates that makers can use to showcase accomplishments and relevant knowledge to potential employers, peers, and collaborators across global networks. This record of skills and accomplishments can also be used to help makerspaces match makers with open product bids. The PSS addresses the critical component of knowledge-sharing for the reproducibility of items – who can provide the expertise for making things. By establishing a shared understanding and vocabulary surrounding the production of goods, we have the potential to open up networked conversations between experts in digital and physical fabrication.

From the preliminary research and analysis on the People and Skills standard, it was determined that the verification and credentialing workflow of a digital maker passport, is reliant on two main forms of verification:



Passport holder (maker) identity



Verifies: *Maker Identity*

The identity of digital passport holders can be established via organisational affiliations, or preexisting verification processes (OpenID, OAuth2, etc). It needs to confirm that an individual is who they claim to be, using standard authentication protocols.

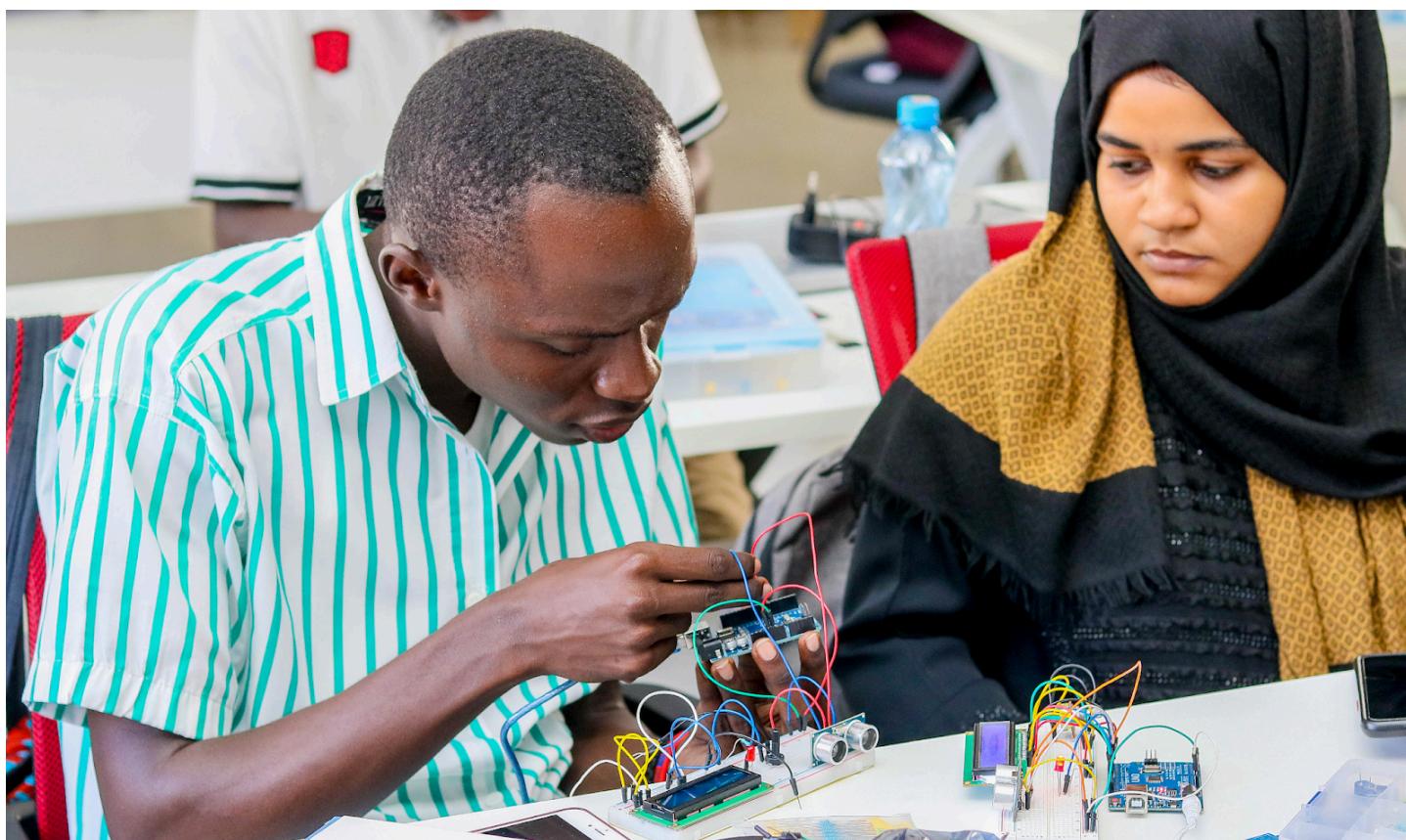
Passport holder (maker) credentials

In production spaces and projects are varying skills and credentials required, based on what machinery, materials, or chemicals are needed.



Verifies: *Maker Credentials*
What makers are qualified to *do* (safely)

With the people and skills specification, an individual maker can communicate their experiences by category, and an organisation can match experiences and skills with what is needed for the production of specific items. Skills and experiences, being the most common and necessary for makers, these credentials need to be proven in a mutual recognition system.



Picture 01: Maker expertise shared during a workshop in the [I.O.Me Innovation Labs](#), a humanitarian fabrication lab in Kenya and one of the sites which tested the People and Skills Specification.

The bridge is really how skills/experience are categorized. Set up for user stories. The following section delves into how these verification mechanisms function and how the categorization of skills and experiences forms the core of the maker passport's design. Specific user stories help understand how maker passports are drivers for strengthening networks and empowering collaboration.

1.5. Research methodology: Iterative data gathering and assessment

Throughout our research process, we have employed a participatory action research (PAR) model, which includes iterative data collection and analysis cycles, with the intent to recalibrate direction as necessary.

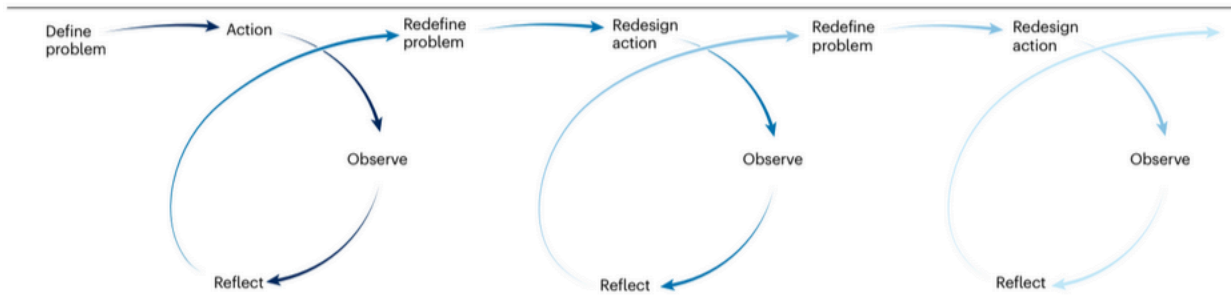


Fig02: Participatory action research cycles (Cornish et al., 2023)

We tested (numbers of makerspaces, individual makers), and are looking more into communities, and into makerspaces, centering global community members as part of a participatory action research process. With each new passport registration, particularly as part of the Innovative Manufacturing in Africa programme, we conducted member checking with each maker to gather additional information on the format of our assessment tools, framing of questions, and ease of use for any platform tools. Feedback from participants was kept confidential, and incorporated into redesigning our instruments as part of an interactive design process.

We expand on the necessity for continuation of this iterative assessment and design process for the maker passport in Section 5: Recommendations.



2. How the Maker Passport Works: Concept

2.1. What do makers need to prove as part of the digital maker passport?



Verifies: *Maker Credentials*
What makers are qualified to do (safely)

When a maker is granted authorization to access a makerspace, what is this authorization claiming they are qualified to do? And, according to whom?

Conceptually, we propose that the identity of digital passport holders can be established via organisational affiliations, or preexisting verification processes (OpenID, OAuth2, etc). Essentially, whichever process is selected by a makerspace vetting the maker's identity, this process needs to confirm that an individual is who they claim to be, using standard authentication protocols.

Once an individual maker's identity has been verified, our process conceptually allows for proof of knowledge and expertise regarding which machines the individual maker knows how to use, allowing for ease of navigation between multiple nodes in a makerspace ecosystem, network, or consortium. Conceptually, once an individual maker is vetted by an issuer as meeting all requirements of a particular skillset, they receive a "stamp" which is an attestation to their personal knowledge and skills.

An institutional partner agreeing to recognize this "stamp" also needs to agree on the standard that provides the specification for meeting the requirements for issuance and receipt of that stamp. This is the way that a makerspace can determine, for example: "you are permitted to use this CNC" or "you are granted access to this lab," because it is known, or attested, that the maker has the skills that will keep themselves and others *safe* and that equipment, tools, and machinery will be used properly.

From the people and skills specification research, we have identified two main areas of skills qualifiers, (1) general orientation and safety training, and (2) specialised equipment and types of making. Providing the vast array of tools, machines, and specific processes that each makerspace has, defining broader categorical definitions for acquired skillsets is the emergent normative amongst makerspaces researched.



1. Skill Qualifier Area 1: General Orientation and Safety Training

Every makerspace or lab has baseline orientation or operations training. Whether in person, online (as a class), or documentation that is **required** for users to complete before using the space. This can be a part of a membership package or programming, or just for day use.

This category of skills includes training such as introductory facilities and space access tours, basic overviews of machinery, safety training, and other logistical operations within makerspaces and labs.

An example of this type of training, provided by [New York University's MakerSpace](#), indicates that all first-time users are **required** to complete the training prior to accessing the space, due to safety implications.

This is a training that **must** be completed in-person, due to the nature of the content.

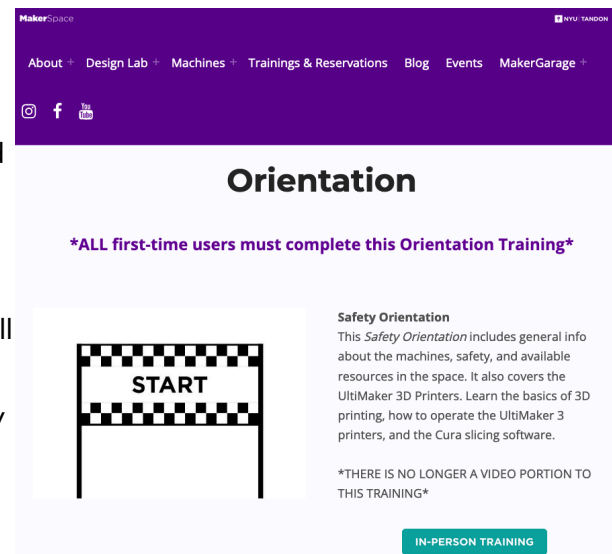


Figure 03: NYU Makerspace training programme interface

2. Skill Qualifier Area 2: Specialized Equipment and Types of Making

Over the course of our research for creating the mutual recognition standard, it became clear that, while there was strong interest in creating a comprehensive taxonomy of all maker skills and experiences, the enormity of this work was far beyond the scope of what our current global community can currently support.

This is the first reason for creating the following subcategories for grouping skills, the second being that, by creating parameters around types of skills, rather than requiring more specificity for assignment of skills, we could provide makerspaces with greater flexibility for customising their attestation of skills and experiences to suit their needs at the local level. The intent is the redistribution of power and increasing autonomy for community makerspaces and organisations by supporting the agency to distribute their own attestations and certification of training and educational content.



These categories merely provide guidelines for grouping skills and experiences; it is not necessary that any are assigned to individual attestation(s).

- a. Workshop
- b. Woodworking
- c. Electronics
- d. Crafting
- e. Laser Systems/Cutting
- f. 3D Modeling/Printing
- g. Sewing/Leatherwork



These categories are derived from text analysis, literature review, and interviews with makers and makerspace leaders across the U.S., Europe, with a focus on Africa as the immediate use case for the People and Skills Standard for development of a digital maker passport as part of the mAKE project.

It may be the case that certain training modules have crossover between both skill qualifier areas, such as safety training and required microcredentialing and/or certification for specific types of machinery or *specific machines*. An example of specific machinery for which safety training as a prerequisite being required for use is shown as part of the University of Wyoming's [Makerspace Access Pass \(MAP\)](#).





Badges

Workshops

More



WRK107: ADVANCED BENCH SAWS

Overview

Outcomes

Enrollment

A table saw is a very versatile woodworking tool, and one of the most popular among woodworkers. Table saws cut straighter lines and can make smoother cuts on smaller and longer boards. DIY projects that require a table saw usually require a more precise cut than handheld or machine saws. Serious woodworkers and crafters alike can use this tool for any number of projects, so we consider the table saw one of the most useful tools in the shop.



Prerequisites:



Location(s):



Picture 02: [WRK107: Advanced Bench Saws](#) is a safety training required prior to using any [Sawtop Industrial Table Saw in the Innovation Wyrkshop](#) at the University of Wyoming. WRK107 additionally has a prerequisite of [SAF150](#), which is a general introductory safety training programme for woodworking.



2.2. How categories show up in preexisting use cases

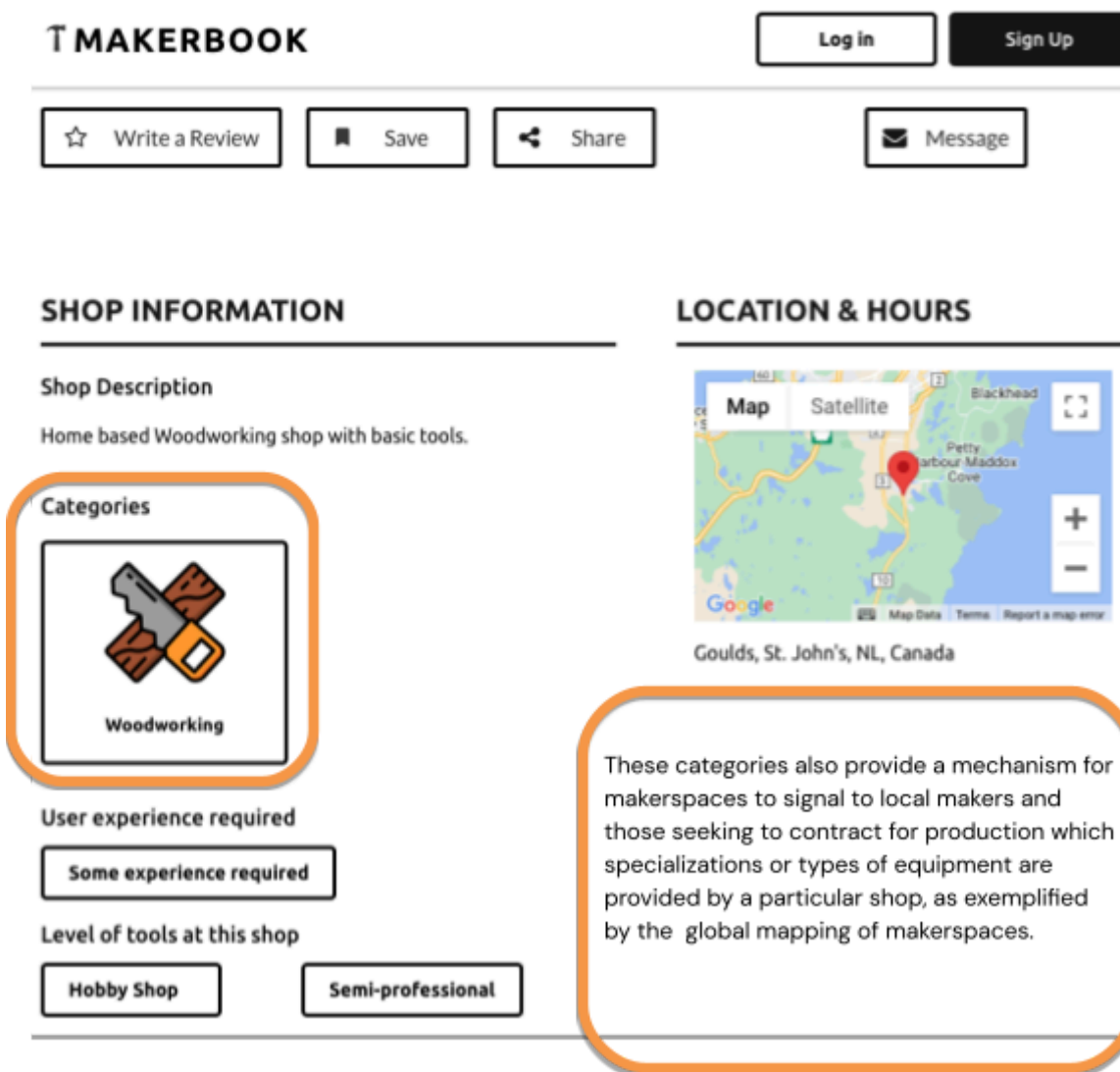


Figure 04: Makerbook global mapping interface categories highlight

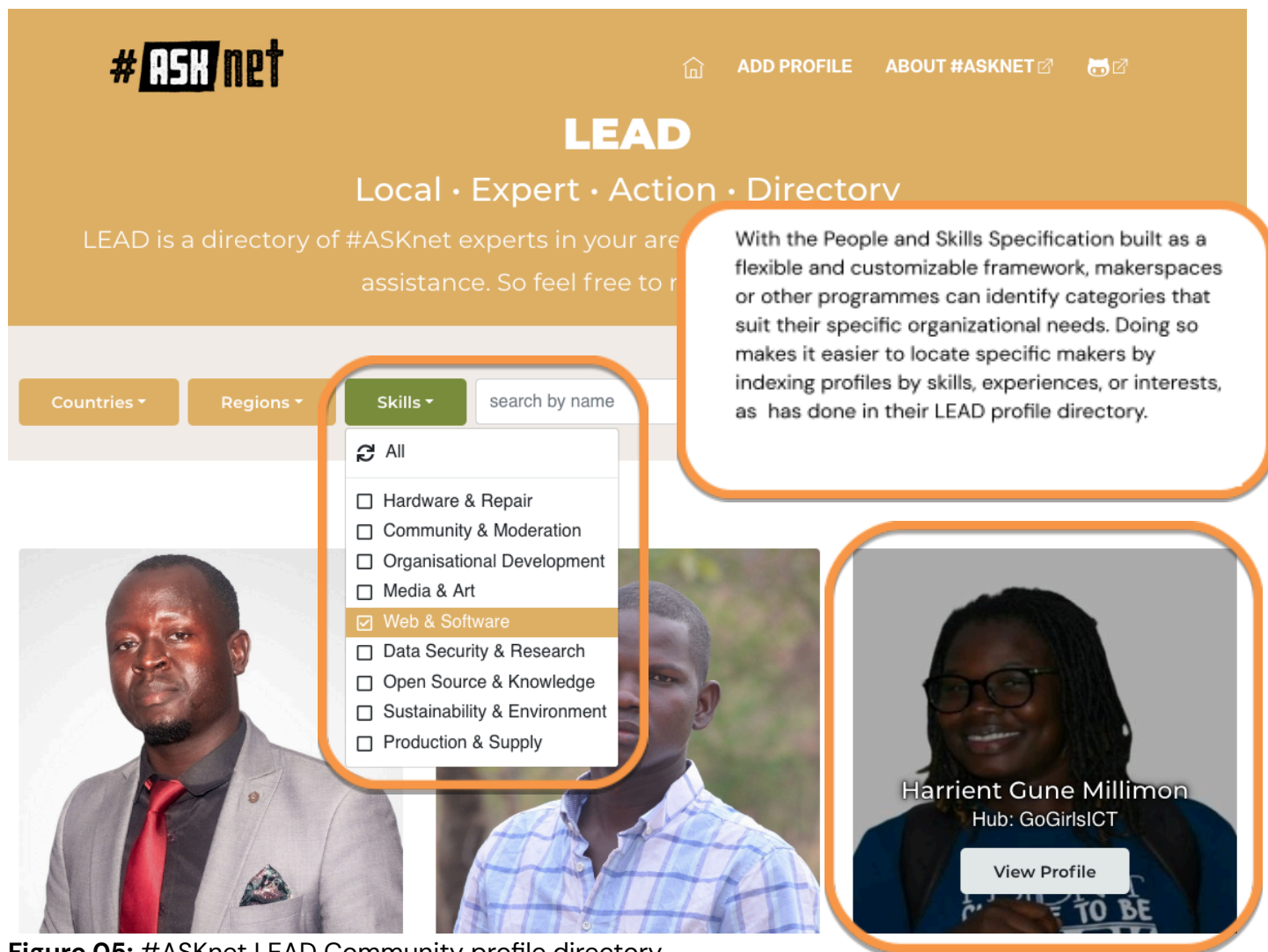


Figure 05: #ASKnet LEAD Community profile directory

2.3. Turning skills attestations into certificates



The process to get to a digital maker passport can be divided in a 6-part process defined as below:

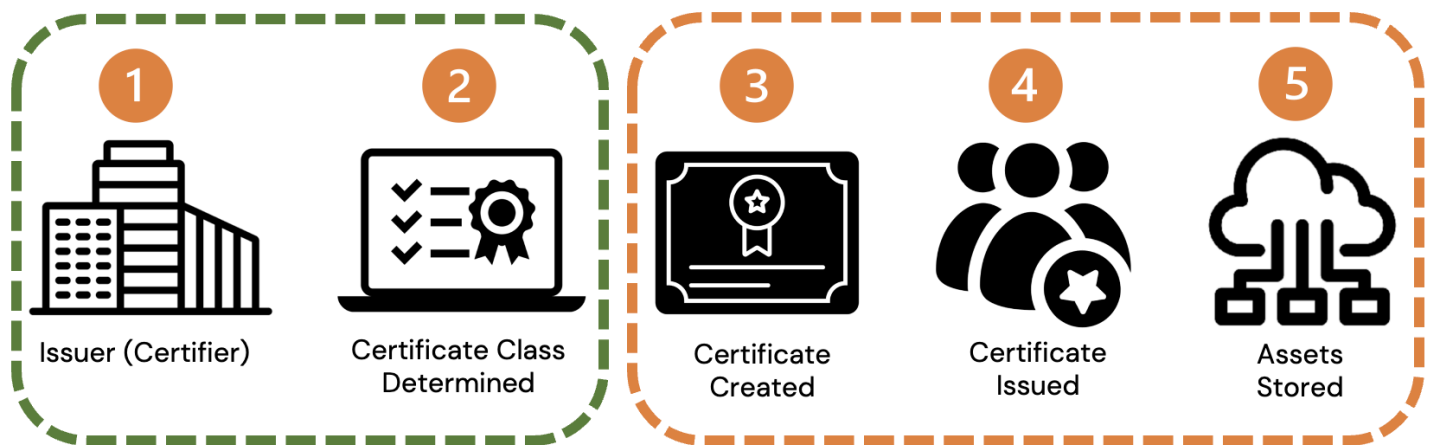
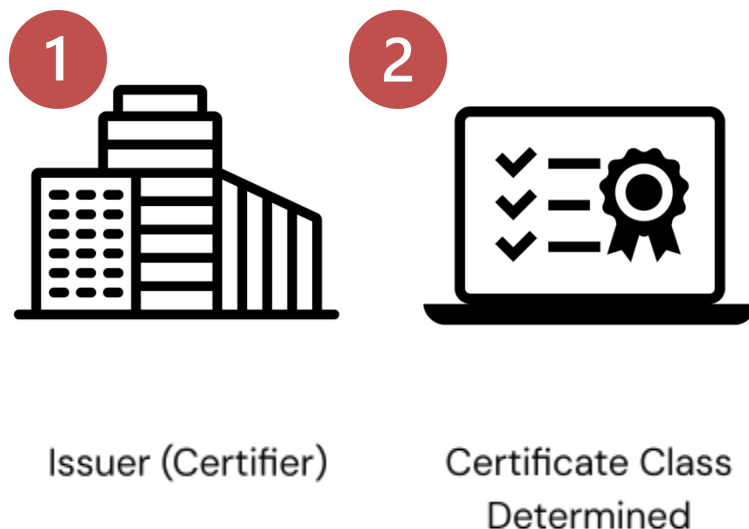


Figure 06: Credentialing workflow of a digital maker passport



Steps 1 and 2 represent the location where the issuance of certification, training or class takes place.

- **An issuer** (makerspace) is the entity making the assertion that a learner has met the requirements to receive a certificate.
- **Certification class** is determined by the issuer, either in alignment with the people and skills specification, or in alignment with local/regional accreditation standards, such as [IVET](#).

The skill taught can be learned in a space or online – it is to the discretion of the organisation issuing the attestation, or certificate, what type of training is required to meet the requirements. We call it a physical or digital training. The institution determines the type of training and certification to be delivered to the maker who has completed the course.

Determined by issuing institution/makerspace and dependent on agreements between makerspaces recognizing credentials.

2.4. Passport method 1: Community-based authentication

Creation of a certificate

Code repo: <https://github.com/nolash/gtk4-kee>

Instructions: <https://github.com/nolash/gtk4-kee/blob/master/README.gemu.adoc>

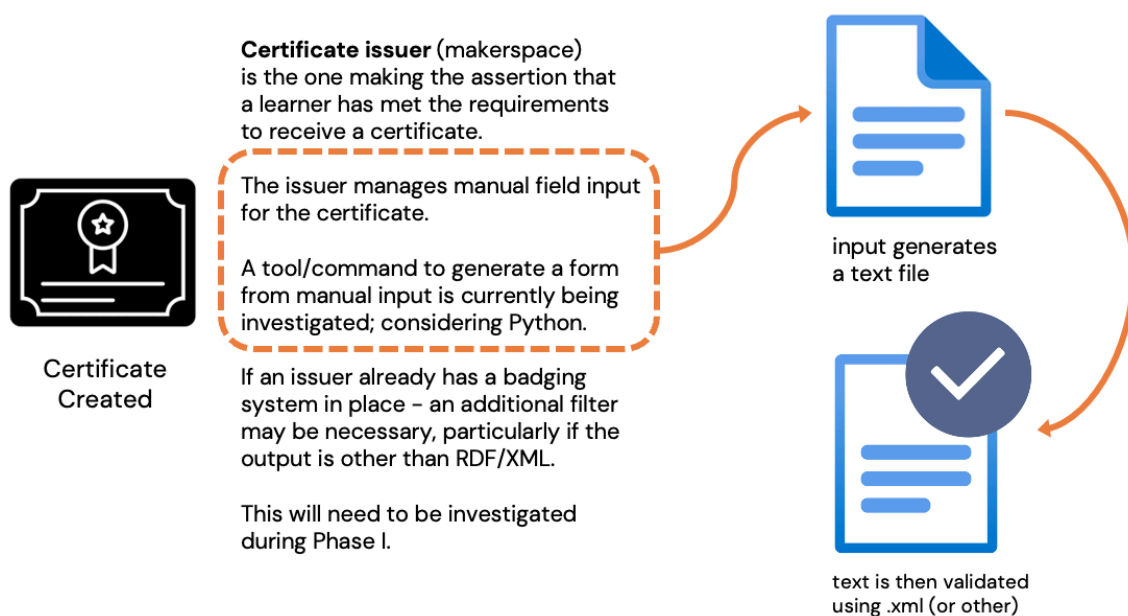


Figure 07: Certificate creation, p1



To receive a certificate, the certificate issuer (makerspace) is the one making the assertion that a learner has met the requirements to receive a certificate. The makerspace director, or any person designated by the issuer can manage the manual input for creating a new attestation/award.

Figure 08: H FabLab (REFFARO) education attestation



The issuer manages manual field input for the certificate; any certificate or award can be mapped to an attestation, since it is manual input. A tool/command will be used to generate a form from manual. The input generates a text file, then the text is validated using .xml (or other). If an issuer already has a badging system in place – an additional filter may be necessary.

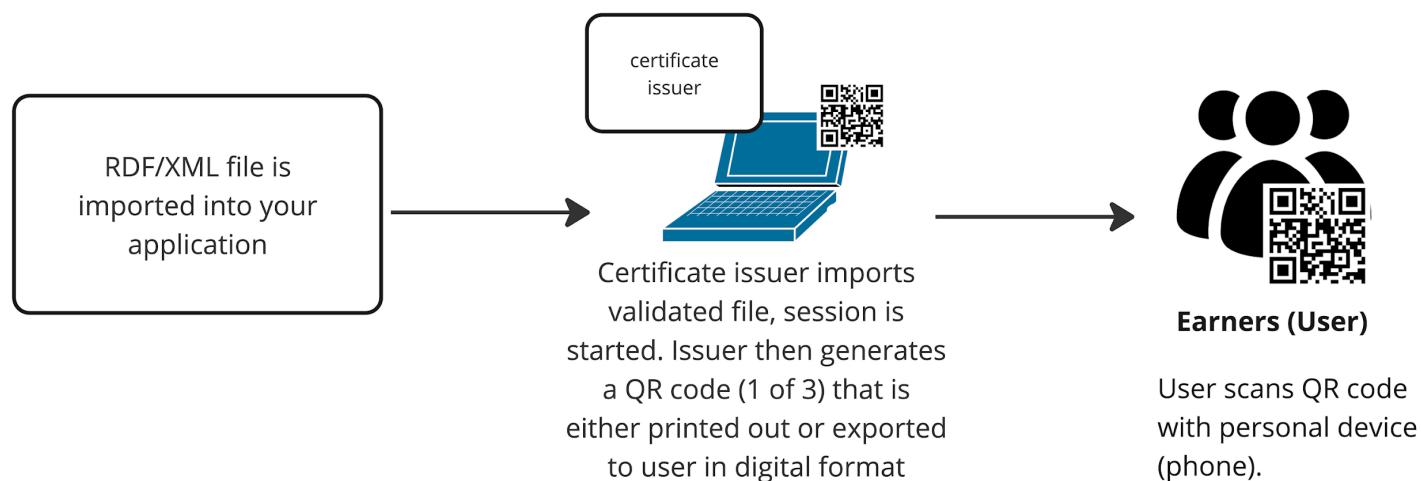
For a Deeper Technical Dive

RDF/XML is created for import into the application.
Consider .ttl for this -

<https://stackoverflow.com/questions/64424376/nest-ed-xml-to-turtle-mapping-using-rmlmapper>

RDF satisfies the EU's Advanced electronic signature (AdES) - this addresses issues of serialization/specific serialization formats.





If the user does not have a handheld device, the certificate issuer confirms identity and manually enters identity.

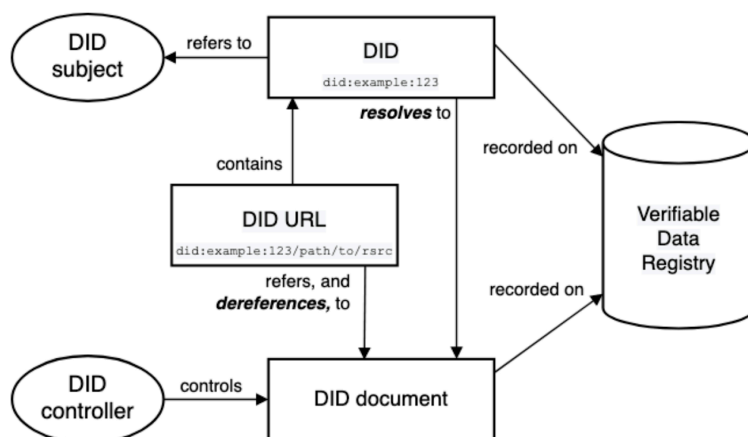


Figure 2 Overview of DID architecture and the relationship of the basic components. See also: [narrative description](#).

Figure 09: Attestation creation and file text validation

Once the text (input) is validated, the certificate is created (step 3) and a QR code 1 of 3 is generated, that can be printed out or exported to the user in a digital format.

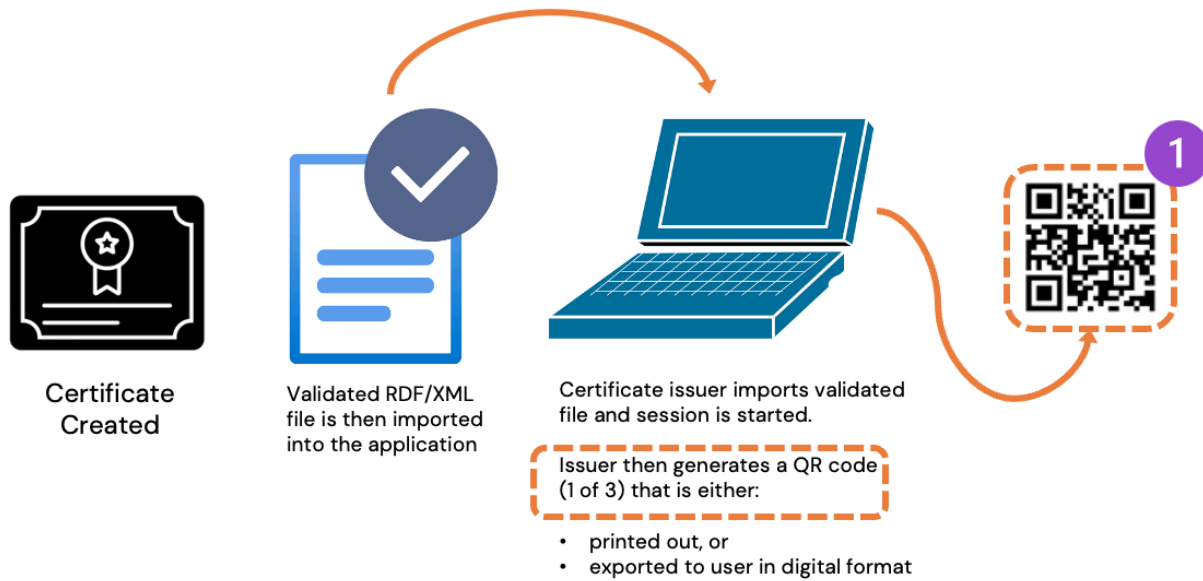


Figure 10: Certificate creation, p2

Issuing a certificate

Once the certificate is created and ready to be issued, the user identity needs to be confirmed as the identity related to this specific training.

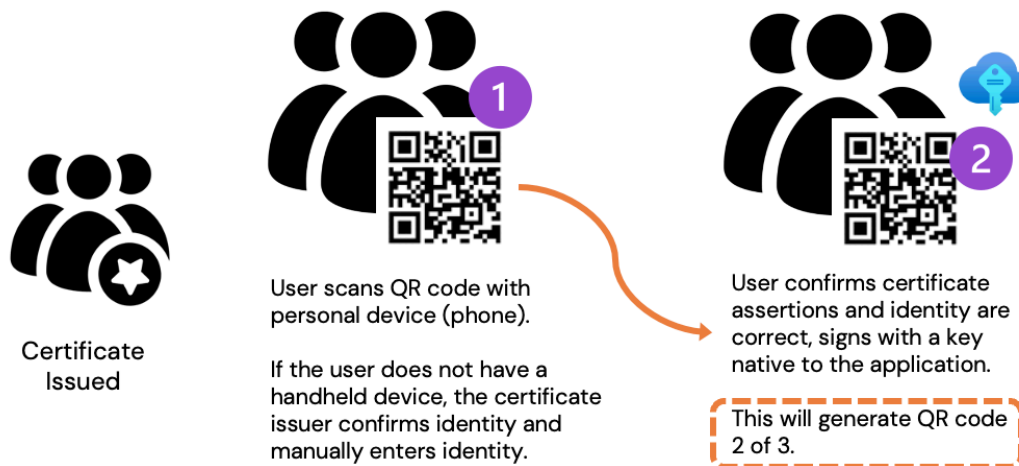


Figure 11: Certificate issuance, p1

1. The user scans the QR code 1 of 3 with a personal device. If the user does not have a personal device, the certificate issuer confirms identity and manually enters identity. User confirms certificate assertions and identity are correct, signs with a personal key. This will generate QR code 2 of 3.



Fig 12: Certificate issuance, p2

2. The certificate issuer will then counter sign. The public key of this key will serve to verify user credentials including all the contents of the certificate. This will generate QR code 3 of 3, final QR code that will serve as the certificate (step 4).

Verifying the certificate owner

There are 2 ways to verify that the credentials belong to the user claiming them.

1. If they don't have a device: the user identity will need to be verified with accepted verification (such as a passport or other government-issued ID).
2. If they do have a device: the user can then prove custody of the key using the application.

If the certificate makes a reference to a form of identification (example: passport #), the passport must also be presented during credential ingest.

Note: this entire process is dependent on **how the makerspace** in a network **chooses for themselves how they wish to verify identity**.

Storing the assets



The storage of the assets (step 5) can be anywhere: on a local device, on a storage app, integrated or using solid-app. The assets are not bound to ANY platform and/or storage solution.

Flexible input methods

The community-based authentication method for issuance of credentials can be used offline for areas that may experience low to no bandwidth or intermittent loss of access to the internet. With a handheld device (smartphone or pine/Linux handheld) or a digital camera that is capable of scanning a QR code, any credential/attestation can be authorised and saved as a local file.



Input Methods

The following are valid input methods for all data exchange described in the following process workflows:

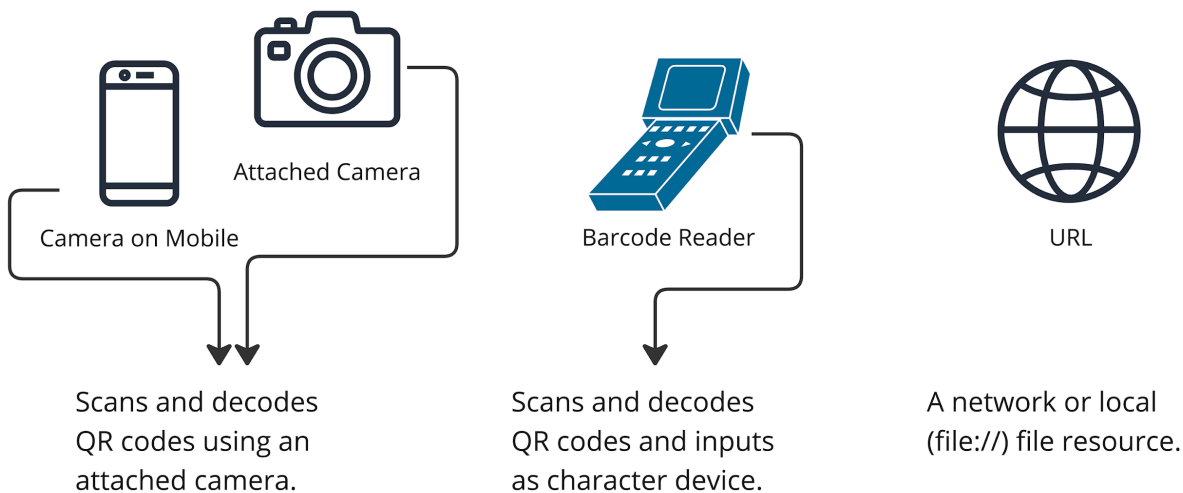
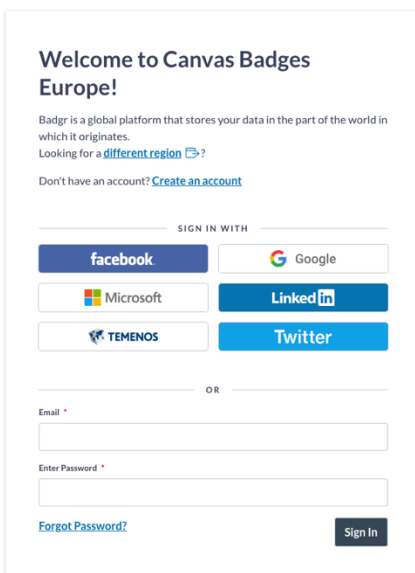


Fig 13: Workflow options for low-to-no bandwidth areas

2.5. Passport method 2: Badging for pre-existing systems



For organisations with pre-existing microcredentialing systems, the People and Skills Specification can be applied to creating attestations and creating badges as a personal issuer using an open badging system. For the purpose of demonstration, [Canvas Badges](#) (formerly badgr) is being used as an example for issuance of credentials.

Demonstration of this platform does not constitute endorsement of any particular product. NOTE: While Europe is included, Canvas Credentials **does not include Africa** in its regional coverage area; if this method was used, issuers and badge creation would need to be based in the EU.

Fig 14: Canvas Badges login page (EU)



Canvas open

Issuers / Create issuer

Create issuer

Creating an issuer allows you to award badges to recipients.
[Learn More](#)

ISSUER INFO

Issuer name *

Issuer website *

Issuer email *

Please select an email address

Issuer description *

Issuer image

Drag & Drop File or [Select File to Upload](#)

☐ I have read and agree to the [Data Processor Addendum](#) *

WE'D LIKE TO GET TO KNOW YOU

Organization name

☐ Same as issuer name

Organization type

— select a type —

What will this issuer's badges represent? (Check all that apply)

☐ Continuing education

☐ Employee upskilling

☐ Professional development

☐ Skills competencies

☐ Other

Who will be receiving badges from this issuer? (Check all that apply)

☐ Event attendees

☐ Customers

☐ Employees

☐ Staff

☐ Faculty

☐ Association members

☐ Students

☐ Trainees

☐ Other

How many badge recipients does this issuer expect to have per year?

— select a range —

Cancel

Create issuer

What's awarding badges?

An issuer can represent an organization, group, course or individual. Create issuers for departments in a company, for example, or for something personal like a book club.

Important: This info will appear on the issuer's public page and will be part of each badge this issuer awards — and whenever recipients can share badges with anyone.

Tell us more about this issuer

Is your issuer part of a larger organization, such as a company or school? How will your issuer use badges? We'll use this information to better understand your issuer and help improve the Canvas Badges experience. It won't display publicly.

Fig 15: Canvas Badges login page (EU)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 101016858.

Page 31 of 50

Badge Creation

Once an issuer has been established, creating customised badges can be accomplished applying the People and Skills specification as a taxonomy framework, with a wide range of flexibility to fit local context.

The PSS is designed to generate JSON, with the intent to integrate into an open badging system, should one already be in used by an organisation.

Badge Class JSON

This code defines the badge and conforms to the Open Badges 2.0 BadgeClass specification.

```
{
  "type": "BadgeClass",
  "id": "https://api.badgr.io/public/badges/r5Y7QprfR3OI25uJTcRIrw",
  "@context": "https://w3id.org/openbadges/v2",
  "name": "Leatherwork - Otinguema Studios",
  "image": {
    "id": "https://api.badgr.io/public/badges/r5Y7QprfR3OI25uJTcRIrw/issuance/1"
  },
  "description": "Orientation of the leather curing facilities, including safety training.",
  "issuer": "https://api.badgr.io/public/issuers/OM2H-UGERyGS_uD57b7C7k",
  "criteria": {
    "narrative": "1. Orientation and tour of leather curing facilities"
  }
}
```

Part of [Open Badges](#)

[View Specification](#)

Copy to Clipboard

Badge creation – general orientations and safety training

CANVAS Badges

BackpackMy PathwaysIssues

Sarah Hutton

IssuesMaker SkillsSafety Orientation - Ashanti Woodworking

Safety Orientation - Ashanti Woodworking

General facilities orientation and review of safety protocol.

Created on: Nov 11, 2024

Public

Bulk award

Award badge

DetailsAwardsData management

Badge details

EARNING CRITERIA

Recipients must complete the earning criteria to earn this badge

1. Walkthrough of workshop

2. Orientation of safety protocol for bleed controls

3. Review bench schedule

4. Completion of Rikon repair and safety training, level 3

We Issue

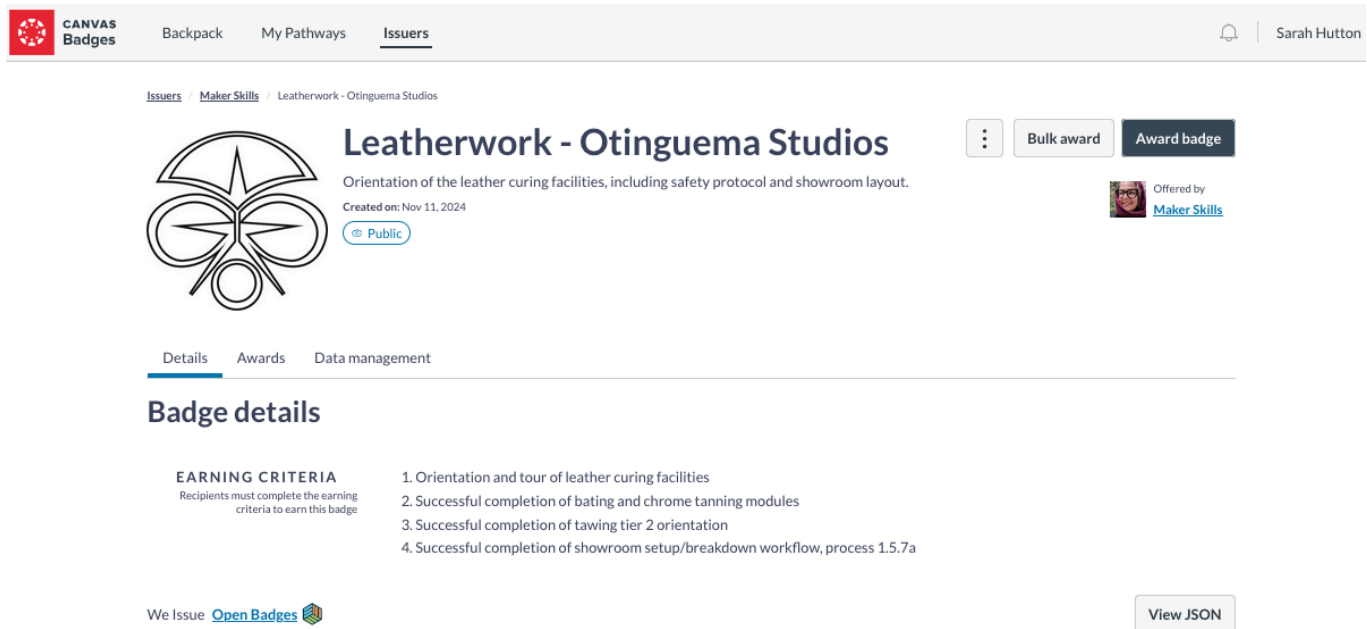
Open Badges

View JSON

Fig 16: Creation of a badge, category 1 – orientation



Badge creation – specialised skills



The screenshot shows the Canvas Badges interface. At the top, there's a navigation bar with 'CANVAS Badges', 'Backpack', 'My Pathways', and 'Issuers'. The 'Issuers' tab is active. On the right, there's a user profile for 'Sarah Hutton'. Below the navigation bar, the breadcrumb trail is 'Issuers / Maker Skills / Leatherwork - Otinguema Studios'. The main content area displays the badge 'Leatherwork - Otinguema Studios' with a logo of a stylized leaf. The description is 'Orientation of the leather curing facilities, including safety protocol and showroom layout.' It was created on Nov 11, 2024, and is public. There are buttons for 'Bulk award' and 'Award badge'. Below the badge, there's a section for 'EARNING CRITERIA' with four criteria listed. At the bottom, there's a 'View JSON' button.

Leatherwork - Otinguema Studios
Orientation of the leather curing facilities, including safety protocol and showroom layout.
Created on: Nov 11, 2024
Public

EARNING CRITERIA
Recipients must complete the earning criteria to earn this badge

1. Orientation and tour of leather curing facilities
2. Successful completion of bating and chrome tanning modules
3. Successful completion of tawing tier 2 orientation
4. Successful completion of showroom setup/breakdown workflow, process 1.5.7a

We Issue [Open Badges](#)

[View JSON](#)

Fig 17: Creation of a badge, category 2 – specific skill(s)

Linking credentials (awards) to specified users

Awards can be [issued to users](#) via email or URL, which allows for ease of integration and linking to maker networking platforms. To issue a badge to a specific user, select the badge and complete the recipient detail as prompted.





Award badge

Enter information about the recipient and their achievement to award this badge.

RECIPIENT INFORMATION

Recipient name (optional)

Note: The recipient name will appear in the awarded badge in plain text.

Identifier

Email address

ISSUE DATE

Date *

11/11/2024



Time *

03:00

EXPIRATION DATE

☒ No expiration date

This badge will never expire.

☐ Custom expiration date

Specify the date on which this badge will expire.

NARRATIVE

(Optional)

Write Preview

Award narrative

Textual narrative describing the achievement represented by this badge

Markdown supported

EVIDENCE

(Optional)

Add additional evidence

Badge awarding

You can award a badge via a recipient's email address or url.

[Learn More](#)

What is issue date?

This is the date on which this badge was awarded, defaulting to today's date. You may choose to change this to a date in the past, if that better reflects when the recipient earned this credential.

[Learn More](#)

What is expiration date?

This badge doesn't have a default expiration date, but you may choose to specify one for this specific award.

[Learn More](#)

What is a narrative?

You can use a narrative to provide an overall description of the work performed by this recipient.

[Learn More](#)

What is evidence?

Evidence is submitted proof that an earner meets the earning criteria for a badge they are applying for. This can be in the form of a narrative that describes the evidence and process of achievement, and/or a URL of a web page presenting the evidence of achievement.

[Learn More](#)

Cancel

Award Badge

Fig18: Linking awards to specified users



Storing assets

While the creation of issuers and badges in Canvas Badges is free, there are several features that are only available if a paid account for [Canvas Credentials](#) is acquired; unfortunately, this means that the *backpack* feature for bundling and storing badges as a part of the pathway feature is not available.



So long as badges are created as *public* by an issuer, linking directly to awards should not be an issue. If data storage beyond local file download is desired, [Solid](#) is a viable option for bundling credential assets. The solid pod app developed in support of design file portability for open source hardware projects could be adapted for the purpose of file bundling and storage; see the [iop-alliance repo](#) for more information on the configuration and install of the [okh-solid-app](#).

3. Proof of Concept and Next Steps

3.1. Continued support and development to achieve proof of practice

Scoping and development of recommendations for adoption of data specifications, including the PSS for the maker passport, was achieved through extensive, global stakeholder engagement processes. Technical authoring, publishing and launch events for each of the data standards was conducted. Adoption support activities, creation of communications materials, an online conference, data mapping workshops and awards, and participation in stakeholder networks and assistance in fundraising for open tools based on the standards was conducted. There are communication materials and dedicated [web pages/website\(s\) for each standard](#), maintained by the registered 'Internet of Production Alliance' legal entity with 20 new members and related communications material.

Use Case: Maker Passport in Distributed Manufacturing

The Innovative Manufacturing in Africa ([IMA](#)) project was a (12) twelve-month sister-project, implemented by Distributed Manufacturing Limited Kenya, with funding from the Research and Innovation Systems for Africa ([RISA](#)) fund, led by the Internet of Production. Trials of distributed manufacturing were held as part of the project, from October to December 2023. The aim of the trials was to test the innovative infrastructures developed within the mAKE project, allowing multiple makers affiliated to 9 makerspaces, in Ghana, Kenya and South Africa, to participate in the distributed production of goods for donation to health care facilities.



From October to November 2023, nine (9) makerspaces were invited to participate in testing distributed local production by making each:

- 100 simple devices ([writing aid](#)) for the 1st trial
- 20 simple products ([test tube rack](#)) for the 2nd trial
- 5 complicated products ([tibial fracture fixation](#)) 3rd trial.




Picture 03. Quality inspection on produced 3D writing aids, run at FabLab Winam, in Kisumu, Kenya (Oct. 2023)

In order to participate in the manufacturing of the selected items, individual makers had to make a bid of the number of items they could produce in this period of time. One of the requirements to be selected was to hold a maker passport. It was the first opportunity to test the first phase of development for the maker passport prototype.




In this case it was shared as a [Google Form](#):




People and Skills Sign-Up

This form should take you less than 10 minutes to complete; it is designed to support makers in creating a personal record of their experiences, skills, and accomplishments in alignment with the [People and Skills Data Specification](#). The record of these skills and experiences will help match production requests with the right people to complete the job.

Please complete this form to the best of your ability. All responses are collected and shared back by researcher Sarah Hutton. If you have any questions, please contact make@internetofproduction.org for more information and support.

schutton@gmail.com [Switch account](#) 

 Not shared

Next **Clear form**

Fig 19: People and Skills/Maker Passport Prototype Sign Up

In addition to common PII such as name, location, and contact information we gathered information on the opinion of makers on whether skills could and *should* be identified, and what their current skillsets and certifications included. A complete list of questions is included in the Appendix.



From this, makers filled out the form and became holders of a “maker passport” where their skills, training and certifications were linked to their identity. Holding a “maker passport” offered the opportunity to be directly contacted for future production. The challenge encountered was that the form was considered too extensive for some makerspace to participate. In some cases, the makerspace leaders offered to take that charge of submitting their members' profiles to be able to participate in production. Another challenge was that some makers in rural regions of Ghana didn't have the possibility to access a computer to fill out the form.

People and Skills Sign Up

Name (Last, First)

Surname, Given Name

Email

preferredemail@domain.com

Birthdate

Select date

This question is necessary in case there is any legal safety requirement (to be over the age of 18) to use space or equipment.

With which makerspace are you currently affiliated?

List any makerspaces, labs, or other workspace(s) you currently work in, or have a membership.

Do you currently belong to any maker networks, artisan guilds, or other related consortia? If yes, please list. If no, enter 'N/A':

Please share any certifications and/or trainings that you have completed or received related to your work in makerspaces or fablabs. This could be anything from basic safety, to using specific equipment, or apprenticing in a certain craft or skill like wood turning or 3D modeling.

Anything additional you would like to share about your work

Submit on WhatsApp

A WhatsApp form created using [WhatsForm](#)

WP4 conducted interviews with representatives of the nine IMA makerspaces who participated in testing the Maker Passport project, and sent out a questionnaire to the first group of 28 makers who signed up to the Passport. From this preliminary feedback, we learnt that the following two main changes were needed:

- The form for creating a new user record for a Maker Passport, using PSS, needed to be shortened, i.e., to have far fewer questions. (After shortening the form, we quickly received 17 new applications upon testing, 11 additional once updates were applied for a total of 28 additional.)
- To reach a broader audience of makers (e.g., when engaging in a call for bids to produce an item), it would be helpful for the Maker Passport form to be available via a mobile app such as WhatsForm.

In alignment with our community-centered iterative design process, we applied maker feedback to light up the application for a maker passport; a new WhatsApp shorter version was shared with the makerspaces and their communities to facilitate the adoption of maker passports, for which we received an additional 11 responses.

Fig. 20: Maker Passport [WhatsApp signup form](#)



Having the maker passport prototype form embedded directly into a mobile app allows for simple distribution, ease of use by participants, and simplified analysis of results via a consolidated dashboard. Whether using WhatsForm or another mobile integration service for surveys, investment in hosting the survey or hiring a third party support vendor will need to be made to manage the data collection and analysis.

For the next call for bids to participate in the distributed manufacturing of the test tube racks and the tibial fracture fixations, makers who were holders of maker passports were among the first ones to receive the new production opportunities for them to apply first and get more chances to be selected.

Use Case Partnerships in Process: Makerspace networks

REFFAO


Le Réseau Francophone des FabLab d'Afrique de l'Ouest ([REFFAO](#) – the Francophone Network of FabLabs of West Africa) is an association that brings together Fablabs from all over West Africa. FabLabs are a global network of local laboratories that make invention possible by giving individuals access to digital manufacturing tools. This network counts over 20 FabLabs in 7 countries.

The REFFAO Network is participating in the research and development of the maker passport and will be testing it, as they see in it opportunities to:


- Share the expertise and knowledge within the network. If a project is adapted to a community in a country it might also be applicable and replicable in other countries of the network. Following the saying “learning by doing”, it would make it easier to identify the makers who participated in a specific project and invite them to train the makers in-person.
- Ease and speed up the set up of makers visiting a makerspace of the network by showing their skills, training and certifications.
- Create common certifications and training that would be recognised within the network and the region.

We have been working with Dodji Honou of H-fablab to review current training programmes and mapping credential issuance processes to preexisting certificates. We expand on continuation of testing in section 5: Recommendations.






[Accueil](#)
[Le ReFFAO](#)
[Activés du ReFFAO](#)
[Devenir Membre](#)
[Contacts](#)



Nos projets

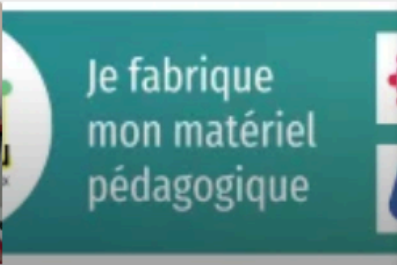


COVID19: une communauté de Maker au ReFFAO pour lutter contre le virus

COVID19: Le Réseau Francophone des FabLab d'Afrique de l'Ouest (ReFFAO) depuis sa création, se voulait être une véritable force, réunissant des acteurs locaux, sur

[VOIR LE PROJET »](#)

avril 20, 2020




La semaine « je fabrique mon matériel pédagogique »

La semaine « je fabrique mon matériel pédagogique » est un événement national ouvert sur la francophonie. Initié par l'association TiersLieuxEdu en partenariat avec le

[VOIR LE PROJET »](#)

janvier 31, 2020



Lancement Du Projet Régional Fair'langue Par La ReFFAO

Lancement réussi du projet régional FAIR'LANGUE, FabLab numérique pour le développement des compétences en français et la formation à l'Institut Français du Bénin les 25

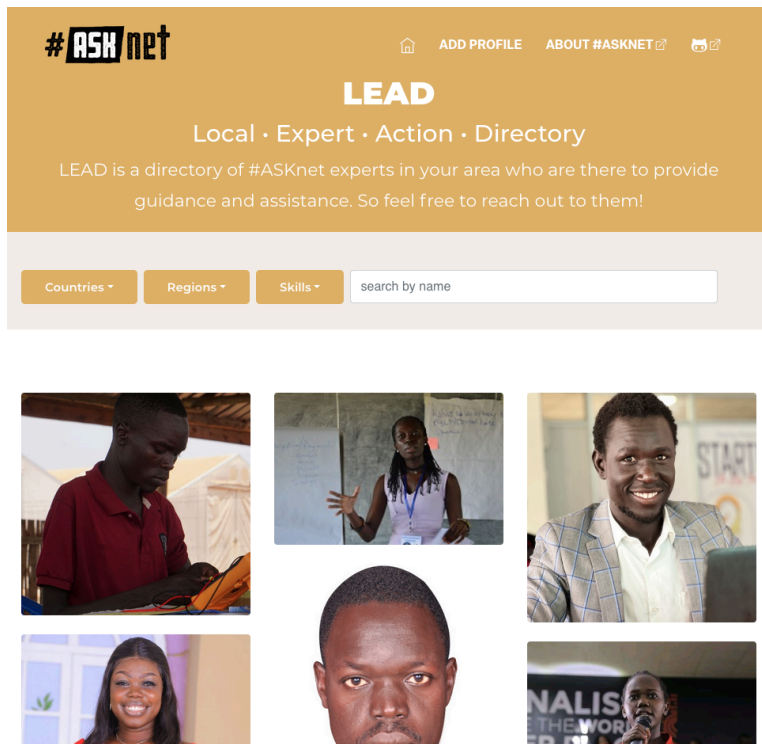
[VOIR LE PROJET »](#)

août 13, 2019

Fig. 21: ReFFAO makerspace network

#ASKnet: <https://lead.asknet.community/>

#ASKnet is a cross-border consortium of community driven organisations with an aim to build a transformative and sustainable open society and a professional media skills ecosystem. The network provides access to a range of open source knowledge and information, media and IT related training as well as community oriented hands-on skills.



The platform provides a directory of makers, experts in South Sudan and Uganda. These experts can be found according to their regions or skills: hardware & repair, community & moderation, organisational development, media & art, web & software, data security & research, open source & knowledge, sustainability & environment, production & supply.

Most of them are affiliated with a space or hub. In their profile, they can indicate their skills, associated with a certificate or training, their achievements (documentation, projects etc) and a general professional introduction.

Fig22: #ASKnet community platform of makers

Introducing maker passports, would bring a layer of verification that ensures the authenticity of a maker's claims about skills and accomplishments. Employers, collaborators, or community partners can trust that listed credentials—such as training certifications or project portfolios—are accurate and recognized within the ecosystem. Maker passport would provide a standardisation and verification of skills, achievements, and professional affiliations. It would help even more organisations and individuals to identify suitable collaborators for projects that require niche expertise, fostering connections across regions and disciplines within the open society. We have not yet partnered with #Asknet for partnership in testing, as their platform development is ongoing. We expand on this in Section 5: Recommendations.



4. Output Matrix and Risk Assessment

4.1. Risks identified by mAkE associated with this work package

Identified Risks and Assumptions	Actions Taken to Prevent Negative Impact
mAkE can build on existing standards for skill representation	The mutual recognition of skills – People and Skills standard was published in March 2023.
Possibility to create a geographically widely accepted tool	By focusing on offline functionality, low-cost accessibility, community-driven trust, and interoperability, the tool has the potential to be embraced in geographically and culturally diverse settings. It balances local autonomy with global connectivity, making it an attractive solution for widespread adoption.
mAkE can find interested experts who are willing to participate in the working group	Six (6) experts have volunteered to join the working group on the mutual recognition standard for the development of maker passports. Members are affiliated to FabAccess , Ostfalia University of Applied Sciences , OpenWorks Baltimore and Berlin University of Applied Sciences
Makers are volunteering to test the system	45 makers tested the maker passport prototype to participate in the production of items as part of the distributed manufacturing trials of the Innovative Manufacturing in Africa project. Plus, the REFFAO network is interested in pursuing the research for the development of authentication-based maker passports for their members (+20,000 people impacted).



4.2. Progress

Technology readiness levels (TRLs) are a method for estimating the [maturity](#)¹ of technologies during the acquisition phase of a program. TRLs enable consistent and uniform discussions of technical maturity across different types of technology.^[1] TRL is determined during a **technology readiness assessment (TRA)** that examines program concepts, technology requirements, and demonstrated technology capabilities. TRLs are based on a scale from 1 to 9 with 9 being the most mature technology.

From the mutual recognition standard (TRL2) to the proof of concept and recommendations, the maker passport prototype system is in constant development and technological evolution. The maker passport has proven to be useful in the sector of distributed production to find the right makers with the right skills in a particular region to manufacture specific items. The authentication-based maker passport is an on-going work in collaboration with the network REFFAO to equip the members of their communities to standardise certifications (TRL7).

TRL	European Union	Maker Passport Prototype System
4	Technology validated in lab	People and Skills Specification confirmed as providing a structure for verifying skills and experience needed to make a specific thing, by providing a shared taxonomy of skills and experiences, and a framework for the recognition of this knowledge.
5	Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)	First Maker Passport signup form shared with nine (9) makerspaces in Africa and their communities in order to participate in production. 45 makers are part of the maker passport database.
6	Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)	The signup form was updated, Makers were directly contacted to participate in the distributed manufacturing of items in the Innovative Manufacturing in Africa project in November 2023.
7	System prototype demonstration in operational environment	Proof of concept and Recommendations

¹ https://en.wikipedia.org/wiki/Technology_maturity



5. Recommendations

5.1. Continuation of the work

Continue Development and testing of the community-based authentication process

task based budget

Hours include documentation.

task	role	description	hours
schema	iop	define minimal viable verifiable PSS schema and example	5
schema	iop	define and publish iop RDF ontology for PSS schema	10
schema	makers	define and publish h-fablab RDF ontology from concrete use-case certificates	30
schema	translations	demonstrate and document validations against all RDF and json schemas	10
cert	makers,iop	organize library of documentation for courses and assets behind certificates	60
cert	makers,iop,backend	define script-based rendering of visual certificate representation from templates	60
tooling	translations,backend	define simple input format and processor script for certificate generation	30
tooling	backend	make interactive command-line-interface tool for simple input format	20
tooling	backend	make command-line-interface tool for validation	20
tooling	backend	implement rudimentary (manual) public key and trust infrastructure	30
tooling	frontend	Adapt kee-gtk4 to serve certificate validations	160
tooling	frontend	Adapt kee-gtk4 to serve certificate counter-signing (as wallet)	160
test	makers,iop	Plan and define criteria for use-tests	5
test	all	Use-tests for certificate generation tools	15
test	all	Use-tests for certificate validation tool	15
test	all	Use-tests for certificate counter-sign tool	30
support	frontend,backend,devops	Create and document VM environment for running tools	20
publish	devops	ontologies hosting	2
publish	devops	documentations hosting	2
publish	all	online project presentations	20
demo	all	prepare presentations at event	20

We recommend completion of the community-based authentication development. While the research and conceptual build was established for this platform, the final work of developing the tooling is the final stage.

With all documentation for kee available openly online, as well as the specifications for continuation of work, it is a feasible next step to dedicate fundraising for sponsorship of community development of the community-centered authentication platform (kee).

Fig23: kee development specifications, established by [nolash²](https://en.wikipedia.org/wiki/Technology_maturity)

² https://en.wikipedia.org/wiki/Technology_maturity



Establish additional use case partnerships for testing: Asknet and IMA

The aforementioned Asknet platform is potentially an ideal use case for partnering on the explorative testing of the maker passport. While we have crossover and connections with project partners Timm Wille and Victoria Wentzelman, we have not yet discussed potential testing of the maker passport. We recommend this as a next step.

At the end of the 2024 calendar year, there will be an additional maker profile platform available for potential collaborative testing of the maker passport, as part of the Innovative Manufacturing in Africa programme, funded by RISA, and collaboratively supported between Distributive Manufacturing and the Internet of Production. A recommended next step would be to contact platform development lead Max Wardeh for discussion on testing.

Iterative data gathering and assessment

We recommend the continuation of our iterative research and design process, which centers community members using a participatory action research (PAR) model. As more makers sign up for the maker passport, using either the Google or Whatsapp form, we recommend that a community member or compensated staff member be responsible for stewardship of the data, and providing collated datasets, scrubbed of PII, for use in future development of the maker passport. As part of our testing for sign-up on the maker passport, we developed a simple automation process that can be applied to collected data, which makes is personally unidentified and will automatically place it into an open repository for easy access:



Fig 24: An automation process for data collection, scrub, and depository to open repository

It would be necessary to appoint a staff member/person responsible for data stewardship to oversee this automation prior to applying it longer term. It has been tested and is operational, but without that appointed steward, it cannot be left unattended as it poses risk to exposing PII.

Resources

People and Skills Initiative – Internet of Production:

<https://www.internetofproduction.org/people-and-skills>

People and Skills Specification: BETA <https://standards.internetofproduction.org/pub/r7gOn9fo/release/4>

Deliverable 4.1 Mutual recognition standard. <https://zenodo.org/records/8370683>

Technology Readiness Level https://en.wikipedia.org/wiki/Technology_readiness_level

Blogpost (Sep. 22): Showcasing Maker Expertise with the People and Skills:

<https://makeafricaeu.org/people-and-skills-specification/>

Task Based Budget for Completion of Community-Based Authentication: Technology

Community-based Authentication code repo: <https://github.com/nolash/gtk4-kee>

World map of manufacturing: <https://map.internetofproduction.org/makeafricaeu.html>

Open Know-How <https://www.internetofproduction.org/openknowhow>

Open Know-Where <https://www.internetofproduction.org/openknowwhere>

IOMe 254 Innovation Hub, Lamu, Kenya. <https://twitter.com/iome254>

New York University's Makerspace. <https://makerspace.engineering.nyu.edu/orientation/>

Makerspace Access Pass (MAP). <https://www.wyrkshop.org/>

WRK107: Advanced Bench Saws. <https://www.wyrkshop.org/workshops/wrk107> [Sawtop Industrial Table](#)

Saw in the Innovation Wyrkshop. <https://www.wyrkshop.org/equipmentlist/sawstop-industrial-table-saw>

SAF150. <https://www.wyrkshop.org/workshops/saf150>

Canvas badges. <https://badgr.com/issuers>

How to award badges to learners.

<https://community.canvaslms.com/t5/Canvas-Badges-Credentials/How-do-I-award-badges-to-learners-in-Canvas-Badges/ta-p/528742>

[Solid](#). <https://solidproject.org/apps>

Internet of Production repository on Github <https://github.com/iop-alliance>

Open Know-How repository [okh-solid-app](#).

Internet of Production Initiatives. <https://www.internetofproduction.org/initiatives>



Innovative Manufacturing in Africa project.

<https://www.internetofproduction.org/innovative-manufacturing-awards>

RISA Fund. <https://www.risa-fund.org/>

Writing aid specification. <https://www.printables.com/model/337308-writing-aid>

Test tube rack specification. <https://www.thingiverse.com/thing:6184727>

Tibial fracture fixation specification. https://www.appropedia.org/Tibial_Fracture_Fixation

People and Skills signup form.

https://docs.google.com/forms/d/e/1FAIpQLSeik8OsvNiX7x1MfnE4na_s3gdOeYObwUNhA9BHPuR2tFBxnQ/viiewform

People and Skills WhatsApp signup form. https://whatsform.com/Q_oQUO

Réseau Francophone des FabLab d'Afrique de l'Ouest. <https://reffao.org/>

#ASKnet: <https://lead.asknet.community/>

People and Skills Working Group. <https://standards.internetofproduction.org/pub/r7gOn9fo#npsgrj7b6jf>

FabAccess, <https://www.fab-access.org/en>

[Ostfalia University of Applied Sciences,](https://www.ostfalia.de/cms/en/forschung/research-areas/digitization/rg_robotics/)

https://www.ostfalia.de/cms/en/forschung/research-areas/digitization/rg_robotics/

OpenWorks Baltimore. <https://www.openworksbmore.org/>

Berlin University of Applied Sciences.

<https://www.srh-berlin.de/en/university/faculty-and-team/peuker-sigrid/>



Appendix

Question List: People and Skills/Maker Passport Prototype Sign Up

- 1) Last Name, First Name & Middle name
- 2) Preferred Pronouns
- 3) Date of birth
- 4) Assigned sex at birth (what appeared on your birth certificate)?
- 5) Current Gender Identity: How do you describe yourself (more terms from Healthline available here)?
- 6) What is your race and ethnicity?
- 7) Email
- 8) Primary phone number
- 9) Permanent address
- 10) With which makerspace are you currently affiliated?
- 11) Do you currently belong to any maker networks, artisan guilds, or other related consortia? If yes, please list. If no, list "N/A":
- 12) How often do you think maker skill credentials should be checked/updated?
- 13) Anything additional you'd like to share about the form or your work
- 14) How would you rate your current skills and experience in the category of General Orientation to makerspaces and fablabs? *Examples: general understanding of a makerspace or fablab, what equipment is typically in the space, depending on the population it serves, and standard approach for use.*
- 15) Please share any certifications and/or trainings that you have completed or received related to your work in makerspaces or fablabs. This could be anything from basic safety, to using specific equipment, or apprenticing in a certain craft or skill like wood turning or 3D modeling. Certification examples: [ETA Basic Electronics Certification](#), [ISCET Journeyman](#), [Arduino.CC](#), [Laser Safety Officer \(BLS\)](#), [ANSI Z136.1 / Z136.3-Compliant Laser Safety](#) trainings (health, industrial, cosmetic), etc.



- 16) How would you rate your current skills and experience in the category of Health and Safety as applicable to makerspaces / fablabs? *Examples: general first aid training and knowledge, such as dressing wounds, CPR, or other emergency first aid procedures.*
- 17) Please list all certifications and/or trainings that you have completed in the category of Health and Safety as applicable to makerspaces / fablabs? *Examples: [American Red Cross Digital Certification](#) (2 yrs) or [N.F.A.A. training](#).*
- 18) How would you rate your current skills and experience in the category of Electronics as applicable to makerspaces / fablabs? *Examples: soldering circuit boards, microcontrollers/Arduino, Raspberry Pi, circuitry components/VCA's.*
- 19) Please list all certifications and/or trainings that you have completed in the category of Electronics as applicable to makerspaces / fablabs? *Examples: [ETA Basic Electronics Certification](#), [ISCET Journeyman](#), [Arduino.CC](#).*
- 20) How would you rate your current skills and experience in the category of **Woodworking** as applicable to makerspaces / fablabs? *Examples: Woodshop safety, operating wood lathes, bench/table/band/miter saws, CNC routers, handheld woodshop power tools, and widebelt/other sanding tools.*
- 21) Please list all certifications and/or trainings that you have completed in the category of Woodworking as applicable to makerspaces / fablabs? *Example: [CITF Trainings](#) (Carpentry), etc.*
- 22) How would you rate your current skills and experience in the category of Laser Systems/Cutting as applicable to makerspaces / fablabs? *Example: Laser cutters; etching on glass, wood, plastic or stone; engraving.*
- 23) Please list all certifications and/or trainings that you have completed in the category of Laser Systems/Cutting as applicable to makerspaces / fablabs? *Examples: [Laser Safety Officer](#) (BLS), ANSI Z136.1 / Z136.3-Compliant [Laser Safety](#) trainings (health, industrial, cosmetic), etc.*
- 24) How would you rate your current skills and experience in the category of 3D Modeling/Printing as applicable to makerspaces / fablabs? *Example: Experience with 3D modeling software such as Maya/Autodesk, Sculptris, and SolidWorks; experience and training with common 3D printers such as Prusa, Ultimaker, Makerbot; printer maintenance and repair/extruder replacement, knowledge of filament and different printing types such as nylon, PLA, metal, etc.*
- 25) Please list all certifications and/or trainings that you have completed in the category of 3D Modeling/Printing as applicable to makerspaces / fablabs? *Examples: [Additive Manufacturing Tips, Tricks, and Techniques](#) (via LinkedIn Learning), [Designing for 3D Printing with Fusion 360](#) (Udemy), etc*



- 26) How would you rate your current skills and experience in the category of Sewing as applicable to makerspaces / fablabs? *Examples: repairing or making items such clothing or upholstery; using Singer (Quantum Stylus or others), Berina (Sergers or others), or Industrial Grade (Consew) machines.*
- 27) Please list all certifications and/or trainings that you have completed in the category of Sewing as applicable to makerspaces / fablabs? [*Example: Master Sewing and Design Professional \(ASDP\)*](#), etc.

