The need for sectoral ownership to steer developments of the European Digital Identity Wallet for the benefit of education

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Abstract

The European Commission and the educational sector are simultaneously working on innovative concepts that involve credentials and wallets. The EU has high ambitions to create a digital identity ecosystem, while educational institutions are exploring ways to use credentials to support flexible and life-long learning. Both initiatives share similar terminology, technology and standards. Also, common use cases can be defined, but that does not make the initiatives identical from a business and governance perspective. When comparing the use cases and roles the educational sector has with the proposed EU digital identity framework (EUDI), this becomes clear. Diplomas are not issued by an identity framework. The educational sector should take ownership of credentials that are part of its core process. At the same time, interoperability with the EUDI ecosystem must be kept. The sector should explore additional ways to influence the EUDI development in architecture, standards and governance.

1 Introduction

1.1 The European journey towards a common identity framework

The European Commission has been working on a common approach for interoperable digital identity and trust services in the European area for several decades. Regulation for the issuance and use of electronic signatures (EC, 1999) was followed by regulation for cross-border electronic identification and trust services (eIDAS, 2014). The EC is now working on the European Digital Identity Framework (EUDI), a major revision of eIDAS, taking digital identity one step further: as a means to empower citizens and legal entities to use digital identity solutions, and as a means for targeted and proportional sharing of identity data (EC, 2022). In this vision, 'identity' is not limited to the familiar administrative set that includes some kind of personal identifier, name, date of birth and similar properties. Instead,

identity is considered as everything that makes up a unique person, including possessions, beliefs, qualifications, etc. This is combined with the notion that only that unique person can decide what to reveal to others, and that in many cases this may be very minimalistic, not sharing more information than strictly required. This is in line with the philosophical thinking about identity, and also very much in line with ideas about self sovereignty and privacy.

1.2   The European Digital Identity Wallet

A center piece of the proposed European Digital Identity Framework is the so-called 'European Digital Identity Wallet' or EUDI Wallet – a secure solution that basically allows any citizen to carry around proof of identity and other personal attributes and credentials. The solution should enable citizens to share these proofs selectively, securely and privacy friendly with parties that need them.Why should the educational sector be involved?

These developments will also strongly impact the educational sector. Thus, the sector should not have a passive attitude towards this ambition, but should be an important party to shape this future. There are three important reasons for that.

First, the underlying movement towards credential and wallet-based ecosystems is real and may have significant benefits. Several initiatives at educational institutions, e.g. around microcredentials and open badges, prove the potential value of business processes built around credentials. Telléus and Lindgren (2022) demonstrate a different approach to digital degrees, and the role credentials can play in redesigning that process. Also, many community and commercial initiatives are leveraging the concepts, such as Europass, Credly, Canvas Badges by Badgr, and national initiatives like EduBadges in the Netherlands.

Second, providing high-quality proof of acquired skills, diplomas, and qualifications are core business for educational institutions. The envisioned European ecosystem for wallets and credentials can only operate to its full extent if digital verifiable equivalents become available to the learners for what we currently provide in physical form or keep for reference in internal systems.

Third, the revision of eIDAS regulation will happen in the foreseeable future, and educational institutions will be confronted with the effects of the regulation anyhow. This assumption is supported by the frequent mention of 'Access to education' as an explicit goal for the revision. Additionally, educational credentials are part of the large-scale pilots that the EU tendered as part of their digital identity programme with many higher education institutes participating (e.g. DC4EU, 2022).

Even if the EC would not continue their revision of eIDAS, the educational sector will have to respond to credential and wallet ecosystems in order to be able to benefit from it on their own terms.

2 Credentials and wallets

2.1 The basics of wallets and credentials, a short primer[*]

On first sight, digital credentials are the digital born equivalents of proofs of identity, qualification, possession or value. Think about passports, diplomas, ownership certificates, and banknotes, that you can carry around to proof something about yourself. In this analogy, a digital wallet (or vault) is simply the mechanism that is used to keep them together and safe.

On second sight, digital credentials and wallets have several aspects that necessarily differentiate them from the physical world. Verification of physical properties is already hard for the average user, but is near to impossible in an online digital interaction. Digital credentials may be more subject to forging and duplicating, simply because they *are* digital and such abuse could also be attempted on larger scale. Basically, these risks are countered by implementing advanced cryptography and advanced verification mechanisms. If properly implemented, a digital credential system could be created that may be more reliable than its physical equivalent. With such a system in place, digital credentials become verifiable, hence the designation verifiable credentials.

A functioning credential ecosystem will require at least the following business roles: holders, issuers, verifiers, and 'registries' (see also Figure 1). Most of them are self-explanatory. Holders are the ones that carry the credentials in their wallets. Issuers are the ones that provide credentials to the holder. Verifiers are the ones that ask you to present a credential before doing business. Registries need some more explanation. They have a function to establish basic trust in the ecosystem and to allow every role to independently verify that trust. Registries store metadata about e.g. credentials, trusted participants and cryptographic methods to be used. They are not stores of personal or business data. Such data should be kept under safe custody of either holder, issuer or verifier.

It should be noted that any actor in the ecosystem may fulfill multiple roles. A university may verify diplomas as a prerequisite for enrollment, while also issuing diplomas to students that completed their studies. Universities, or their staff, may also hold credentials, e.g. to sign a diploma before issuance.

2.2 Credentials in education: Diplomas, badges and microcredentials

Figure 1 presents a selection of many possible use cases and contexts that could benefit from credentials. Learning processes in (formal) education usually result in the issuance of 'credentials' to learners – more commonly known as diplomas or proficiency certificates. Issuing such credentials is the output of the primary process of an educational institution. With these credentials, learners can prove in their life and career that they 'hold' specific capabilities or skills. The European Digital Identity Framework recognizes the value of diploma credentials by including them as a core use case for wallets.

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[*] Terminology used is corresponding to the Verifiable Credentials data model (W3C, 2022). The strength of the model is that it relates strongly to known concepts and roles. Other frameworks, including the ARF, use different terminology for comparable concepts.
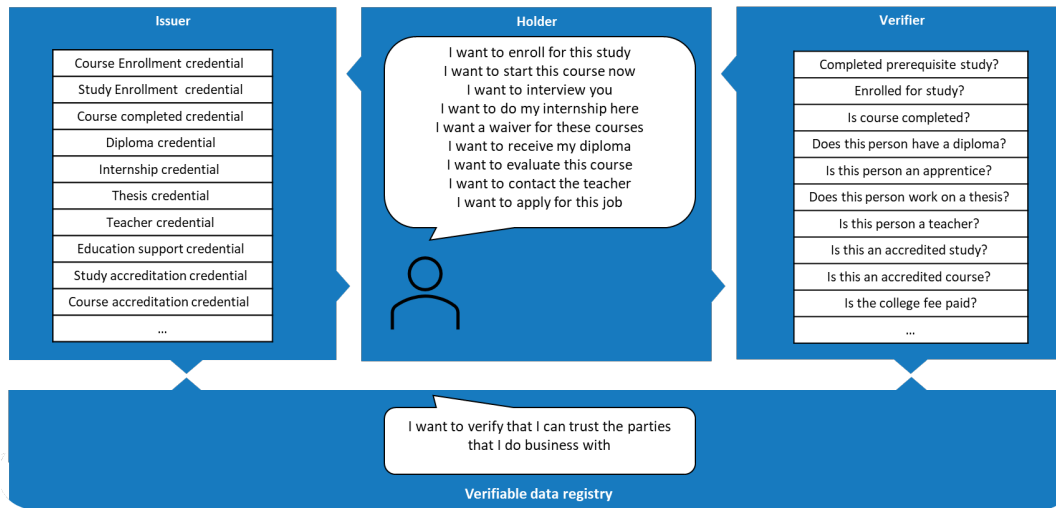
Figure 1: Examples of credential use cases in education processes. (Adapted from HOSA, 2022)

Educational institutions have another use case for credentials, that is less visible from an external perspective. The sector has experimented with microcredentials for several years now, and several institutions are already using them to hand out credits for what learners have achieved. This development started independently from the identity credential ecosystem, with different drivers and motivators, such as the demand for more flexible learning and the need to support life-long learning. Being able to issue proof of completion for smaller units of learning is an enabler for building learning paths that are not following a standard curriculum, are followed across different institutions, or are interrupted for some time. Open badges, while originally not designed as verifiable credentials, have a similar function and value (Law, 2022). The convergence of both concepts has started with a proposed update of the required standards (1EdTech, 2023).

A third use case lies within the administrative IT domain within institutions. Credentials could have a role in financial processes and distribution of access, license and usage rights. In fact, very similar concepts, such as access tokens and credits are already being used. Other sectors will have similar use cases.

3   The EUDI Wallet and educational credentials

Before discussing how educational credentials relate to the EUDI Wallet initiative, first, an introduction to the underlying framework.

3.1   The European Digital Identity Wallet Architecture and Reference Framework

The first public version of the European Digital Identity Wallet Architecture and Reference Framework (ARF) became available in February 2023 (DG CONNECT, 2023). The ARF provides a good insight into the current thinking on what the technical and organizational ecosystem could look like from the EU perspective.

The ARF highlights the importance of Educational credentials, by explicitly including them in the objectives section:

"*Educational credentials and professional qualifications.*
Providing documents for qualification recognition procedures can be costly and time-consuming for end Users, companies and employers, education and training providers, and other academic institutions. For example, digital diploma attestations could be presented cross-border in a verifiable, trusted, and consumable format to another education or training institution or a prospective employer. The EUDI Wallet may be a repository for educational digital credentials as Electronic Attestations of Attributes and a means for exchanging them by a learner."

The ARF distinguishes three different types of credentials. The first two types establish the core personal identity (designated by the acronym PID) and the credentialized equivalents of highly trusted identification documents (QEAAs, qualified electronic attribute attestations) such as identity cards and driving licences. Given the central and generic role in establishing trust in the framework, very specific requirements and a strict supervision regime are imposed on entities that provide and handle these credentials.

A third type of credential (EAA, electronic attribute attestation) has been defined to cater for credentials that have a different origin than PIDs and QEAAs, for example educational credentials. The ARF at this stage does not provide further guidance on how to proceed with EAAs. The suggestion is that they will be under a lighter regime with more freedom for sectoral or topical specialization, while still assuring conformance to the framework and its standards.

The ARF presents the generic roles and interactions that are required in a wallet ecosystem. An overview is presented in Figure 2, to get an idea about the many roles and their interactions. Although the ARF uses different terminology and has much more specialized roles, the general placement of the roles (in yellow) corresponds with the roles holder, issuer, verifier and registry as used in Figure 1. Additionally, governance roles for the EUDI ecosystem (in red) are defined.
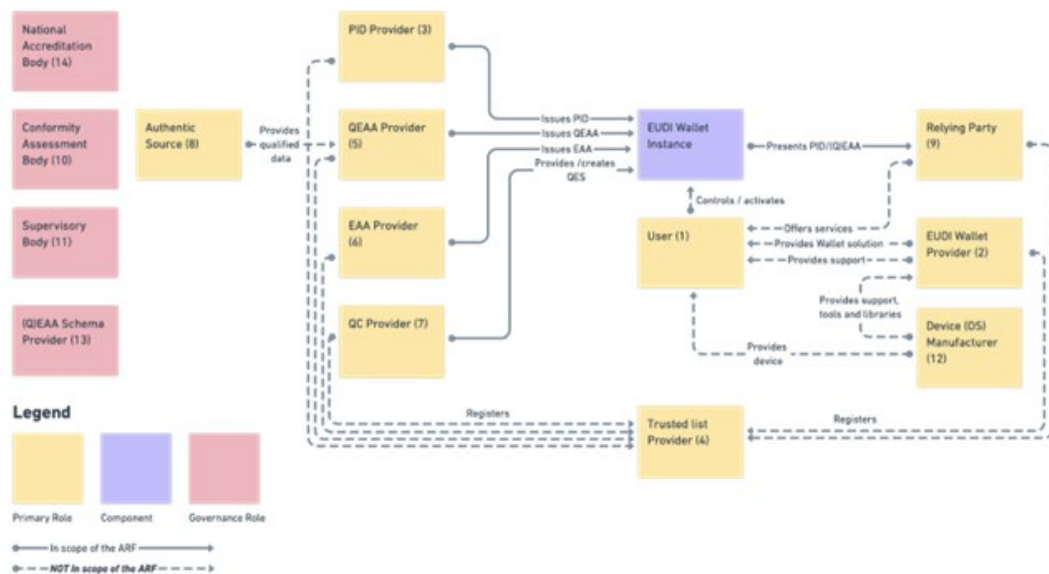

Figure 2: Overview of the EUDI Wallet roles (taken from the ARF)

The ARF also presents requirements and standards, in this version primarily focused on wallet providers and pilot participants. Soon after publication, some thorough critiques were published, e.g. discussing cryptographic concepts, measures to prevent traceability of individuals, assurance that the holder of a mobile device is indeed the owner of the wallet (Hoepman, 2023), and the risk of overidentification (Leisegang, 2023). While these are essential concerns, less attention is paid to the roles and requirements that are needed to embed the framework in a real-world 'business' context, such as the higher education domain. Some reviewers point out organizational complexity of implementing the EUDI framework at a large scale (Tobin, 2023), the fundamental differences between several types of credentials, and the ownership of their semantics (Hoepman, 2023).

An ecosystem that is primarily designed to handle identity credentials necessarily has other characteristics than an ecosystem that handles educational credentials. The current focus on the core identity credentials and wallet technology that are foundational to the ecosystem, is understandable from the ARF perspective, but only *mentioning* an education use case will not be sufficient to capture essential differences or get an idea about the full impact on the educational sector. Planned pilots with educational credentials will surface some issues and differences, but their scope is deliberately limited to the diploma use case, not yet covering the various other potential areas of application or impact for the educational sector. Initiatives that come forward from the educational and employment sector, such as Digital Credentials for Learners and the related European Learning Model (Europass, 2023) do not relate explicitly to the parallel EUDI initiative.

3.2 The roles that the educational sector has with respect to the EUDI Wallet

The absence of specific clarity and guidance on EAAs might also read as an invitation to the sector to proactively take ownership of their own use cases and come with proposals. Formulating a vision from the educational business perspective on the ARF will help both the educational sector in understanding what the impact and required actions of EDI could be, as well as providing the ARF authors with useful feedback. As an initial step an indicative mapping of credential types to roles in the ecosystem is presented in Table 1.

	Core Identity Credentials (PIDs and QEAAs)	Education Specific Credentials (Education EAAs)	Other types of credentials (non-Education EAAs)
Primary roles *(mapped to ARF roles)*			
Issuer *(ARF: EAA Provider, Authentic source)*	Member state approved identities Driving licence Identity Card	Diploma, microcredentials Proof of enrollment 'ECTS credits'	e.g. Licences for Educational content
Verifier *(ARF: Relying Party)*	All types of credentials can be expected, depending on the desired business interaction		
Holder *(ARF: User)*	Any citizen Any legal entity 'Anonymous'	Student Teacher Examinator	'Customer'

	Core Identity Credentials (PIDs and QEAAs)	Education Specific Credentials (Education EAAs)	Other types of credentials (non-Education EAAs)
Registry *(ARF: Trusted list provider)*	List of Member state certified parties/roles & generic data schemes	Trust lists of institutions, studies, courses Educational credential data schemes	Sector specific trust lists & data schemes
Governance roles			
Legal Governance	Identity framework (EU/national)	Education specific (national) regulation	Sector dependent
Standards Governance	EU + member countries	Standards ('schemes') for education content and process + Conformant to ARF standards for interoperability with framework	
QA, supervision and accreditation	National accreditation body (European Regulation 765/2008)	Education specific agencies and bodies	

Table 1: indicative mapping of credential types to roles in the ecosystem

The first column lists the primary and governance roles, with their mapping to a selection of ARF roles. The other columns represent the different viewpoints associated with the different types of credentials. The EAA view is split into a view for the Educational sector and one for other sectors, primarily to indicate that other sectors also issue their specific credentials and that the educational sector also has to deal with those, e.g. as a customer that purchases licenses.

From the third column, listing education-specific credentials, an interesting observation can be made: at the level of EAAs, the set of credentials becomes richer and more concrete, moving away from abstract concepts and roles ('identity', 'citizen') towards more tangible concrete concepts ('diploma', 'student'). Such education-specific credentials can only be issued using information from authentic sources and processes that exist within the sector. A citizen becomes a student only if proper enrollment with an educational body has taken place. The enrollment process can benefit from a reliable identity that comes from the EUDI ecosystem, but a credential that confirms the enrollment could only come from the sector itself as an issuer.

In the role of the verifier, the sector should be prepared to receive credentials from a very heterogeneous set of issuers. The different credentials may come packaged in a limited set of technical formats, but to understand their content, different data schemes should be understood. For the educational sector, it would be very efficient and effective to be able to consume the credentials in identical formats as they were issued. That requires common data standards that only the educational sector can define. Also, this requires mutual trust between issuers and verifiers within the educational sector, which may result in the Educational sector being the main provider of reliable trust lists regarding entities and credentials that are education specific.

A last observation about the governance roles. Figure 2 may suggest that there is an overarching governance that covers everything, overseen by a single national accreditation body. By listing the several legal, standards, and QA roles for the EUDI framework and the educational sector next to each other in Table 1, it becomes clear that layered governance is more likely to succeed. The quality of a diploma can only be guaranteed by educational institutions themselves, under the supervision of sector-specific bodies. It is also clear that the complex EUDI framework requires adequate supervision to establish the high level of trust and interoperability that needs to be achieved. Two separate ecosystems, but connected by credentials.

4 Conclusion and actions

'I don't trust the identity ecosystem to issue my diploma'. That statement may best summarize what is stated before. The EUDI framework will not magically arrange everything correctly for the educational sector. The sector should be responsible for their own credentials and their own part of the EUDI wallet ecosystem. It's obvious that EUDI will not 'take over' the educational sector responsibilities. However, there are many touch points that require mutual understanding and a clear definition of responsibilities. Ignoring those may result in a non-fit, additional implementation costs, delay, and poor learner experience.

Several action lines can be envisioned to go forward. None of them are novel, but their importance is again stressed by the outcome of the analysis above. As the authors do not have the final answers, they are formulated as questions as an invitation to continue thinking about viable solutions.

- *Standards, standards, standards*. Many standards exist, and there are many ideas and actions to improve, update, extend or replace them. Parts of the problem may be overcome with a pragmatic approach (see e.g. Fridell, 2022). Specific technology standards may converge towards the set that is promoted in the ARF. The real challenge that EUDI poses is that a divergent set of semantic standards for different types of educational credentials is less likely to get accepted as a viable standard to be used EU wide. Leveraging what we already have, how fast could we present such a coherent set?

- *Adequate representation at EU level*. European formal decision making is primarily organized through national hierarchies, while international cooperation between educational institutions primarily works horizontally, cross-border. How will be achieved that a common understanding on e.g. the information standards to use for educational credentials reaches the decision level of the EU? What forms of organisation are needed? Additionally, while not discussed in this paper, it is likely that other sectors have similar challenges. How did e.g. national road agencies succeed in including their mobile driving licence standards in the ARF?

- *Active sharing of knowledge, solutions and experiences*. There is no shortage of experiments, pilots and initiatives to explore important aspects. Large scale pilots on European scale, many experiments and programs between educational institutions and also many initiatives outside the educational sector, both community-driven and commercial, are exploring the solution space. In itself, this is not wrong, as there is a lot to be learned. Possible improvements are increasing the effectivity of demonstrating results, and leverage acquired knowledge and solutions for reuse across the initiatives. In other layers of the technology stack, organizations such as GÉANT have been quite successful platforms for this type of cooperation. Where do we find the common platform for educational credentials?

- *Smart design of the education credential ecosystem roles.* Within the higher education several types of actors can be identified: Universities, National Research and Education Networks (NRENs), suppliers, EUNIS, and also regulatory bodies. Each actor can be assigned a specific role and characteristics within the ecosystem (see e.g. Bok et al., 2022). The ARF reference framework also defines roles, although of a different nature. Even without detailed knowledge of the exact ARF layout, would it be possible to create a tentative mapping of how the ARF roles are distributed across the education ecosystem? Such a mapping could help to identify where specific ARF implementation challenges could be most effectively addressed.

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