UAC STAKEHOLDER CONSULTATION

Credentials and the future of learning: is it time for a consistent, national approach?

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1. EXECUTIVE SUMMARY

The education sector is undergoing significant change, with rising expectations of students, rapidly evolving digital technologies, growth in credential types (including micro-credentials) and the evolution of the concept of lifelong learning.

The emergence of a new class of digital credentials known as Verifiable Credentials represents a significant advancement. An opportunity now exists for the Australian education sector to leverage that technology and reap significant benefits for students, institutions, government and all involved in the education sector.

UAC has invested significantly in the research and development of solutions that use this technology. With the support of the other tertiary admission centres (TACs), government and the sector, we are well-placed to provide those solutions on a national scale.

However, to do that requires collaboration of all stakeholders to develop consistent, national approaches to policy, framework and standards.

With that in mind, this paper sets the scene, describes the technology landscape and poses questions for the group for further consideration.

2. CONTEXT

An outstanding feature of the higher education sector is the high level of activity associated with review and change. Reviews of standards, frameworks and policy, in addition to government- and sector-led initiatives are numerous, with much effort directed towards keeping pace with the sheer volume of work. Additionally, other elements of the external environment are changing, most notably digital technologies, social/consumer behaviours and public expectations associated with education. With these shifts, many organisations – including for-profit organisations – are looking to integrate with and perform larger roles in the education sector.

Of course, not all initiatives are related, nor should they be conflated when there is no rationale for doing so. However, for those initiatives that are related, some of the challenges include:

- coordination of the sector's response across a very broad range of issues
- consistency of proposed policy
- ensuring that initiatives keep pace with dramatic changes in the external environment
- optimising design principles for solutions to serve multiple policies and initiatives
- maximising value of resource allocation.

The above-mentioned initiatives are largely responses to recent, current and anticipated changes in the sector's operating environment. The education sector and the Australian Government are also currently grappling with issues such as:

- threats to the international competitiveness of Australia as an education exporter
- more choice for students but poor student experience
- inefficient and opaque practices around academic credit and recognition of prior learning
- lack of connection to and preparation for employment
- multistep accreditation and lifelong learning
- new qualification types, including professional practice credentials, badges and micro-credentials.

UAC has researched the technology and is developing potential solutions to these issues; with the support of the other TACs and the sector, these could be used on a national scale with significant benefits for all.

3. THE TECHNOLOGY LANDSCAPE

In parallel with the above challenges, there is rapid growth in new technologies such as distributed ledger technology (DLT), artificial intelligence, quantum computing, big data, digital identity and cryptography. These technologies are presenting significant threats and opportunities to the education sector.

Distributed ledgers are a class of technology causing disruption across a vast range of industries and services. New service providers are emerging to challenge long-established business models.

There is great potential to make use of this and related technologies across many aspects of the education sector. Such technologies are already being used to increase social impact, develop new services, increase transparency, lower cost and raise service efficiency.

There is clearly a desire to increase student mobility and transparency, and also to provide a better platform on which credit and credentialing services can be based. On a local level, My eQuals went some of the way towards fulfilling these objectives, as did the initiatives arising from the review of admissions transparency by the Higher Education Standards Panel. My eQuals, designed to deliver electronic transcripts, fulfilled that task. It does, however, have shortcomings that preclude it from being used as a national platform to deliver a broader range of services for institutions, students, government and other stakeholders. An initiative arising from the review into admissions transparency, Course Seeker (the national admissions information platform), went further and has proved useful in bringing a level of consistency to what was a fragmented approach to providing information to prospective students. However, the technologies and approaches discussed in this paper have a much further-reaching and larger potential impact on education.

4. SOCIAL IMPORTANCE OF CREDENTIALS

Credentials serve an important social function: they convey information regarding the individual (or entity) and confirm some form of ability, achievement or purpose that has been granted by an authority. Credentials of different types are used on an enormous scale globally and are an essential part of public, government and business interaction at all levels.

Credentials are increasingly important in the knowledge economy. They are used by industry as a measure of skills and knowledge. They are used as a social currency that can be traded for privilege and to act as a signal to employers that the holder can deliver to an expected standard.

The social value of a credential requires trust. It is important that the verifier has confidence that the issuer can be identified and validated, that the holder is the true recipient, standards have been met, and that forgeries or false claims have not been made.

Paper-based credentials have served this purpose for centuries. Techniques such as seals, handwritten signatures, watermarks and secure printing have been used to secure a level of trust within the document.

In the past decade, the education sector has seen a transition from traditional paper-based credentials to digital credentials.

The broad spectrum of credential classifications is presented in the diagram below (with a full description of features and advantages in Appendix 1).

Paper Credential	Digital Copy	Digital Document	Electronic Signatures	Digital Signatures	Open Badges	Blockchain Credentials	Verifiable Credentials

The evolution of digital credentials has served a progression of needs over time, with the development of Digital Signatures in My eQuals at just over the half way point. The sector is now entering a new era of maturity, with the technology at the end of this spectrum in place.

5. A PARADIGM SHIFT

One of the limitations of the Internet is that it was not created with an identity framework. It is not possible to know the identity of who and what you are connected to. This has resulted in the creation of workarounds where each entity creates a repository of identity information (accounts) to provide services. Individuals have become accustomed to providing personal information, passwords, addresses and other identifiers to multiple third parties to create their online identities. This model has given rise to the mismanagement, exploitation, and theft of personal information which has eroded public trust in the internet and online services.

A new class of digital credentials known as Verifiable Credentials has emerged, building on the decentralised concepts employed for blockchain credentials. These have been designed to incorporate Decentralised Identifiers (DIDs) into the credential, such that a verifier can prove that the credential was issued to the individual presenting the credential. **For the first time, this enables trust between parties in an electronic format.** Information of any type can be embedded, issued and validated.

The concept of decentralised identity also enables another important concept: Self-Sovereign Identity (SSI). All current forms of digital identity are **issued to** individuals. They are not **under the control of** the individual. An email address or user account for example, can be taken away and or reissued to another individual. DIDs are completely unique identifiers that can only be issued once by a decentralised network (that has no controller). The individual is issued credentials linked to these identifiers and they have full control over all issued information. They can then present a claim built from elements of multiple credentials which can then be validated, disclosing minimal personal information. Services such as proving you are over 18, without revealing your date of birth become possible. Internet services can now be built where the individuals' data is no longer a product to be monetised. Digital identity can be protected and is under the control of the individual.

Verifiable Credentials are designed to be used as a digital alternative to traditional paper credentials that were physically held (controlled) by an individual, without the need for central repositories. They can scale and are cost effective, so are an effective solution for issuing micro-credentials with embedded data. They could be created at the curriculum definition stage, with course content and learning outcomes, and can be represented as building blocks of any size. They can be issued, combined, stacked and used to improve efficiency of highly automated systems such as admissions, enrolment, transfers, credit, issuing certificates and many other services.

While the control of the credential once issued rests with the individual, the rules relating to how the credentials relate to one another are determined by issuing authorities. Thus, education institutions, provided they possess the authority to determine those relational rules, are able to determine what a given credential is worth. This is important, for example, when determining advanced standing and admissions standards. For entities such as governments, which have a strong interest in the integrity of the education system as a whole, transparency and automated reporting can be achieved at every step of the process.

This technology is not only suitable for credentials as currently utilised by the education sector. They can be used for any purpose that requires validation that a claim was issued to an individual. Verifiable Credentials have been demonstrated as an alternative to usernames and passwords. They can be used to grant access to systems, to validate that a person is authorised to access a secure area, or that an individual presenting their biometric profile is in fact attending their exam. In other applications, they could be used to prove that a medical practitioner has the qualifications, accreditation and insurance to perform a complex procedure.

Verifiable Credentials represent a significant advancement. The technology is currently available, with international standards being developed by the World Wide Web Consortium (W3C). Once finalised it will become a native web technology standard and used by all browsers and devices around the world in a similar manner to FTP, HTTPS, HTML5 and other web protocols.

A number of global initiatives are currently underway to develop and implement solutions. CULedger which represents 600 North American credit unions, currently issue an access credential from a Know Your Customer (KYC) process that can be used to validate the individual and grant login access to any entity on the network. They plan to roll this out globally. Microsoft has announced they will be launching a decentralised ID service. In British Columbia, Canada, all legally registered organisations have been issued with a decentralised identifier. The World Economic Forum is advocating leadership, research and adoption in readiness for the Fourth Industrial Revolution. This technology is seen as an essential component in this digital transformation. While already significant, the potential social impact of this technology is immense, with the possibility for instant digital identification and verification of any digital asset or credential.

This is a glimpse of what is happening on a global scale. The end of the credential technology spectrum presented above is now accessible. If implemented with the correct governance, frameworks, processes and tools, Verifiable Claims/Credential technology would allow for automated, cost efficient services on a scale that has not been previously possible.

At UAC, we are highly involved with these technologies. We are members of the Decentralized Identity and Verifiable Credentials working groups within W3C. We have gained in-depth knowledge of these technologies and recognise the potential impact to our core business, envisioned sector solutions and ecosystems, have developed proof of concepts and been recognised through national innovation awards for existing production solutions.

However, we recognise that without the appropriate governance, planning and implementation approaches the potential benefits could be limited. To be involved now means that the Australian higher education sector and the Australian Government can help shape the standards that will have significant social impact for many years to come.

6. THE NEED FOR A COMMON APPROACH

One of the general challenges with new technologies is that they can be adopted and applied in different ways, thereby creating siloed systems and environments that are not interoperable. Universities are currently experimenting with issuing micro credentials in multiple formats, using different technologies. They are not universally recognised or understood in a way that is practical for automated admissions or for offering external credit. This severely limits the recognition, exchangeability, value and adoption of short-form credentials.

Another challenge is that local solutions appear before systemic (e.g. national) planning and governance have been considered. Current solutions for Verifiable Credentials allow any entity to join, create credential types and issue them. This poses a serious problem if the entity does not have the authority or is not accredited at a national level to do so.

How do we protect the integrity of the sector? What is the framework to allow an entity to issue a particular credential type? Should an entity be allowed to create a new credential type?

It is clear that these issues call for a national solution, national framework and policy. This issue can't be fragmented. There is nothing to be gained by operating in silos on this issue.

Coordination of policy at a national level will be vital, as the policy will determine the process and solutions that the sector and the broader public use for years. Robust policy will require feedback from important stakeholder groups about its implementation. Good policy should lead to solutions that are able to be implemented, are workable and have a high degree of utility to their stakeholders.

If it is accepted that greater consistency is needed, one question that arises is: what arrangements are already in place that enable the question of consistency to be addressed? Whilst there are numerous sector groups in place to deal with a range of issues, there seems, at first, to be none that would naturally deal with the whole issue of credentials and the evolving interface between the individual, lifelong learning, employment and broader social impact.

7. THE IMPORTANCE OF STANDARDS AND PRINCIPLES

Common standards and principles will be critical to success.

What are the principles on which we may want to base any solutions? Amongst other issues, self-sovereignty, transportability, and the consideration of micro and other credentials need to be addressed.

Should we be thinking about establishing a currency of conversion for credentials across employment, skills, other experience, the AQF and other types of learning? This should not be a currency that requires the predetermination of equivalence between credentials, but rather one that enables institutions and other credentialing organisations to negotiate, determine and apply their own interpretation of equivalence.

What do we need such a credentials platform to take into consideration?

Do we need to comply with any existing standards which may apply internationally, such as alignment with developing global standards in relation to personal information, self-sovereignty and others?

What standards are required in relation to data structure, validation methods, access and others?

We also need agreement around the format of credentials. If there is an agreed common format of credentials then challenges such as credit management become much easier to solve.

8. POTENTIAL SOLUTION

At UAC we have been researching the technology, developed concepts and have the capability to implement solutions for our immediate needs. It is because of this that we understand the potential of this technology, and recognise the broader benefits if we coordinate at a national level with the other TACs, government and all levels of the education sector.

We believe that it is essential to develop a single nationally recognised solution, modelled on the established education governance structure within Australia.

These governance arrangements must be defined and agreed **by** the sector **for** the sector.

A single platform would reap benefits for us all.

We have developed a video of our vision for a potential solution, which shows how our vision would come to life for education institutions and students. The video will be presented at the meeting.

9. BENEFITS OF A CONSISTENT, AT-SCALE SOLUTION FOR VERIFIABLE CREDENTIALS

There are significant benefits to this potential solution in both the adoption of Verifiable Credentials themselves and also in an array of education-related processes.

The benefits of Verifiable Credentials include:

- digital and highly scalable
- efficient and cost effective
- high resistance to forgery
- data theft becomes unusable without identity proof
- high resistance to identity theft
- puts information under the true owner's control
- enables minimum disclosure
- aligns to GDPR requirements.

The benefits for the education sector include:

- efficiencies in enrolment and admissions
- elimination of fraud
- broad efficiencies for students and institutions in administrative services
- efficiencies in a number of administrative corporate services such as asset and IP management
- management of credit and recognition of prior learning
- credentialing
- curriculum design, development and management
- providing a mechanism for lifelong learning.

For education institutions, the value is clear – a single platform from which an array of services can be provided in an efficient, cost-effective, secure and scalable manner, using the latest international technology standards.

10. WHERE TO FROM HERE?

We have thought a lot about this and UAC is developing a credentialing platform for the sector that will allow prospective students to share verified, accredited credentials of all types, including micro-credentials, further streamlining admissions by enabling applications to be submitted faster, processed more quickly with increased effectiveness, and allowing faster times to offer.

UAC and the TACs, long valued for admissions expertise, can help the sector, students and government with innovative technologies on a national scale.

We believe that there currently exists a rare window of opportunity for Australia to be global leaders and do something bold, the benefits of which will be reaped for generations. Our interest in this is as a trusted partner (amongst other trusted partners) to the education sector and government; given that changes such as this could mean radical change for tertiary admissions, UAC is not motivated by self-interest in calling for a solution to these issues.

It is clear that the policy and the solution need to go together to ensure future consistency of credentials and an optimum interface between learning, life and employment.

Any other approach to deal with the impending changes to lifelong learning will result in fragmentation of effort and dilution of systemic impact.

We believe there needs to be more investment of time and resources to drive this forward, with the TACs, sector, government and other trusted partners working together.

A new entity could be established (or an appropriate existing entity used) to consider the issue of credentials and the interface between learning and work at system and policy levels. Such an entity would need to take into account the perspectives of major stakeholders and would guide the development of a sector-wide approach. Potential participants/members could include representatives from TACs, providers and government working together for the long-term benefit of all involved in the education sector.

The technology is already here, and time is of the essence for us to collaborate and ensure that our sector reaps all the benefits it brings.

11. QUESTIONS FOR DISCUSSION

Does this group agree that this needs further consideration, investment of time and resources as a joint sector and government initiative on a national level?

If yes:

- Can we achieve the buy-in of all stakeholders?
- Can we agree on the end goal of that collaboration?
- Can we use an existing entity to drive this forward or should a new entity be established?
- What are the principles on which we may want to base any solutions?
- How do we protect the integrity of the sector?
- What is the framework to allow an entity to issue a particular credential type?
- Is it necessary to consider the exclusion from any governance arrangements those educational institutions that are not accredited by the appropriate body to issue particular credential types?
- Should an entity be allowed to create a new credential type?
- Should we be thinking about establishing a currency of conversion for credentials across employment, skills, other experience, the AQF and other types of learning?
- What do we need such a credentials platform to take into consideration?
- Do we need to comply with any existing standards which may apply internationally, such as alignment with developing global standards in relation to personal information, self-sovereignty and others?
- What standards are required in relation to data structure, validation methods, access and others?

If no:

- How does the group think these issues will evolve in the next 1-5 years?

APPENDIX 1

Type	Description	Example	Advantages	Disadvantages
Paper Credential	Printed paper format	Traditional degree, diploma or qualification	Well understood. Personal ownership and control of physical asset. Sets the minimum standard for alternative solutions	High cost to issue. Can be forged. Requires a registry & high cost manual back to base verification. Cannot be revoked Individual responsible for storing credential
Digital Copy	Scanned copy or photo	Digital upload of paper credential	Low cost, simple to use	Easily forged, duplicated. Requires high cost manual back to base verification. Not suitable for credential issue
Digital Document	Electronic document	Word, PDF or other digital document in standard format	Low cost, simple to use	No security features. Easily forged, duplicated. Not suitable for credential issue
Electronic Signatures	Digital image, symbol, process or sound	Electronic acceptance of contract or record. DocuSign eSignature	Legally enforceable for business and personal transactions. Suitable for agreements between two parties	Medium cost. Requires a third-party service. Not suitable for credential issue
Digital Signatures	Digitally Signed PDF with Public Key Infrastructure (PKI)	Digitary (My eQuals), Parchment, Paradigm, DocuSign	Difficult to forge or tamper. Suitable for credential issue	Medium cost. Requires 3rd party tools to validate. Complex, requires PKI and Certificate Authority (CA). Certificates expire and must be renewed
Open Badges	Open standard for combining information into a portable image file. Web based validation	Credly, Badger, Mozilla	Low to medium cost. Extension of Digital Badges which can incorporate PKI digital signage (additional cost)	Specification does not require digital signage. Most issuers do not sign badges, often used for non-formal learning. Requires 3rd party tools to validate
Blockchain Credentials	Credentials digitally signed on a decentralised ledger	UAC - NSW ATAR (2017+), Blockcerts, Learning Machine	Low cost, secure, Independent, decentralised verification, independent timestamping, do not expire, Personal ownership and control	Complex, not well understood. Individual responsible for holding and storing credential
Verifiable Credentials	Decentralised identities issued to Issuers & Holders. Credentials & ID cryptographically signed on a decentralised ledger	UAC - POC, Hyperledger Indy, Sovrin, Evernym	As previous +, validate issuer identity, validate holder identity, revokable, can share subset or combination of information, self-sovereign identity, No longer require data repository, International standards being developed	Complex, not well understood. Individual responsible for holding and storing credential. The term is often incorrectly associated with the above forms of digital credentials that has a verification process