Digital Transformation of Education Credential Processes and Life Cycles

A Structured Overview on Main Challenges and Research Questions

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About me

• Diploma in Physics at University of Regensburg, Germany
• Dr. europeus by University of Granada, Spain
• Experience in biomedical data analytics, high order statistics
• Main interests:
  • Distributed systems and networks (blockchain, etc)
  • Open science and Open Data
  • Biomedical data analytics
• See my VIVO page: https://vivo.tib.eu/fis/display/n0000-0002-9878-1698
Our Research groups

Scientific Data Management
• Knowledge graphs
• Domain specific ontologies
• Integration of data sources
• Federated query engines
• Tools like SDM-RDFizer, Falcon
• ... and much more

Open Science Lab
• Linked Open Data & research information
• Open Education
• Open Research Data
• Open Science communication
• Self Sovereign Identity & Distributed Identifiers
• ... and much more

https://qualichain-project.eu/
Contents
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2. Challenges in credential management
3. Framework for evaluation
4. Use case
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Motivation
Motivation

Education credentials rule our lives:

• School
• University
• Jobs
• Life long learning

Still mostly in paper, but digital formats are coming.
Question

How can we evaluate credential management solutions for the transformation from paper to digital?
Answer

...We look at the challenges:

• In analogue world
• In analogue to digital transformation
• In digital world
Challenges of paper-based credentials
According to a survey by CareerBuilder.com (one of the largest online job finder sites)

- Resumes and job applications with falsifications: 53%
- Resumes are misleading: 78%
- Resumes with fraudulent degrees: 21%
- Resumes with altered employment dates: 29%
- Resumes with inaccurate job descriptions: 33%

Dependency on Issuer

• Cost of anti-counter feign measures
• Trust based on big institutions
• Manual verification required for peer 2 peer certificates (e.g. letters of reference)
Handling

• Easy with few credentials
• High effort with many (e.g. job application process at HR)

Image by Free-Photos from Pixabay
Data Security

• Paper sensitive to fire, humidity, vermin
• Perfect duplication impossible
• Good knowledge of preservation in archives

Image by Michal Jarmoluk from Pixabay.
Challenges of transition from analogue to digital credentials
Digitisation

- Should retain all important information
- Structured data needed
- Simple scans not enough
Workflows

Needs to handle:
• Paper based credentials
• Digital credentials
Challenges of digital credentials
Private data protection

Person rights from GDPR:

• Information about data processing
• Access to personal data
• Correct and delete wrong data
• Erase old/unlawful data
• Data portability
• Human decision making
Data Security

• Lots Of Copies Keep Stuff Safe
• Physical storage degrades over time
• Frequent re-copying
• Open formats necessary
Data Management

• Digital data needs to be rendered
• Where is the data
• How can I handle the data?

Image by Free-Photos from Pixabay
Data Sovereignty

• Who has power over credential?
• Paper: physical ownership
• Digital: ?

The Economist, 6. Mai 2017
https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data
Evaluation Framework
Method

- Questionnaire
- Cover all challenges
- Qualitative questions on each challenge
- Quantitative questions on specific characteristics of solution
## Example: Data Security

<table>
<thead>
<tr>
<th>Question</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>How is the credential stored in the system?</td>
<td>qualitative</td>
</tr>
<tr>
<td>Is the credential data format public and open?</td>
<td>yes/no</td>
</tr>
<tr>
<td>How many independent copies of the credential are stored in the system at any time?</td>
<td>number</td>
</tr>
<tr>
<td>How is the credential secured against accidental loss or data change?</td>
<td>qualitative</td>
</tr>
<tr>
<td>How is the credential secured against unauthorised, but intentional, loss or change of data?</td>
<td>qualitative</td>
</tr>
</tbody>
</table>

Use Case
QualiChain Pilots

Cross-University Degree Equivalence Verification

Smart Curriculum Design

Staffing the Public Sector

Provision of HR Consulting & Competency Management Services

https://qualichain-project.eu/
Outlook

- Evaluation will start in 2021
- Extended framework submitted to the International Journal On Advances in Intelligent Systems