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MICRO-CREDENTIAL AGGREGATOR PLATFORM: FOR AGGREGATING, VERIFYING, AND MANAGING ONLINE LEARNING CREDENTIALS

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***Abstract*:** Online learning platforms like Coursera, Udemy, and LinkedIn Learning have made it possible for millions of people of the world to finish their courses and get digital certificates. But these credentials often stay on the platforms that give them out, which makes it hard for learners who want to keep track of all their accomplishments and for employers who need to make sure they are real. This paper presents the Micro-Credential Aggregator Platform, an intuitive web-based system enabling users to collect, organize, and disseminate digital certificates from multiple online learning providers in a centralized location. The platform makes sure that users can register and log in safely, makes it easy to upload certificates and their metadata, has a single dashboard for all credentials, and gives employers a link to a public profile that they can share. The system is built with widely used web technologies like HTML, CSS, and JavaScript for the front end and Node.js with a MySQL database for the back end. It is designed to be extensible and user-friendly, making it easy for both institutions and individual users to deploy. The main objective is to solve the problem of scattered online credentials by giving students a one place to keep track of and show their academic and professional achievements

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Keywords: micro-credentials; online certificates; credential aggregator; web application; digital portfolio; certificate management; Node.js; MySQL; skill verification.

I. INTRODUCTION

In the last 10 years, online education has growned a lot. Coursera, Udemy, edX, and LinkedIn Learning are just a few of the platforms that offer thousands of courses on topics like programming, data science, design, and professional communication. When the students finish a course, they get a digital badge or certificate that shows what they learned.

Class Central says that there are more than 4,000 micro-credential programs available on major online platforms right now. In 2025, Coursera added more than 700 new programs. According to a survey by Open LMS, 95% of employers know about micro-credentials, and 60% think they are a good way to tell if someone is ready for a job.

This paper suggests the Micro-Credential Aggregator Platform as a particular answer to this problem. Users can upload certificates from any learning provider, store them all in one place, and send a professional credential profile to potential employers. The system is made to work on any platform and be easy for everyone to use, no matter how tech-savvy they are.

The problem of credential fragmentation is not just an annoyance; it is a structural barrier to fairly recognizing skills in today's job market. Students who spend a lot of time and money on online courses often find that their achievements are not visible to employers who don't

have direct access to each issuing platform. A software developer who has taken courses on Coursera, Udemy, and LinkedIn Learning must keep separate accounts on each of these sites and share multiple URLs when applying for a job. This is a hassle for the applicant and hard for the recruiter to check. This friction makes it less likely that learners will get more certifications and makes micro-credentials less useful as professional signaling tools.

Universities and training providers face analogous challenges at the institutional level. Right now, academic programs that use online learning from other platforms can't put all of a student's grades into one system. Institutional administrators must manually verify and monitor third-party credentials due to the absence of interoperability standards for commercial learning management systems. This takes a long time and is easy to get wrong. The European Commission has noticed this lack of interoperability and has pushed for the creation of unified credentialing frameworks that make it easier for member states to recognize each other's qualifications.

The current credentialing system's architecture has not kept up with the growth of online learning options from a technical point of

view. Most digital certificates come as static PDF files or image files that don't have machine-readable metadata. This makes it almost impossible to check them automatically. Open Badges and Verifiable

Even though this growth has happened, there is still a major structural problem: each certificate is stuck on the platform that gave it out. Figure 1 shows how employers feel, and Figure 2 shows how quickly MOOC-based programs grew from 2019 to 2025

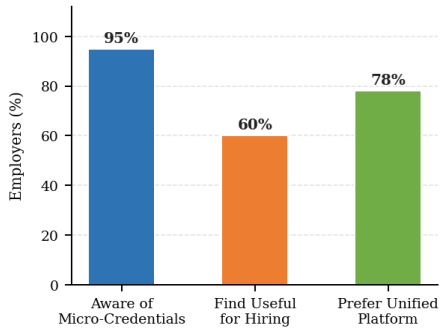

Fig. 1. Employer Attitudes Toward Micro-Credentials (Open LMS, 2025)

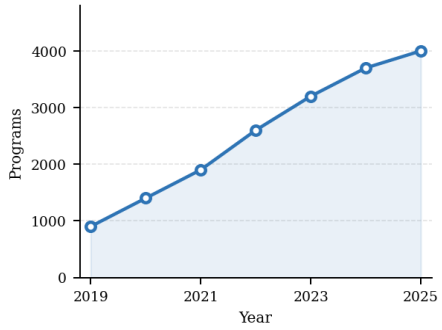

Fig. 2. Growth of MOOC-Based Micro-Credential Programs,

Credentials are new standards that could help with structured credential data, but not all major platforms are using them yet. There isn't a consumer-facing aggregation tool yet that can connect learners with credentials in different formats with employers who need a single, reliable source of truth.

The socio-economic dimension of credential fragmentation necessitates concentrated scrutiny. Drabowicz's research indicates that the learners who would gain the most from micro-credentials are those from low-income backgrounds who opt for online education instead of costly formal qualifications. These are also the students who are hurt the most by the fact that there isn't a unified credentialing system.

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II. PROBLEM STATEMENT

Despite the growing availability of online learning platforms and micro-credentials, no unified system exists for learners to consolidate, manage, and share credentials obtained from multiple sources. This absence presents the following specific challenges:

- Credentials are dispersed across multiple independent platform accounts, with no interoperability between them.
- No unified dashboard exists through which all credentials can be viewed and managed simultaneously.
- Learners lack an effective mechanism to present their accumulated credentials in a structured, professional format.
- Employers have no straightforward means of verifying the authenticity of certificates issued by disparate online platforms.
- No tool exists to track and visualise the progression of a learner's skills across multiple courses and platforms over time.

The Micro-Credential Aggregator Platform is designed to systematically resolve each of these challenges. Figure 4 (Section V) illustrates the contrast between the fragmented model and the proposed unified architecture.

III. RELATED WORK

In the past few years, there has been a lot more research into digital credentialing and managing micro-credentials. Yildirim, Kir, and Bozkurt examined 205 research papers on micro-credentials published until 2025 and identified credential portability and unified management as significant unresolved challenges.

Raj et al. determined that the lack of a centralized credentialing system constitutes the primary obstacle for both learners and employers. The OECD also said that information about online credentials is still broken up and not well documented, making it harder for both policymakers to make decisions and employers to hire people.

Credly and Accredible are two examples of existing platforms that let you issue digital badges. However, these solutions are meant for institutions and don't help individual learners who want to collect certificates from more than one provider. The suggested platform is focused on the learner.

From a technical standpoint, Yadav et al. illustrated that the integration of Node.js, Express.js, and a relational database constitutes an efficient stack for developing a web-based credential system. Shanmughan et al. emphasized the incorporation of AI in micro-credentialing to facilitate personalized learning trajectories.Liyanagunawardena and Williams examined blockchain-based credential verification as a supplementary method, whereas Drabowicz analyzed the socio-economic ramifications of micro-credential adoption throughout Europe.

IV. PROPOSED SYSTEM

The Micro-Credential Aggregator Platform is a web application that enables users to register an account, upload certificates obtained from any learning platform, and record associated metadata including course name, issuing platform, completion date, and skill category. All credentials are consolidated on a personal dashboard, and a shareable public profile URL enables users to present verified achievements to prospective employers.

A. Key Features

- **User Registration and Authentication:** Users register via email-based credentials with cryptographic password hashing.
- **Certificate Upload:** Users upload a PDF or image file with structured metadata (course name, issuing platform, completion date, skill category).
- **Personal Dashboard:** All uploaded certificates are presented in a consolidated view with filtering options.
- **Public Profile Link:** Each user is assigned a unique shareable profile URL accessible by employers.
- **Credential Verification:** A unique verification code is associated with each credential record for employer authentication.

B. System Workflow

- **Step 1:** The user registers for an account and authenticates via the login interface.
- **Step 2:** The user uploads a certificate file and enters the associated credential metadata.
- **Step 3:** The system persists the certificate file and its metadata in the database.
- **Step 4:** The dashboard presents all credentials in a structured, categorized list.
- **Step 5:** The user shares the public profile URL with prospective employers.
- **Step 6:** The recruiter accesses the profile URL and reviews the verified credential list.

V. SYSTEM ARCHITECTURE

The platform follows a standard three-tier architecture comprising a presentation layer, an application logic layer, and a data layer. Figure 3 provides a schematic overview of this architecture, and Figure 4 contrasts the proposed unified model with the current fragmented credential landscape.

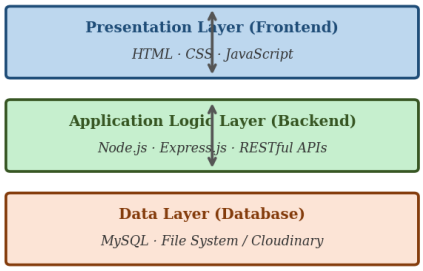

Fig. 3. Three-Tier System Architecture of the Platform

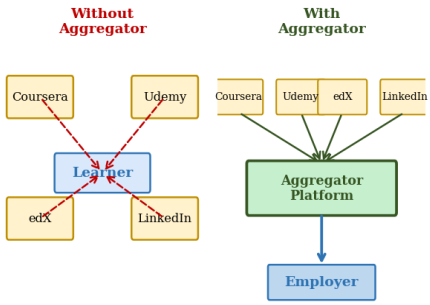

Fig. 4. Fragmented Model vs. Unified Aggregator Platform

- **Presentation Layer (Frontend):** Built with HTML, CSS, and JavaScript, providing dedicated web pages for registration, authentication, the credential dashboard, and the public profile view.
- **Application Logic Layer (Backend):** Built with Node.js and Express.js, responsible for handling user requests, processing business logic, and communicating with the database.
- **Data Layer (Database):** MySQL is used to persist user records and credential metadata. Uploaded certificate files are retained within a designated directory on the hosting server.

TABLE I. TECHNOLOGY STACK

Layer	Technology	Function
Frontend	HTML, CSS, JavaScript	Renders user interface
Backend	Node.js + Express.js	Server-side logic & APIs
Database	MySQL	Persists user & credential data
File Storage	File System / Cloudinary	Stores certificate files
Authentication	Session / JWT	Secure user auth
Version Control	Git & GitHub	Code versioning

VI. METHODOLOGY

The project is developed incrementally following a structured Software Development Life Cycle (SDLC) comprising the phases illustrated in Figure 5.

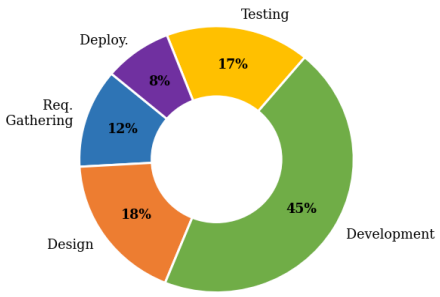

Fig. 5. SDLC Phase Effort Distribution

- **Requirement Gathering:** The problem domain was investigated by analyzing how learners currently manage certificates across platforms and identifying employer needs during recruitment.
- **Design:** Web page layouts (wireframes) were designed for the registration, authentication, dashboard, and profile pages. The relational database schema was defined at this stage.
- **Development:** Frontend pages were developed using HTML, CSS, and JavaScript. The backend logic was implemented in Node.js and Express.js to handle user registration, certificate upload, and data retrieval via RESTful API endpoints.
- **Testing:** Each module was tested independently through unit testing, followed by integrated system testing to verify end-to-end functionality.
- **Deployment:** The application is deployed on a cloud hosting platform and is accessible through any standard web browser without local installation.

VII. DATABASE DESIGN

The database schema comprises two primary tables responsible for retaining all user and credential data:

- **Users Table:** Stores user ID, name, email, password (hashed), and profile URL.
- **Credentials Table:** Stores credential ID, user ID (foreign key), course name, issuing platform, completion date, skill category, file storage path, and a unique verification code.

The two tables are related via a foreign key constraint on the user ID field, establishing a one-to-many relationship. Table II summarises the full schema.

TABLE II. DATABASE SCHEMA SUMMARY

Table	Field	Description
Users	user_id (PK)	Unique integer primary key
Users	name, email	Display name and login email
Users	password_hash	Bcrypt-hashed password
Users	profile_url	Unique public-facing URL
Creds.	credential_id (PK)	Unique credential identifier
Creds.	user_id (FK)	References Users (one-to-many)
Creds.	course_name, platform	Course title and issuer
Creds.	completion_date	Date course was completed
Creds.	skill_category	Skill domain (e.g., Programming)
Creds.	file_path	Path to uploaded certificate
Creds.	verification_code	Unique employer auth code

VIII. TESTING

The following testing strategies are applied to ensure the correctness, reliability, and security of the platform:

- **Unit Testing:** Each system module (user registration, authentication, certificate upload, and dashboard rendering) is tested independently to validate its individual functionality.
- **Integration Testing:** All modules are tested in combination to validate end-to-end system behaviour and inter-component communication.
- **User Testing:** A representative group of participants evaluated the platform and provided feedback that informed subsequent iterative design refinements.
- **Security Testing:** Verification was performed to confirm that passwords are stored as cryptographic hashes, file uploads are restricted to PDF and image formats, and role-based access controls ensure that each user can access only their own credential data.

IX. EXPECTED RESULTS

Upon successful implementation and validation of the platform, the following outcomes are anticipated:

- A fully operational web application enabling user registration, certificate upload, and access to a consolidated personal credential dashboard.
- A unique public profile URL for each user, accessible by employers to review the user's verified credential portfolio.
- All credential records stored securely in the database and accessible at any time from any internet-connected device.
- A measurable reduction in the time and effort required by learners to compile and present credential evidence during job applications.
- An intuitive user interface that requires no prior technical expertise for operation.

Future enhancements may include AI-driven skill gap analysis and course recommendations, as well as integration with professional networking platforms such as LinkedIn [8]. Blockchain-based immutable credential records are also envisaged as a long-term enhancement [9].

X. CONCLUSION

This paper has presented the Micro-Credential Aggregator Platform, a practical web-based system designed to address the documented challenge of fragmented online credentials. In contrast to the prevailing model in which credentials are dispersed across multiple independent platforms, the proposed system enables learners to consolidate all credentials within a single repository and present them to prospective employers via a verified public profile.

The platform is implemented using widely adopted web technologies, including HTML, CSS, JavaScript, Node.js, and MySQL, ensuring long-term maintainability and the capacity for incremental extension. Grounded in findings from recent literature, the platform offers a learner-centric solution of value to learners pursuing professional recognition and to employers requiring efficient, reliable credential verification.

As online learning continues to expand globally, platforms of this nature will become increasingly indispensable in supporting the formal recognition of competencies acquired by learners outside of traditional educational pathways. The graphical analyses presented herein (Figs. 1–5) corroborate the urgency and relevance of this work.

XI. ACKNOWLEDGMENT

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