


وزارة التعليم العالي
والبحث العلمي والابتكار

الجامعة الوطنية
National University
Science & Technology للعلوم والتكنولوجيا

# المؤتمر الواحد و الأربعون للمنظمة العربية

## للمسؤولين عن القبول والتسجيل في الجامعات بالدول العربية

بعنوان: دور الذكاء الاصطناعي في تعزيز عمليات القبول والتسجيل

تحت رعاية

**معالي الأستاذة الدكتورة/ رحمة بنت إبراهيم المحروقية**

وزيرة التعليم العالي والبحث العلمي والابتكار

خلال الفترة من 15 الى 18 ديسمبر 2024

# Revolutionizing Transcript Authentication Using Blockchain Technology: A Novel Trusted Transcript Management System

Dr.Mamoon AlDmour
University of Jordan
Amman, Jordan

# Introduction to the Problem

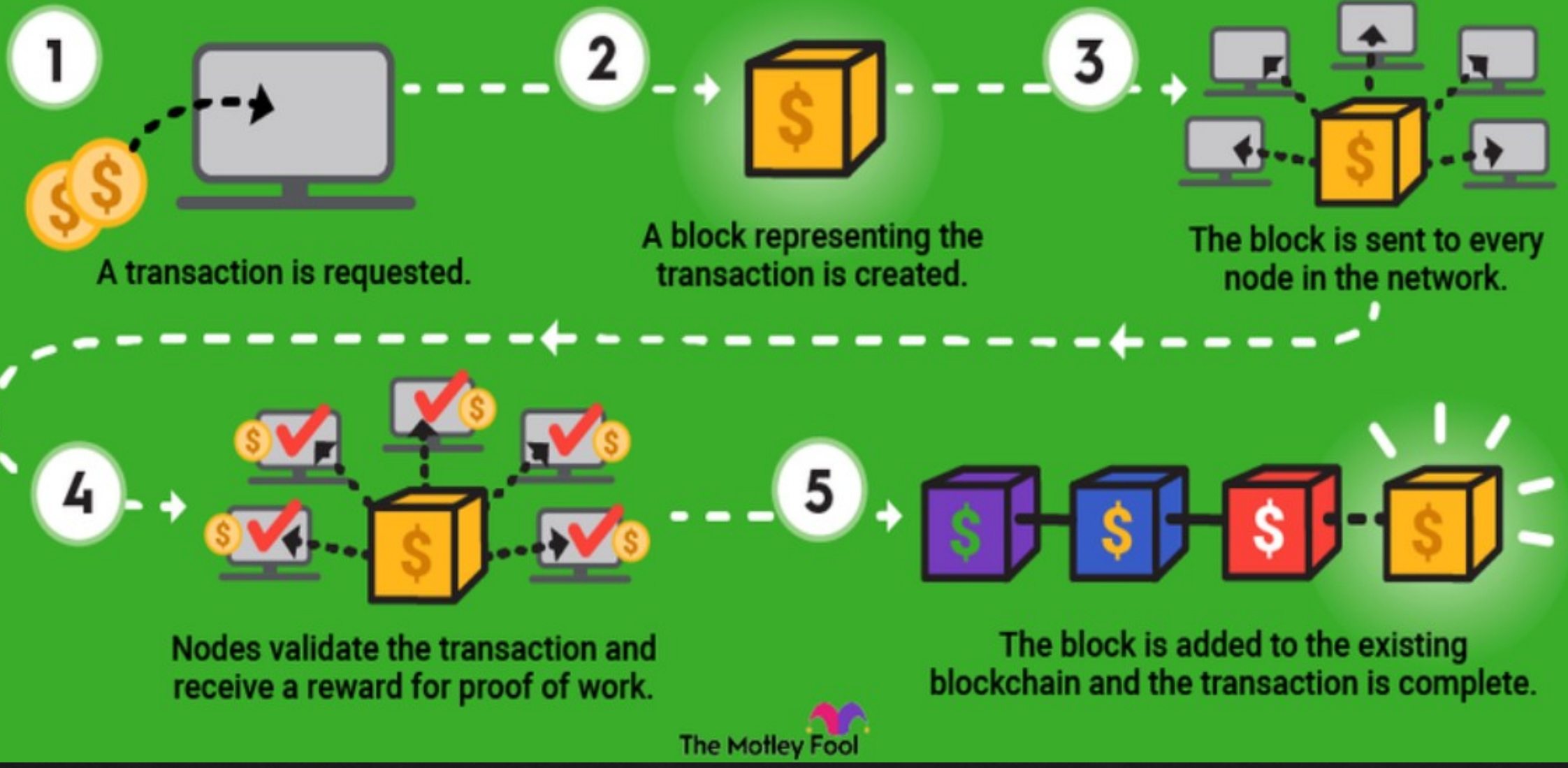
- Challenges in current transcript authentication:
  - Fraudulent credentials
  - Manual verification inefficiencies
  - High costs of third-party verification
  - Need for a tamper-proof, efficient system.

- Objective of the presentation: Introducing Blockchain as the solution.

# What is Blockchain?

- Definition: A decentralized, immutable, and distributed ledger.
  - Key features relevant to authentication:
  - Immutability: Prevents tampering.
  - Decentralization: Eliminates reliance on intermediaries.
  - Transparency and Security: Public verification with privacy safeguards.

# HOW BLOCKCHAIN WORKS

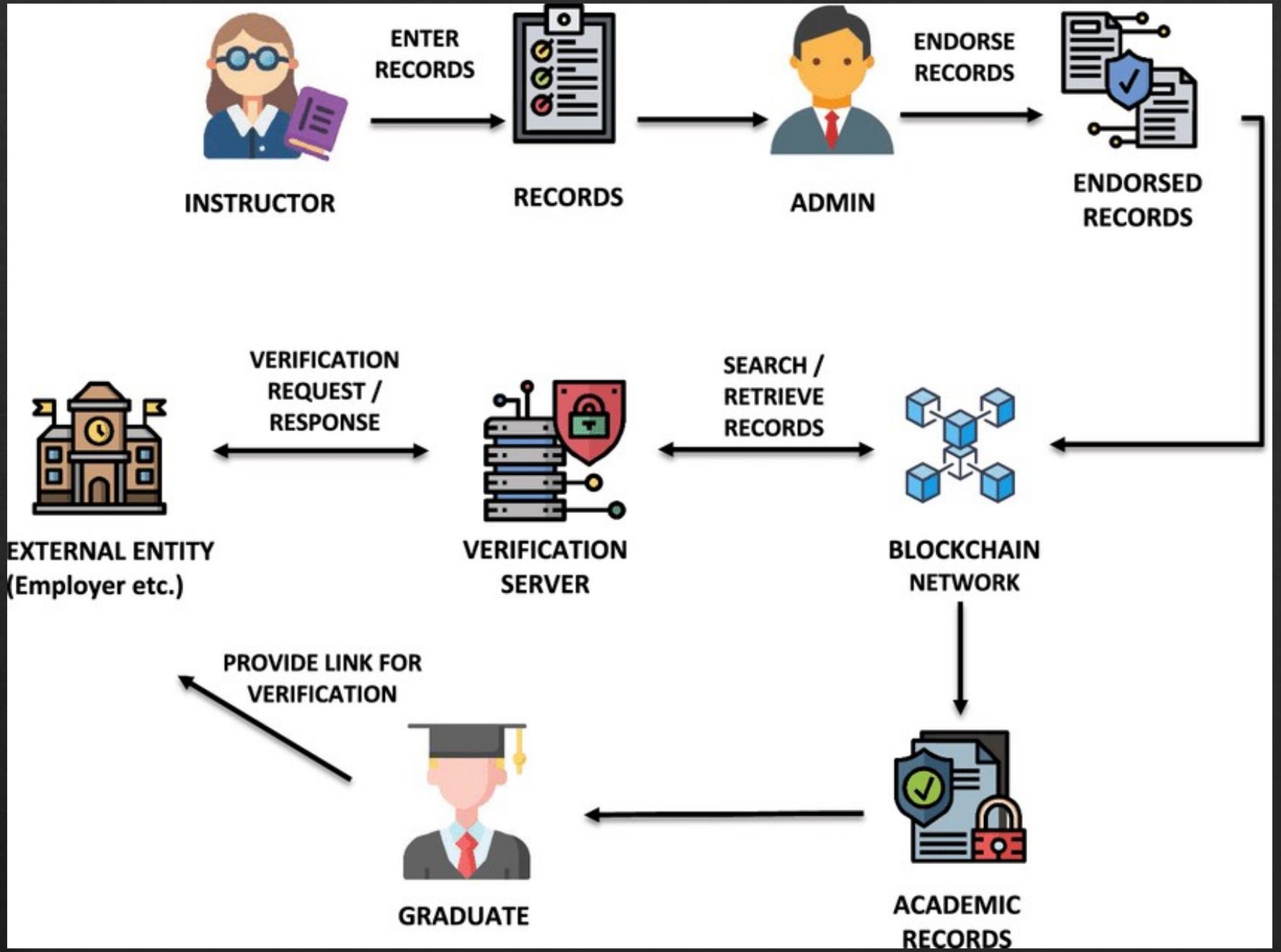



The Motley Fool

# The Trusted Transcript Management System (TTMS)

- Overview of the system:
  - Using Blockchain for transcript issuance, storage, and verification.
  - Integration with cryptographic hashing and smart contracts

- Key benefits:
  - Fraud prevention.
  - Instant verification.
  - Privacy-focused decentralization.


INSTRUCTOR
ENTER RECORDS
RECORDS
ADMIN
ENDORSE RECORDS
ENDORSED RECORDS
EXTERNAL ENTITY (Employer etc.)
VERIFICATION REQUEST / RESPONSE
VERIFICATION SERVER
SEARCH / RETRIEVE RECORDS
BLOCKCHAIN NETWORK
ACADEMIC RECORDS
GRADUATE
PROVIDE LINK FOR VERIFICATION

# Step-by-Step Development of the System

- Phase 1: System Design and Requirements.
- Phase 2: Blockchain Network Selection and Smart Contract Development.
- Phase 3: Decentralized Data Storage.
- Phase 4: Transcript Issuance and

# Blockchain in Transcript Authentication

- How it works:
  - Transcript hashing.
  - Storing hashes on Blockchain.
  - Smart contracts for automation.
  - Decentralized verification process.
- Example of a verification workflow (e.g., scanning a QR code).

# 1. Transcript Issuance

This step involves the university securely issuing a transcript and leveraging blockchain for tamper-proof record storage. Below are the full details of how this process unfolds:

### 1.1. Uploading the Transcript

- The university's **trusted administrator** logs into the system via a secure portal.
- The transcript is uploaded in **PDF** or another standard format to the system.
- Metadata associated with the transcript (e.g., student ID, course completion date, GPA, issuance date) is also entered into the system.
- **Role-based access control** ensures that only authorized university personnel can perform this operation.

### 1.2. Cryptographic Hash Generation

- Once the transcript is uploaded, the system applies a **cryptographic hash algorithm** (e.g., SHA-256 or SHA-3) to the transcript.
- A hash function generates a **unique digital fingerprint** of the transcript.
    - Example:
        - Input: Transcript of "John Doe"
        - Hash: `3e23e8160039594a33894f6564e1b134f3d6ecb7b1c64ad996a7b354e3b004c9`
- The hash ensures data **integrity**—if even a single character of the transcript is modified, the hash will completely change.
- The actual transcript document is **not stored on the blockchain**, maintaining privacy while using the hash as the unique identifier.

### 1.3. Storing the Hash on Blockchain

- The generated hash, along with essential metadata, is **stored as a transaction on the blockchain**.
- Metadata typically includes:
  - Student ID or encrypted pseudonym.
  - University ID or issuer information.
  - Timestamp of issuance.
  - Program or degree ID (e.g., Bachelor of Science in Computer Science).
- The transaction is broadcast to the **blockchain network**, where it is validated by network nodes and added to a block.
- Immutability: Once stored, this data cannot be altered or deleted, ensuring the authenticity of the transcript forever.

### 1.4. Student's QR Code or Unique Hash ID

- After the blockchain transaction is confirmed, the system generates a **QR code** or a **unique transaction ID** linked to the blockchain record.
    - QR Code: Encodes the transaction hash and metadata for easy sharing and verification.
    - Transaction ID: A shorter alphanumeric reference to the blockchain transaction for manual entry.
- The QR code or transaction ID is sent to the student via:
    - Email.
    - University's secure student portal.
    - Digital wallet app integrated with the blockchain system.

### 2.3. Recalculating the Transcript Hash (Optional)

- To further validate the authenticity of the provided transcript, the verifier can upload the transcript they received from the student.
- The system generates a new cryptographic hash of the uploaded document and compares it with the hash stored on the blockchain.
- If the hashes match:
  - The transcript is verified as **authentic**.
- If the hashes do not match:
  - The transcript is deemed **tampered with** or **invalid**.

# Conclusion and Future Directions

- Summary:
  - Blockchain as a game-changer for transcript authentication.
  - TTMS ensures trust, transparency, and efficiency.
- Future Directions:
  - Wider adoption across universities globally.
  - Integration with other credential systems (e.g., diplomas, certifications).
  - Potential challenges: cost, adoption rate, and scalability.

- Call-to-Action: Encouraging universities to adopt blockchain for a trusted academic ecosystem.

# Thank You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