

A NATIONAL ACADEMIC DEPOSITORY

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Abstract:

The National Academic Depository of India is a crystallized vision. The depository was conceptualized to digitalize academic awards offered by educational institutions at one place. The depository can eliminate the need to store awards in physical form. It can verify the awards issued by different organizations to different individuals. The secure digital depository is a good remedy to fake and forged certificates. The concept of academic depository is very similar to the concept of financial securities. The concept of depository was tried out with the help of academic awards of one examination body in India. The pilot was completed successfully. In order to become fully functional, the depository has to overcome a few challenges with respect to academic diversities in terms of duration of courses and equivalence. The Legislation on academic depository is being drafted to take care of these challenges. Besides that, the NAD is begetting with many other new kinds of uses and possibilities. The NAD may open up new roles for the educational institutions as well such as to prepare reports for teachers from examination data on teaching learning gaps rather than just labeling students. Academic Depository is a pioneering effort of its kind in the world.

Key Words: Academic depository, Dematerialization of academic credentials, Smart card of qualifications, E-verification of degrees and certificates,

Introduction

Evaluation is integral to education so is certification to evaluation. The practice of awarding degrees and mark sheets on unique water mark paper is an age old tradition. The 'award' on a unique paper, style, color and size is the mark of the pride for an institution. Similarly, the preservation and accumulation of various awards is the pride of an individual. Both individual and institution preserve the data on qualifications for different reasons. However preservation is a challenge for both. The awards are used by the employers as indicator of quality of the manpower being hired. The employer also verifies these awards.

The idea of establishing a National Academic Depository (NAD) or Repository is a novel and unique concept to cover existing needs of these three stake holders. Besides that, the NAD is begetting with many other new kinds of uses and possibilities.

Academic Awards and Issues

Preservation: At individual level, these credentials are preserved in files and folders with the help of lamination type techniques in physical form. There are innumerable instances when insects, mice, fire, water and misplacement of certificates has created difficult situation. In such circumstances, the individual goes back to each of the awarding institution for issuance of duplicate certificate. Besides that, an individual has to produce copy of these certificates throughout his/her career which may span to four or more decades.

At the institution level, storing of data on qualifications is a marathon task. At CBSE, as per data storage policy, the data is stored for thirty long years. However, being a school board, CBSE certificates are also used for verification of date of birth of the individual. This may be required in some cases right upto the time of retirement of an individual. This would obviously mean that the policy of maintaining the records for a period of 30 years may not be sufficient.

Theft: At the institutions level, security measures are observed for security of blank certificates, printing of certificates and result dossiers. The digital data is securely held in password protected CDs in the custody of a senior official. In case of theft of a certificate, the authenticity is

verified from the stored data. If a data is manipulated it is verified from the backup data records maintained at different locations at the time of result preparation. The paper theft of certificates is protected by the institution by selecting secure printer and by using security marks at different places. The security marks are placed at 9-14 places. If the complaint is with respect to forged certificate, it is verified from the unique security marks used by the individual institutions. With these measures, the problem of theft of data or certificate is rare at the institutional level. It has been reported only twice in last twenty years at CBSE.

Forgery: The forgery is most common problem. The employer is not able to differentiate the original from the forged certificate as there are hundreds of awarding institutions in a country and thousands in the world. Taking advantage of the difficult scenario, many forged degrees get through the system without being detected. For a department dealing with sensitive issues, verification of degrees of the prospective employees is a huge task. The racket of forged certificates also includes getting duplicate issued from the awarding institution and letting it used by the person having same name.

Touts: The awarding institution has to maintain a full fledged branch or section for the verification and issuance of duplicate copy of awards. The processes are cumbersome and time consuming for the individual. At one hand, the stringent steps and documents required to establish genuineness of the records is annoying for the genuine individual. On the other hand, laxity in rules and processes allows issue of duplicate certificate to fake individuals. Taking advantage of the needs, fragility of records, and complex processes, middle men also start operating.

Number of records: The number of records is another issue. As per the press release, 1179182 students appeared in class Xth in the year 2012 in the CBSE. The Storage of their data for fifty long years till their retirement is a huge task. The CBSE maintains one office at Ajmer for storing and verification alone.

As per the study conducted by Council of Boards of Secondary Education (COBSE), the total enrollment in the year 2011 in all school leaving exam is approximately 7.5 million in India. As per the target of the country, approximately 3 million students would enter in different courses in tertiary level courses for another 3-5 years. The multiplicity of records and tracking it individual wise is a mammoth task.

Tracking individual: The mechanism of linking of various academic records of an individual is not available as on date. If an individual has passed two examinations from the same examination body, the identity of the individual cannot be ascertained. Because the identification key is the roll number issued to an individual for a particular exam. The roll number varies from exam to exam even though exam may be conducted by the same examining body. The linking of academic records of different examining bodies is still farfetched but desirable. Under the circumstances it is recorded at individual level only. The resume is prepared by individual only.

Qualification resume: There is no way to determine how many individuals are available on a particular date having combination of two or more required qualifications except advertising in a city, state or country. If an organization/ government want to know how many individuals are available below forty years having legal and commerce degree, it cannot be find out. Thus collating desired information from the plethora of people is almost impossible.

Quality improvement: At present educational institutions are performing the function of judging and labeling students through exams. The examination data is not being used to provide feedback to teachers, school and colleges to inform about gaps in learning and teaching. Performance of the students on 'items of assessment' is not being prepared. The academic awards are not serving the purpose of systematic 'systemic' improvement.

The National Academic Depository Concept

The depository of academic credentials is conceptualized as a befitting solution to the problems faced by individuals, employers and awarding institutions. It would store multiple qualifications earned by an individual from multiple institutions. The academic depository would be a recurring store of the qualifications earned by an Individual from school to college level, pre to in service level at one place. It would also facilitate an individual to accumulate, preserve and list all his

/her qualifications at one place. A smart card of qualifications can also help the individual to present his credentials with just a swipe.

Some universities and some of the school boards in India keep their records in electronic form. It is a recent but growing phenomenon. Similarly the practice of online verification is still rare. In India It is made available by Central Board of Secondary Education (CBSE) since 2004 and by University Grants Commission (UGC) of National Eligibility Test (NET) since 2006. Many more educational institutions are in the offing to follow the practice. The depository is conceptualized to store academic awards of all the institutions at one place. It will facilitate the employers to verify the credentials of the potential candidates from one source itself.

The depository would store the data in electronic format. It would curtail the problem of physical storage and mutilation of awards caused by environmental vagaries. The depository would verify and issue duplicate of academic awards itself curtailing the work load of academic institutions.

The depository can generate reports of academic awards individual wise, institution wise and subject wise. The reports could be generated by any variable for better manpower planning of the country.

In addition, the depository may also specify the level of qualifications as per the education qualification framework of the country. If accreditation framework for all the programs gets established in the country, the depository may also certify the quality of awarding institutions at the time of award.

The need for depository is magnified in the present context of skill development, Information Technology and demand to update oneself continuously. The National Vocational Educational Qualification Framework (NVEQF) proposes to draw parity between academic vs professional, and pre vs in - service qualifications offered by different recognized institutions.

The frequency of earning academic awards has also increased due to IT enabled education platforms. A generation back, a person used to work for three or more decades based on qualification once earned during his adolescent years. Today job demands earning academic credentials intermittently say every five years. Today an individual can earn recognized qualifications all through his/her life through formal or informal mode of education-

Mechanism

At the conceptual stage of the academic depository, the parallel could only be drawn with financial securities or with the digitalization of land/building record repositories where certificates are scanned, digitalized and retrieved with the help of document management systems (DMS). The financial securities trade with money. The Land and building repository deals with land/plot as a unit and national academic depository is to deal with degrees. The academic depository falls in the middle of continuum with respect to standardization of its units.

The money has a standard unit. Because of this 'standard' the money can be added and accumulated. The financial security system or dematisation of shares could build itself upon the edifice of very well laid out banking system. The Information technology added speed and accuracy wherein regulatory framework secured it against theft.

The Land/building repositories are not having standardized process of converting unit into value. The land/plot repository deals with each plot as a unit. These units are stand alone units. The unit is not transposable by itself. The process of conversion of plots into value is arbitrary. Therefore the requirement of this repository was to protect, retrieve, verify and store the documents alone. The DMS provided the solution. This was a rudimentary model for the requirement of the academic depository.

The Academic depository has academic credentials in the form of certificates which can be added but the units are not as sophisticated as money. At the same time, requirements is much more than property records where scanning alone of the certificate can not suffice the purpose. The process of accumulation and value of academic records is neither arbitrary nor standardized but is very close to a standard.

Therefore the academic depository was conceptualized on the model of dematisation of shares. In a financial depository, shares are held in electronic form. A demat account of an individual is like a portfolio which gives an account of number and value of shares owned by an individual of

different companies. The regulatory body of market i.e. Securities and Exchange Board of India (SEBI) has mandated that all trading has to be in electronic form. The regulations are formulated for trading processes and registration of agents.

On the similar lines, it was conceptualized to formulate a law on academic depository that would help establish and protect such a system in the country. The law can mandate organizations as well as processes of the depository. As per available information, such a depository of academic qualifications does not exist in any country.

For the first time Ministry of Human Resource Development (MHRD) of India floated an Expression of Interest for establishing a depository of academic credentials. Many interested parties responded in response to the EOI. The data security is of paramount importance for academic depository. Therefore it was decided to engage only government financial depositories (there are two in India) which are registered with Securities and Exchange Board of India (SEBI). These are National Securities Depository Ltd (NSDL) and Central Depository Securities Ltd.(CDSL). No other organization was issued asked to participate.

The Pilot study on NAD

Meanwhile, the MHRD instructed Central Board of Secondary Education (CBSE) to carry out a pilot project with both the agencies to test the concept. The pilot study would also help in the preparation of the legislation. The CBSE assigned the task to NSDL and CDSL with the following mandate:

1. Provide access to CBSE to the database of the depository.
2. Facilitate CBSE to efficiently upload, in the database, the academic qualifications awarded by it.
3. Train CBSE in the process of lodging and retrieval of records of academic qualifications from the database.
4. Provide efficient online verification of any specific academic qualification stored in the database, if required.
5. Verify and authenticate any specific academic qualification in the database when so requested by any person.
6. Provide an authenticated copy of contents of any specific academic qualification in the database when so requested by any person.
7. Maintain the authenticity, integrity and confidentiality of the database.
8. Ensure that the national database is, at all times, accessible online to authorized person.
9. Inter operability mechanism
10. Any other function which depository wants to demonstrate in their solution.

The pilot project was conducted with the results of the class XII and the Central Teacher Eligibility Test (CTET) conducted by the Board. The number of awards used in the pilot study is given in the following table:

Academic Award	Number of awards
Senior School Certificate Examination 2011	7,70,042
Central Teacher Eligibility Test 2011	7,94,079
Total Number of records	15,64,121

The CBSE issued a circular dt. Oct.11th 2011 to all the school principals to use the facility of online verification lodged with two depositories and to provide feedback. The data was available for three months. The viewership details are as follows:

Particulars	Count
People visited NAD site	781
Users registered	279
Number of Verifications done	118

The pilot on depository demonstrated the following seven features:

Registration:

The access to data was available to only authenticated users. The users were required to register with NAD. An online registration form was available to the users for registration purpose.

Uploading of academic awards by registered academic institutions (Boards / Universities)

The CBSE could upload the details of its academic awards to NAD. The NAD specified the file format in which the data files were to be prepared. A provision was also available to forward the academic awards data in a portable media to NAD for further uploading.

Verification of awards

Registered users with NAD had the facility to verify the academic awards lodged in the database.

Mapping of Academic Awards

Certificate holders who got registered with NAD had the facility of mapping their academic awards available in the system to their NAD account by submitting a request to NAD agent. Once the awards are mapped, certificate holder was able to view his awards under a single view in his login.

Authentication Certificate /Mark Sheet request by certificate holder:

Registered certificate holder requested NAD to issue authentication certificate / mark sheet. Facility to email/courier Authentication certificate / mark sheet as per the request of the certificate holder was also available.

MIS Reports for academic institutions

Facility to generate reports was available to academic institutions such as state wise, status wise (pass/fail) number of records etc. This facility is of immense use to educational planners. The report on number of verifications done by other users on the academic awards issued by them was also available.

User Management:

User management allowed entities like boards / universities etc. to create and manage their own operational users. The administrator of entities created by NAD had the following features

- Create Operational users,
- Assign user rights to operational users,
- Modify details of operational users,
- Reset/Change password of operational users in case of forgot password.

The Logistic features: The hardware of the pilot was classical three tier architecture hosted on open system platform comprising Web server, Application server, database servers and SAN storage. This architecture was used because it helps segregation of presentation layer (user Interface), Business logic (application) and database hosting. The modular implementation improved maintainability and allowed for scaling up of any layer independent of the other layers. Further, separating these layers in independent network enhanced the security. A few distinct features were:

- A strict adherence to J2EE standards so that a migration to any middleware was feasible without major re-writing efforts. The software was thus truly platform or product agnostic and portable.
- 128 bit URL authentication SSL certificate from a recognized Certifying Authority for the Authentication of the NAD site to the user and enable encryption of data transferred over the network.
- A clearly defined standard file-format for academic award file preparation.

- The academic record could be submitted in a clean text ASCII format facilitating convenience in preparation for the various types of academic institutes who use wide-ranging technology and database platforms. These files were fixed record length with pre-defined character as delimiter thus reduces the File size and for efficient transfer of data over the network.
- A Platform independent file validation utility for the academic institutes to verify whether the files prepared by them were as per the prescribed file format.
- file validation utility to ensure that the data was not tampered after it is passed through the utility and before it is uploaded in NAD system.
- A web-based facility for direct uploading of academic record files with digital signature;
- A provision to send digitally signed electronic copy of academic award to the specified email addresses.

NAD System was accessible to all users over Internet. To ensure security several measures were taken which included:

- Two sets of firewall of different make each having hot standby redundancy.
- Intrusion detection system (IDS).
- Access for users from CUG as well as Internet was restricted to only web servers located in demilitarized zone. Application and database servers were located in secure zone and access was permitted through firewall to only known IPs of NSDL Group internal infrastructure.
- To ensure highest level of security, access to the DB Server was permitted only through application server. The web servers (where user request from public network was terminated) did not have any direct access to database servers.
- OS of servers had been hardened to ensure that only required services and ports were activated.
- Only authorized users were allowed to access the system.
- The system used both password as well as Digital Signature Certificate (DSC) based authentication mechanism. The high end users such as Academic Institutes and NAD Agents can access the system using only DSC based login.

Software development tools, operating stems and hardware used

- The NAD system was J2EEE compliant with major development being done in Java. File Validation utility which was freely downloadable was developed using c++ and Java.
 - Web servers were configured on Red hat Linux Enterprise version as an OS and Apache Web server. The JBoss was used for application server and PostGres as RDBMS.
 - The entire set up was configured on Intel platform.
- The pilot was successful with both the agencies. The feedback of the Pilot was given to the MHRD as an input to the draft Bill on National Academic Depository.

The national Academic depository bill

The Bill proposes to make it mandatory for all the academic institutions to upload data in the depository. It also provides for safeguards for security of storage, access, retrieval of records. It has added a few more functions such as issuance of duplicate certificate by the depository. There would be more authorized institutions other than academic institutions to act as agent on behalf of depository. There would be stringent punishments if data is tampered with.

The bill is silent about cost recovery method by depositories. During the various discussions with NSDL and CDSL, it was suggested that service should be free for students and academic institutions. The charges should be levied on employers and others who may use the service for verification purposes. The depositories would work on Build, Own and Operate (BOO) model.

The challenges for the NAD

The NAD has a few challenges to overcome before it can provide meaningful service. The first challenge is of number of accounts. Ideally every student graduating from K-12 level should have

an account in the depository. In the present scenario where elementary and secondary education is going to be made compulsory, the number of students graduating from the k-12 level is going to be more than ten million. At present, student has different roll numbers for different exams at one hand and on other hand there are more than thirty boards and five hundred universities in the formal education system alone. The number of institutions awarding degrees through informal and in-service education is much more than formal system. Unlike the financial securities, wherein an account holder is identified by the PAN number, there is no mechanism to identify an account holder in the academic depository to map the academic credentials. It is desirable that Academic depository should take cognizance of UID/ Aadhar/ for opening of new account. The educational institutions have not yet started following the practice of using Aadhar for enrollment purpose. A policy directive may help build this practice.

The second challenge is number of institutions in the country. The knowledge Commission has recommended opening of three thousand universities as against existing four hundred. The vocational mission recommends opening of one lakh vocational centers in the country during twelfth plan period. All the institutions eventually need to get registered with the depository. The IT may provide the solution. There could be possibility of inter and intra operability of different depositories located at two or more locations.

The third challenge is of equivalence of qualifications. At present pre service qualifications offered by recognized school Boards and Universities are having a mechanism to establish equivalence of degrees/awards. At present formal education system is also going through a change. It is changing from annual exams to credit based system. The credits would help in standardization of academic units. These units can be added and accumulated. Another paradigm shift is taking place from concept based curriculum to competency based curriculum to define a level of education. It is evolving. The clarity on its framework is prerequisite for the depository.

Besides formal education, there are many training programs offered outside the formal education system by the organizations for their respective employees. These are recognized by the employers for the purpose of employment but are out of the ambit of recognized qualification framework. The academic depository would pose big challenge before the educational planners to decide on equivalence of awards offered by informal and in- service education providers. Leaving these qualifications out of the ambit of the depository would make it truncated.

The fourth challenge is of security of data. The financial securities have faced IPO scam in spite of many safety measures. The system lacked restrictive mechanism to check an individual from opening multiple accounts. The academic depository is also vulnerable on account of determination of identity of the student as of today.

Conclusion

There are many challenges related to hard ware, software, logistics, security and acceptance of depository by the students and academic institutions. It needs collaborative efforts of IT, education, planning, legal and media professionals. Though at present, the depository may fulfill only part of the objectives It should not deter us from taking this further. The depository may go alongside with academic institutions to begin with. Both may be storing the data for a few years till the time, the depository becomes full proof solution. If planned meticulously and established successfully, the NAD of India would prove to be beneficial for storing, retrieving, verifying the degrees and information system for planners. The data would help in manpower planning of the country. It may open up new vistas for quality enhancement in teaching and learning by reducing mundane work load on educational institutions. The educational institutions may take up other more important tasks such as analysis of quality of test items, preparation of performance on items and feedback report to teachers, schools and colleges. It would help in serving the main objective of evaluation by enhancing quality of teaching and learning. It would also show the path to other countries to follow the initiative.

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