

Role of Information and Communication Technology (ICT) in a Good Examination System

Sajjad Akbar*, Abdul Quddus Qureshi

Foundation University, Islamabad, Pakistan

*Corresponding author: col_sajjad_akbar.ce@fui.edu.pk

Abstract This paper presents the growing role of examinations in improving the quality of education by embracing the integrated automated exam system for providing the robust, transparent, accurate and authenticated outputs. This automated exam system through ICT will bring substantial quality improvement in education. A part from implementing ICT quality, problem in exam has also been discussed. ICT will make exam system more efficient and transparent account. This will produce competent human resources, which will contribute to the development of the country.

Keywords: ICT, quality of exam, accuracy

Cite This Article: Sajjad Akbar, and Abdul Quddus Qureshi, "Role of Information and Communication Technology (ICT) in a Good Examination System." *American Journal of Educational Research*, vol. 3, no. 11 (2015): 1438-1443. doi: 10.12691/education-3-11-14.

enrolment have increased to 111,75.87 in 2014 in the HEIs.

1. Introduction

ICT plays an important, valuable and critical resource university. ICT usage has become very common but its full potential is yet to be discovered. It is a helpful tool for creating good governance in the working of any organization. Developing countries have now understood the importance of ICT and have started adapting to it as a basic tool for good governance. The ICT mediated governance is also known as "e-governance". In Pakistan at large, University examination systems are managed manually. The manual examination system faces problems of accuracy and cause delay in timely results' declaration. ICT in shape of Campus Management System (CMS) is an effective tool for integrating and automating the activities of examination system to bring reliable, efficient, transparent and robust e-governance solutions for universities.

2. ICT in Examination System

In Pakistan HEIs (Higher Education Institutions) there has been increase in its institutional capacity since independence. The numbers of universities in Pakistan have increased from 2 in 1950 to 1634 by the end of 2014 and colleges from 500 in 1950 to 20,677 in 2008. Students

3. Number of Universities/Degree Awarding Institutions (Dais) In Pakistan

There were only two universities at the time of creation of Pakistan namely Punjab University at Lahore and Sind University at Jamshoroo. Province wise numbers of Universities/DAI are given in Table 1 and enrolment is shown in Table 2.

Table 1. Number of Public and private sector Universities/DAI by region as on 31.12.14

Region	Public	Private	Total
Punjab	20	22	44
Sind	17	30	47
KPK	19	10	29
Baluchistan	6	2	8
Federal Areas	24	6	30
AJK	4	2	6
GilgitBaltistan(GB)	1	0	1
Total	91	72	163

Table 2. Enrolment at Universities/DAI + Constituent Colleges by Area and Sector during 2012-13

Sector	Distance Learning	Federal Areas	AJK	Baluchistan	G.B	KPK	Punjab	Sind	Total
Public	474510	101433	7778	17297	2506	64322	184174	88794	940814
Private	-	14634	2077	1447		26894	75967	55754	176773
Total	474510	116067	9855	18744	2506	91216	260141	144548	1117587

Still the fact remains that the Gross Enrolment Ratio (GER) in Pakistan is quite low compared to that of the

developed countries world average GER is more than 55%. Pakistan government aims to enhance GER concerted

effects. Pakistan higher education system is progressing but still behind even the developing countries however students' enrolments at university and at collegiate level are increasing sequentially.

The management of examination data of students is a very tiresome and a complex task involving different kinds of basic data. According to Sofield [7], many developing countries have not taken up ICT to the fullest possible extent as a means of reaching increased socio-economic development.

HEIs are also increasingly recognizing the importance of adopting the CMS to bring reforms in universities examination. CMS is a computing and communication artifact which is a rapidly advancing technology. ICT has provided means for faster and effective communication, efficient storage, retrieval and processing of data and exchange/utilization of information to its users. ICT has the potential to provide reliable and quick services to the people interaction with enterprises, communication and exchange of information between different agencies of the government in a speedy, convenient, efficient manner. If this potential of ICT is used, it can tremendously increase efficiency and effectiveness of the system. The cases of Pakistan computerization and online banking are the examples demonstrating the benefits of ICT. Thus, ICT has become indispensable and an effective tool of growth in any society. The nature of technology is that every activity becomes almost transparent. In his 2004 Indian Independence Day speech, Dr. A.P.J Abdul Kalam, the then president of India, said that “there is a demand for a more transparent and reliable system of examination, evaluation and reporting”.

4. Examination System in Universities of Pakistan

Examination plays a significant role in a university education system. Examination is an important tool to test the student cognitive skill and retention during course of study. University examinations have motivating effect on both students and teachers. It motivates the student to put in best efforts to attain his goals, Examination may be used as a tool to organize and integrate knowledge. It encourages student toward study and read various books and integrate ideas to respond to a given problem in a problem based learning system. For a teacher too, examination gives a stimulus and goal orientation to his work, not. We can say that the examinations become inevitable as students and teachers work will neither have precision nor any direction without it. Examination mechanism is an effective tool to assess the quality and quantity of knowledge or say learning in a specific field Mishra [5]. University examinations are conducted at various stages of learning till the end of the academic session. Examinations are conducted regularly & periodically throughout the session. Examinations also cause physical and mental stress for students. Notification of results also takes very long time especially in manual system owing to which students remain idle for months. Moreover, the dates of examinations and those of notification of result vary between universities, so sometimes students miss the chance of getting admission

to higher studies in the universities or academic fields of their choice.

5. Conduct and Phases of Examination System

Conduct of examination is a technical job involving different types of data managed within the examination branch of the university. Complexity increases with the increasing number of examinations and centers during an academic session. Right from the enrolment/registration phase of students to the final phase of the declaration of result, various jobs are required to be under-taken with secrecy, care and with full commitment.

In public & private sector universities, it is essential to understand the organizational structure of the university and sources of data. The university has campus teaching departments, distance learning education, may be having departments and affiliated colleges spread all over provinces/country. The examinations are conducted for those students who are on regular rolls of the University. There are also students either part failures, repeaters, improvements or who are authorized by the law to appear as private candidates in the examination. The regular students apply for examination through the institutes they are studying and other students apply directly to the Controller of Examinations (COE) as private candidates. Therefore, the examination data can be divided conveniently into three phases as under:

a. **Pre-Conduct Phase.** The admission forms of the students are processed, prescribed fee payments, attendance and all the details of students like college code, registration number, course code, are created. Any discrepancy in these forms is communicated to the student for correction. Examination Centers are earmarked for the conduct of the exam. Supervisory Staff like Superintendents, Deputy Superintendents and Invigilators are detailed. Their briefing sessions are conducted. Date Sheets of different sessions are notified. This is one time activity carried out at least one month before the examination.

b. **Conduct Phase.** Conduct of Exam is a critical phase. Release of papers from secrecy, deployment of invigilator staff (replacements in case of absentees) , issuance of serial numbered answer sheets, arrangements of candidates according to the seating plan, verification of candidates ,disposal of cheating cases are the major components of this phase.

c. **Post-Conduct Phase.** This phase involves from sending answers sheets for marking, collecting evaluated answer books, tabulation of marks obtained, declaration of results, generating and dispatching detailed marks cards (DMCs) and final transcripts to the graduating students etc. Processing student's request for rechecking of paper, some processes can be carried out time and again like student can always ask for duplicate DMCs etc.

The student exam data is preserved for a specific period of time and some of the data like notification of results, DMC and degree records etc need to be preserved permanently in order to ensure future verification or to settle disputes if any. The sections of Examination Branch Registration Branch, conduct section, secrecy section work in harmony; therefore, all the sections are placed in

the close vicinity. These sections are manned by different officials by clearly defining their jobs description and they are accountable for any breach or any foul play with the

examination activities. All data related activities are performed by examination section in co-ordination as shown in Figure 1 in manual System as per **Anx "A"**.

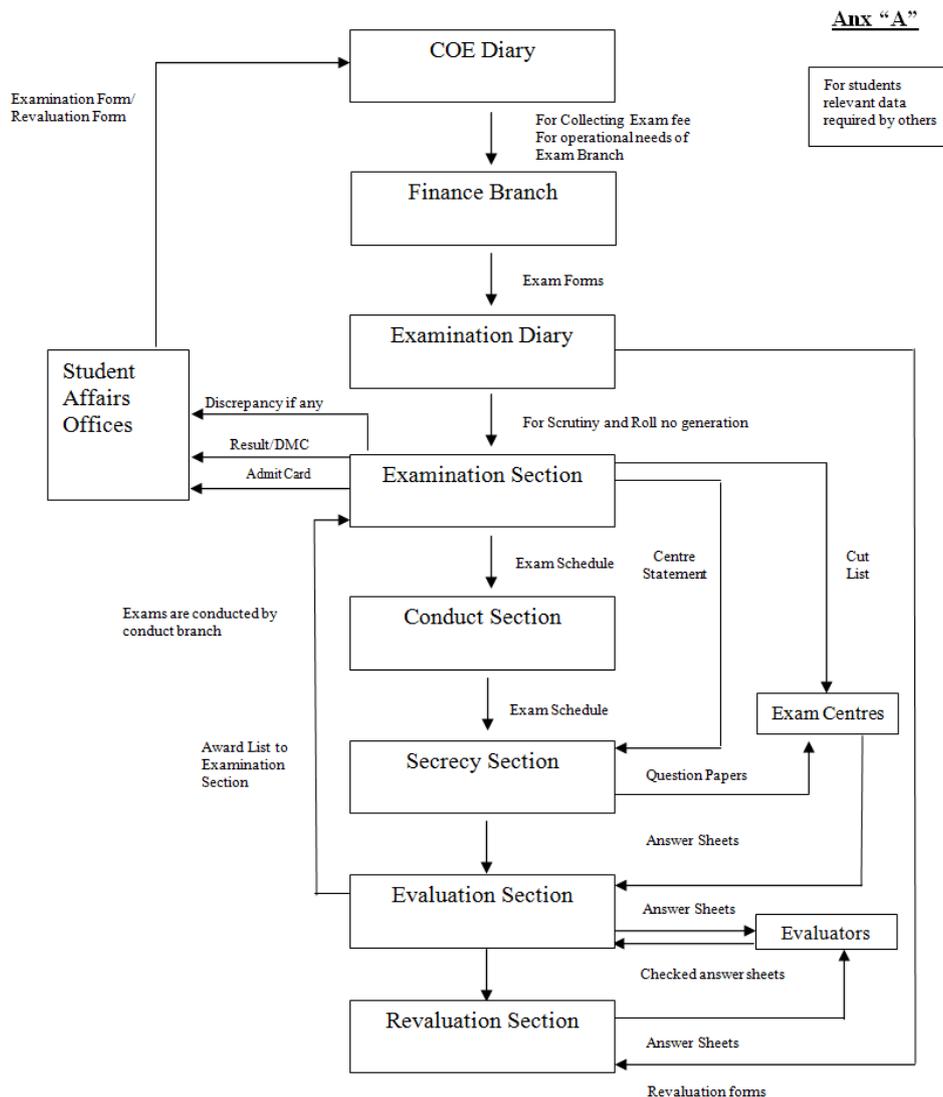


Figure 1. Organization of Manual Examination System

6. Limitations of Manual Examination System

Manual examination system is structured in well defined physical section, still the process is very slow due to the nature of the technical data required to be handled. The examination process in manual system takes longer times causing both physical and mental strains over the examinees. Notifications of results take long time owing to which students remain idle for months together. Sometimes the delay in notification of result cause losses to the students as they may lose chance of further studies to appear in competitive exams or join jobs due to the non-availability of examination result in time. The few limitations of manual examination system are as follows:

a. Students may have to correspond through mail or visit university for minor queries regarding examinations. At times due to increased paper work in the examination branches their mails may get delayed. The personal visit to universities wastes student's valuable time, money and cause unnecessary harassment. We also see students

jostling around university in various service windows for many reasons.

b. The manual examination system leads to arithmetical errors, more time consumption is inefficient and wastage of valuable resources.

c. There is repetition of work as the same data is handled in different section of the examination. Retrieval of students' records through manual registers, maintenance of records and data reconciliation etc. are time consuming.

d. There remains possibility of tempering of students records in manual examination system. There is no online verification of the same. This leads to unfair practices and also affects the credibility of a university.

7. Automated Examination System

There is need to automate the existing examination system, because the manual examination system was used when the numbers of students registered were less and the numbers of courses taught were less. In present scenario the increasing burden of examination due to increase in

GER is leading to inefficiencies. We can minimize human intervention by adopting ICT since the technology leads to compact storage, speedy retrieval of data and Maki [4] has described ICT in exam processing as “that technology which can be used right from student Admission to alumina by taking care of all activates.” Ulf Fredriksson et.al [9] mentioned that “Communication and general administration are the two main areas in which ICT is used in the management of education in University.” Zainally [10] has also elaborated the uses and ICT in Universities for administrators as “It has changed the nature of administration in higher education, the way information is transferred, stored, retrieved, and processed results.” Bhardwaj and Singh [2] have suggested “the concept of integration of examination system at the University level to bring integrateable, transparent and robust e-governance solution.” By integrating and placing student’s database from different sections of examination at centralized computer server interconnected on LAN or Internet, the data inconsistencies can be minimized and made available anywhere, anytime through internet. Some of the tangible benefits of automation and integrating the examination systems are as under:-

- a. Use of ICT will facilitate integration of all section, though logically these sections may keep on working as before.
- b. This will streamline the procedure for exam fee defaulters, short attendances and keeping a track of particular class. There will be centralized, secure and robust database of the candidates appearing in the examination without duplication of records.
- c. The quality of services will improve to the stakeholders.
- d. The automation of Examination System will lead to effective monitoring of examination processes and fraudulence will be minimized.

e. The statistical analysis of data will enable to see trends in result at various levels and also to make strategic decisions.

Apart from these benefits, major impetus for change to an alternate approach of examination is the societal pull. Frauds and corrupt practices in the society are increasing in academic activities. The major factors causing academic fraud are expanding higher education, competition among students and institutions, globalization which is resulting in international mobility of students, use of traditional method of management of examination system, poor rules and regulation and lack of accountability. Hallak and Poisson [3] have pointed out academic frauds and corrupt practices in quality assurance and accreditation processes in higher education institutions/universities. Transparency and effective management leads to reduce academic frauds. Bhardwaj Singh [2] has discussed security threats in automated examination systems and suggested measures to deal with these security threats.

8. Connecting Examination Process with Centralized Database

The ICT can undoubtedly, ensure transparency and effective management, Overall function of automated system has been shown in Figure 2 as per **Anx “B”**.

Student get registered on-line or otherwise for the particular examination, before the examinations start. If student is not eligible for the particular exam, he/she will be informed about the discrepancy. If his/her examination forms are found to be eligible, he will be allowed to sit in the exam. Some examples of the automated examination process are given below.

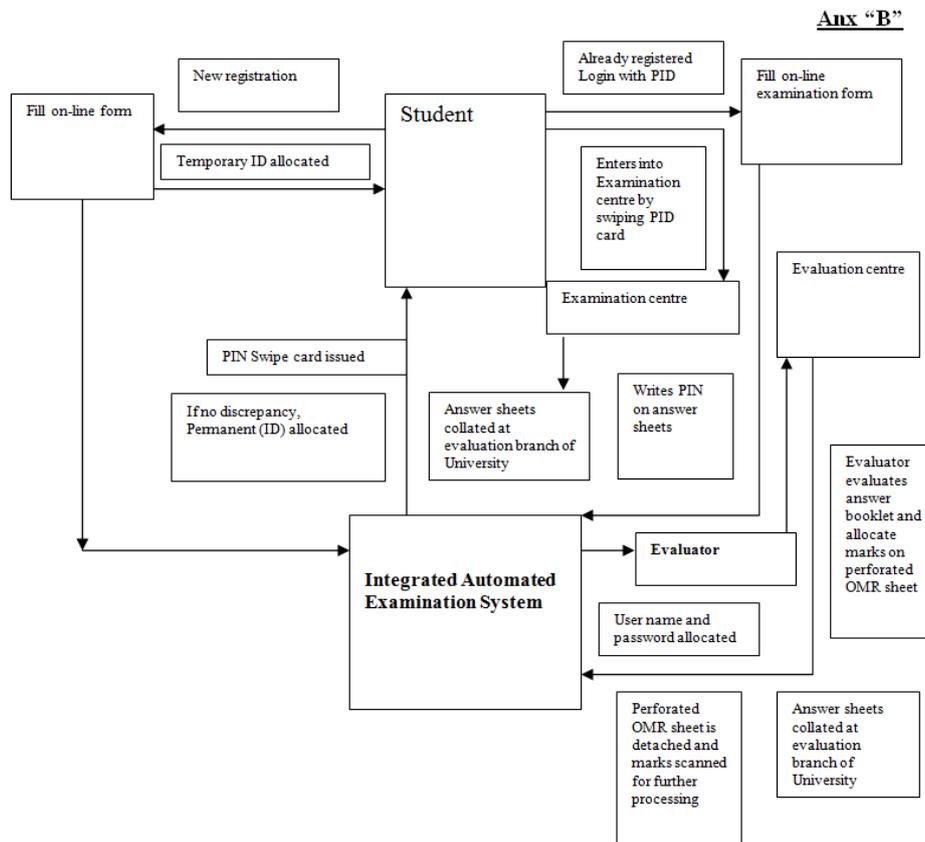


Figure 2. Automated Integrated Examination System

9. Permanent Identity Card Numbers (PIN)

Students are issued a temporary ID number on getting registered. After verifying his/credentials, eligibility and other documents, he will be allotted Permanent Identification Number (PIN). This PIN will be required for all the queries.

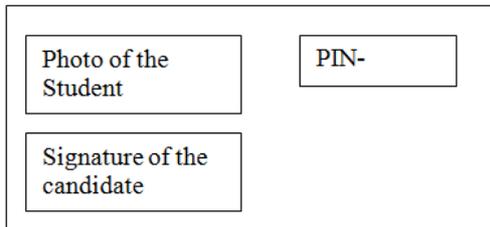


Figure 3. Permanent Identity Card issued to student for appearing in examination

10. Appearing In Examination

All the sections are interconnected in automated exam system and there is a centralized database of students. Students are informed about their examination centre. Student has to bring PIN card roll number for appearing in exam. He can enter in the examination hall only by displaying his PIN card through card reader. Access authorization to computers and database can be authenticated through user ID and password, this signifies attendance and validates the identity and verify the person with the photograph. Student who is sitting in the examination centers has to write PIN on the answer sheet.

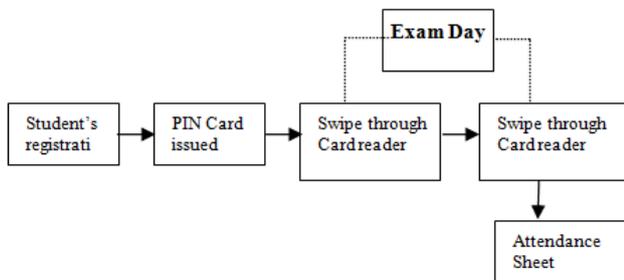


Figure 4. Swiping of student's ID card on examination day

11. Challenges of Integrating ICT In Education

ICT can be used to make the Pakistan universities fully automated universities. The manual work can be taken care of by ICT, but there are many threats which challenge the exploration and exploitation of its opportunities. Some of the key challenges are highlighted below:

a. Non-availability of ICT infrastructure.

Lack of proper facility for ICT technologies in the organization. This is due to lack of proper planning. IT equipment is purchased ahead without planning & developing infrastructure.

b. Reluctantancetoadoptnew technology.

ManyPakistanUniversities specially established in 60s or 70s and its old employees are working in these

universities. It is very difficult to change mind set to adopt new technology. The employees are reluctant to learn and use ICT facilities. Officer/staff should be exposed to new technology and made aware of the benefits of the technology.

c. Lack of motivational quality.

ICT usage in university examination requires concerted efforts. It requires support from higher management also for its implementation therefore motivational leader is required for implementation of the task.

d. Changes in administration

The changes in administration adversely affect the organization. New incumbent takes months to understand the situation. Sometimes before understanding the situation may leave the institution.

12. Salient Features of Good Examination System

The good exam system should posses the following features:

- Exam System is governed by academic people.
- It should be flexible to adoption of changing mode.
- Exam system procedures and regulations be transparent.
- Proper infrastructure for HR, computing facilities and software to process data.
- Exam system must have transparency accuracy secrecy and efficiency.
- Quality problems in Exam System should be taken care of meticulously.
- Judicious assessment by examiner.

13. Recommendations

To convert the manual exam system to automated mechanism following is important:-

- Registration of all students in their appearing subjects and issuing roll number slips from Examinations Branch.
- Date Sheet generation, approval and notifying.
- Nomination of Examiner and Invigilating/ Supervisory staff for Examinations.
- Moderation of papers, printing and sealing.
- Conducting examinations for University Students Internal, External and other allied courses.
- Releasing the results of all faculties,
- Awarding Results.
- Conducting postgraduate courses, other Certificate and Diploma courses.
- Issuing results sheets, Transcripts and other Academic Statements to the students.
- Facilitating in organizing and conducting the Annual General Convocation and awarding degrees to the Graduates.
- Issuing Degree and Medals Certificates.
- Maintaining the student database and issuing student related information's whether requested by the Higher Education Commission (HEC) and other organizations.

For any good exam system the components of Conduct of Examinations, Strong Secrecy with staff, and notifications of results play basic and pivotal role. Exam branch aloof cannot ensure the quality and credibility of a

system unless it is clubbed with all the statutory bodies of university including Board of Faculties, Academic Council, Research Committees and Accreditations Bodies.

Last but not the least important factor in this regard is the creditability of the exam staff (HR factor) which is associated with all the phases of the examinations till graduation of a student. Their personal traits, characters become an asset to any system and university in the time to come.

14. Conclusion

Today is the era of technology which is resulting in changing the life style of people. Today many Pakistan Universities are imparting education in the field of ICT, but its application in the functioning of University is meager. The meaning of computerization is limited to just typing or surfing web; full potential of ICT has not been explored. ICT is a useful tool to have transparency, reliability and efficiency in university examination system. There are tremendous facilitations integrating ICT with examination system. CMS will ensure efficiency and effectiveness in the examination system and effectively deals with thus bringing changes in the existing manual examination system.

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