Impact of ICT in Improving the Quality of ODE: A Statistical Analysis

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Abstract:
Open and Distance Education (ODE) has become increasingly popular as a flexible and accessible mode of learning, enabling individuals from diverse backgrounds to pursue education without the constraints of traditional classroom settings. The integration of Information and Communication Technology (ICT) in ODE has brought revolutionary changes, transforming the learning experience and enhancing educational outcomes. This study aims to investigate the impact of ICT on the quality of ODE through a rigorous statistical analysis.

Utilizing a mixed-methods approach, the research collected both quantitative and qualitative data from a diverse sample of ODE students and educators across multiple institutions. The statistical analysis focuses on identifying correlations between the use of ICT tools and key academic indicators, including student performance, course completion rates, and student satisfaction.

In this paper, the emphasis is given on the role and impact of ICT in Improving the Quality of Distance Education. The Distance Education is such an education where students or learners are physically separated from their teachers by physical distance and so technology is widely used to bridge this instructional gap. This study also explores certain important factors related to the effective implementation of ICTs for quality education (at higher education level) for distance learner.

Keywords: *ICT, Distance Education, Teaching-learning technology, ODE*

1. Introduction

Open and Distance Education (ODE) has emerged as a flexible and inclusive mode of learning, breaking down the barriers of time, location, and accessibility, to provide education to a diverse array of learners. Over the past few decades, ODE has witnessed exponential growth, owing to advancements in technology, particularly in the realm of Information and Communication Technology (ICT). The integration of ICT in ODE has revolutionized the educational landscape, bringing about significant improvements in instructional methodologies, course delivery, and learner engagement.

The rapid proliferation of ICT tools, such as computers, the internet, multimedia, mobile devices, and educational software, has enabled learners and educators to transcend the limitations of physical classrooms. This seamless integration of technology in the learning process has opened up new possibilities for both learners and educators, making education more accessible, engaging, and efficient. The ability to access educational content, interact with peers and instructors, and participate in collaborative learning activities from remote locations has been a game-changer for millions of learners worldwide.

In recent years, researchers and educational policymakers have taken an increasing interest in examining the impact of ICT in ODE. Numerous studies have explored the relationship between ICT use and various indicators of educational quality, such as learning outcomes, student satisfaction, retention rates, and course completion rates. While some studies have shown promising results, others have highlighted challenges and potential pitfalls associated with excessive reliance on technology.

This study seeks to contribute to the existing body of knowledge on the topic by conducting a comprehensive statistical analysis of the impact of ICT on the quality of ODE. By adopting a mixed-methods approach, combining both quantitative and qualitative research methodologies, this study aims to provide a holistic understanding of the effects of ICT integration in ODE settings.

2. Research Background
2.1 Evolution of Open & Distance Education
Open and Distance Education (ODE) has a rich history, with its origins dating back to the 19th century. The concept of providing education to remote learners through correspondence courses marked the initial phase of distance education. With advancements in postal services, printed study materials were sent to students, who would complete assignments and examinations at their own pace, sending them back to their educational institutions for evaluation.

The 20th century witnessed significant developments in distance education, with the advent of radio and television broadcasting allowing for audio and visual communication to reach a wider audience. This era also saw the establishment of dedicated distance learning institutions and the emergence of open universities, aimed at providing education to learners who were unable to attend traditional brick-and-mortar Universities.

The 21st century brought about a paradigm shift in distance education with the widespread adoption of Information and Communication Technology (ICT). The advent of the internet and digital technologies transformed ODE, making it more interactive, personalized, and accessible. Learners now had access to vast repositories of online educational resources, virtual classrooms, discussion forums, and collaborative learning platforms.

2.2 Role of ICT in Open & Distance Education
ICT has played a pivotal role in enhancing the quality of ODE by addressing several challenges that have historically plagued traditional distance education. The integration of ICT in ODE has facilitated: Enhanced Access and Flexibility: ICT tools have made education accessible to learners regardless of their geographical location or time constraints. Learners can now access learning materials, participate in discussions, submit assignments online etc. enabling them to balance their education with work and other personal commitments.

Personalization and Adaptability: ICT enabled learning platforms can tailor educational content to individual learner preferences and progress. Adaptive learning systems, powered by artificial intelligence can analyze learner performance and provide personalized learning pathways to meet each student's unique needs.

Interactive Learning Environments: The integration of multimedia and interactive elements in ODE has made learning more engaging and dynamic. Live/recorded lectures, simulations, virtual labs etc. learning experiences enrich the learning process, fostering active participation and knowledge retention.

Communication and Collaboration: ICT tools facilitate real-time communication and collaboration among learners and instructors. Discussion forums, video conferencing, and instant messaging enable learners to interact with peers and educators, fostering a sense of community and social learning.

Continuous Assessment and Feedback: Online assessments and quizzes enable continuous monitoring of learner progress, allowing educators to provide timely feedback and support. This iterative feedback loop enhances the learning experience and contributes to improved learning outcomes.

Lifelong Learning Opportunities: ICT has paved the way for lifelong learning, enabling learners to acquire new skills and knowledge at any stage of life. Professionals seeking to up-skill can access the online courses and certifications to stay relevant in their fields.

3. Research Rationale
While the impact of ICT in ODE has been widely acknowledged, empirical evidence on its effectiveness and its influence on educational quality remains fragmented and context-specific. Many studies have examined the effects of ICT in traditional face-to-face education, but the unique characteristics of ODE warrant a separate investigation.

Understanding the role of ICT in ODE is essential for policymakers, educational institutions, and educators alike. By gaining insights into the implications of ICT integration, stakeholders can make informed decisions to optimize technological interventions and improve the overall quality of ODE. Furthermore, as technology continues to evolve rapidly, it is crucial to continuously assess its impact on educational practices to adapt and refine pedagogical approaches.

4. Objectives of the study
1. To study the acquaintance of faculty counsellors with online teaching methods in the context of NEP 2020
2. To study the challenges of using ICT in distance education system.
3. To suggest few possible solutions to overcome the challenges.

5. Scope and Limitations of the study
This research focuses on investigating the impact of ICT in ODE settings, encompassing various forms of technology, such as online learning platforms, educational software, multimedia resources, and communication tools. The study will involve both quantitative data collection for statistical analysis and qualitative data gathering through surveys and interviews.
However, this study acknowledges certain limitations, including:
- The generalizability of findings may be limited due to the diverse nature of ODE settings and technological infrastructures across different regions and educational institutions.
- The potential for response bias in self-reported data may influence the accuracy and reliability of survey results.
- As technology is constantly evolving, the findings may be subject to temporal limitations, requiring further research to examine emerging ICT trends.

6. Literature Review
A comprehensive review of relevant literature on the evolution of ODE, the role of ICT in education, and prior research on the impact of ICT in ODE settings is represented in this section.

By definition, distance education represents an educational technique where the counselor/teacher/mentor and the learner/mentee need not have face to face interaction during the teaching and learning process. The concept of distance education is not so recent; various universities all over the world have been offering correspondence courses since the nineteenth century (McIsaac &

Gunawardena, 1996). Distance education was mainly comprised of four types of media: print, voice, video, and computer (Charles, 1991). In due course of time, the pattern of imparting knowledge through ODE has undergone various changes in the way of generations. With the advancement in ICT, several innovative methods are used for effective transmission of knowledge to the learners in distance and open learning system with the aid of variety of audio-visual equipments, online lecture platforms & softwares, television broadcast through various channels and so on. Distance education is planned learning that normally occurs in a different place from teaching necessitating special techniques of course design. Instruction, special method of communication by electronic and other media and special organization and administrative arrangements (Moore, 1989; Kearsley 1996). The ODE has experienced changes gradually from first to second to third generations. First-generation model of distance learning refers to correspondence education - the use of a single technology, while the use of integrated multimedia is termed as second-generation model. Third-generation of distance education, also known as two-way communicative, interactive, multimedia distance education, places an emphasis on communication and learning as a social process typically through the addition of interactive media such as computer medicated communications, audio graphics or video conferencing (Nipper, 1989). The learning is termed as 'synchronous learning' when the students are engaged in distance learning in real time, with teachers giving live streaming classes via the internet. On the other hand, 'asynchronous learning' represents prerecorded classes that are always accessible to students. Online education through ICT itself has advantages as well as disadvantages. Advantages include augmented entrée to knowledge and learning, reduced expenditures in teaching, less time consuming, etc. Disadvantages may be decreasing the 'market value' of an academic degree, waning the learning quality, less scope of direct interaction with counselors/lecturers/teachers, etc. Its success depends on the optimum blending of technology and pedagogy, the two characteristics that demand training (Nipper, 1989). However, Moore's (1989) interaction model suggests three types of interaction essential in distance education. First, is the learner-instructor interaction that includes the motivation, feedback, and dialogue between the counselors/lecturers/teachers and the learner. Second focusses on the learner-content interaction where the learners find knowledgeable information from the lecture session. Third, is the learner-learner interface, comprising of exchange of information, ideas and dialogue among the learners about the course. An additional fourth model, the learner-media interaction, was added by Hillman, Willis, and Gunawardena (1994) as the interaction between the learner and technology is a vital constituent. In a nutshell, use of ICT tools play a critical role in the knowledge imparting procedure in ODE.

7. Research Methodology
7.1 Research Design
To investigate the impact of ICT on the quality of Open & Distance Education (ODE), a well-structured research design has been employed. The approach allows for a comprehensive exploration of the research problem, data collection and analysis techniques. The entire component focusses on statistical analysis, examining the relationship between ICT usage and some important and different key educational indicators provide valuable insights into the perspectives and experiences of ODE learners and educators concerning the use of ICT.

7.2 Sampling Technique
A purposive sampling technique is employed to select a range of ODE institutions, including open universities, distance learning centers, and online learning platforms followed by a random sampling technique is used to select participants from the identified institutions. Efforts are made to ensure a balanced representation of participants across different age groups, genders, academic disciplines, and geographical locations to enhance the generalizability of the study's findings.

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7.3 Data Collection
After selecting institutions through purposive sampling, Primary data is collected randomly from 46 persons through a well-structured questionnaire distributed to the randomly selected ODE educators. The questionnaires are designed to elicit information and prepared on 8 parameters viz.

Have you ever been connected with distance mode of education?

Do you have computer/laptop in your home?

Do you have sufficient smart classes in your institute?

Do you have sufficient computers in your institution?

Do you have any class recording studio in your institute?

Do you have high speed net connectivity / wi-fi facility in your institution?

Do you have software engineer or technical person in your institute to look after the technical glitches or to guide you in technical issues?

Do you find attendance of students in online classes satisfactory?

Few other questions pertain to the aptitude of the teachers in teaching skill using ICT aids as well as their perception towards education using ICT. The analysis is carried out based on 5-point scale viz., 'strongly disagree', 'disagree', 'neutral', 'agree' and 'strongly agree'.

7.4 Data Analysis
Primary data collected through structured questionnaires has been analyzed by using some appropriate mathematical and statistical methods.

The entire statistical analysis may help to identify the significant patterns and associations in the data.

8. Findings and Discussion
The findings obtained from the respondents through structured questionnaire is analysed in this section. However, a depiction of the respondents may be helpful for having an idea of the sample.

8.1 Age of the respondents
The respondents are categorised in certain groups.

Table 1: Age group of the respondents

Age (years)	Percentage of respondents
25-45	43.5
45-55	43.5
55-60	10.8
Above 60	2.2

Source: Primary data

87 percent of the sample respondents are in the range of 25-55 age group. A small percentage of the sample is from the age group of above 60 years.

8.2 Gender of the respondents
About 61 percent of the samples are male

Table 2: Gender of the respondents

Category	Percentage of respondents
Male	60.9
Female	39.1
Better not to say	0

Source: Primary data

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8.3 Occupations

As stated earlier that the sample consists primarily the teachers, the respondents are Associate Professors, Assistant Professors, Post Graduate Teachers and Visiting / Guest lecturer / Academic Counsellors from various institutes.

Table 3: Occupation of the respondents

Occupation	Percentage of respondents
Associate Professor	17.4
Assistant Professor	43.5
Post Graduate Teacher	6.5
Visiting / Guest lecturer / Academic Counsellor	32.6

Source: Primary data

8.4 Type of institute

The respondent faculties are from the Open & Distance Learning Centres are located in various institutions or are imparting their knowledge in any of the ODE centres.

Table 4: Type of institution of the respondents

Institute Type	Percentage of respondents
Degree College	82.6
Technical College	6.5
University	10.9

Source: Primary data

The respondents are mailny rendering their services in Degree Colleges. 82.6 percent are from this institute type. Others are from Universities and Technical Colleges.

8.5 Teachers' acquaintance, ability & perception towards ICT enabled classes in ODE

Even in this era of information and communication technology, imparting knowledge in ODE system sometimes becomes difficult for a section of the teaching community. An attempt has been made in this study to have an idea of the teachers' ability & perception towards ICT enabled classes or lectures in ODE. For this a 5-point scale has been used namely, 'strongly disagree', 'disagree', 'neutral', 'agree' and 'strongly agree'. The findings are framed in the table.

Table 5: Acquaintance, ability & perception of the teachers based on scale (in percentage)

Parameters	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Teachers have basic knowledge of operating computers	2.2	2.2	15.2	60.9	19.6
Teachers know how to prepare and present power point presentations in class	4.3	17.4	10.9	47.8	19.6
Teachers know how to show YouTube lectures, videos, etc. for the benefit of the students	0.0	4.3	19.6	58.7	17.4
Teachers require proper training to teach digitally	2.2	0.0	6.5	37.0	54.3
Information & Communication Technologies (ICT) are helpful in distance mode learning	0.0	0.0	2.2	50.0	47.8
ICT enhances quality education	0.0	0.0	13.0	50.0	37.0

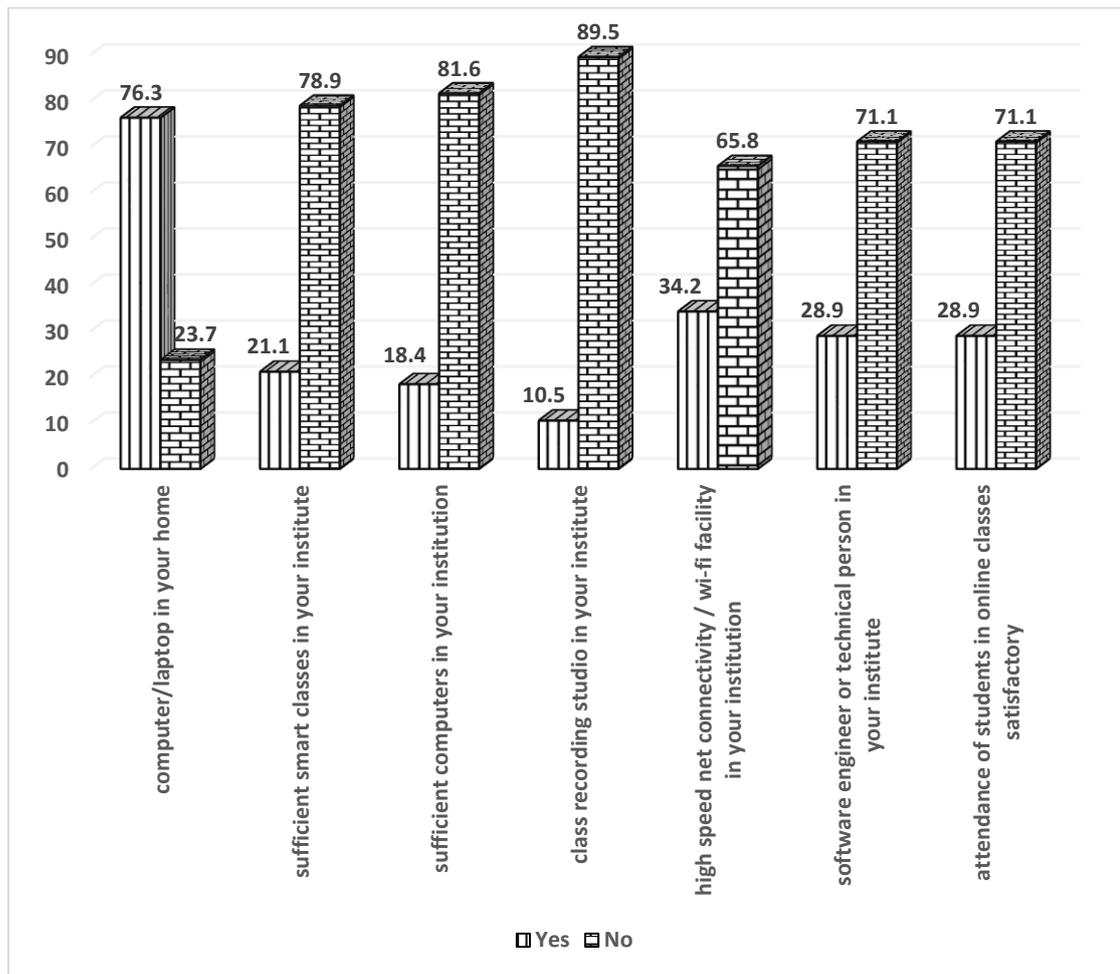|					
To use ICT properly, teachers should be digitally literate	0.0	0.0	0.0	47.8	52.2
To use ICT properly, teachers should understand how to integrate it with curriculum	0.0	0.0	0.0	60.9	39.1
Teachers find it difficult to use ICT in teaching-learning process due to less expertise in handling ICT tools	0.0	4.3	8.7	45.7	41.3
Teachers know how to maintain official records using ICT tools	10.9	15.2	28.3	39.1	6.5
Teachers by now are capable of using ICT tools after taking regular online classes during covid19 pandemic	0.0	15.2	8.7	56.5	19.6
It is easier to take classes digitally in place of traditional chalk-duster method of teaching	4.3	23.9	21.7	37.0	13.0
Integration of ICT makes education accessible to people in remote areas	2.2	23.9	10.9	45.7	17.4
Students' attendance in class in traditional system is normally more in ICT based classes	6.5	30.4	26.1	26.1	10.9
Students are more responsive in ICT based classes	2.2	30.4	28.3	30.4	8.7
It is difficult to know the level of understanding of a student in online classes	0.0	6.5	15.2	47.8	30.4
Teachers do not find satisfaction in online classes as there is no eye-contact between teachers & students	0.0	13.0	10.9	37.0	39.1
Handling of ICT logistics becomes more important in ICT classes making teaching secondary	0.0	17.4	30.4	37.0	15.2
ICT based teaching requires more classes compared to offline teaching to cover syllabus maintaining quality education	6.5	23.9	13.0	43.5	13.0

Source: Compiled from primary data

The data set in the table clearly indicates a response in favour of the statements raised. The response towards 'agree' and 'strongly agree' are much higher compared to the other points.

8.6 Response from teachers regarding ICT infrastructure – the Challenges

Few questions were raised for the teacher educators regarding the infrastructural availability in their respective institutions for running the ODE classes. The scenario what was revealed from the analysis is alarming.

Chart 1: Infrastructural availability in the institutions – challenges for the teachers

78.9 percent of the respondents are of the view that there are not sufficient smart classes in their institute to run the lecture sessions. 81.6 percent opined that computer availability is not sufficient. There is no facility of recording the classes as per 89.5 percent respondents. According to 65.8 percent of the respondents, there is no wi-fi or high-speed internet connectivity in their institute. 71.1 percent of the sample revealed that there is no software engineer or technical person in the institute to look after or to solve the cropped up technical glitches. Again, 71.1 percent is not satisfied with the attendance strength of the students in online classes.

Around 81 percent respondents have personal laptops or other ICT essentials including net facility with which the lecture sessions are to be conducted.

9. Conclusion

The infrastructural backwardness in terms of ICT facilities in the institutes is a challenge for the teacher educators or counselors in the way of imparting quality education. Especially in the context of National Education Policy 2020, where the thrust is on quality education with the involvement of technology and also on enhancing skill initiatives, the infrastructural limitations need to be solved. The need of the hour is to provide more funds to the institutes to develop all-round advanced ICT enabled facilities.

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