ICT Competency among Students in Delhi NCR: A Survey-Based Study with Implications for Digital Transformation

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ABSTRACT

Information Technology (IT) has become a key driver in transforming library systems, redefining how information is organized, accessed, and delivered in the digital age. The integration of Information and Communication Technology (ICT) has shifted libraries from conventional, print-based environments to interactive, digital, and user-focused service models. This study investigates the level of ICT awareness and competency among users, along with its influence on the effectiveness of library services in academic settings.

Using a structured research approach, the study analyzes user awareness, access patterns, and utilization of digital resources, while also identifying challenges related to technological infrastructure, skill gaps, and information accessibility. The findings reveal that although ICT has improved the efficiency and reach of library services, limitations in user competency and awareness continue to hinder optimal use of available resources.

The study highlights the importance of continuous training, user education, and institutional support to enhance digital competencies and service quality. It concludes that strengthening ICT capabilities is essential for promoting effective library services and supporting ongoing digital transformation in academic libraries.

Keywords: Information Technology, ICT, Academic Libraries, Digital Libraries, Library Automation, User Awareness, Information Services.

1. INTRODUCTION

The rapid growth of Information and Communication Technology (ICT) has significantly reshaped the educational landscape, transforming traditional modes of teaching and learning into more dynamic, interactive, and technology-driven processes. In contemporary education, ICT is not only a supportive tool but a fundamental component that enhances access to information, promotes collaborative learning, and facilitates the development of critical thinking and problem-solving skills among students.

ICT competency refers to the ability to effectively use digital technologies, communication tools, and information resources for academic and professional purposes. It encompasses a range of skills, including basic technical proficiency, information literacy, digital communication, and the ethical use of technology. In the context of the 21st century, ICT competency has become essential for students to actively participate in knowledge-based societies and adapt to rapidly evolving technological environments.

In India, particularly in the Delhi National Capital Region (NCR), there has been a significant push toward integrating ICT in education through policy initiatives, infrastructural development, and the adoption of digital learning platforms. The implementation of smart classrooms, ICT laboratories, and online learning systems reflects a growing commitment to digital transformation in the education sector. These developments have created new opportunities for enhancing the quality and accessibility of education.

However, despite these advancements, disparities in ICT competency among students remain a concern. While many students demonstrate familiarity with basic digital tools such as smartphones and internet applications, their ability to effectively utilize advanced technologies for academic and analytical purposes is often limited. Factors such as unequal access to digital resources, lack of structured training, and variations in socio-economic background contribute to these disparities.

In this context, assessing ICT competency among students in Delhi NCR becomes essential to understand their preparedness for digital learning environments and to identify gaps that may hinder effective technology integration. A survey-based approach provides a systematic method for evaluating students' awareness, proficiency, and usage of ICT tools, as well as their attitudes toward digital learning.

The present study aims to examine ICT competency among students in Delhi NCR and explore its implications for digital transformation in education. By identifying key challenges and opportunities, the study seeks to contribute to the development of strategies that can enhance digital skills, promote inclusive access to technology, and support the transition toward a more innovative and technology-enabled educational system.

2. BACKGROUND & LITERATURE REVIEW

The rapid advancement of Information and Communication Technology (ICT) has significantly transformed the educational landscape across the globe. ICT has emerged as a key driver in enhancing teaching–learning processes, enabling access to vast information resources, and fostering collaborative and student-cantered learning environments. In the context of India, particularly in the Delhi National Capital Region (NCR), the integration of ICT in education has gained momentum due to policy initiatives, infrastructural development, and the increasing adoption of digital learning platforms.

The shift to hybrid and digital libraries has significantly reshaped both staff roles and user behaviour. Library professionals now require a combination of traditional knowledge and technological skills such as digitization, database management, and digital system design, along with soft skills like communication and leadership, making continuous professional development essential *(Chowdhury & Chowdhury, 2003; Choi et al., 2006; Aina, 2004).* Library functions are also increasingly divided into curatorial, technical, and service roles *(Malkawi)*. For users, Information Technology has made information-seeking more dynamic, with a growing reliance on online resources such as databases and search engines alongside traditional materials (*Chang & Perng, 2001*). Studies further show that users prefer quick and simple search strategies, though their ability to evaluate information varies depending on experience *(Hölscher & Strube, 2000; Spink & Jansen, 2004; Dong, 2003).* Overall, these developments highlight the need for libraries to enhance digital services, strengthen user education, and ensure efficient access to reliable information.

ICT competency refers to the ability of students to effectively use digital tools, technologies, and information systems for academic, professional, and personal purposes. It encompasses a wide range of skills, including digital literacy, information management, communication, problem-solving, and ethical use of technology. With the growing emphasis on digital transformation in education, ICT competency has become an essential requirement for students to participate effectively in modern knowledge economies.

The implementation of the *National Education Policy (NEP) 2020* has further strengthened the role of ICT in education by promoting digital learning, multidisciplinary approaches, and skill-based education. However, despite the availability of advanced infrastructure such as smart classrooms and ICT laboratories, disparities in ICT competency levels among students continue to persist. A study on digital readiness in Delhi schools revealed that even when a significant proportion of students had access to advanced tools, gaps in digital literacy and higher-order skills remained evident.

Moreover, recent trends indicate increasing reliance on emerging technologies such as artificial intelligence (AI) among students in Delhi, with many using digital tools for academic purposes. However, issues related to accessibility, trust, and effective usage continue to pose challenges.

In this context, assessing ICT competency among students in Delhi NCR through a survey-based approach becomes crucial for understanding their readiness for digital transformation and identifying areas for improvement.

2.1 **Concept of ICT Competency**

ICT competency is widely recognized as a combination of technical, cognitive, and social skills required to effectively utilize digital technologies. It is closely linked with information literacy, which involves the ability to identify, locate, evaluate, and use information efficiently and ethically.

A systematic review of information literacy competency highlights that such skills are fundamental for critical thinking, independent learning, and research, particularly in digital learning environments.

Additionally, ICT competency includes dimensions such as digital communication, collaboration, data management, and adaptability, which are essential for functioning in modern educational and professional settings.

2.2 **ICT Awareness, Proficiency, and Usage among Students**

Several studies have examined ICT competency through three major dimensions: awareness, proficiency, and usage.

A survey-based study on students found that while students generally possess awareness and basic proficiency in ICT tools, significant variations exist across gender and usage patterns.

Similarly, research on digital literacy among students indicates that most learners are familiar with digital tools and frequently use them for academic purposes. However, their usage is often limited to basic functions rather than advanced analytical or creative applications.

These findings suggest that although students are increasingly exposed to ICT, their competency levels may not fully align with the demands of digital transformation.

2.3 **ICT Competency in Delhi NCR Context**

Region-specific studies in Delhi NCR provide important insights into ICT competency among students.

A study focusing on student-teachers in Delhi NCR found a significant positive relationship between ICT competency and professional development, indicating that higher ICT skills contribute to better academic and career outcomes.

Another study on Delhi schools highlighted a critical gap between access to digital infrastructure and actual competency. Despite the availability of advanced ICT tools, many students lacked higher-order digital skills, reflecting a gap in effective utilization and training.

These findings underscore the need for not only providing access to ICT resources but also ensuring their effective integration into the learning process.

2.4 **Factors Influencing ICT Competency**

The literature identifies several factors that influence ICT competency among students:

- Infrastructure and Access: Availability of devices, internet connectivity, and digital labs significantly impacts ICT skill development.
- Training and Curriculum Integration: Structured ICT education enhances students' competency levels.
- Socio-economic Background: Digital divide continues to affect equitable access to ICT resources.
- Self-efficacy and Motivation: Students' confidence and attitude toward technology influence their learning outcomes.

Studies based on the Technology Acceptance Model (TAM) further emphasize that perceived usefulness, ease of use, and ICT self-efficacy are key determinants of ICT adoption among students.

2.5 **ICT Competency and Digital Transformation**

ICT competency plays a pivotal role in facilitating digital transformation in education. It enables the adoption of innovative teaching methods such as e-learning, blended learning, and flipped classrooms.

Research indicates that ICT skills contribute significantly to academic performance, communication abilities, and employability by preparing students for digital workplaces.

Furthermore, the increasing use of AI and digital tools among students reflects a shift toward technology-driven learning environments, although challenges related to accessibility and trust remain.

2.6 **Research Gaps Identified**

Despite extensive research on ICT competency, several gaps remain:

- Limited empirical, survey-based studies specifically focused on Delhi NCR students
- Lack of emphasis on advanced ICT skills such as AI, data analytics, and digital research tools
- Insufficient research on discipline-wise comparison of ICT competency
- Need for studies linking ICT competency directly with digital transformation outcomes

The reviewed literature indicates that ICT competency is a multidimensional construct essential for academic success and digital transformation. While students in Delhi NCR demonstrate basic awareness and positive attitudes toward ICT, gaps in advanced skills, effective usage, and equitable access persist. These findings highlight the need for systematic efforts to enhance ICT competency through improved infrastructure, curriculum integration, and skill development initiatives.

3. RESEARCH METHODOLOGY

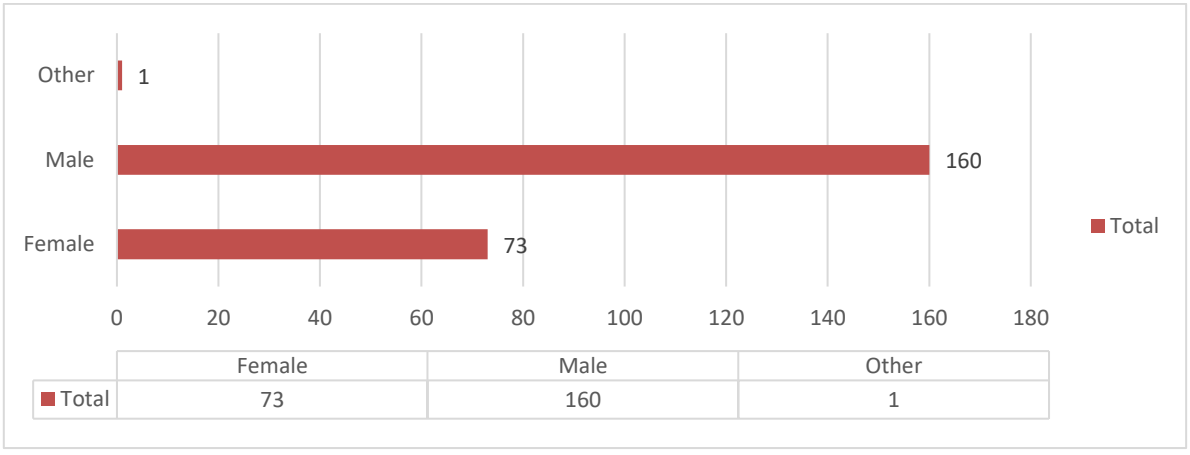
4.1 **Research Design**

The present study adopts a quantitative research approach using a descriptive survey design to examine ICT competency among students in Delhi NCR. The survey method is considered appropriate as it enables the systematic collection of data from a large population and facilitates the measurement of variables such as awareness, proficiency, usage patterns, and attitudes toward ICT. The design also allows for identifying relationships between ICT competency and factors influencing digital transformation in education.

4.2 **Study Area**

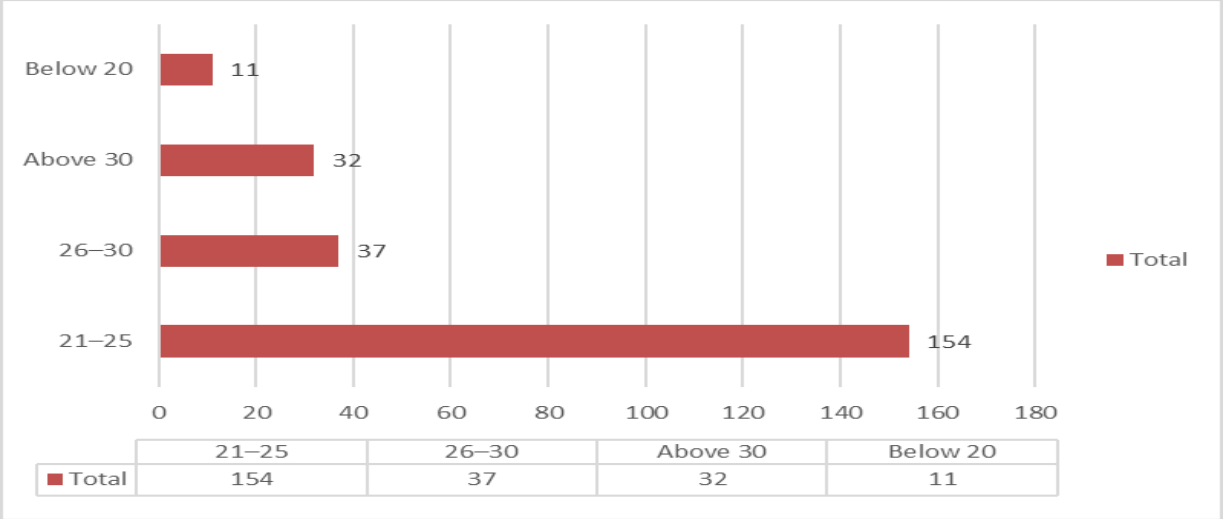
The study is conducted in the Delhi National Capital Region (NCR), which includes Delhi and its surrounding urban and semi-urban areas. The region is characterized by diverse educational institutions, varying levels of ICT infrastructure, and a heterogeneous student population, making it suitable for examining differences in ICT competency.

The gender distribution of respondents shows a clear predominance of male participants in the study. Among the 234 respondents, 160 (68.4%) are male, 73 (31.2%) are female, and 1 (0.4%) identifies as another gender. This indicates that males make up a significant majority of the sample, while females represent a smaller but notable proportion. The representation of other genders is very limited. Overall, the data suggest a male-dominated sample, which may reflect the enrolment trends in the selected Library and Information Science (LIS) programs. However, the inclusion of female participants still allows for comparative insights across the main gender group.



Gender-wise distribution of respondents

The age distribution of respondents indicates that the majority are young adults, with most participants falling in the 21–25 years category. Out of 234 respondents, 154 (65.8%) belong to this group, making it the largest segment. The 26–30 years group includes 37 respondents (15.8%), while 32 respondents (13.7%) are above 30 years. Only 11 respondents (4.7%) are below 20 years, representing the smallest share. This pattern suggests that the sample is largely made up of individuals in the typical age range for postgraduate studies in Library and Information Science. At the same time, the inclusion of respondents aged 26 and above indicates the presence of more mature learners, possibly with prior work experience. Overall, while younger students dominate the sample, there is still a reasonable spread across different age groups.

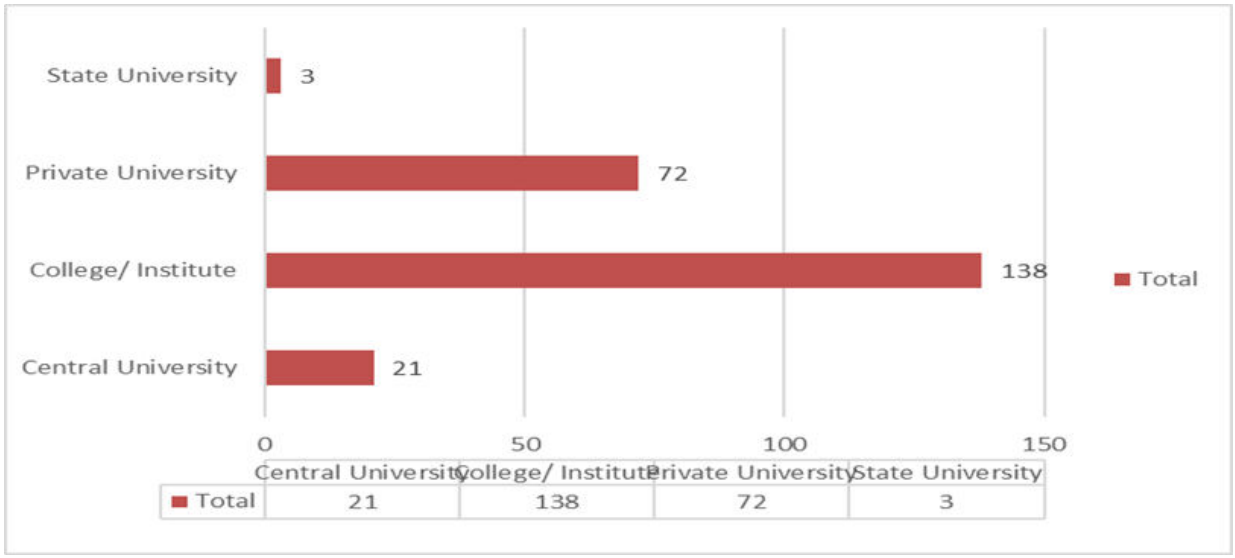


Age-wise distribution of respondents

4.3 **Population of the Study**

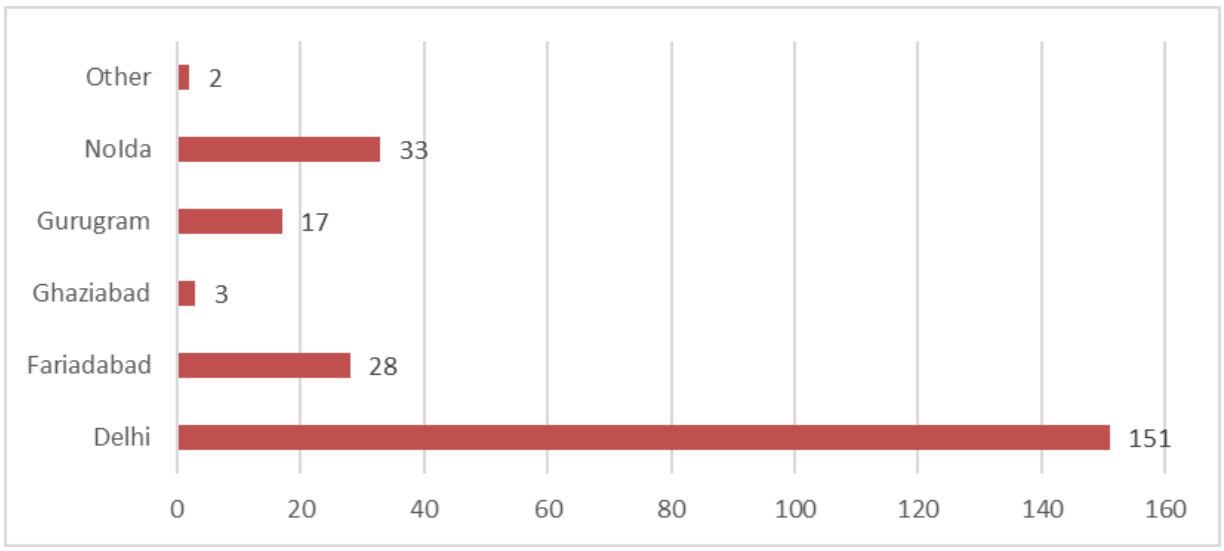
The target population of the study comprises students enrolled in schools, colleges, and universities across Delhi NCR. The population includes students from different academic disciplines such as arts, science, commerce, management, and library and information science (LIS), ensuring a comprehensive representation of learners.

The institutional distribution of respondents shows that a majority of participants are enrolled in Colleges and Institutes. Out of 234 respondents, 138 (59.0%) come from this category, making it the largest group in the sample. Private Universities account for 72 respondents (30.8%), while 21 respondents (9.0%) are from Central Universities. Only 3 respondents (1.3%) belong to State Universities, indicating very limited representation from this segment. This pattern suggests that Colleges and affiliated Institutes form the main source of participants, possibly due to the wider availability of Library and Information Science programs in such institutions. At the same time, the inclusion of respondents from Private and Central Universities adds some diversity to the sample, although State Universities remain underrepresented. Overall, the data reflect participation from different types of institutions, with a clear concentration in Colleges and Institutes.



Institution-wise Distribution of Respondents

The location-wise distribution of respondents reveals a strong concentration in Delhi, with 151 participants forming the largest share of the sample. Noida follows with 33 respondents, while Faridabad accounts for 28 participants. Gurugram contributes a smaller yet noticeable portion with 17 respondents. In contrast, only a few participants are from Ghaziabad (3) and other areas (2). This pattern indicates that the data is largely drawn from Delhi and nearby NCR regions, suggesting that the findings mainly reflect the views of respondents from institutions situated within and around the Delhi NCR area.



Location-wise Distribution of Respondents

4.4 **Sample and Sampling Technique**

A total of 234 students were chosen as the sample through a stratified random sampling method, ensuring proper representation from different academic levels and fields of study, including undergraduate and postgraduate programs. This technique enabled the selection of participants

from varied groups in a balanced manner. By using this approach, the study minimized the chances of sampling bias and strengthened the validity and wider applicability of the results.

4.5 **Data Collection Tools**

Data for the study were gathered through a well-structured questionnaire developed in alignment with the research objectives and supported by relevant literature. The instrument included both closed-ended and Likert-scale questions and was organized into key sections covering demographic details (such as age, gender, educational level, and discipline), ICT awareness, ICT proficiency, ICT usage patterns, and students' attitudes toward ICT. These sections were designed to capture information on participants' knowledge of digital tools, their skill levels in using ICT applications, the frequency and purpose of their usage, and their perceptions and readiness for digital learning. To ensure broader participation and inclusivity, the questionnaire was distributed through both online platforms, such as Google Forms, and offline modes

4.6 **Validity and Reliability of the Instrument**

To maintain the rigor and effectiveness of the research instrument, several validation and reliability measures were undertaken. The content of the questionnaire was carefully examined by subject experts to ensure that it adequately addressed all relevant variables and aligned with the objectives of the study. A pilot study was also carried out with a small group of respondents to identify any ambiguities or inconsistencies, allowing necessary modifications before final administration. Furthermore, the reliability of the instrument was assessed by calculating Cronbach's Alpha to determine internal consistency, with values exceeding 0.70 considered acceptable for ensuring dependable results.

KMO and Bartlett's		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.934
Bartlett's Test of Sphericity	Approx. Chi-Square	6769.627
	df	990
	Sig.	.000

Reliability Statistics	
Cronbach's Alpha	N of Items
.883	5

4.7 **Data Collection Procedure**

Data is collected over a specified period through direct distribution of questionnaires and online dissemination via email and academic networks. Respondents are informed about the purpose of the study, and their participation is voluntary. Confidentiality and anonymity of responses are strictly maintained.

4.8 **Data Analysis Techniques**

The data collected for the study were systematically coded and analyzed using statistical software such as SPSS and Excel. Both descriptive and inferential statistical techniques were applied to derive meaningful insights. Descriptive measures, including frequency, percentage, mean, and standard deviation, were used to summarize the data and present general trends. Where applicable, inferential methods such as t-tests were conducted to examine differences based on gender, ANOVA was used to compare variations across different groups, and correlation analysis was performed to explore relationships among key variables. This analytical approach enabled a clear understanding of ICT competency levels and helped identify the factors influencing them.

4.9 **Variables of the Study**

The study considers several independent variables, including demographic characteristics such as age, gender, and level of education, along with factors like access to ICT infrastructure and the extent of training and exposure to digital technologies. These variables are examined in relation to the dependent variable, which is ICT competency. ICT competency is assessed through multiple dimensions, specifically students' awareness of digital tools, their proficiency in using ICT applications, and their patterns of usage. This framework helps in understanding how different factors influence the overall level of ICT competency among students.

4.10 **Ethical Considerations**

The study follows established ethical research principles to ensure the rights and well-being of all participants are protected. Participation in the research is entirely voluntary, and respondents are informed about the purpose of the study before providing their consent. Strict measures are taken to maintain confidentiality and anonymity, ensuring that personal information is neither disclosed nor linked to individual responses. Additionally, the data collected are used exclusively for academic and research purposes, reinforcing the integrity and ethical responsibility of the study.

4.11 **Limitations of the Study**

The study has certain limitations that should be acknowledged. It is confined to students from the Delhi NCR region, which may restrict the generalizability of the findings to other

geographical areas. Additionally, the reliance on self-reported data may introduce response bias, as participants' answers could be influenced by personal perceptions or inaccuracies. Furthermore, the study places relatively less emphasis on advanced ICT domains such as artificial intelligence and data analytics, which may limit a comprehensive understanding of higher-level digital competencies.

4.12 **Scope of the Study**

The study offers valuable understanding of students' ICT competency and highlights its significance in supporting the ongoing digital transformation in education. The findings serve as a useful reference for educators, policymakers, and academic institutions in developing effective strategies to strengthen digital skills among learners. By addressing identified gaps and promoting the integration of technology in teaching and learning processes, the study contributes to enhancing the overall quality and accessibility of education in a digitally driven environment.

5. RESULT

The study suggests that while students demonstrate basic awareness of ICT tools and maintain a positive outlook toward their use, their overall skill level remains confined to elementary and intermediate stages. They are generally comfortable with routine digital tasks, but lack the advanced competencies needed for complex academic work and future professional requirements. Additionally, their engagement with ICT is mostly limited to practical and task-based activities, with little emphasis on critical analysis, creativity, or innovative applications.

Therefore, it can be inferred that there is a pressing need to enhance ICT capabilities among students by strengthening curriculum integration, offering structured training in advanced technologies, and encouraging the development of higher-order digital skills. It is equally important to address existing challenges such as unequal access to digital resources, insufficient learning support, and concerns related to data security and information credibility. By focusing on these areas, students can be better prepared to utilize ICT effectively in both academic and professional contexts.

The results reveal that most students are familiar with basic Information and Communication Technology (ICT) tools, particularly smartphones, internet-based applications, and online learning platforms. However, their understanding of more advanced technologies such as artificial intelligence, data analytics, and specialized digital research tools remains relatively low. In terms of skills, students show a strong command of basic operations and a fair ability to locate and retrieve information, but they lack higher-level technical expertise. This suggests that their overall ICT proficiency largely falls within the basic to intermediate range.

In practice, students mainly use ICT for academic purposes, including research, attending online classes, and communication. Their use of technology is generally practical and task-oriented, with limited emphasis on critical thinking, creativity, or advanced analysis. Despite

these limitations, students hold a positive perception of ICT and recognize its value in enhancing learning outcomes and access to information. However, several challenges persist, such as unequal access to digital resources, inadequate training in advanced ICT skills, limited incorporation of ICT into the curriculum, and concerns regarding data privacy and the reliability of online information.

8. RECOMMENDATIONS

In light of the findings on ICT competency among students in Delhi NCR, it is essential for educational institutions to adopt a holistic strategy for digital skill enhancement. ICT should be meaningfully incorporated into all subject areas to promote practical and context-based learning. Regular training initiatives focusing on contemporary technologies, including artificial intelligence and data-driven tools, should be provided to both students and educators to strengthen their digital capabilities. Improving institutional infrastructure—such as ensuring stable internet access, well-equipped computer facilities, and availability of digital learning resources—is crucial for inclusive and effective learning. Additionally, students must be sensitized to ethical issues in the digital environment, including responsible online behavior, data protection, and cybersecurity risks. Emphasis should also be placed on encouraging the academic use of ICT for research, analysis, and knowledge creation. Building linkages with industry and continuously evaluating ICT proficiency levels will help institutions remain responsive to technological advancements and better prepare students for a digitally evolving academic and professional landscape.

9. CONCLUSION

The study indicates that students in Delhi NCR have a satisfactory level of basic ICT skills and generally show a favourable attitude toward digital modes of learning. However, gaps remain in terms of advanced competencies, equal access to digital resources, and meaningful use of technology for academic purposes.

To achieve effective digital transformation, it is necessary to enhance infrastructure, integrate ICT skills into academic programs, and provide targeted training for students. Addressing these areas will support the development of a digitally capable and future-ready student community.

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