CHAPTER - 1
INTRODUCTION AND STATEMENT OF PROBLEM

1.1 Introduction to Information and Communication Technology (ICT)

The main purpose of ICT in Education means implementing ICT Equipments and Tools in Teaching-Learning process as a media and methodology and to familiarize students with the use and workings of computers.

Information and communications technologies are a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information. Communication and information are at the very heart of the educational process, consequently ICT-use in education has a long history. ICT has played an educational role in formal and non-formal settings, in programs provided by governmental agencies, public and private educational institutions, for-profit corporations and non-profit groups, and secular and religious communities [1]. Information and communication technology is the study of developing and using technology to process information and aid communication.

ICT increases the flexibility of delivery of education so that learners can access knowledge anytime and from anywhere. This in turn would better prepare the learners for lifelong learning as well as to contribute to the industry. It can improve the quality of learning and thus contribute to the economy. ICT makes the education available freely and at any time and also at any place. This helps learners to make all the study material available freely. This can lead to lifelong learning. Students can develop the habit of learning
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through Internet. This will directly influence the economic growth and development of nation.

Information and Communication Technology (ICT) is widely viewed as a means of effective change in education, which will directly result to increased economic development. ICT supported education system directly or indirectly affects the economic growth of the nation. Today’s Information and Communications Technology can significantly and positively impact the educational and economic environment of the country.

Information and communication technology (ICT) is the rapid technology now-a-days. It is the technology that is helping to exchange the information in fast and easier way. Due to this technology the distance between the different nations is reduced and now world is becoming a global village. For a country like India, which has a confluence of vibrant culture and diversified languages, the technology plays a greater significance in the development of country.

This work focuses on the model of promoting information technology and its role in promoting rural education across Rajasthan. This work will also provide an up-to-date introduction to the increasingly important field of Information & Communication Technologies (ICT) in Rural Education, and its implementation in the form of technological innovations for rural development.

This paper explores the various factors affecting the use of computers in school. ICT encourage students to take responsibility for their own learning and offers problem centered and inquiry based learning which provides easy access and information based resources. Especially in developing countries like India, effective use of ICT leads to development of the educational sector resulting in educational competitiveness and increased employment. South and West Asia, Bangladesh, Nepal and Sri Lanka have national stand-alone, sector-wide ICT in education plans. In fact, in Bangladesh and Nepal, these plans were published as recently as 2013[71]. The inclusion of a smaller number of computers and other devices in classrooms helps to build stronger
Education is the driving force of economic and social development in any country [13]. Considering this, it is necessary to find ways to make education of good quality, accessible and affordable to all, using the latest technology available. ICT has the potential to remove the barriers that are causing the problems of low rate of education in any country. An author claimed that lack of access, time pressures, lack of mentors and opportunities for training have effect on teachers’ use of ICT in teaching and learning[16]. It can be used as a tool that helps to overcome the issues of cost, less number of teachers, and poor quality of education as well as to overcome time and distance barriers which are the major hurdles in the field of development. The integration of ICT in schools in Asia is characterized by numerous approaches, including integrating radio, television, computers and the Internet in classrooms, computer laboratories, and other locations, as well as developing a structure to support mobile learning using different smart phone and tablet devices [75].

Educational system is dynamic and changes with time. It responds to the demands of the society, by assimilating the advances in technology. The various kinds of ICT products available and having relevance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counseling, interactive voice response system, audiocassettes and CD ROMs etc have been used in education for different purposes. A critical factor in the effective use of ICT is the role played by the school management that addresses future development and consistency and includes some means of monitoring progress against identified milestones. This assimilation of technology leads to a new mode of education. It is diagrammatically represented in a spiral model as follows.
Virtual learning environments are the basic component of open and distance learning and a virtual classroom is a teaching and learning environment located within a computer-mediated communication. Just like in a real-world classroom, a student in a virtual classroom participates in synchronous instruction, which means that the teacher and students are logged into the virtual learning environment at the same time.

1.2 Rationale of study

“Technology is the instrument for providing non-linear growth to our economy.” The analysis of the need for promotion of rural technology would result in focusing on the basic necessities of people. We can separate five elements of social and economic infrastructure, which should be taken care of effectively by the local bodies and central government. They are – health, education, drinking water, housing and electricity. Followed by these the need for roads, efficient agricultural output, employment at grassroots level and telecommunication cannot be neglected as well. All these goals of rural
development converge towards development of effective rural technologies and a sound rural education[2] to absorb the technological innovations. The work analyze the impact of ICT on teaching and learning especially in Rural regions of Rajasthan.

It is generally acknowledged that the education system is in dire need of reforms. Information and communication technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy. In most primary, secondary, and tertiary level institutions across the country especially in Rajasthan, education is not supported by ICT-based systems. Where ICT exists, it is marred by several challenges ranging from lack of stable electricity supply to scarcity of ICT qualified educators.

ICT capital is superior to Non-ICT capital in enhancing economic growth: a higher level of ICT capital stock per capita allows a typical economy to achieve a higher growth rate for given levels of growth in labor and capital inputs. With respect to [3], it is also possible to say that sometimes it may not be how much capital you invest, that makes a difference, but rather how you invest it.

Most policy makers, corporate executives, practitioners, and parents assume that wiring schools, buying hardware and software, and distributing the equipment throughout will lead to abundant classroom use by teachers and students and improved teaching and learning [4].

Three different goals for high-tech hardware and software in schools unite this disparate but powerful ad hoc coalition [5].

Goal 1 : Make schools more efficient and productive than they currently are.

Goal 2 : Transform teaching and learning into an engaging and active process connected to real life.
Goal 3 : Prepare the current generation of young people for the future workplace.

E-learning allows higher participation and greater interaction. It challenges the concept that face-to-face traditional education is superior to it [6]. The web and the Internet is the core ICTs to spread education through e-learning. The components include e-portfolios, cyber infrastructures, digital libraries and online learning object repositories. All the above components create a digital identity of the student and connect all the stakeholders in the education. It also facilitates interdisciplinary research [7]. [8] States that the experience of many teachers, who are early innovators, is that the use of ICT is motivating for the students as well as for the teachers themselves. [9] Mention that the use of ICT can improve performance, teaching, administration, and develop relevant skills in the disadvantaged communities. It also improves the quality of education by facilitating learning by doing, real-time conversation, delayed time conversation, directed instruction, self-learning, problem solving, information seeking and analysis, and critical thinking, as well as the ability to communicate, collaborate and learn [10]. [11] Mentions that ICTs also provide a platform for sharing information and knowledge.

The main task of this work is to examine the behavior of students towards the use of ICT. There is a particular emphasis on the way pupils actually uses the technology as opposed to how they ought to use it.

1.3 Role of ICT in education

ICT is increasingly becoming a more and more powerful tool for education and economic development. The main purpose of ICT in Education means implementing of ICT Equipments and Tools in Teaching-Learning process as a media and methodology. ICT has also enabled learning through multiple intelligence as ICT has introduced learning through simulation games; this enables active learning through all senses.
ICT in Education can serve the following purposes:

a) Restructuring education system,
b) Diversifying teaching-learning methods and practices,
c) Engaging all stakeholders of education and adapt rapidly to changes in society and the environment, and
d) Enhancing education efficiency, effectiveness, and productivity.

[12] sees three key investment components in long term economic growth.

She believes that:

(a) Investment in knowledge leads to sustained economic growth,
b) Knowledge economy framework, and
c) Educational reforms to build relevant skills.

ICT in Education has three main goals:

(a) Individual development,
(b) Education reform, and
(c) Social and Economic growth.

Figure 2: Goal of ICT in Education
There are several ways in which ICT can be a catalyst to educational development.

(a) By providing tools which teachers use to improve teaching and
(b) By giving learner’s access to electronic media that make concepts clearer and more accessible.

ICT can also remove inequalities particularly between urban and rural communities. With ICT, teachers can no longer be “the transmitters of knowledge” but rather “the facilitators” of the learning process. The teacher’s primary task becomes to teach the students how to ask questions and pose problems, formulate hypotheses, locate information and then critically assess the information found in relation to the problems posed”. Teachers often view their role as “provider of knowledge” and regard students as empty vessels to be filled.

1.4 ICT development at school level-To implement ICT in schools some efforts needs to be implemented in a systematic form. We categorize these efforts into four phases. First is the introductory phase. Initially at the beginning stages of ICT development schools are at the introductory phase. Schools at this level begin to purchase the computing equipment and software. At this stage administrators and teachers of the school starts to think about the consequences of using ICT in long term. This phase introduces the awareness of uses of ICT.

Next is the upcoming phase in which teachers tries to start implementing ICT for already existing school management and regular work. Teachers tries to learn and implement their work with ICT.

Next is the integrating phase. At this stage teachers try to integrate ICT into their school curriculum. They start implementing computer based technologies in laboratories, classrooms and offices. The curriculum begins to merge subject areas to reflect real-world applications.
Last stage is the transforming phase. In this phase ICT becomes the integral part of every section of school. Mainly the concentration is on the integration of subject areas in real world applications with ICT. Finally students adapt ICT in total in their curriculum.

ICTs also allow for the creation of digital resources like digital libraries where the students, teachers and professionals can access research material and course material from any place at any time[6][13]

1.4.1 Models and tools for knowledge transfer-

ICT can be used as a tool in the process of education in the following ways [14]

- **Informative tool:** It provides vast amount of data in various formats such as audio, video, documents.
- **Situating tool:** It creates situations, which the student experiences in real life. Thus, simulation and virtual reality is possible.
- **Constructive tool:** To manipulate the data and generate analysis.
- **Communicative tool:** It can be used to remove communication barriers such as that of space and time[15].

1.4.2 Benefits of ICT based Model

There are lots of benefits in ICT based models in the development of rural based education, some key benefits are:

- **Anytime, anywhere:** One defining feature of ICTs is their ability to transcend time and space. ICTs make possible asynchronous learning, or learning characterized by a time lag between the delivery of instruction and its reception by learners. Online course materials, for example, may be accessed 24 hours a day, 7 days a week. ICT-based educational delivery (e.g., educational programming broadcast over radio or television) also dispenses with the need for all learners and the instructor
to be in one physical location. Additionally, certain types of ICTs, such as teleconferencing technologies, enable instruction to be received simultaneously by multiple, geographically dispersed learners (i.e., synchronous learning).

- **Access to remote learning resources:** Teachers and learners no longer have to rely solely on printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at any time of the day and by an unlimited number of people. This is particularly significant for many schools in developing countries, and even some in developed countries, that have limited and outdated library resources. ICTs also facilitate access to resource persons - mentors, experts, researchers, professionals, business leaders, and peers - all over the world.

![Figure 3. ICT and Education](image-url)
1.4.3 Challenges in implementing ICT

The barriers identified in the literature can be broadly grouped into two levels: those relating to the individual (teacher-level barriers) and those relating to the institution (school-level barriers)[2][3].

A. Teacher-level barriers

1. lack of time-for both formal training and self-directed exploration and for preparing ICT resources for lessons
2. lack of self-confidence in using ICT
3. negative experiences with ICT in the past
4. fear of embarrassment in front of pupils and colleagues
5. classroom management difficulties when using ICT, especially where pupil-to-computer ratios are poor
6. lack of the knowledge necessary to enable teachers to resolve technical problems when they occur
7. perception of computers as complicated and difficult to use

B. School-level barriers

1. lack of ICT equipment and the cost of acquiring, using and maintaining ICT resources
2. lack of access to ICT equipment due to organizational factors such as the deployment of computers in ICT suites rather than classrooms
3. obsolescence of software and hardware
4. lack of technical support
5. lack of administrative support
6. lack of institutional support through leadership, planning and the involvement of teachers as well as managers in implementing change
7. lack of training differentiated according to teachers existing ICT skill levels
8. lack of training focusing on integrating technology in the classroom rather than simply teaching basic skills.
7.1 Possible implications for schools and teachers for the integration of ICT into education

a. Providing ICT resources including hardware and software
   • Taking advantage of resources offered at schools
   • Access to ICT resources at home

b. Resistance to change
   • Training in new pedagogical approaches
   • Being open minded towards new ways of teaching

c. Lack of time
   • Providing sufficient time: reducing the number of teacher lessons or increasing the daily lesson time
   • Acquiring skills of self-organization and time managements

d. Lack of training
   • Providing training courses in dealing with the new devices, modern technologies, and new pedagogical approaches
   • Preparing themselves (pre-service) by self-training
   • Taking up opportunities for training offered at schools
   • Knowing how to access to resources

e. Lack of technical
   • Providing continued technical support

Relying on them to be able to solve problems in their use of ICT Accessing available support:

1.5 Impact and factors of ICT on teaching and learning

ICT act as a medium for teaching and learning. This refers to ICT as a tool for teaching and learning itself, the medium through which teachers can teach and learners can learn. The complete process has four dimensions input, output, result and finally the impact. Input consists of funding for schools to buy computers and to establish computer labs in different schools at different
locations and funds to pay to teachers. Output is the percentage of schools with computer connections or improved student to computer ratio. Outcome is the broader result achieved by ICT investment such as greater use of ICT in teaching. Impact is the overall achievement of the intervention on the educational system or improvement in learning in school.

High investments in education can have a very direct effect on the economic growth and developments of the country. ICT capital is superior to Non-ICT capital in enhancing economic growth: a higher level of ICT capital stock per capita allows a typical economy to achieve a higher growth rate for given levels of growth in labor and capital inputs [18]. It is also possible to say that sometimes it may not be how much capital you invest, that makes a difference, but rather how you invest it[18]. ICT in education act as a catalyst for the growth and development of country.

1.5.1 Impact of ICT on pupil

With ICT, direct causal impacts are not very easily identifiable. Furthermore, drawing clear conclusions on the impact of ICT from the range of research evidence is difficult. There are a number of factors that limit effective comparisons, such as differences in sample sizes, methodologies and effects, and education systems. When the impact of ICT in education is considered there tends to be a focus on whether and to what extent, ICT can raise pupil attainment. A, positive relationships has been found between ICT use and improvement in subject-related learning in several subject areas. The fact was seen that the longer the pupils have used computers the better they performed. An interview was conducted to analyze the present teachers and pupils views about the consequences of using ICT in schools. After looking at the views it was concluded that pupils, teachers and parents consider that ICT has a positive impact on pupils’ learning. In the question ‘does ICT improve pupil performance’, eight out of ten teachers reported that there has been an
improvement in their pupils’ achievement of subject-related performance and their basic skills like calculation, reading and writing. In addition, teachers consider that academically strong students benefit more from ICT use. The above facts were also confirmed by the pupils themselves as well as their parents.

Important factors at the school level that can foster the use of ICT by teachers are school Policy, access to hardware, the availability of adequate software, teacher time, internal support, and communication about ICT use.

Gender can also have an impact on access to, participation in, retention and completion of education [76]. Yet, if girls are to leave school ready to participate equally in the knowledge economy, then they too will require the benefits of ICT-assisted instruction, including the knowledge, skills and attitudes imparted by using these tools. There has been substantial analysis of the digital divide based on gender [77][78]. Many researchers have focused on differences in the manner in which girls and boys access and use ICT to learn and experience the world around them [79][80][81], while household data generally suggest that boys are more likely than girls to use the Internet at home, work and informal settings in both developed and developing countries [82]. Based on these perspectives, it is important to assess access to ICT in education, not only at an institutional level but also at the enrolment level, through the lens of gender [83].

1.5.2 Factors affecting the implementation of computers in school-

1) Enthusiasm of a teacher to learn and teach

Time to learn, time to practice, time to reflect. Time is a crucial factor with regard to the implementation of ICT in education. The amount of time a teacher devotes to attend training or workshops, to experiment with machines, to discuss with other teachers about the effective use of computer in education are all the factors that affect the implementation of ICT in education. Short-term training, even when conducted intensely during summer months or
intersession, cannot, by itself, produce change. Training must be accompanied by a well-designed maintenance plan that provides opportunities for teachers to talk about their issues, ask questions, and get feedback. By viewing the adoption of technology as a process that takes place gradually, schools can provide both the time and the resources to help teachers implement technology effectively. How much time there is for teachers to familiarize themselves with ICT depends on decisions made at the community level, choices made at the school level and choices made by the teachers themselves.

2) Support from the school principal: may accelerate the implementation of ICT in education

Concerns about the slow adoption of new technology by teachers are not new. Many researchers have from various angles studied the phenomenon through different approaches from case studies [19], to historical analysis [20], to large surveys [21]. They offer various accounts of why teachers do not frequently use technology to its full potential or in revolutionary ways that could truly lead to qualitatively different teaching and learning experiences. One of the findings has shown that school principals generally have favorable attitudes towards the use of computers in education.

3) School’s policy and management’s attitude towards the use of ICT in school

Some important parameters can be seen

- Whether the school will give priority to the use of computers for instruction
- Whether the school will prescribe which hardware and software to use
- Whether all students have to compulsorily have to acquire knowledge about computers.
- Selection and provision of teacher training
- Allocation of budget
• Provision of internal support
• Prescriptions with regard to the use of ICT for management purposes.

4) Availability of sufficient hardware

Obviously, the availability of hardware is an important issue for the use of ICT in education. However, just the availability is not enough. Implementing technology in education calls for extra space in classrooms, individual places for study and/or computer rooms. There has to be dedicated computer rooms available in the school. In this way, all pupils have access to the technology, and full-group instruction is possible.

5) The availability of adequate software

The availability of software which fits into the curriculum is to a large part determined by factors at the community level. However, the purchase of suitable software that is available on the market depends on school policy with regard to the acquisition of software and to the attribution of financial resources for the purchase of courseware.

1.6 Objective of the study:

The purpose of this study is to find out the impact of ICT on different categories of students by conducting statistical analysis (performing Chi-square test) on the data collected on a reasonable size of students from different schools in Rajasthan. The study will search the challenges involved in implementing the use of ICT in teaching and learning. Simply putting computers into schools is not enough to impact student learning. But specific applications of ICT can positively impact student knowledge, skills and attitudes, as well as teaching practices, school innovation, and community services.”
The agenda of this thesis is to address the issue within the specific context of ICT for education in Rajasthan by exploring innovative and alternative approaches.

The purpose of this study is to examine the direct impact that ICT may have on the students of different regions of Rajasthan. The study is performed on different categories of students bifurcating them on the basis of region (urban/rural), gender (male/female), type of school (private/government) and merit of student (low/high). This study considers the role of ICT literacy in education and examines some of the challenges that are faced for the successful implementation of an ICT-supported education. It will also deal with the different strategies used for the successful implementation of ICT in education in Rajasthan.

1.7 Limitations of Study

- Sample size is limited to 1000 students and this work is not adequate to represent the whole population.
- Some of the respondents might not have taken the questionnaire seriously resulting in error in data collection.
- The Chi-Square test is sensitive to sample size. The size of the calculated chi-square is directly proportional to the size of the sample, independent of the strength of the relationship between the variables.
- The Chi-Square test does not give us much information about the strength of the relationship or its substantive significance in the population.