

Technology and Social Construct for the Diffusion of ICT in Higher Educational Setup: A Case Study of Ranchi (Jharkhand)

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Abstract

Education is one of the most important requirement of human being Education is not only the communication of information by teacher or the achievement of knowledge by the child. But education is the total development of child's personality. In India education is making it more efficient in terms of teaching and learning. Integration of Information and Communication technology (ICT) in teaching learning process is becoming a crucial convolution. However, in education system teachers are playing as a builder of whole educational environment. But today there is need of ICT diffusion in education sector for creating healthy learning environment whenever they are teaching. This paper tries to show the ICT diffusion in education system (mainly higher education) in Ranchi district of Jharkhand by diffusion of innovation approach covering various aspects like as time, communication channel, innovation (particular technology used), and social system. Data were drawn from Autonomous Institutes (IIM, IIFFT and XISC); Universities (Central University of Jharkhand, Ranchi University); and Colleges (St. Xavier College, Doranda (Boys and Girls) College, Ranchi College, Nirmala (Boys and Girls) College, Marwari Boys College, and Gossner College) by using semi structured questionnaire. And by doing analysis it was found that ICT diffusion is taking place but is varying from autonomous to central universities and college. In turn there is need of such model which can diffuse ICT in the education system.

Keywords: ICT, Diffusion of Innovation, Education, Educational Technology

I. Introduction

In the education system the term education is more important. So, the word 'Education' has been originated from Latin word "Educatum". It means the art of teaching. In another words "Educare" which means "to bring up". According to this meaning, education inculcates the good human qualities, impart knowledge and skills and promote understanding. Education plays an essential role in the development of any country. It is considered as a powerful mean to build

a society, based on knowledge (Dubey). But now a days, Indian education system is facing many challenges in the form of access, equity, quality and higher dropout rates in higher education, unemployment etc., (MHRD). Higher education in India is detecting a major change in terms of access, equity and quality. This change is highly motivated by the rapid developments in ICT in education system in all over the world.

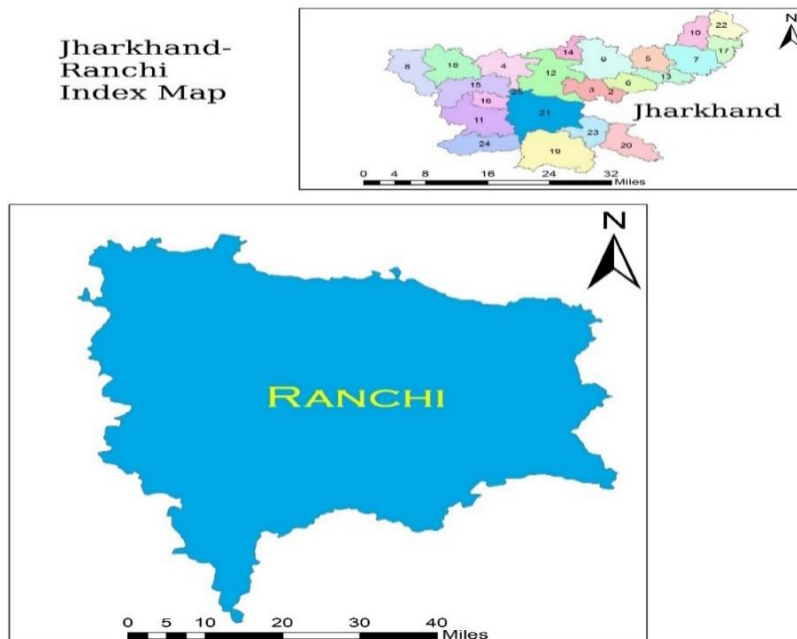
The best use of the opportunities of ICT diffusion in higher education system presents a strong challenge for higher education institutions (Snehi). Indian higher education system is advancing in Science and Technology, mainly ICT, which plays a dynamic role in all segments of the educational process. Internet technology has developed as a main force of this vital developments of ICT. It has completely influenced in every sector of Indian education system. In education sector, institutions are using the computers in their academic programs and producing better quality of research output and learning (Achimugu, Oluwagbemi and Oluwarnti).

“ICT is a term that describes types of technology that are used specifically for communication. It is like information technology, but ICT focuses more on technologies that deal with communication, such as cell phone, internet, computer etc.” (Young), (Kumar). ICT is a good technology that is used in various fields such as Industries, businesses and organizations. However ICT is the combination of IT with other related technologies, specifically communication technology (Kroeker). It includes the capacity of innovations within organisations by authorising and promoting the use and sharing of information. The profits of ICT in organisations and society includes the capacity to reorganise, reformulate, restructure and renew the organisations inside and their interactions with other organisations and individuals within the networks in which they place (Burt and Taylor). According to 2011 census, ‘India is the second most populated country in the world. Population of India is 1.311 billion and its literacy rate is 74.04% where male and female literacy rate is 82.14% and 65.46% respectively. Kerala is on first position in literacy rate and Jharkhand is at the second last a little ahead of Bihar’ (Census).

Jharkhand, with 32 million population, is the 13th most populated state of India. Jharkhand covers 79000 sq. km areas of the total land of India. It is a small state in terms of area. Its density of population is about 414 per sq. km. Its growth rate is about 22 per cent which, to some extent exceeds the national growth rate of 17 per cent. Its population is increasing significantly due to the lack of education and understanding about family planning. Its total literacy rate is 66.41% in which male and female literacy rate is 76.84 per cent and 55.42 per cent respectively (Census).

Ranchi district has a population of 2,914,253 of which males are 1,494,937 and females are 1,419,316. Average literacy rate of Ranchi is 76.06% while male and female literacy rate is 84.26%, 67.44% respectively. However, the state has to overcome the lack of number of schools and educational centers especially in rural areas, which is lesser than urban areas. Even nowadays, many people are below poverty line and unaware about free education through right to education act. Because of being tribal community, most of the population live in remote areas, therefore, they never get education facilities. Because of this, the dropout rate in tribal areas of Jharkhand is high (Census).

Figure: 1 Map of study area Ranchi



Sources: Compile by Author

Subsequently, this paper examines the ICT diffusion in Ranchi district of Jharkhand. This paper has been organized in five sections. The next section deals with literature review linked to the key constructs reflected in our study. The succeeding section proposes the conceptual framework relating to all the important theories considered in our study. This is followed by a section that provides the research objectives, scope, sampling and methodology adopted in our study to address the identified research gaps. Further, in the next section, the results of the study are discussed. The final section summarizes the findings of the study in form of conclusion.

II. Literature Review

To begin with, we review the literature that explores the importance of innovative approach in education field in terms of educational technology.

Educational Technology

Technology in education is defined as a collection of tools that helpful in student learning (Goswami). Educational technology is the use of all kinds of modern media and materials for maximizing the learning experiences. Earlier, teachers used traditional teaching methods in class rooms. The education technology is the method of e-learning and moral exercise that helps in the development of educational quality and performance of the students.

Innovation

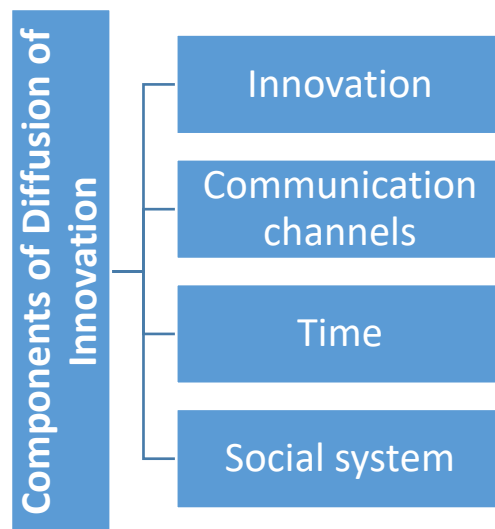
In the 20th century, Schumpeter suggested ‘innovation’ as “keeping the capitalist machine in motion”. The Schumpeter mentioned the innovation to be important for the development of organisational profits and social wealth. (Smith), (J. A. Schumpeter), (J. A. Schumpeter), (J. A. Schumpeter). Innovation is the set of scientific, technical, firm, marketing, making tools for better products and processes (OECD). Freeman defined innovation as an idea, a strategy, new

or progressive model, and action for organisation in 1982 (Freeman). In other words, innovation may be defined as the introduction of a novel, through toward the product, processes or other views of an organisation so as to guide or raising the value. The value is defined as a broad model to involve the above rate of association and profits of customer or other association (Reguia).

Diffusion of Innovation

Innovation is communicated through certain channels over time among the members of a social system is called diffusion. An innovation is a knowledge, training, or thing imagined as new by an individual or another unit of adoption (E. M. Rogers). Diffusion theory is generally used in the social sciences, marketing, education, health, agriculture, communication, development studies.

Figure: 2 Components of Diffusion of Innovation



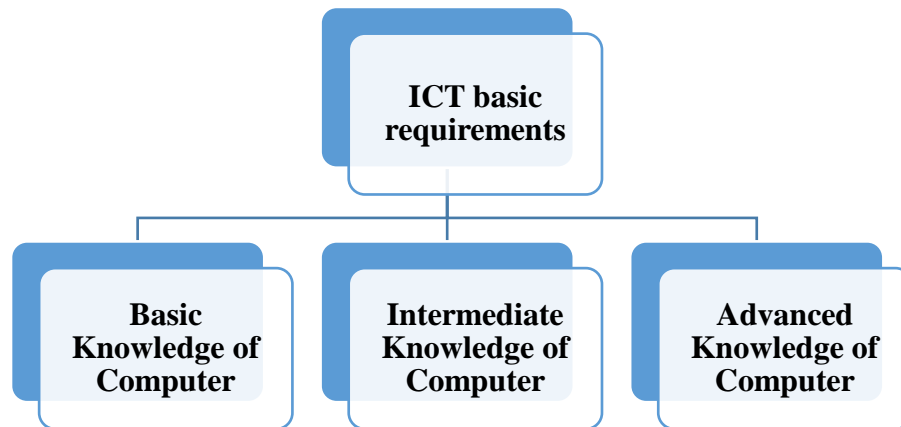
Sources: (E. M. Rogers).

ICT as innovation

During the last few years, the use of information and communication technologies has increase in all sectors of education. It is possible that the diffusion and adoption of information and communication technology in that context are following a form and similar to that has been considered the adoption of any innovation in other fields such as agriculture and medicine (Kumar). The group which make technology at first, is known as ‘innovator’ and they test technology first. The innovators influence early adopters. In this way, the technology shifts from the periphery to mainstream. Customers want to see proof of the benefits of adoption and are less likely to be influenced by the debate of the believers. As further evidence, supporting adoption of technology becomes available. The late adopters adopt the technology after taking more time when they satisfy with the view of others about that technology. Late majority adopt technology after the adoption of late adopters. The group of people who never adopt any technology and argued negative use of technology are known as “laggards”. It is arguable that the adoption of information and communication technology in education has, in general terms, got the stage of early adoption. They need to be influenced by the evidence before making

wholesale changes (Glen and Farrell). As ICT innovation requirement in education system three basic thymes are required (Dubey and Sinha).

Figure:3 Basic Knowledge About ICT



Sources: Compile by Author

Diffusion of ICT in Education in Context of Higher Education

The technology helps teachers as catalyst to specify instruction and to empower students. Thousand innovations have happened with the help of computer technology, which improved the teaching learning process. After the arrival of technology, the nature of education changed that made a new community which lead to new innovation (Parisot). Dale Parnell examined the influence of technology on higher education in 1990. He believed that the technological innovation would come in the form of simulated learning which utilize a new technology like compact disc in education. Parnell looks the simulation learning as an accessible reality, in spite of advanced dream. This is a part of education and training program of business. This industry was mainly used by the military.

The Army National Guard had used an artificial flight trainer for helicopter pilots. This program simulated problem-solving situations which did not create risk to the life of the pilot. Parnell said that the impact of this type of learning through technology, simulates a learning condition in which students can apply knowledge of real-life experience (Parnell). During 1980s, when a new computer technology came into existence, it was predicted by a few scholars that, the new computer technology would help to improve education facilities and conditions (Strange). Earlier, teachers were not aware of computer technology, but after adopting it, they could enhance its knowledge and could use it during teaching (Foa). Dickerson and Gentry supported that the early adopters of home computer have the analogous characteristics such as middle-aged person, higher income, more education, and an opinion leader and information searcher. They found that the early adopters of home computers had more understanding of technological production and services than the comparison of non-adopters.

According to Rogers plan if the background of innovator is good, then they would adopt an innovation easily (Dickerson and Gentry). Isleem has examined the use of computer for teaching purpose. He also studied the relationships between the level of computer users and selected factors such as expertise, access, attitude, support, and teacher characteristics. He found that in technological education, teachers use more conventional computer applications than

computer specific applications. He found that those teachers who uses computer personally, they focused more on the use of computer technology in education field. In his study, Isleem argued that technical training is an important way to increase computer use. (Isleem).

Verhoeven, Heerwegh and Wit said that students use a computer information communication technology instruments regularly like hardware and information communication technology programs. Many software were developed which played important role in education field. Students were regularly engaged in online study such as Internet, e-mailing, chatting, determined the online searching, downloading movies or music, contributing in newsgroups, writing blogs, and playing games etc. Frequently they used information communication technology hardware like PC, laptop, internet, mobile, iPad or tablet, digital camera, e-reader, and e- library etc. in the field of education. They used particular software for education likes word processing, worksheets, databases, social network service (SNS), twitter, computer-generated learning environments, drawing software, statistical programs, qualitative data analysis programs, and specialized software (Verhoeven, Heerwegh and Wit).

The literatures of diffusion theory have given the platform to understand how innovation diffuses in any field. The use of technology started in Indian higher education during fourth five year plane (1969-1974) to improve quality of education. The education technology plan was originated as a broad-based and combined effort between the Ministry of Education and Social Welfare. The Ministry of Information and Broadcasting of Indian, concerned about the Space Research Organizations. It was the best example of inter-agency coordination, systematic planning, scientific evaluation and effective use. The aim of plane was to provide technology for large areas, particularly in rural areas. Its focus was to improve the quality of education on all stages and to reduce wastage and introduce new methods of teaching and innovation (NCERT).

The diffusion of innovation theory plays crucial role in diffusion of ICT in higher education. This study tries to understand the dynamic role of diffusion of innovation for adoption of ICT in higher education institutions in Ranchi. Diffusion of innovation has the four component like; innovation, communication channels, time, and social system. This study will limelight on these components. So diffusion of innovation theory has its relevance in this research and provide better understanding. The relation of diffusion component with key actor of this study are shown in below table.

III. Conceptual Framework

A conceptual framework developed based on the literature review, linking the key constructs of ICT as innovative tool in higher education field of Ranchi.

Table: 1 Relation among the diffusion components and key actor of study

Innovation	Communication channels	Time	Social system
Information communication technology (internet, projector, computer, laptop, CD, DVD, E-contents, Journal, audio-video contents, video conferencing etc.)	Teacher, students, peer-group, policy, media,	2000 th to 2017 th	Central university, state university, colleges, autonomous institutions,

Sources: Compile by Author

IV. Objectives and Methodology

Objectives

To emphasise on the awareness of ICT among the students of higher education.

To assess the diffusion and adoption of ICT in higher education in Ranchi.

Scope

The study analyses the diffusion of technology especially in terms of Information Communication Technology (ICT) in Ranchi district in Jharkhand. ICT is one of the important tool for the development of education system. Very few studies have been done on diffusion of ICT in higher education system in India but, particularly, there is no study has been found in the district of Ranchi in Jharkhand. Further, it provides the idea about innovators, communication channel, time, functions of society which is the main components of diffusion of technology. It is thus, the study has considered to assess the ICT infrastructure of university, college, institution in Ranchi.

Sampling and Specifics of Data Collection

The research methods is the tool by which research information is collected in the research filed. Different kind of tool and techniques of data collection have been used in this study. Some research methods such as group discussion with the students and interview of the teachers in higher educational institutions etc. is taken into account. Both, primary and secondary sources of data can used for the study. Primary sources include interviews with respondents located in education filed, teachers, students of university, colleges and institutions. Secondary sources of data includes the papers, articles, books, education policy, five year plans and ICT in education.

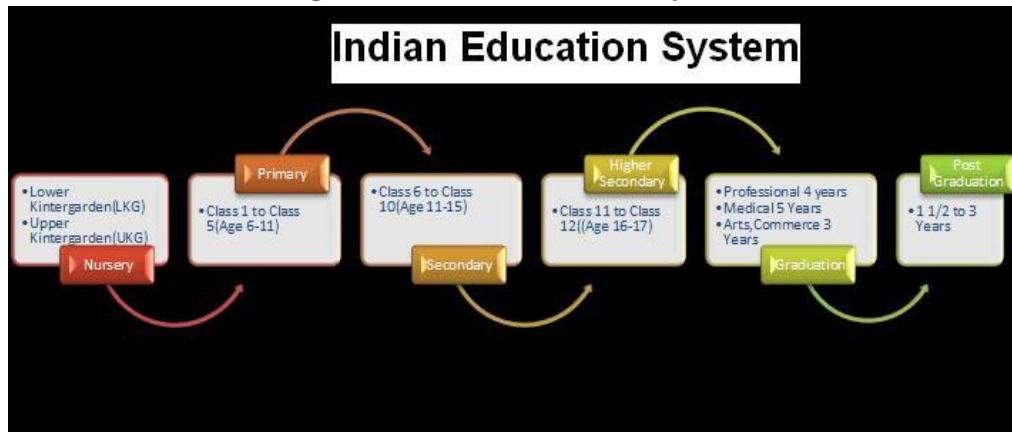
4. Dimensions, Variables and Measures

4.1 Education system

Education is an effective tool for the people to understand the society in the right way and live accordingly. It also changes the scenario of the world. Education offers opportunities to societies for social, cultural, economic, moral, spiritual and political awareness. Education plays an essential role in the development of any country, therefore, it is considered as a powerful tools to build a knowledgable society (Chahal).

In India the education system is divided into various types like pre-primary education, primary education, secondary education higher secondary, and graduation, post-graduation, as show in figure.

Figure:4 Indian Education System



Sources: Compile by Author

In addition to above figure others can be seen as doctoral, post-doctoral and so. In this paper there is focus on higher education (that include Colleges, States University, Central University, IIT, and IIM).

4.2 Innovation

The definition of innovation has been discussed previously in this paper. As stated there is focus on diffusion of innovation a research scholar named Rogers in 2003 defined the characteristics of innovation on the basis of adoption rate and innovation of diffusion product. According to Rogers, if innovation has the following five qualities then it will diffuse easily. This qualities are as above;

- (1) Relative advantage, can be understood better than the idea it succeeds. The degree of relative advantage can be measured in commercial terms, but social status, conveniences for the satisfaction of innovations which is an important factor.
- (2) Compatibility, is the degree in which an innovation is supposed to be reliable with the current values and past experiences, and needs of the potential of adopters.
- (3) Complexity, is the complexity of innovation is the degree in which an innovation appears difficult to understand for users.
- (4) Trial ability, is the trial ability of innovation is the degree in which an innovation may be tested on limited basis.
- (5) Observability is the observability of innovation, or any new technology is the degree in which the result of an innovation is visible to others.

4.3 Communication channels

The Communication is the process in which members create and share the information with one another in order to spread a mutual understanding. The communication channel is the way by which information travel from one person to another.

4.4 Time

The time is involved in the diffusion of innovation in three ways. First, time is used to take decision about the innovation-decision process. The innovation-decision process is the intellectual process through which a person passes knowledge of an innovation to adopter for making attitude toward the innovation. Time helps adopter to take decision for adopting or rejecting the innovation. In this process, the innovator tries to know merits and demerits of innovation (Rogers 2003).

Adoption Categories of Innovation

There are five adopter categories or classifications of the members of a social system on the basis on their innovativeness given by Rogers.

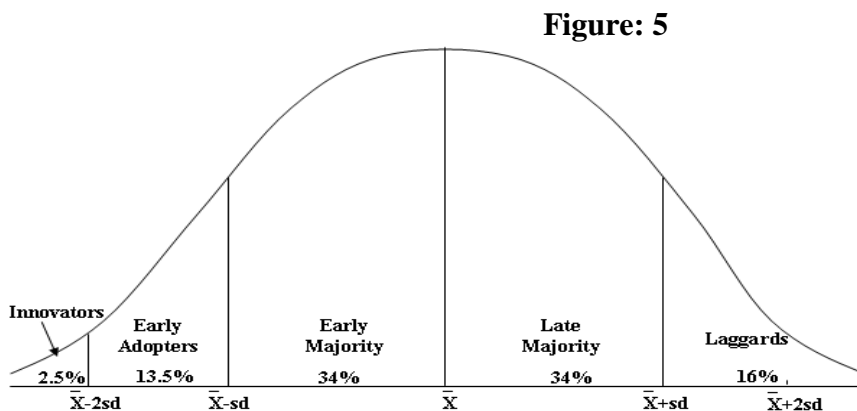
Innovators – 2.5%

Early adopters – 13.5%

Early majority – 34%

Late majority – 34%

Laggards – 16%



Source: (Roger).

Table: 2 Adoption Categories of Innovation

Innovators (2.5%)	The innovators are the parson who innovates the new idea, knowledge or new technology and adopt first in the social system.
Early adopters (13.5%)	Early adopters are the group peoples in the social system who adopted the innovation after innovators
Early majority (34%)	The early majority is the group of people who adopt the innovation after early adopter and give contribution in adoption of innovation to 34 percent of the individuals in social system
Late majority (34%)	The late majority is the group of adopters who adopt the innovation after early majority and give the 34 percent contribution in adoption process.
Laggards (16%)	The laggards are the group of adopters who adopt the innovation after late majority and given their contribution in the adaptation of innovation process in social system

Sources: Compile by Author

4.5 Social system

A social system can be defined as “a set of unified group that are involved jointly in problem-solving to achieve a common goal. The members of this group may be personal, informal groups, organisations or sub-systems”. The social system deals in two ways that is first it

creates a boundary in which an innovation diffuses. And second is to see how standards affect diffusion. The standards here are the established behavior model for the members of a social system. A modification agent is a person who attempts to influence customer's innovation decisions in the way that is believed necessary by agency (E. M. Rogers).

5. Results and Discussion

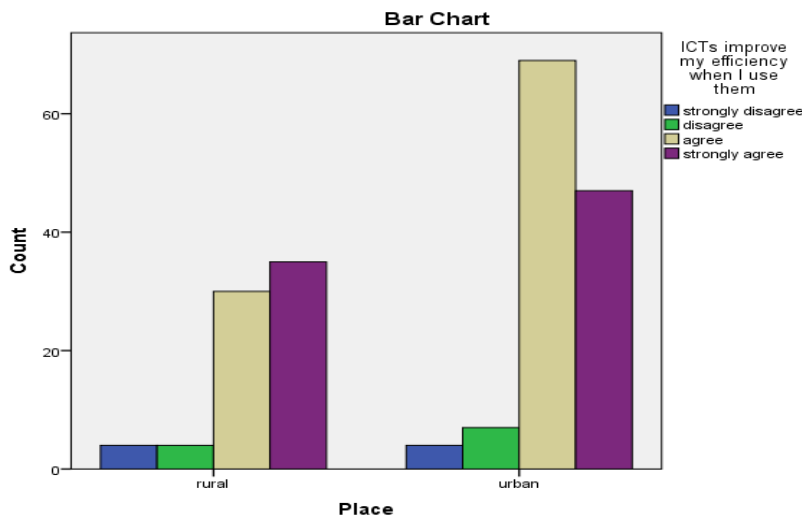
It starts from the initial context related to ICT diffusion in education system that is the rural urban, caste, gender and economy states of the of student since this all helps in diffusing the components of ICT in their life and daily routine. So based on primary work results and analysis s is shown in form of figure here.

Diffusion of ICT and Their Impacts:

Awareness of ICT amongst Students at Ranchi through analytical and graphical analysis has been divided into four parts. To know about the awareness of ICT among the students, the total two hundred samples were collected in the city of Ranchi, Jharkhand. The result is shown in tables and represented in the figure.

Table 3 ICTs improve my efficiency when I use them in the learning process						
Count						
		ICTs improve my efficiency when I use them				Total
		strongly disagree	disagree	agree	strongly agree	
Place	rural	4	4	30	35	73
	urban	4	7	69	47	127
Total		8	11	99	82	200

Figure: 6



Sources: Compile by the author during field work

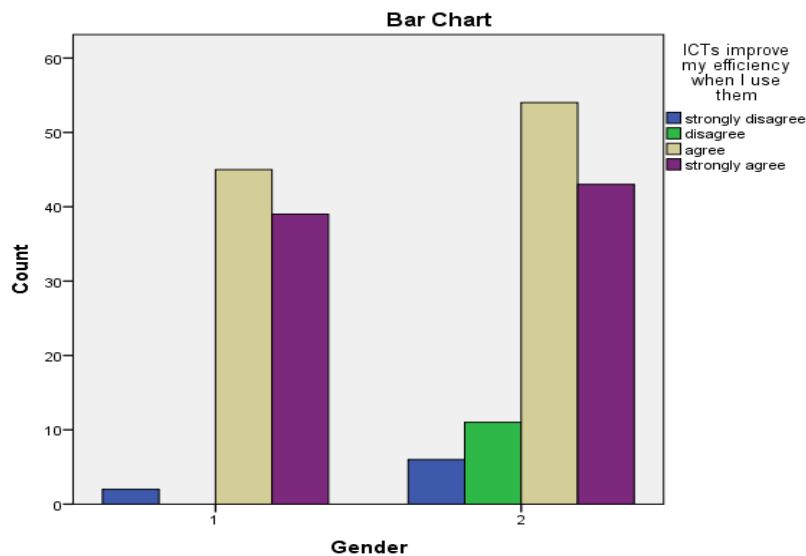
According to the data that, there are around two hundred students that are planning to enhance their productivity by utilising ICT in learning process. And data show that diffusion of innovation based on the place of residency like rural and urban. Seventy-three students in the

rural region and one hundred twenty-seven students in the urban area participated in the study. Similarly, in a rural location, 35 students highly agree, 30 agree, but 4 disagree, and 4 strongly disagree on using ICT to boost their learning efficiency. Among 127 urban students, 47 highly agree, 69 agree, 7 disagree, and 4 strongly disagree. Overall, out of two hundred students, 82 students highly agree, 99 students agree, 11 students disagree, and 8 students strongly disagree. Data shows a wide gap between rural and urban areas. Therefore, students in rural areas are less aware of the use of ICT in the early phases, whereas students in urban areas are more aware of the use of ICT as a result of a better-established infrastructure for ICT in urban areas. Overall, 90.5% of students think that using ICT makes them better at university or in other areas. In addition to allowing students to work at their own pace and in their location, ICT has also improved the students' attitudes toward ICT learning.

Table:4 According to gender

		ICTs improve my efficiency when I use them in the learning process				Total
		strongly disagree	disagree	agree	strongly agree	
Gender	1	2	0	45	39	86
	2	6	11	54	43	114
Total		8	11	99	82	200

Figure: 7

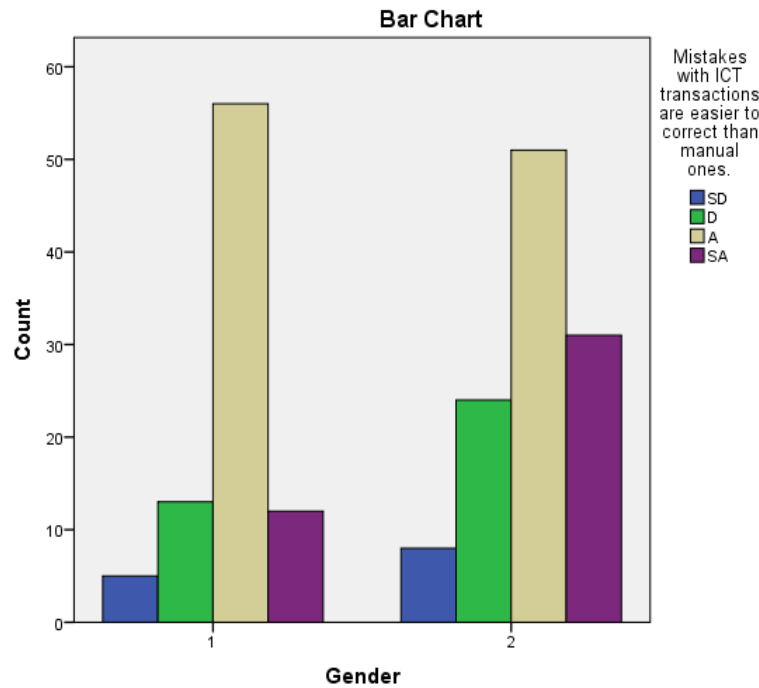


Sources: Compile by the author during field work

The studies also seen the gender wise view of students. In two hundred students, eighty-sixes are male students and one hundred fourteen students are female. In male students, thirty-nine students strongly agree, forty-five students agree, zero students disagree and only two students strongly disagree. Similarly, from female students, forty-three students strongly agree, fifty-four students agree, eleven students disagree and six students strongly disagree. This is so, because in Ranchi there is literacy gap between male and female (census 2011), the male literacy rate 76.84% and female literacy rate 52.04%. According to male and female views on

ICT, 97.67% male and 85.08% female say that ICT improve their efficiency when they used ICT. However, from the overall sample, 41% students strongly agree, 49.5% students agree, 5.5% students disagree and 4% students strongly disagree. Based on the result, it can said that, the awareness of ICT among students is good and also fulfil the norms of diffusion models.

Figure 8



Sources: Compile by the author during field work

The above figure, shown that gender wise students' views about Mistakes with ICT, transactions are easier to correct than manual ones. In two hundred students, eighty-sixes are male students and one hundred fourteen students are female. However, from male students, twelve students strongly agree, fifty-six students agree, thirteen students disagree and five students strongly disagree. Similarly, from the female students, thirty-one strongly agree, fifty-one agrees, twenty-four disagree and eight students strongly disagree. It can be seen from the table, the female students more strongly agree than male, but, in a second aspect the situation is vice-versa.

The overall male & female percent is 79.06% male students are aware of the use of ICT and on the other side 20.93 % are not aware about the use of ICT. Similarly, 71.92% female students aware about the use of ICT but 28.07% female students have not aware about the use of ICT. The reason of this situation is because, in higher education enrollment number of female students is less than male students. From the overall representation, 75% students are supported the use of ICT and only 25% student are not supported the use of ICT.

Based on the field survey and observation, ICT fully diffuses in higher education system and mostly students aware about the ICT and frequently used in the learning process and enhance their knowledge. It can be said the Rogers diffusion of innovation theory is proved because 75% students in higher education are aware of ICT and frequently use them mains ICT is fully spread in higher education.

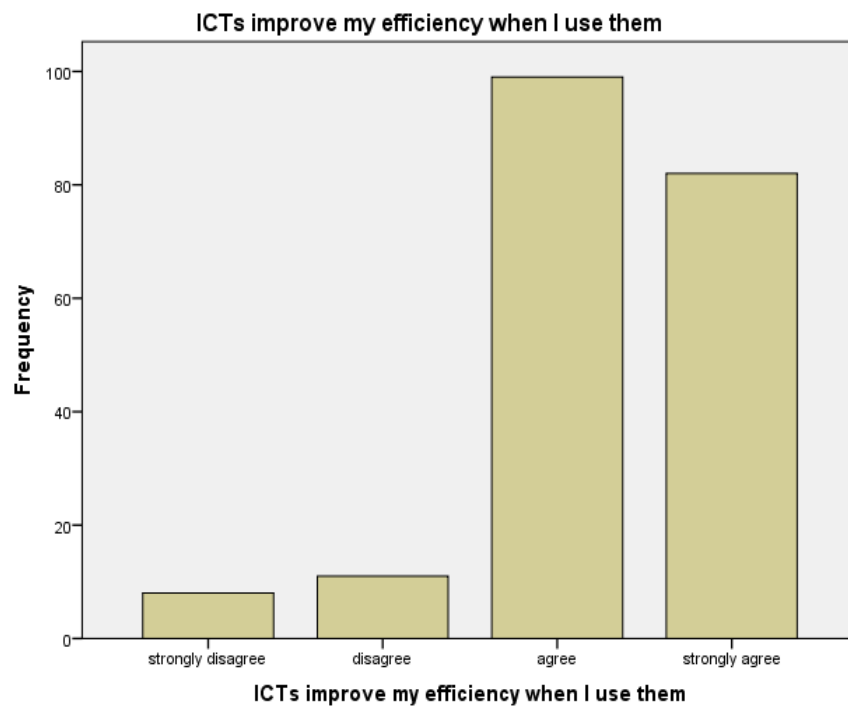
In addition to check about the enough advantages of ICTs for students, gender wise awareness among students, whether ICT help to enhance the teaching learning process in higher education

in Ranchi. The bellow table 3 show the There are enough advantages of ICTs for me to consider using them.

Table: 5 ICTs improve my efficiency when I use them

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	8	4.0	4.0	4.0
	disagree	11	5.5	5.5	9.5
	Agree	99	49.5	49.5	59.0
	strongly agree	82	41.0	41.0	100.0
	Total	200	100.0	100.0	

Figure: 9



Sources: Compile by the author during field work

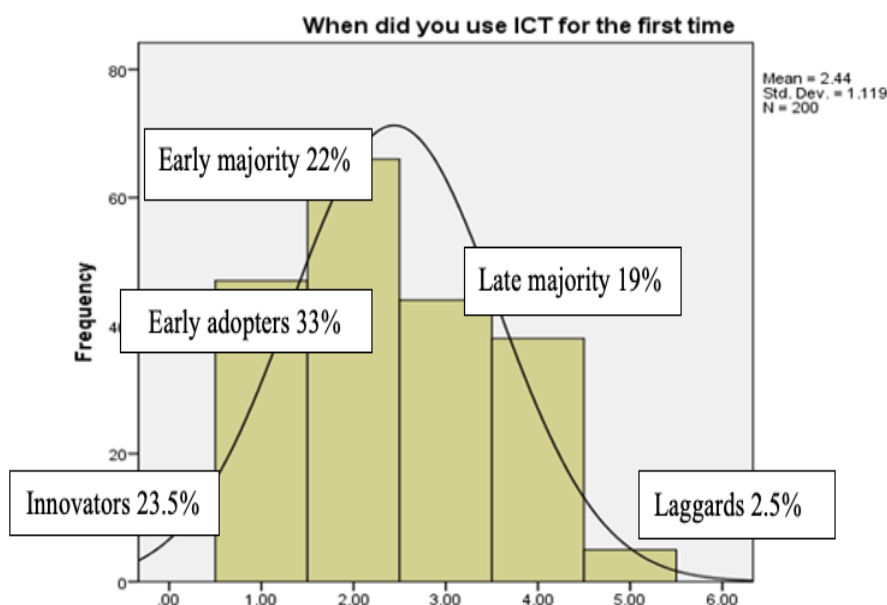
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male and 85.08% female say that ICT improve their efficiency when they used ICT. However, from the overall sample, 41% students strongly agree, 49.5% students agree, 5.5% students disagree and 4% students strongly disagree. Based on the result, it can say that, the awareness of ICT among students is good and also fulfil the norms of diffusion models.

Table:6 ICT diffusion at Various Levels in Higher Education

When did you use ICT for the first time		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2000-2004	47	23.5	23.5	23.5
	2004-2008	66	33.0	33.0	56.5
	2008-2012	44	22.0	22.0	78.5
	2012-2016	38	19.0	19.0	97.5
	2016-2020	5	2.5	2.5	100.0
	Total	200	100.0	100.0	

Figure:10



Sources: Compile by the author during field work

This figure illustrates the perspectives of students toward the adoption of ICT. There are five distinct time intervals that each used to classify this data differently. Therefore, between the years 2000 and 2004, ICT was used by 23.5% of students in higher education. Thirty-three percent of students used ICT during the 2004–2008 academic year. In the years 2008–2012, 22% of students utilised ICT in the classroom. Between the years of 2012 and 2016, 19% of students used ICT in their education. This is because the government has put more focus on using ICT in higher education and made policies that improve the quality of education. Figure 4.15 presents an unmistakable illustration of the five distinct stages involved in the process of

invention diffusion. These stages include the inventors, early adopters, early majority, late majority, and laggards. These results fit the S-shape model of invention dissemination. The graph shows that most students in higher education have embraced the use of ICT and adhere to the diffusion theory of learning. And find that, ICT is widely used among Ranchi's higher education students.

Conclusion

The study's findings support the idea put up by several students that new ICT-related tools are more adapted to encouraging the functional use of certain ICT tools than the alternatives. Because of the ease of use, students and teachers choose technologically modern educational tools over more traditional ones. Many students now have access to digital learning, computers, cellphones, and other educational technologies. Studying how people interact with new technology has been enriched by including Rogers's diffusion of innovation theory. Individuals normally classified as "Early Adopters" were discovered in the research. People are more likely to use ICT if they are familiar with it because of their day-to-day interactions with familiar technology, applications, and advantages (e-books, online learning). It was found that the participants, in general, viewed their experience with ICT to be on the "Slope of Enlightenment," which provides more examples of how technology may help pupils.

Participants have realized that e-books still have many benefits over printed books, but certain drawbacks must be addressed, such as the fact that e-books do not display optimally on e-readers and smartphone devices because of the unsupportive formats. Adopters, on the other hand, were more knowledgeable about ICT and had more information on how to use associated access devices. Using the diffusion of innovation model, see the adoption challenges (infrastructure, found, lack of skilled teachers) connected to the increasing use of technology for teaching and learning in university. This study also suggests that university it is possible to plan a budget, create policies and procedures, and prepare the workforce for new technologies. when they are aware of the benefits of ICT in education. Because they are better prepared to adopt new technology, institutions are better able to get support from many different government agencies. This lets them use the new technology to its fullest potential as soon as it is available.

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