Effectiveness of ICT-Based Intelligent System Using Cloud Computing for Research Programme During Covid-19 Pandemic

V.Vamsi Krishna*, G. Gopinath**

Abstract: ICT-based education system refers to the education system which is based on "Information and Communication Technologies". The use of ICT in the education system is very effective and efficient to enhance the engagement of the students towards their learning. The use of modern technology in the education system helps to enhance the productivity of the students. Therefore, the usage of technology in the education system of India is increasing day by day. There are several services of ICT-based education systems and among them cloud computing is one of the most important services for developing education systems. Thereafter cloud computing is a networking and technology-based process which help students to learn together. During the covid-19 pandemic situation the Government of India has declared a certain stoppage of the education system in the country and people had to maintain social isolation at the time. Moreover, the use of ICT-based education systems and cloud computing processes help the students to continue their education during the pandemic. Thus, the usage of cloud computing processes and ICT in the education system has mostly increased during the pandemic. Therefore, the purpose of this specific research article is to analyse the effectiveness of ICT-based education systems using cloud computing for research programs during the pandemic situation in India. The concept of ICT-based education system and cloud computing is analysed in this specific research article properly. Apart from that the usage of ICT based education system and soft computing for research programs is also analysed please research study. There are different types of cloud computing services and its impact on the education system is also different. Therefore, all the cloud computing services analysed below in this research article appropriately. The researcher has adopted several methods and techniques to gain more knowledge and information about ICT-based education systems and cloud computing. Thereafter, the researcher has adopted the primary techniques for gathering data and uses the quantitative method to analyse all the collected data in this research article properly. Thus, the impact of pandemic and cloud computing on the education system is analysed in the research article.

Keywords: Education system, ICT-based, pandemic, impacts, COVID-19, Cloud computing.

1. Introduction

ICT-based education system refers to delivering the learning materials to the students by using "***Information and Communication Technologies***". Therefore, the usage of technology in the education system of India can be identified and after the pandemic it increased. There are several processes of the ICT-based education system such as E-learning, cloud computing and others that are used for the education of the student. The particular research article is based on the concept of ***cloud computing*** and its effect on the education system of the country. Furthermore, the purpose of this research article is to analyse the effectiveness of the ICT-based education processes to enhance the efficiency of the education system. On the other hand, cloud computing is a process where students can learn together from their houses by using some specific tools. The researcher has used the

sources of the primary method to collect data and analysed all the data quantitatively.

2. Literature Review

2.1 Concept of ICT-based Education System

"Information and Communication Technology (ICT)" is identified as a broader term regarding information technology (IT) that helps in communicating different sources of network. It includes ***computers, wireless networks, middleware, social networking, cell phones, software***, and ***other media applications***. ICT in the education system has an effective and efficient area in playing a vital role. As observed by Ngwacho (2020), delivery of all types of information can be led by that technology system that is able to improve students' education process. It can enhance the engagement of the students towards their learning. Accompanied with appropriate technological knowledge, maintenance of networking concepts is also a significant key tool to manage the educational process

In India, the usage of technology in the education system is increasing day by day that helps to enhance the productivity of the students. It is important to notice that

*Research Scholar, School of Computer Science, Engineering & Applications,
Bharathidasan University,
Tiruchirappalli, Tamil Nadu, India.
**Professor, School of Computer Science, Engineering & Applications,
Bharathidasan University,
Tiruchirappalli, Tamil Nadu, India.

the cost of education equipment is enhancing rapidly in all the states across the world. As opined by Çaldağ *et al.* (2021), ICT technology has a remarkable and positive impact on students' achievement. The education system can be updated with **better knowledge, innovative capabilities**, and **presentation skills**. Accompanied with remote devices access of course material can be controlled in an appropriate way. Flipped classroom is another approach that is blending learning to the content at home. Employing the flipped classroom concepts also can be possible within this technology. It is able to provide new sets of skills by which students can gain their learning experiences to achieve something best.

2.2. Information and Communication Technologies using Cloud Computing

Cloud computing is a ***next-generation technology*** that is capable of providing services to the user in multiple ways depending on the network as well as the internet system. Using cloud computing connectivity with the internet can be cost-effective. As stated by Aceto *et al.* (2019), cloud computing is one of the most important services for developing education systems. Accompanied with this application, fast internet connections and standard web browsers can be implemented to access and control high demand of education. As cloud computing offers virtual and physical computers, it has become one of the most appreciable technologies to operate the education system.

Accompanied with cloud computing, big size data can be handled within a perfect approach and protecting the data can become easy. In the words of El Mhouti *et al.* (2018), cloud computing has been identified as a powerful paradigm to establish a strong connection with existing resources in order to execute data mining as well as intelligent analysis. It is capable of supporting, assisting, and cooperating with future direction, emerging technologies to enhance the education quality. In addition, it needs certified documents to operate the system and provide perfect support to establish data communication and electronic equipment in the cloud computing system. Thus ICT has a great role in leading an educational goal towards success by operating cloud computing. Based on deep learning research, improving technological development has a great impact on balancing the information management process.

2.3 Advantages and Disadvantages of ICT in Education

In the networking industry, controlling skills and knowledge ICT has been considered as a beneficial element to operate the work from anywhere with modern technologies. ICT has several advantages in controlling the education system. It can offer the opportunity for students centered teaching. As per the view of De Paepe *et al.* (2018), giving greater exposure to vocational and educational skills for students becomes easy with ICT. the proper meaning and opportunity of updated education can be understood by adopting ICT in the education system. In order to expand further skills within computers and computer related programs can be connected with the education process in the adoption of cloud computing. It can help in developing a ***paperless education system, minimize cost, save time***, ***can provide automatic solutions to manual paper-based processes, provide direct classroom teaching,*** and ***be able to control student management processes***.

In addition, the teachers can teach the students with ***better images, graphics, videos***, and educators can engage with the online education system. Apart from several advantages, there are a few disadvantages as well in the ICT system. Accompanied with this technological application risk of cyber attacks and hacks can occur. As proposed by Criollo-C *et al.* (2018), misuse of technology along with misleading and misleading information is a serious concern in operating communication technologies in the education system. In addition, several times modern technology does not remain accessible everywhere. Furthermore, implementing cloud computers and the internet is becoming expensive compared to the expectation. As it is different from the convention education curriculums, it may replace the traditional system.

2.4 Comparing advantages of ICT-based education system before and after COVID-19 Pandemic

The COVID-19 pandemic situation has resulted in shutting all the educational sectors across the world. It has been identified that in 186 countries over 1.2 billion children are out of the classroom due to the dangerous situation. Before the pandemic, the education system depended on the offline process. As cloud computing has the ability to make resourceful decisions as well as implement tasks automatically without any mistakes, it has become popular in the education process before the pandemic. Thus ICT and cloud computing supported the system of better skillful education before the pandemic but the real dominance was realized after the pandemic. In order to support this negative situation, ICT has become considered as one of the most useful key tools to manage the online educational system. With the help of ICT and the distinctive rise of e-learning, education has changed dramatically. As per the view of Guo *et al.* (2021), physical classroom has become a virtual classroom with a cloud computing system. In the COVID-19 pandemic situation, several facilities have been adopted by the educational system to deliver a high quality and standard education to students.

In addition, the importance of online platforms for learning has increased with a massive amount within the

cloud computing technological system. As within cloud computing applications, ICT-based education systems have the opportunity to serve language apps, video conferencing; it has become a significant surge in usage since COVID-19. According to Jordan *et al.* (2020), introducing the system of ICT-based learning is becoming an important key factor as it allows students to learn in their own place and time. Since there is no time limit in the case of educational practice, this method is useful to manage the learning process according to one's own time. As it is an advanced technological tool to detect the various learning materials in advance, the demand for it in education has increased a lot.

3. Methodology

In order to fulfill the objectives of the study, the researcher has adopted specific tools to operate the process of methodology to collect the relevant data, analysis, and answer the research questions. In order to gather data suitable for and relevant to the research topic, research instrument selection has a vital role. The *"primary quantitative research"* has been opted for to progress with survey process. All 51 respondents have been consulted from educational department to take part in survey. As opposed by Dolnicar (2020), in primary quantitative process, it is observed that the researcher has the ability to gather poignant information. The questionnaire set is considered to be relevant to the topic and every respondent needs to carry out survey ensuring safety along with security. Rather than depending on the data collected from previously done research, first-hand data always provide better and appropriate knowledge related to the topic.

A total of 10questions were made by the researcher to lead the research work to get the result of this study. As in this procedure, the data gathering process has been implemented directly from the source, the value of the information remains important. According to Levitt *et al.* (2018), the sample size of primary quantitative research is more in comparison with primary qualitative methods that increase research scope. In order to lead the research forward, primary research has the distinct feature that only focuses on the process of collecting data. In the primary quantitative process, the researcher has provided *3 demographic questions* and *7 close-ended questions* to the participants to recognize the significance of ICT-based education systems within cloud computing for research programs. It has been stated after observing the outcomes of this research that for all quantitative result research methodologies or studies, survey research is considered as one of the most fundamental tools.

After the collection of raw data, the important step is analysing the data to understand the aspect of the process. It is important to establish a strong connection of the outcomes to the objective of the research to maintain the statistics of the ICT-based educational system. In the words of Kaur *et al.* (2019), data analysis is a vital stage of conducting a particular study to derive statistical inferences. In this scenario, the researcher has taken the help of *MS Excel* to analyse the collected data and information. *MS Excel* as a data analysing tool supported the researcher to find the proper meaning of the close-ended questions. After conceptualization and the units of analysis, choosing a research instrument is done to conduct a particular research topic. This provides the researcher with a more accurate opportunity to understand highly complex data and make the research outcome efficient. Thus, while collecting data and information through primary data, it may be analysed in multiple ways. The researcher has adopted *MS Excel* as it is quite easy to access complex data.
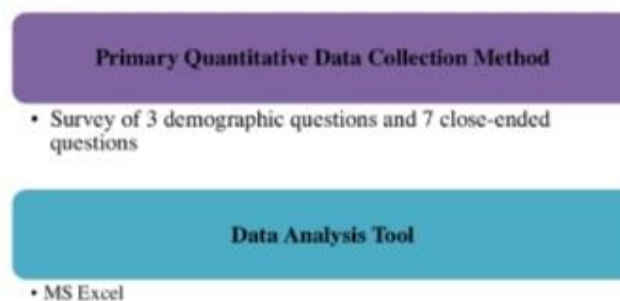
Fig. 1: Justification of Methodology

(Source: Self-created)

## 4. Result and Discussion

4.1 Results

The researcher has adopted the primary method and has done a survey for gathering data and information about the research topic. Therefore, the researcher created a questionnaire and there were a total of *10 questions* in the questionnaire. Thereafter, all the questions are related to the concept of ICT-based education system and its effectiveness. Furthermore, there were a total of *51*

respondents that have provided their opinion on the statements of the questionnaire. Thus, the data that are collected from the survey are analysed below in this research article. In addition to that, the researcher has divided the questionnaires into two sections and both the sections are analysed below.

Section 1: Demographic Block
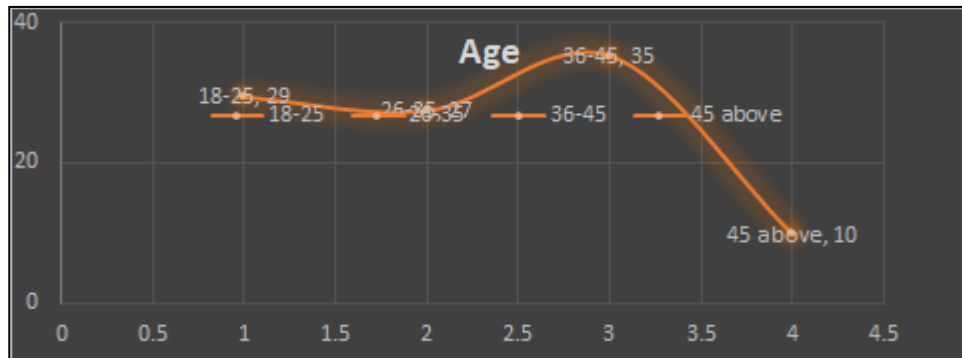

Fig. 2: Age

(Source: Self-developed)

Age is one of the important factors in the particular survey and it was mandatory that all the respondents need to be 18 years or above. Therefore, four groups were taken into consideration as per their age limit. The first group was within the 18-25 age group, the second group was within the 26-35 age group, the third age group was within the 36-45 age group and the last group was 45 above age group. Thereafter, *around 29%* of the respondents were from the first age group and *about 27%* of the participants were from the second age group. Apart from that, *nearly 35%* of the respondents were from the third age group and *about 10%* of the participants were from the fourth age group.
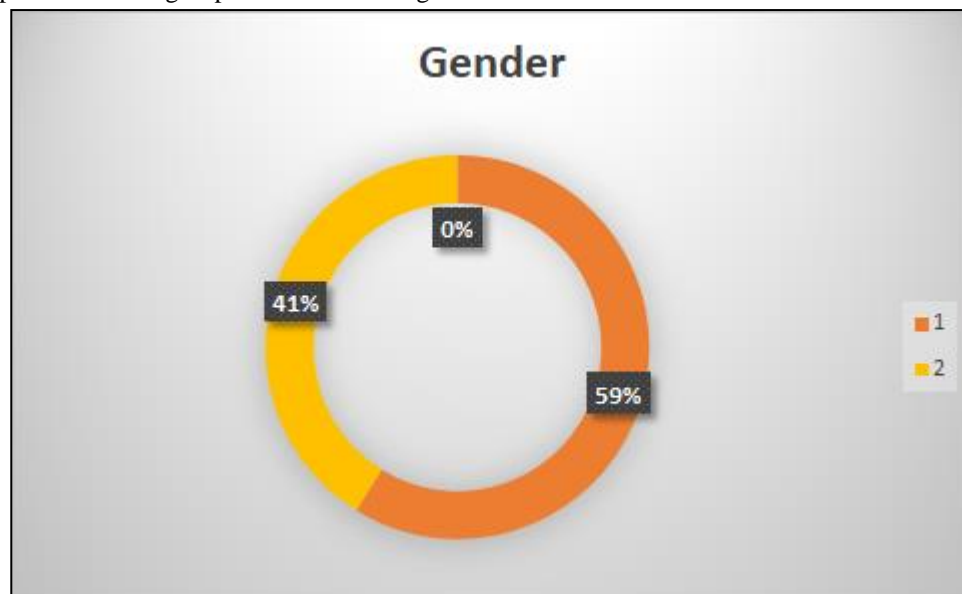

Fig. 3: Gender

(Source: Self-developed)

Gender was another important factor of the survey and the gender status of the participants were asked as the second question of the survey. Thus, *nearly 59%* of the participants were female and *about 41%* of the participants were male in the survey. There were both females and males indicating diversity and inclusion in terms of selection criteria. In this regard, it can be stated that the teaching profession is more female-oriented therefore, it is important to understand whether technologies such as cloud computing have been helpful to establish a combination between technologies such as ICT-based systems and teaching or not.
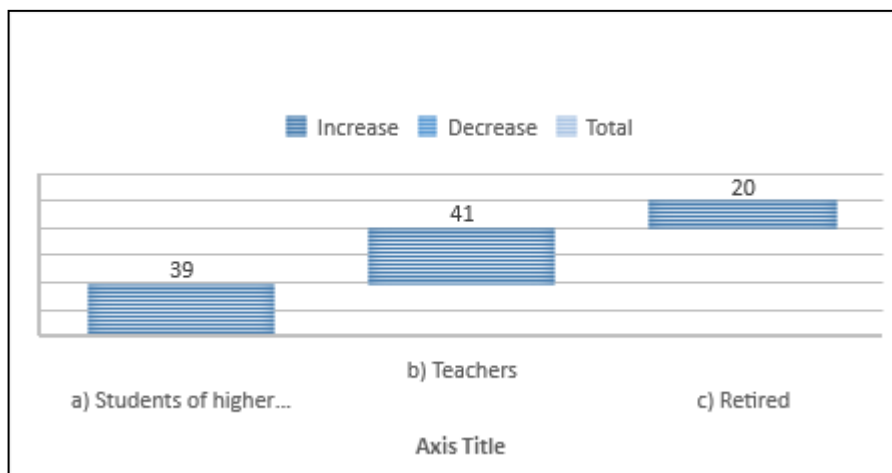
Fig. 4: Occupation

(Source: Self-developed)

The third question of the questionnaire was based on the occupation of the respondents. Therefore, gaining knowledge about the occupation of the participants was important because all the participants must have knowledge about the ICT-based education system and its effectiveness. Furthermore, there were people with three types of occupation such as students of higher education, teachers and retired people. Thereafter, *nearly 39%* of the respondents were students of higher education and *about 41%* of the participants were teachers. In addition to that, *around 20%* of the respondents were retired people.

**Section 2: Effectiveness of ICT-based education system**
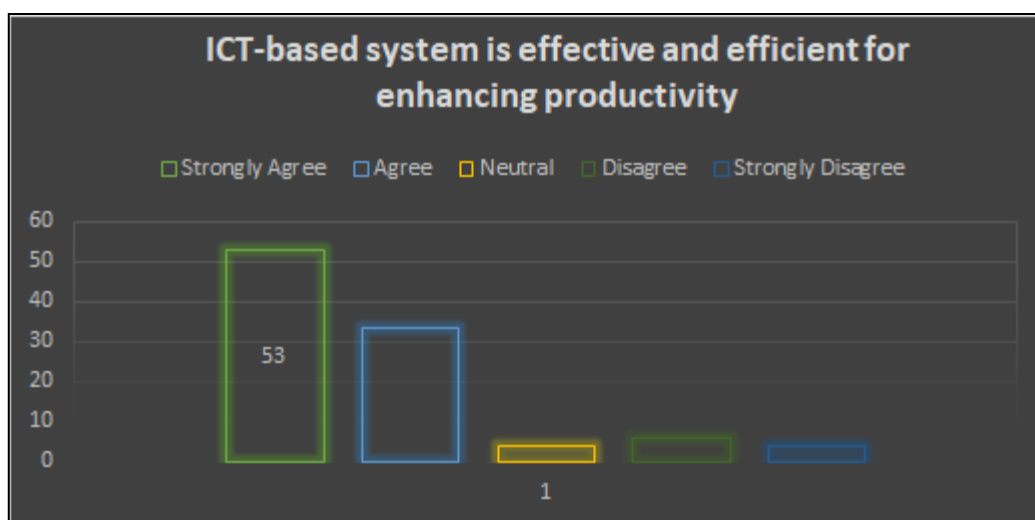
Fig. 5: Effectiveness of ICT-based education system for enhancing productivity

(Source: Self-developed)

The next question was about the effectiveness and efficiency of the ICT-based education system for enhancing productivity. Therefore, *nearly 53%* of the participants have strongly agreed with the particular statement and *about 33%* of the respondents have agreed with the statement. In addition to that, *about 6%* of the participants did not provide any opinion about the statement. Furthermore, *nearly 4%* of the respondents have disagreed and *about 6%* of the participants have strongly disagreed with the specific statement.
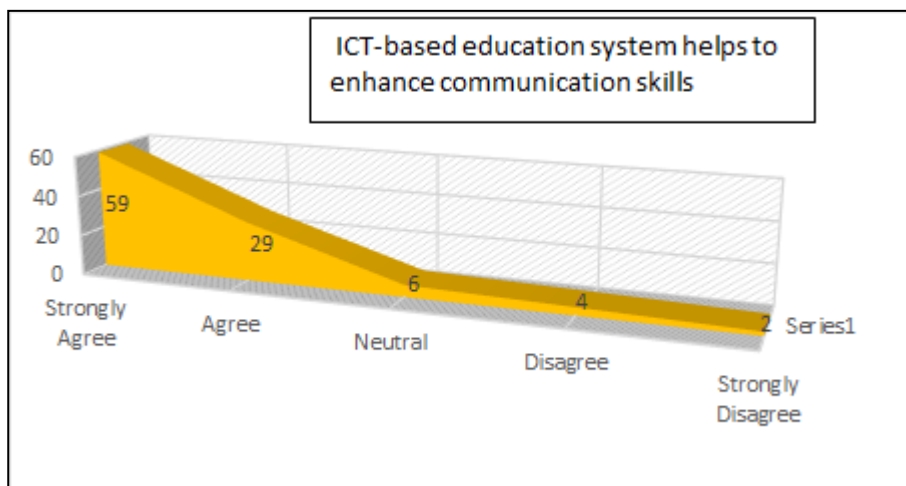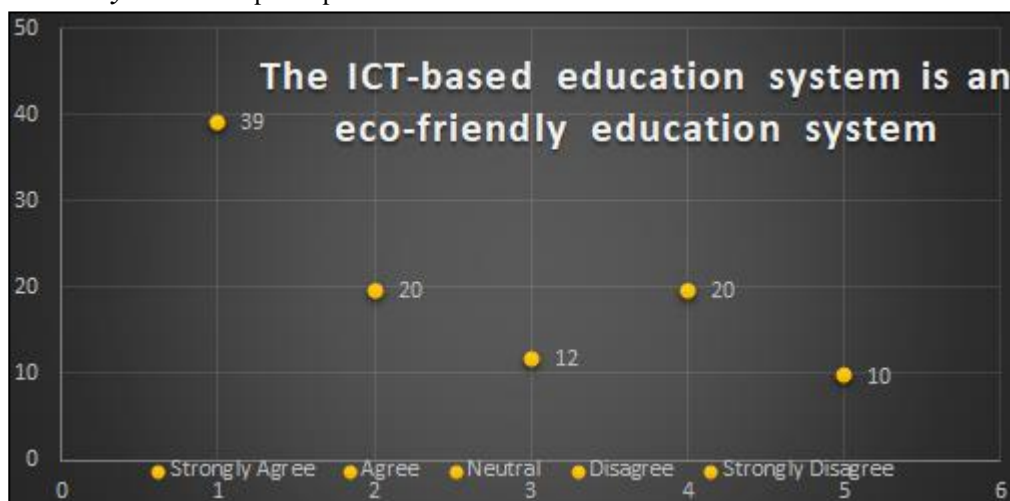
Fig. 6: ICT-based education system helps to enhance communication skills

(Source: Self-developed)

Nearly 59% of the participants have strongly agreed with the next statement which is that the ICT-based education process helps to enhance communication skills. Apart from that, *about 29%* of the respondents have agreed with the statement and *nearly 6%* of the participants did not provide their perspective towards the statement. In addition to that, *around 4%* of the respondents have disagreed and *about 2%* of the participants have strongly disagreed with the particular statement.
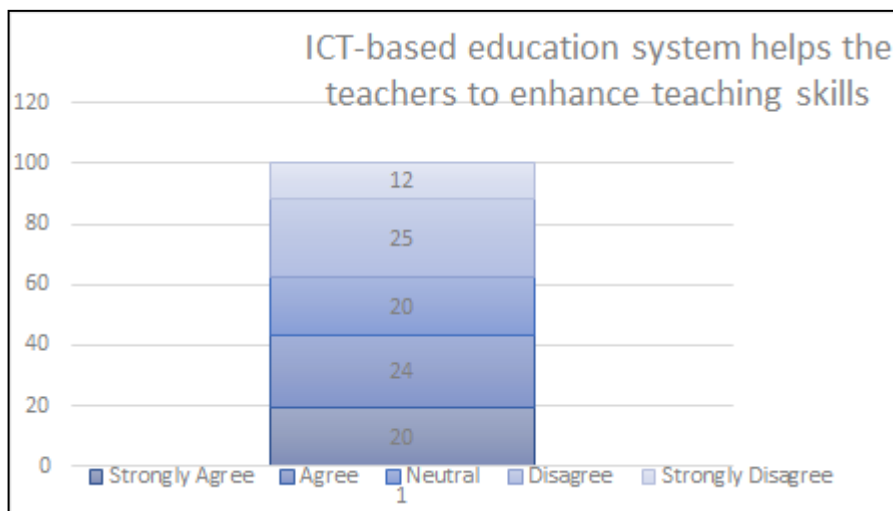

Fig. 7: The ICT-based education system is an eco-friendly education system

(Source: Self-developed)

The next question was about the eco-friendly system of the ICT-based education system. Therefore, *nearly 39%* of the participants have strongly agreed with the particular statement and *about 20%* of the respondents have agreed with the statement. In addition to that, *about 12%* of the participants did not provide any opinion about the statement. Furthermore, *nearly 20%* of the respondents have disagreed and *about 10%* of the participants have strongly disagreed with the specific statement.
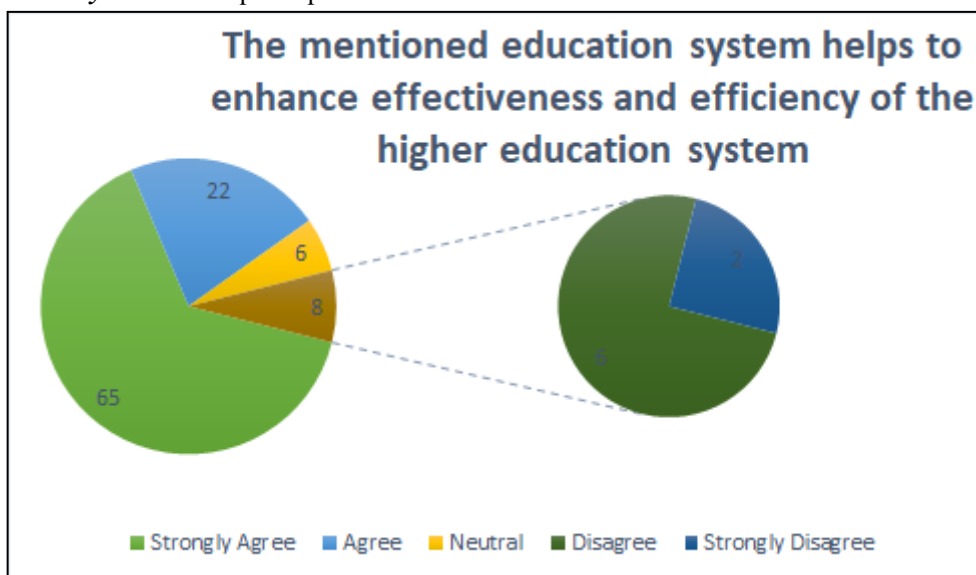
Fig. 8: ICT-based education system helps the teachers to enhance teaching skills

(Source: Self-developed)

Nearly 20% of the participants have strongly agreed with the next statement which is that the ICT-based education system helps the teachers to enhance teaching skills. Apart from that, *about 24%* of the respondents have agreed with the statement and *nearly 20%* of the participants did not provide their perspective towards the statement. In addition to that, *around 25%* of the respondents have disagreed and *about 12%* of the participants have strongly disagreed with the particular statement.


Fig. 9: The mentioned education system helps to enhance efficiency of the higher education system

(Source: Self-developed)

The next question was about the effectiveness of the ICT-based education system for enhancing the efficiency of higher education. Therefore, *nearly 65%* of the participants have strongly agreed with the particular statement and *about 22%* of the respondents have agreed with the statement. In addition to that, *about 6%* of the participants did not provide any opinion about the statement. Furthermore, *nearly 6%* of the respondents have disagreed and *about 2%* of the participants have strongly disagreed with the specific statement.
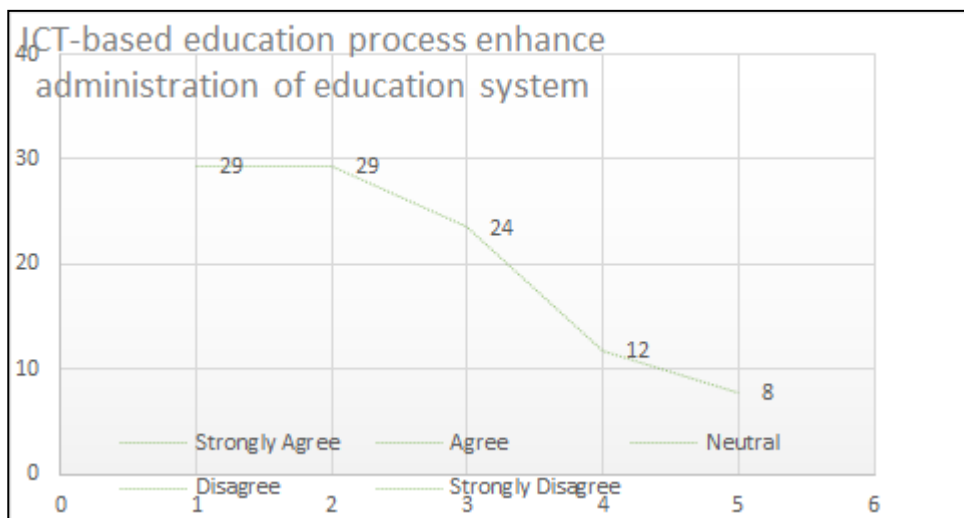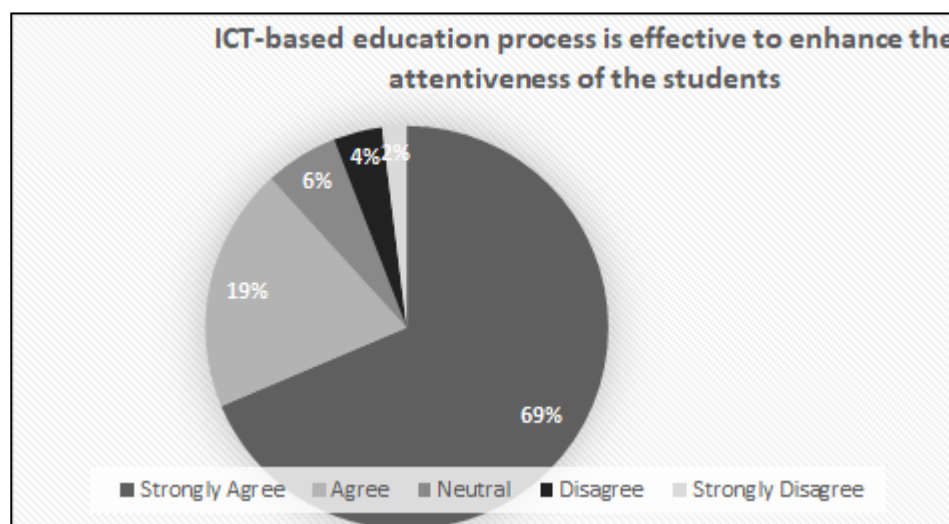
Fig. 10: ICT-based education process enhance administration of education system

(Source: Self-developed)

Nearly 29% of the participants have strongly agreed with the next statement which is that the ICT-based education process enhances administration of the education system. Apart from that, *about 29%* of the respondents have agreed with the statement and *nearly 24%* of the participants did not provide their perspective towards the statement. In addition to that, *around 12%* of the respondents have disagreed and *about 8%* of the participants have strongly disagreed with the particular statement.

Fig. 11: ICT-based education process is effective to enhance the attentiveness of the students

(Source: Self-developed)

The next question was about the effectiveness and efficiency of the ICT-based education system for enhancing attentiveness of the students. Therefore, *nearly 69%* of the participants have strongly agreed with the particular statement and *about 19%* of the respondents have agreed with the statement. In addition to that, *about 6%* of the participants did not provide any opinion about the statement. Furthermore, *nearly 4%* of the respondents have disagreed and *about 2%* of the participants have strongly disagreed with the specific statement.

4.2 Discussion

It is identified that a large number of people have agreed with the statements related to the positive effects of the ICT-based education system. The mentioned education system helps to enhance the productivity of the students as well as increase the teaching skills of teachers. Apart from that, the ICT-based education process helps to enhance efficiency of the education system of the country (Dey, 2019). Thus, a large number of people have agreed that the ICT-based education system is effective and efficient to enhance the efficiency of the education system of the country.
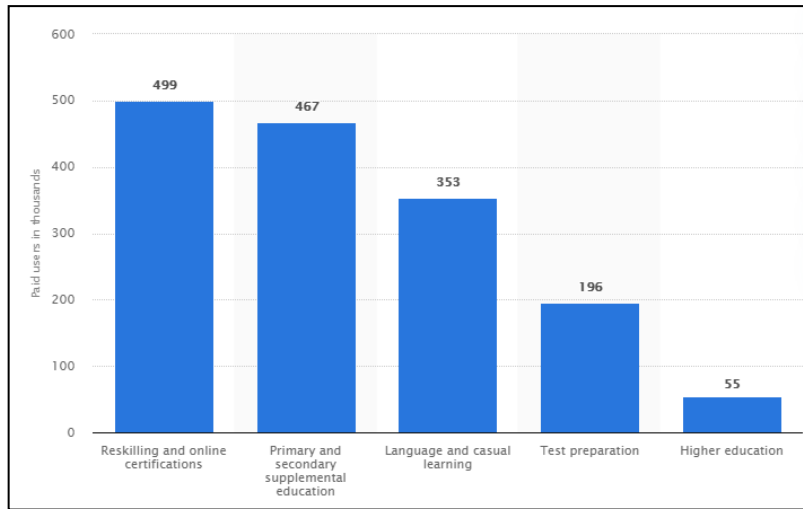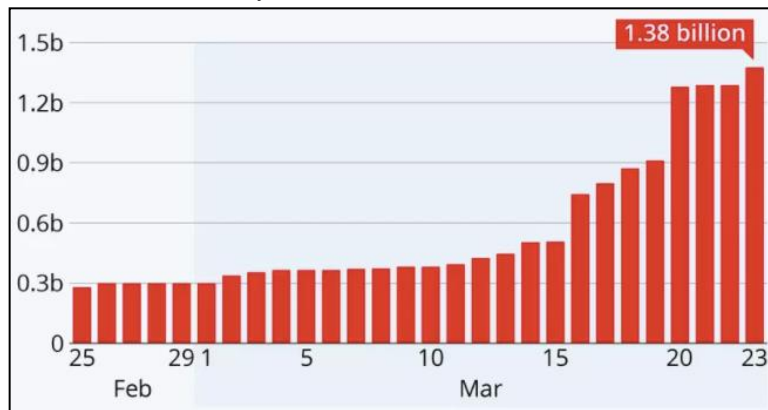
Fig. 12: ICT-based education system before the pandemic in India

(Source: Dey, 2019)

The usage of online education platforms has increased during the pandemic. The certain stoppage of education was affecting the productivity of the students. Therefore, the process of ICT-based education was adopted and the education of the students started in the country. Furthermore, the process of an online education system is lower costly than the system of offline education (Irrinki, 2021). Apart from that, there are a lot of beneficial sites of the ICT-based education system and because of that the usage of the mentioned education system has increased in the past few years.

Fig. 13: ICT-based education system after the pandemic in India

(Source: Irrinki, 2021)

5. Conclusion

The usage of ICT-based education processes has increased during the COVID-19 pandemic in India. Therefore, the education of the students has stopped for a certain time because of the pandemic situation and by using several online platforms the education system has continued. The researchers have done a survey on the usage of ICT-based education systems and it is identified that a large number of people agreed that the ICT-based education system is better than the offline system. The mentioned education system is not only important for the students but also important for the teachers as well. The ICT-based education system not only helps the students to enhance their productivity but also helps the teachers to enhance their teaching skills. Thus, it can be said that the online education tools and processes are more effective than the offline education processes.

References

[1] Aceto, G., Persico, V. and Pescapé, A., 2019. A survey on information and communication technologies for industry 4.0: State-of-the-art, taxonomies, perspectives, and challenges. IEEE Communications Surveys & Tutorials, 21(4), pp.3467-3501.

[2] Çaldağ, M.T., Gökalp, E. and Alkış, N., 2021. ICT-Based Distance Higher Education: A Necessity During the Era of COVID-19 Outbreak. Emerging

Technologies During the Era of COVID-19 Pandemic, 348, p.365.

[3] Criollo-C, S., Luján-Mora, S. and Jaramillo-Alcázar, A., 2018, March. Advantages and disadvantages of M-learning in current education. In 2018 IEEE world engineering education conference (EDUNINE) (pp. 1-6). IEEE.

[4] De Paepe, L., Zhu, C. and Depryck, K., 2018. Online Dutch L2 learning in adult education: educators' and providers' viewpoints on needs, advantages and disadvantages. Open Learning: The Journal of Open, Distance and e-Learning, 33(1), pp.18-33.

[5] Dey, A. and Roy, N.R., 2019. Confluence of ICT Based Education and Teacher Preparation: Need of the Hour. *IJRAR-International Journal of Research and Analytical Reviews*, 6, pp.2348-1269.

[6] Dolnicar, S., 2020. Why quantitative papers based on primary data get desk-rejected by Annals of Tourism Research. Annals of Tourism Research, 83, p.102981.

[7] El Mhouti, A., Erradi, M. and Nasseh, A., 2018. Using cloud computing services in e-learning process: Benefits and challenges. Education and Information Technologies, 23(2), pp.893-909.

[8] Guo, M., Xu, P., Xiao, T., He, R., Dai, M. and Miller, S.L., 2021. Review and comparison of HVAC operation guidelines in different countries during the COVID-19 pandemic. Building and Environment, 187, p.107368.

[9] Irrinki, M.K., 2021. LEARNING THROUGH ICT–ROLE OF INDIAN HIGHER EDUCATION PLATFORMS DURING PANDEMIC. *Library Philosophy and Practice*, pp.1-19.

[10] Jordan, J., Yoeli, E. and Rand, D., 2020. Don't get it or don't spread it? Comparing self-interested versus prosocially framed COVID-19 prevention messaging. PsyArXiv, 10.

[11] Kaur, N., Vedel, I., El Sherif, R. and Pluye, P., 2019. Practical mixed methods strategies used to integrate qualitative and quantitative methods in community-based primary health care research. Family practice, 36(5), pp.666-671.

[12] Levitt, H.M., Bamberg, M., Creswell, J.W., Frost, D.M., Josselson, R. and Suárez-Orozco, C., 2018. Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA Publications and Communications Board task force report. American Psychologist, 73(1), p.26.

[13] Ngwacho, A.G., 2020. COVID-19 pandemic impact on Kenyan education sector: Learner challenges and mitigations. *Journal of Research Innovation and Implications in Education*, 4(2), pp.128-139.