*ICT Tools and Technologies and the Challenges for the Learning Community During the Pandemic: A case for the Application of Web Scraping*

*Section A-Research paper*

# ICT TOOLS AND TECHNOLOGIES AND THE CHALLENGES FOR THE LEARNING COMMUNITY DURING THE PANDEMIC: A CASE FOR THE APPLICATION OF WEB SCRAPING

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**Abstract**

Information and Communication Technology ( ICT), as an all-encompassing technological evolution and the one that combines a wide range of technologies, has helped shape information generation, and its dissemination and application. ICT has grown to affect every aspect of life from education to economy, health care to space exploration and from addressing climate change to solving global social issues. ICT's role in education is the primary focus of this research. It looks at the challenges faced by students everywhere in applying ICT in less desirable circumstances. In doing so, the concepts of Natural Language Processing ( NLP) is applied to gather data on ICT application in education.

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## Introduction

Information and Communication Technology ( ICT), as an all-encompassing technological evolution and the one that combines a wide range of technologies, has helped shape information generation, and its dissemination and application. ICT has grown to affect every aspect of life from education to economy, health care to space exploration and from addressing climate change to solving global social issues. ICT's role in education is the primary focus of this research. It looks at the challenges faced by students everywhere in applying ICT in less desirable circumstances. In doing so, the concepts of Natural Language Processing ( NLP) is applied to gather data on ICT application in education.

## Research Objective

ICT has been an integral part of education ever since its emergence as a discipline. It has also served the role of a catalyst, a facilitator, an enabler, an accelerator and more. While ICT has been used extensively in the regular mode of delivery of education, it has also been at the center of delivering education through distance and online modes of education. And yet, it is still evolving and promising to impact education at all levels for a long time to come. The growth of ICT, its application in education and its impact on society are not evenly distributed. It is because of this, ICT continues to be a major area of interest among researchers in various parts of the world.

This study has two objectives. The first is to consider the role of ICT in two of the largest educational systems in the world, the USA and India. While the USA is considered a global leader in higher education and research, India is the second largest country in terms of its student population. Both countries represent the diversity and variation that exist in the global education process. The first part of this research looked at the role of ICT in those two countries and explored the similarities and differences in the ICT use.

The second part of this research considered the challenges that the learners faced in using ICT during the pandemic. In the last three years, the world has experienced a pandemic and has suffered its impact in every aspect of life. Education of pupil everywhere has undergone serious adjustments and changes. Although ICT has played a key role in keeping the education process active and moving forward, the learners have faced serious challenges during the pandemic, partly due to the use of technology or lack of it, and partly due to the way the society was able to deal with life during a pandemic.

## Review of Literature

There have been considerable interest in studying the application of ICT in education. The literature provides ample evidence on such work. There have also been works on the application of NLP to study ICT use in education. An Italian study scraped the internet to gather data on ICT use in that country. It then compared the results with a survey on ICT use. The author reported that the process proved to be very good and the results were encouraging [1]. It is this approach that we have followed in carrying out the current research.

Another study scraped 2400 websites to determine the use ICT in the Brazilian industry. The data were then compared with the survey on ICT use [2]. The web scraping application provided predictions on the use of ICT that were reasonably closer to the results of the survey on ICT use. An overview of Web Scraping as a tool for data mining and its application to e-commerce and other fields were discussed in a recent papers [3, 4].

A study on distance education concluded that ICT would serve well in educating masses, provided the process takes into account the following: broader

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accessibility to technology, its suitability for pedagogy, public acceptance of the system and its cost effectiveness. The focus of the research was the direct and indirect challenges faced in the application of ICT [5].
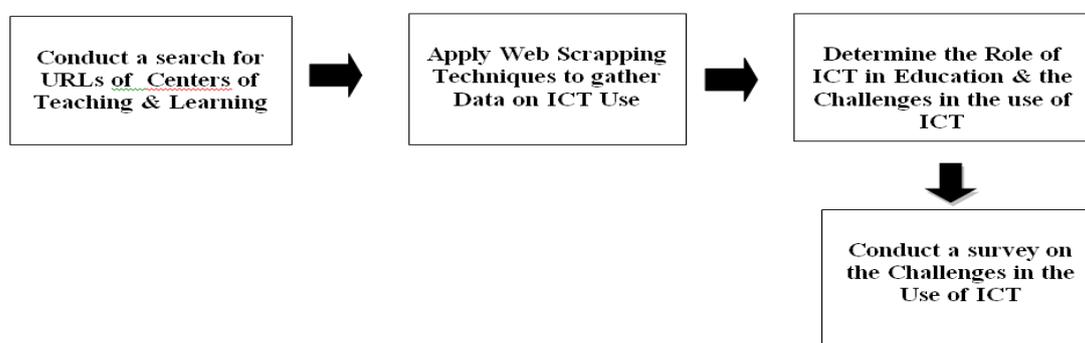
**Research Methodology**

The research methodology for the study involved two parts. In the first, it utilized the Web Scraping techniques and the Natural Language Processing (NLP ) tools to determine the role of ICT in education. In the second, the results from the first were used to conduct a survey on the challenges faced in using ICT in education during the pandemic.

Web Scrapping served as an excellent tool to look at the data available in the public domain and extract what is appropriate and useful for a given purpose. In this research, the teaching and learning centers in the USA and India served as the primary source of data, at least in part, to determine the role of ICT in education in both countries. The Centers of Teaching and Learning are considered major components of higher education in the USA. They help develop faculty and support the delivery of education, whether it is in the traditional mode of in-person learning or in the on-line and distance mode of learning. The Teaching and Learning Centers and the Educational Cells for Training and Development in the Indian educational institutions serve the same purpose as the US systems. For the purposes of the current research, the Web Scraping techniques and tools were used to extract data on the role ICT in education and the challenges in their use. As a follow up, a survey of two groups of faculty in the Indian institutions was conducted to get their views on the challenges in the use of ICT in education in India. Figure -1 presents the framework for the study.

**Figure 1: ICT in Education:  Web scraping Application**



**The Role of ICT in Education:**

The web scarping of Teaching and Learning Center operations revealed the following as the role of ICT in education:

1. Enable Curriculum Development

2. Enhance Teaching in- person and on-line

3. Enable easy  Assessment  of Student work

4. Support to Deploy the Following Tools:

- Flip the class

- Use Assessment tools

- Use of Learning Management System

- Organize online  Meetings

- Send and receive Emails

- Use Instant Messaging

- Share Contents of the Screen

- Use discussion Blogs

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- Use of social media platforms
- Use Voice, Video, Web Conferencing
- Use digital discussion Rooms
- Utilize various modes of phone communication

5. Facilitate the use of:

- Computers
- Internet
- Projection systems
- Voice & Video links
- Audio / video capture devices
- Power backup
- No cost software and systems:
    - o Powerpoint
    - o Google slides
    - o Google classroom
    - o Google docs
    - o Googlemeet
    - o Microsoft Teams
    - o Skype
    - o Zoom
    - o Moodle
    - o Fileshare
    - o Drop box
    - o CAD systems

- o Simulation systems
- Software for the following:
    - o Collect ungraded assignments
    - o Return graded assignments securely
    - o Provide feedback
    - o Identify possible plagiarism
    - o Attach a rubric to assignments
    - o Grade students anonymously

A review of the results revealed that the web scraping process captured the key aspects of ICT deployment in education. It also showed that the key areas affected by ICT are curriculum development, teaching, student learning and assessment of student work. In carrying this research further to explore the challenges faced by the learners during the three years of the pandemic, a survey of faculty members associated with computer science and engineering subjects was conducted. The survey participants included 77 computer science faculty members and 52 engineering faculty members. An abbreviated version of the survey results are presented in Table -1.

Table -1: Survey Results of Faculty on the Challenges in the ICT Based Education During the Pandemic

| Challenges in ICT Based Education During the Pandemic | % of Faculty Indicating Challenges | |
|---|---|---|
| | Computer Science Faculty ( N = 77 ) | Engineering Faculty ( N= 52 ) |
| Lack of ICT infrastructure to support education during pandemic | 82% | 84% |
| Limited capacity of the systems for the learners | 78% | 4% |

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| | | |
|---|---|---|
| Frequent interruption of power | 96% | 96% |
| Limited access to internet | 100% | 94% |
| Limitations due to the use of mobile phones for learning | 88% | 86% |
| Limitations in the capacity for group communication | 72% | 79% |
| Lack of adequate room for applied learning | 75% | 71% |
| Limitations in the online assessment process | 61% | 60% |
| Inadequate maintenance support | 74% | 70% |
| Issues relating to engaging and motivating the learners | 46% | 60% |
| Limited feedback to faculty and students | 40% | 46% |

The results of the survey indicated that the limitations in the infrastructure to support on-line education was the major challenge. From having uninterrupted power to full access to internet were the major challenges. Use of mobile phones helped manage the learning process, but with serious hindrances. Limited group communication, limitations on experiential learning and the system maintenance were the other issues. From a broader perspective, the entire system was caught unprepared not only to deal with the pandemic, but to deliver education in a non-conventional mode to a large student population.

**Conclusions:**

This research considered the application web scraping to assess the role of ICT and to consider the challenges faced by the learners under unexpected circumstances. Although the ICT has evolved to be a powerful element of the educational infrastructure, widespread application of the technology will require large scale investments in a country like India. From uninterrupted power supply to unlimited access to internet with adequate hardware and software for the learners will serve as an important starting point. Since the world has faced the pandemic under dire circumstances and succeeded, it is certain that the challenges faced by the learners in using ICT will be resolved and will lay the

foundation for a much larger role for ICT in education.

**References:**

1. Barcaroli,G., Italian National Institute of Statistics, " Use of web scraping and text mining techniques in the Istat survey on "Information and Communication Technology in enterprises", European Conference on Quality in Official Statistics, Wien (June 2014), Researchgate.net/publication/2639219 51.

2. Marcelo, P., "Innovations in the Use of Multiple Sources of Data Web Scraping as an alternative data source to predict E-Commerce indicators" , Proceedings of Statistics Canada Symposium 2018 Combine to Conquer: Innovations in the Use of Multiple Sources of Data, https://www.statcan.gc.ca

3. Matta, P., etal, "Web Scraping: Applications and Scraping Tools", International Journal of Advanced Trends in Computer Science and Engineering, Volume 9, No.5, September - October 2020.

4. Seri, "How to Scrape Google News Results", NLP Example from Hexomatic, July 15, 2022. https://hexomatic.com/academy/2022/

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07/15/how-to-scrape-google-news-results/

5. Rehman, H., "The Role Of ICT In Open and Distance Education", Turkish

Online Journal of Distance Education, December 2014- 15(4).

https://www.researchgate.net/publication/273898911_The_Role_Of_Ict_In_Open_And_Distance_Education

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