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Analytical Study of Virtual Teaching and Learning during Covid-19 in Higher Educational Institution of UT of Jammu and Kashmir

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Abstract

The year 2020 had begun with a new virus covid-19 and its transmission rate halted the physical classes across the globe at once and even all educational and companies across the globe migrated to online mode as soon as possible to avoid loss in the respective filed. Since transmission rate of covid-19 was very high and without much knowledge all educational institution at any level stopped their classes and later on moved to online mode. In our State, we had already issue of Internet connectivity in remote area and connectivity in most of parts in UT of Jammu and Kashmir was with 2G based internet connectivity. We have conducted the detailed survey on the impact of covid-19 in UT of Jammu and Kashmir especially in higher education and gathered dataset using a well framed questionnaire with 22 parameters and very surprisingly, we have found that the most of Teachers and Students lacks judicious usage of ICT. Through this research article, we have conducted a studyin 40 different Institution of UT of Jammu and Kashmir under Sponsored Project by JKDST and data from 705 teachers have been recoded and analysis based on 22 parameters have been presented by creating as Dashboard which shows strength and weakness of Institutions.

Keywords: *Learning Management System, Covid-19, ICT, Virtual Teaching*

I. Introduction

Pandemic had compelled all activities to be stopped suddenly in educational Institutes without preparing or deciding next course of action. Since most of the educational institutes were not prepared for this sudden closure and adoption of online teaching-learning mode which led to major crisis in education during the pandemic. It was not so easy formany stake holders including teachers, students and families of both teachers and students specially who were staying in a remote location due to internet connectivity the basic need of online learning mode.
Major impact was also on those who could not bear ICT resources for their wards being not financially so sound as most of the families were deprived of necessities during the pandemic. [1,9]. Many Countries across the globe had adopted simple strategy to stop local and international airports, the closure of universities and other educational institution of all level,

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restaurants and hotels and gathering in public parks, public events and public marriages and mandatory quarantine for suspected and infected people. With ban on physical classes at all level of teachings activities and their migration to the virtual teaching has opened many challenges as well as opportunities by allowing flexibility in teacher hours in teaching and learning but it has hampered the things and This research is carried to see the impact in UT of Jammu and Kashmir where we have diverse locations with many challenges for both learners and teachers. [2-4]

II. Related Work

No doubt virtual education has opened many opportunities for those not able to learn physically and with the rise in EdTech companies, there is a rise in online degree courses, online education by opening digital universities with collaboration with EdTech companies and This has wider potential in transformation of global education system with introduction of new innovative pedagogical methods and new educational opportunities with the transforming student populations leading to the development of regional as well as international languages [5,6,7,10], which in turns be more reliable, and stress free for both teachers and learners.

III. Field work for data gathering process

Although Academic performance is very broad term, and it can include many factors about the study of Learners in classroom and Labs during practical conducted by them. It is very tough to get data about the Marks obtained in class tests, Number of tests conducted by teacher and evaluated, Number of active learners in Class/Lab, Number of advanced learners in Lab/Class, Number of Assignment completed by Learners, Early submission of Assignments, Quality/Type of Assignment given by Teachers, Online certificate related to subjects completed or participated by Learners, number of Webinar conducted in class/lab etc. In fact, no such trends or initiatives have been taken by Teachers for Learners in higher education in Jammu and Kashmir yet. All the items stated above are basic parameters for analysing academic performance of Learners.

Table 1 Details of Parameters considered for data gathering

S.No	***Attribute Name***	***Attribute Type***
1	College/University Name	Polynomial
2	College Type	Binomial
3	Affiliating University	Polynomial
4	Streams	Polynomial
5	Internet Connectivity by Teachers	Polynomial
6	Location of Institute	Polynomial
7	Internet Connectivity by Students	Polynomial
8	Average Device Used by Students	Polynomial
9	Average Device Used by Teachers	Polynomial
10	Average attendance of Student	Polynomial

11	Lecture Mode	Polynomial
12	App used by for Lecture Delivery	Polynomial
13	e-Content Created	Binomial
14	Public Content Used	Binomial
15	Lecture Recorded	Binomial
16	Tools used for Audio/Video recording	Polynomial
17	Tools Used by Teacher	Polynomial
18	LMS used	Binomial
19	Examination Conduction mode	Binomial
20	Handwritten Verification	Binomial
21	Identity Verification of Examinee	Binomial
22	Assignment Types Conducted in Classes	Binomial

This Research Article is related to study on the conduction of classes by faculty, App or software used by Faculty for class conduction, Number of Students enrolled in classes, Number of students actually attended the classes in course wise, faculty wise, college wise etc, e-Content Shared, Presentation shared, Internet issued faced by students, number of student having smart phones, Any Learning management used by Faculty, Any video creation tools used by Faculty, Online meeting conducted by Faculty with students. Objectives of the Research is to identify the colleges in higher education in UT of J&K. effectively using ICT and LMS Tools and to identify Faculty creating and sharing e-Content of their courses and uploading the content and enrolling Students on the LMS platform.

Due to Pandemic most of the institutions were closed and conducting their class work in online as well as Blended Mode. So, keeping this fact in view a questionnaire has been designed with parameters including affiliated university, college type, teachers engaged, streams of the courses, Internet Connectivity by Teachers, Location of Institute, Internet Connectivity by Students, Students enrolled in a Class, Average Device Used by Students, Average attendance of Student, Lecture Mode, App used by for Lecture Delivery, e-Content Created, Public Content Used, Lecture Recorded, Tools used for Audio/Video Recording by Teachers. Total of 22 Parameters have been considered for survey in this Project. The Questionnaire was shared in offline mode as well in online mode by research associates with faculty of 40 different colleges of UT of Jammu and Kashmir. Collection of datasets with all field and parameters selected for study in offline and online mode

During the data gathering process a questionnaire was designed based on 22 parameters involve in Virtual Teaching and Learning and data was gathered in online and Physical mode by the involving Associates and a total of 705 entries was made in off-line and online mode. Data gathered in online mode and offline mode had many discrepancies in the entries which was removed during the data processing process involving many techniques.

IV. Hardware and software Used for dashboard Creation

For data analytics and designing work sheets and Dashboard we have adopted Tableau software under Educational Licenses and Windows System with 16 GB RAM and 10TB HDD is used.
Out of Total 705 entries, 684 entries were from Non-Technical Colleges and rest 21 were from Technical colleges. below listed Table 2 shows the details of Technical and Non-Technical entries in the dataset.

Table 2 Total Data Entries from Technical and Non-Technical Institutions

College Type	
Non Technical	684
Technical	21

The Graphical representation is shown below in Fig 1

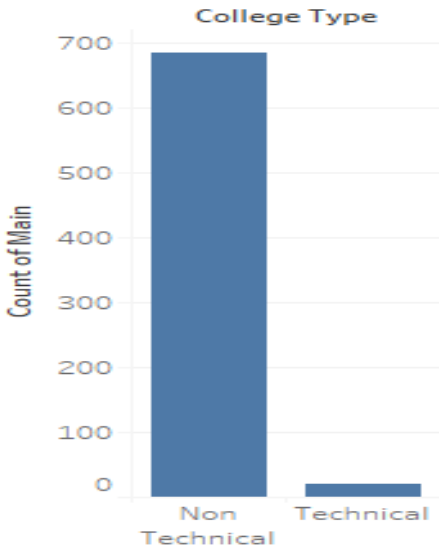

Fig 1 Entries from Technical and Non-Technical Institutions

V. Location wise details of institutes

Since the Project has been carried with scope to cover most of Institutes of Higher Education located in UT of Jammu and Kashmir, data from the Teachers of 40 different colleges and 4 Universities has been collected for the analysis and creation of the Dashboard. The details of different colleges and number of Teachers shared their data is depicted in Table 3 given as Under:

Table 3. Data Collected from different Institutes

College/University Name	
Amar Singh College,Srina..	6
Department of Punjabi	3
GCET, Jammu	12
GCOE, Jammu	6
GCW Parade, Jammu	54
GCW, Gandhi Nagar Jammu	135
GCW, Nawakadal Srinagar	3
GDC Boys, Udhampur	6
GDC Sidhra	3
GDC, Bani	3
GDC, Bhaderwah	42
GDC, Billawar	3
GDC, Hiranagar	9
GDC, Ramgarh	3
GDC, Samba	3
GDC,Basohli	3
GDC,Kishtwar	3
GDC,Marh	3
GDC,Nagrota	3
GDC,RS Pura	3
GDC,Thathri	3
GDCB, Kathua	15
GDCW, Kathua	9
GOVERNMENT GENERAL ..	3
Govt Degree College Lang..	3
Govt. Degree College Kish..	6
Govt. Degree College Kunj..	3
Govt. Degree College, Poo..	6
Govt. Mulana Azad Memo..	75
Govt. PG College,Rajouri	15
Govt. SPMR College of Co..	186
Govt.Gandhi Memorial Sci..	30
JK College of Education,Ja..	6
Ranjit College of Educatio..	12
S.P College, Srinagar	3
UIET Kathua	9
University of Jammu	15

The Graphical Representation of Location wise each Institute is shown in Fig 2 as Under:

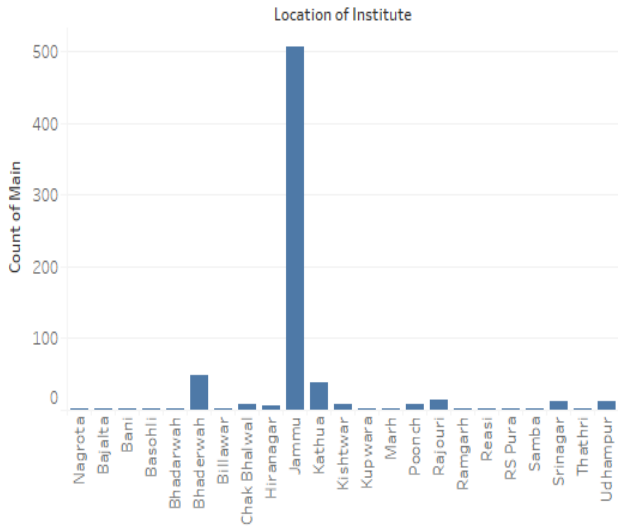

Fig 2 College wise data entries from different Institutes

Faculty from Total of 40 Institutes were involved in sharing their data for the Projects regarding the tools used for teaching classes during pandemic and University wise data is depicted in Table 4 as Under:

Table 4 Affiliating Universities from where data entries from different Institutes has been made

Affiliating University	
Cluster University of Jam..	423
Cluster University of Kash..	9
University of Jammu	267
University of Kashmir	6

There were 4 Affiliating Universities from where data entries from different Institutes has been made and Graphical Representation of data is shown in figure 3 as Under:

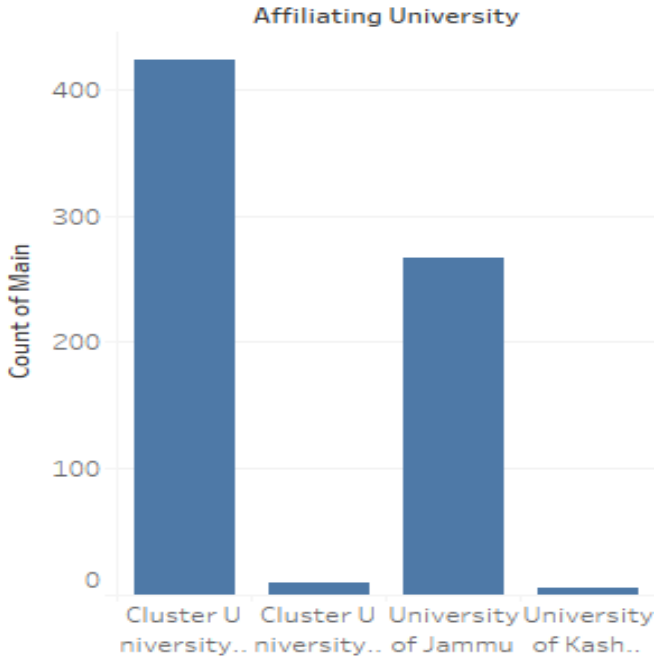

Fig 3 Affiliating Universities from where data entries from different Institutes has been made

VI. Devices used by students for attending Classes in online mode

During the Pandemic one of the major concerns for lack of smartphone/Laptops/PC with students specially from economic weaker sections and survey has made to identify the different devices used by Students for attending the classes in Online mode.

The Details of different devices used is depicted in Table 5 as depicted below:

Table 5 Device used by Student for Attending the classes in Online Mode

Avg Device ..	
Laptop	12
Mobile	690
PC	3

It has been observed that majority of Students have used Mobile may be due to compatibility as well internet issues in many areas of Jammu and Kashmir and the Graphical representations shown in figure 4

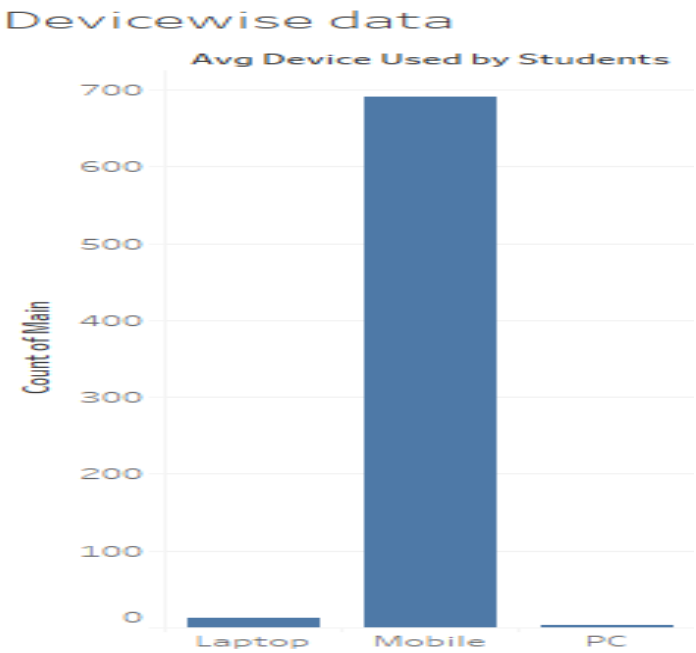

Fig 4 Devices used by Student for Attending the classes in Online Mode

VII. Streamwise participation of college

During the data gathering process different streams of colleges have been visited and Faculty from four different streams Arts, Commerce, Engineering and Science have participated and data is depicted in Table 6 as under

Table 6 Data of Streamwise College participation

Streams	
Arts	177
Commerce	138
Engineering	15
Science	375

The Graphical representation is shown in fig 5 given below

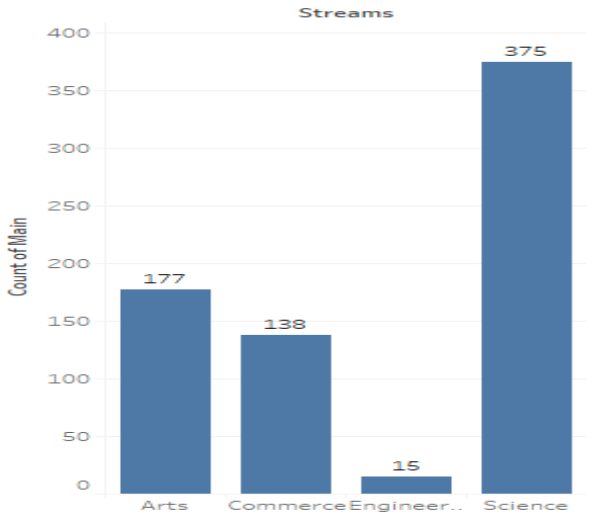

Fig 5 Graphical representation of Streamwise participation

VIII. Internet connectivity of teachers and students

During the pandemic, one of major concern was Internet connectivity used by Teachers and Students and It has been a very challenging Task for Teachers to reach to their students using lightweight apps and the data in table 7 and table 8 shows the exact numbers of Internet Type used by Teachers and Students.

Table 7 Type of Internet Connectivity used by Students

Internet Connectiv..	
Broadband	78
Fibre Connection	96
Mobile Data	531

Table 8 Type of Internet Connectivity used by Teachers

Internet Connectiv..	
Broadband	189
Fibre Connection	243
Mobile Data	273

The Graphical representation of same is depicted in figure 6 and figure 7 representing students and Teacher's data.

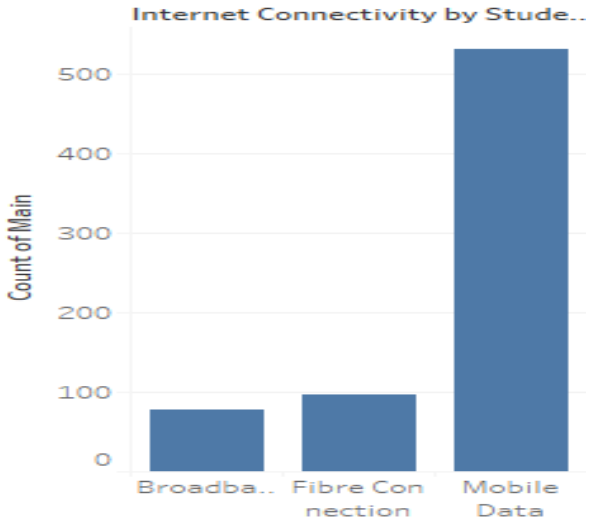

Fig. 6 Type of Internet Connectivity used by Students

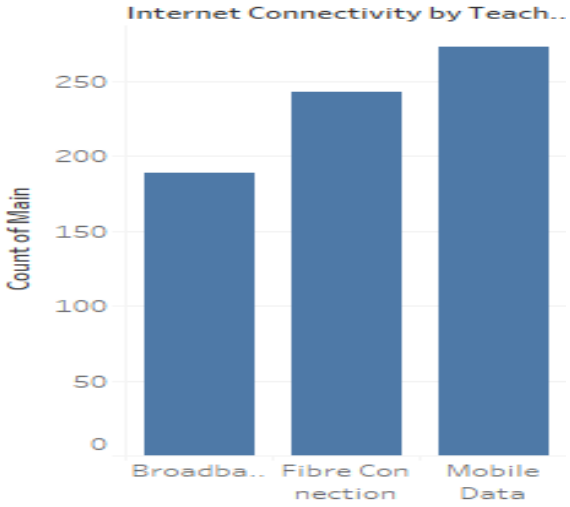

Fig.7 Type of Internet Connectivity used by Teachers

IX. E-Content designed by teachers

Since there were many issues in virtual teaching in live mode and so teachers have been involved in sharing the study materials and lecture notes to students from public platform's as well as self-designed materials and details of e Content Designed by Teacher's from both Technical and Non-Technical Institutes is as Under:

Table 9 Details of e-Content Created by Teachers

e-Content Created	
No	171
Yes	534

More than 75% of the Faculty members have created e-Contents during the pandemic and graphically data is represented in below listed figure 8

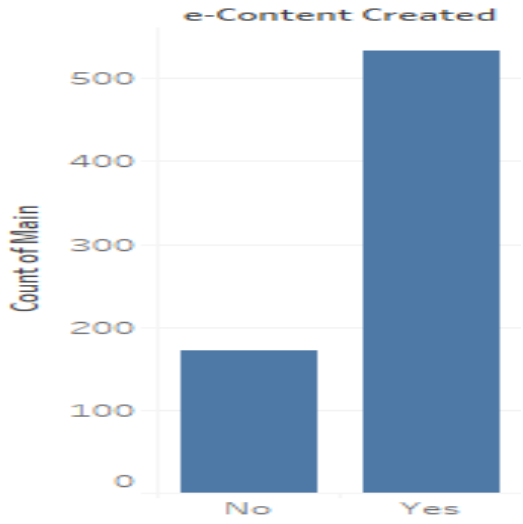

Fig. 9 Data of e-Content Created by Teachers

X. E-Contents used by teacher from public platform used by teachers

Many Teachers had faced many problems in designing the e-content and study material for student as they did not have infrastructure for the same and details of Public contents used by Teacher is depicted in table 10

Table 10 Details of Public Content used by Teachers

Public Cont..	
No	228
Yes	477

The Graphical representations is depicted in figure 9 as given below

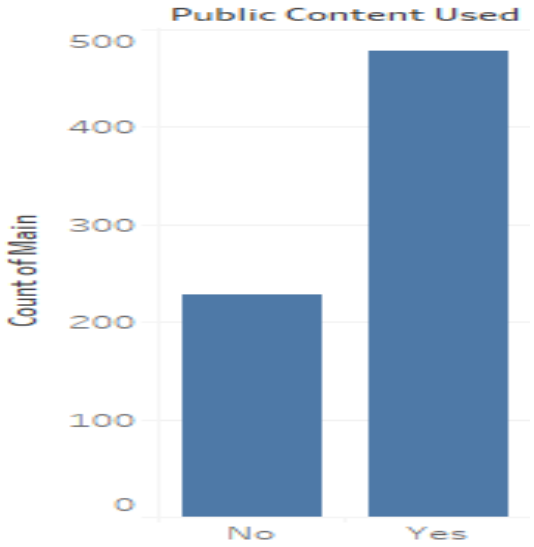

Fig. 10 Public Content used by Teachers

Since during the pandemic colleges were closed at once and most of Teachers and their managements could not able to conduct the physical meeting to decide the course of action for smooth conduct of classes and almost none of the institutions had data about the internet and smartphones/PC owned by students as well faculty members. Survey shows maximum device owned by students and teachers was mobile only. Data regarding the Lecture mode adopted by Institutions and Tools used by Teachers for conducting classes in depicted in table 11 and table 12 and graphical representation is depicted in figure 10 and figure 11 respectively.

Table 11 Details of Lecture Mode adopted by Teachers

Lecture Mode	
Blended	294
Online	399
Physical Classes	12

Table 12 Details of APP/Tools Used by Teachers

Tools used for Audio/V..	
AZ Recorder	33
Google meet	3
Kinemaster	3
Laptop	3
Microsoft PowerPoint	30
Mobile	3
None	372
OBS	30
Presentation Tube	48
Screencastify	93
Teachmint	3
Tripod	3
Webex	3
Whatsapp	3
Wiseapp	9
Youtube	6
Zoom	60

The Graphical representation of data regarding lecture mode is depicted below

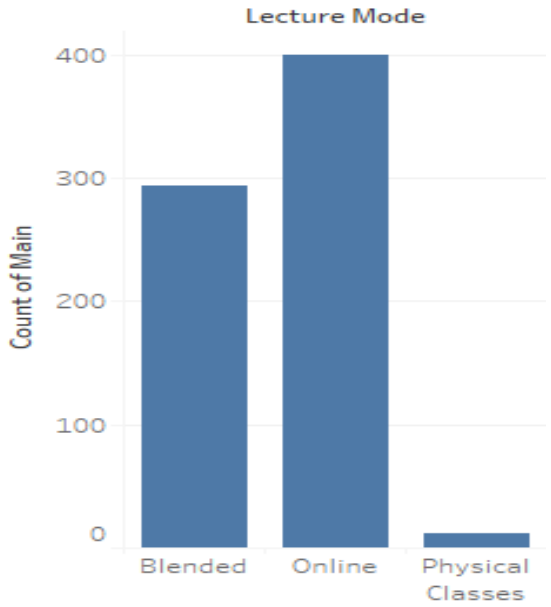

Fig. 11 Mode of Lecture Delivery

The Graphical representation of Various Tools used by Teachers is depicted below

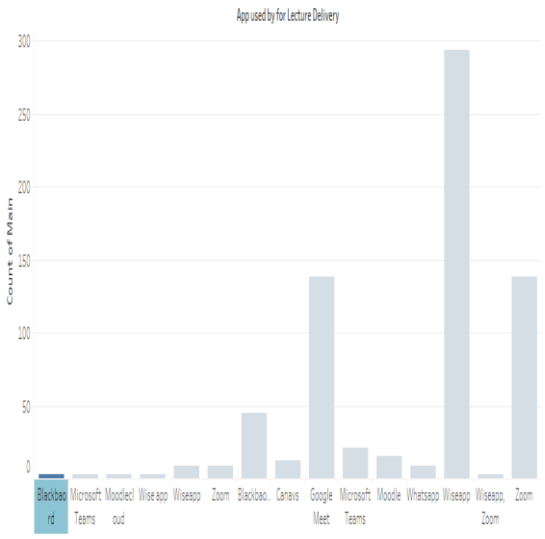

Fig.12 Different Tools used by Teachers

More Interestingly Streamwise analysis on Internet connectivity used, Lecture Mode adopted by Teachers, Tool used by Teachers and average attendance of Students have been recorded as depicted in table 13, table 14. table 15, table 16 and graphical representation is shown in figure 12,13,14, and 15 respectively.

Table 13 Streamwise Internet connectivity used by Teacher

	Streams			
Internet Connectiv..	Arts	Comme..	Enginee..	Science
Broadband	15	21		42
Fibre Connection	21	30	3	42
Mobile Data	141	87	12	291

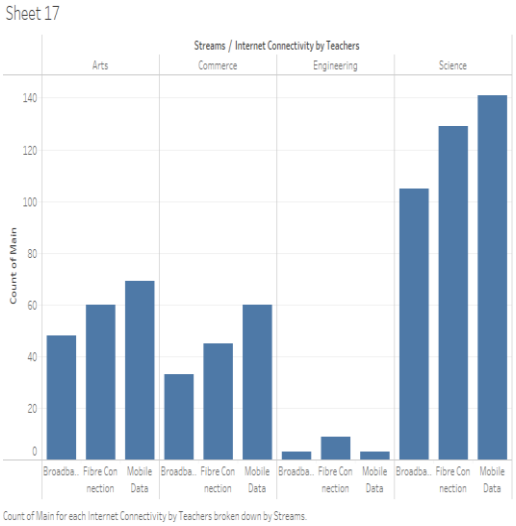

Fig. 13 Streamwise Internet connectivity used by Teacher

Table 14 Details of Lecture Mode adopted by Teachers Streamwise

	Streams			
Lecture Mode	Arts	Comme..	Enginee..	Science
Blended	39	45	3	207
Online	129	93	12	165
Physical Classes	9			3

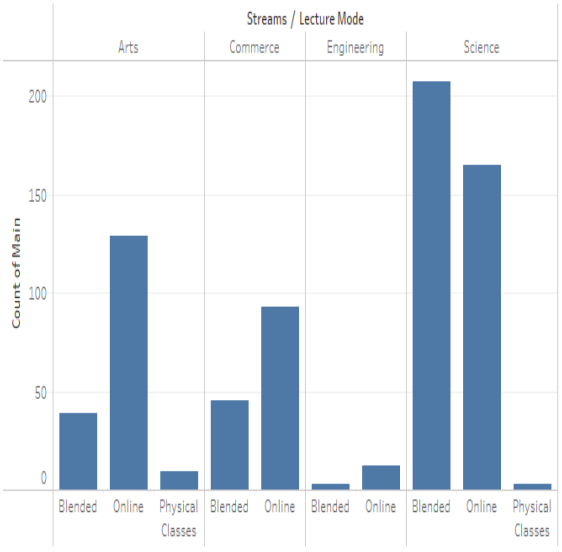

Fig 13 Lecture Mode adopted by Teachers Streamwise
Table 15 Details of Streamwise Tool used by Teacher

Tools used for Audio/Video recording

Streams	AZ Recorder	Google meet	Kinema..	Laptop	Microsoft Power..	Mobile	None	OBS	Presentation Tu..	Screenc..	Teachm..	Tripod	Webex	Whatsa..	Wiseapp	Youtube	Zoom
Arts	9		3		9		102	9	3	21	3			3	6		9
Commerce	6				3	3	66	9	30	21							
Engineering	3	3					3			3		3					
Science	15			3	18		201	12	15	48			3		3	6	51

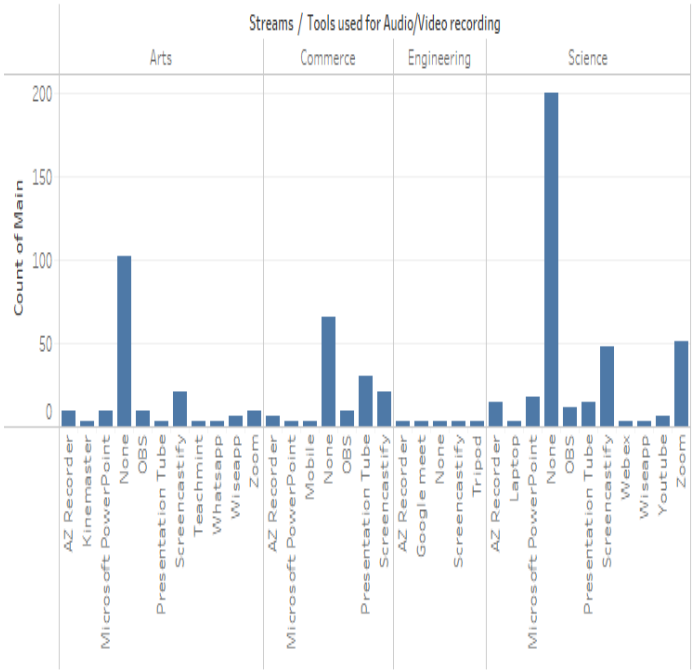

Fig. 14 Streamwise Tool used by Teacher

Table 16 Details -of Average Courses Taught and Average Attendance and Internet type streamwise

Internet Connectivit..	Streams	Avg attendance ..	Courses Taught ..
Broadband	Arts	3,231	150
	Commerce	2,397	81
	Engineering	240	12
	Science	7,269	321
Fibre Connection	Arts	3,717	225
	Commerce	2,880	147
	Engineering	630	54
	Science	9,543	372
Mobile Data	Arts	4,575	255
	Commerce	4,026	180
	Engineering	120	6
	Science	9,459	468

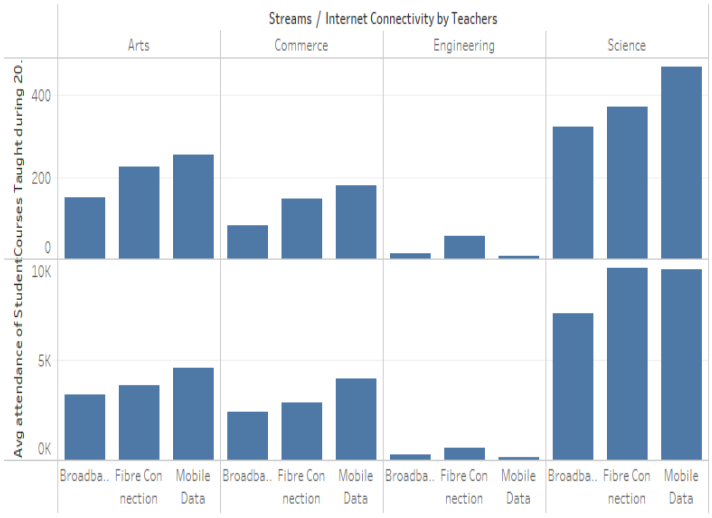

Fig. 15 Dashboard representing Average Courses Taught and Average Attendance and Internet type streamwise

Details of Learning Management System used by Universities in UT of Jammu and Kashmir is shown in Table 17 and Graphically represented in Figure 16,

Table 17 Data Regarding LMS used by Colleges during Pandemic

College Type	LMS used	
Non Technical	Blackboard	6
	Canvas	3
	Moodle	11
	Moodlecloud	1
	None	663
Technical	None	21

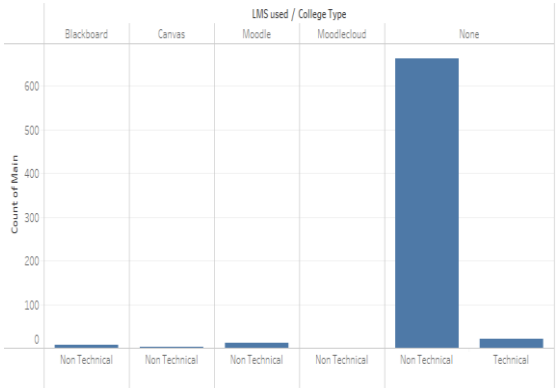

Fig. 16 Graphical Representation of College where LMS is depicted below

Total LMS Used in All Institution is represented in Figure 17 below

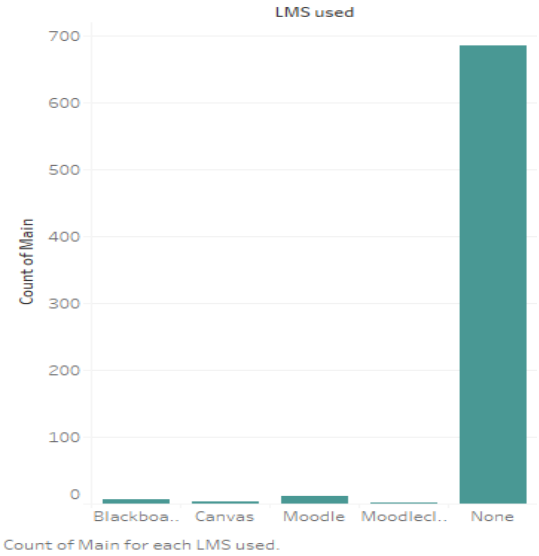

Fig. 17 Details of LMS Used in all Institutes

The Streamwise type of LMS used in Institute is shown in Figure 18

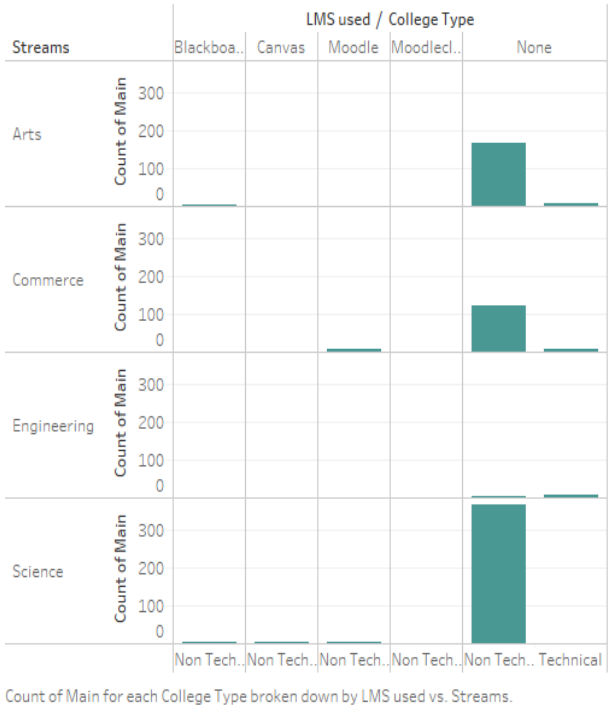

Fig. 18 Streamwise LMS adopted by Institutes

Total four Universities has participated in survey and universities LMS usage is depicted in figure 19 given below

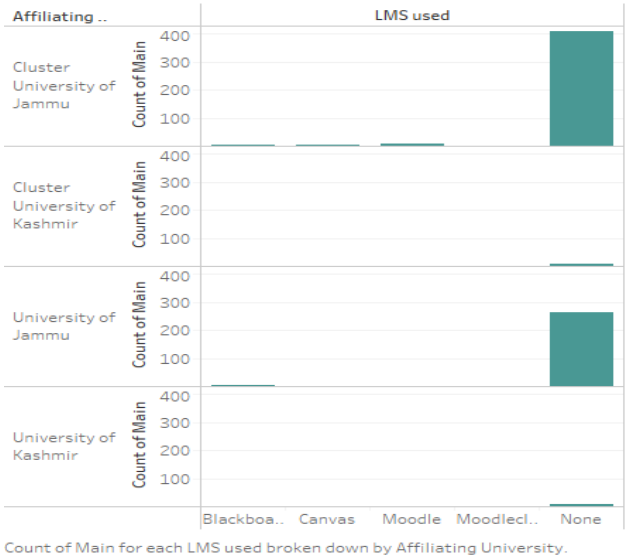

Fig. 19 University wise LMS usage details

Dashboard view regarding Internet connectivity college type and app used by Teachers is depicted in figure 20 given below.

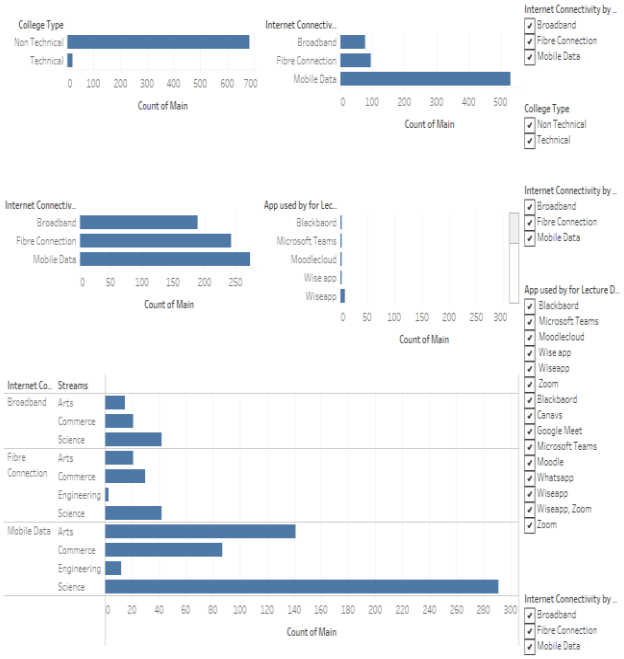

Fig. 20 Internet Connectivity of Teachers and Students, App used College wise

XI. The details of LMS used by Teachers University wise, Streamwise in different institutions

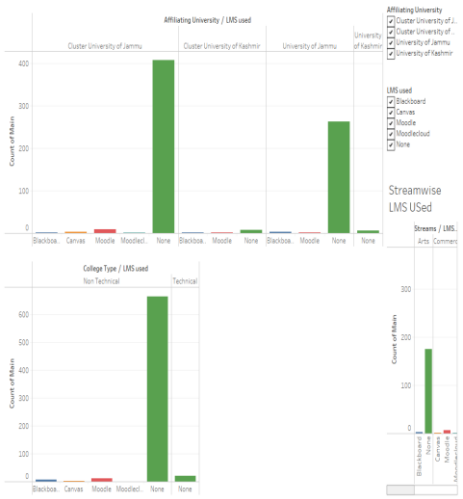

Fig. 21 LMS used by Teachers University wise, Streamwise in different institutions

The Dashboard designed on the basis of worksheets obtained with tableau is depicted in below listed figure 22,23,24 and 25,

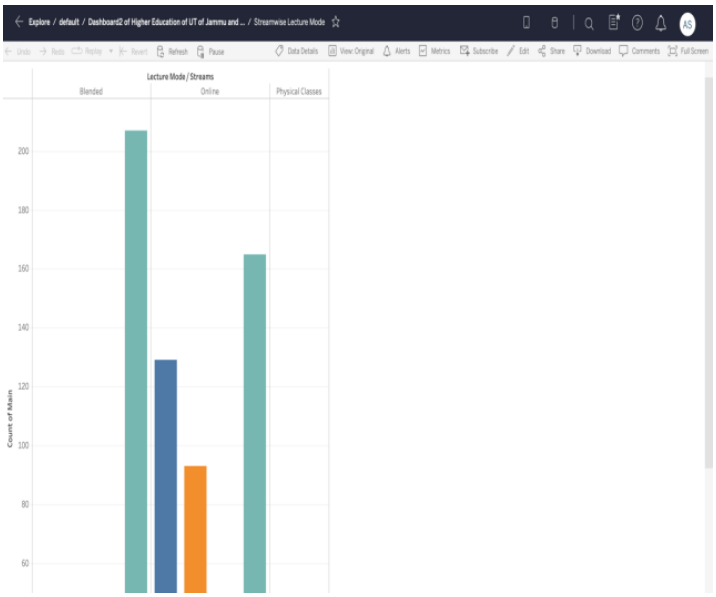

Fig. 22 Dashboard representing Lecture Mode in Various colleges

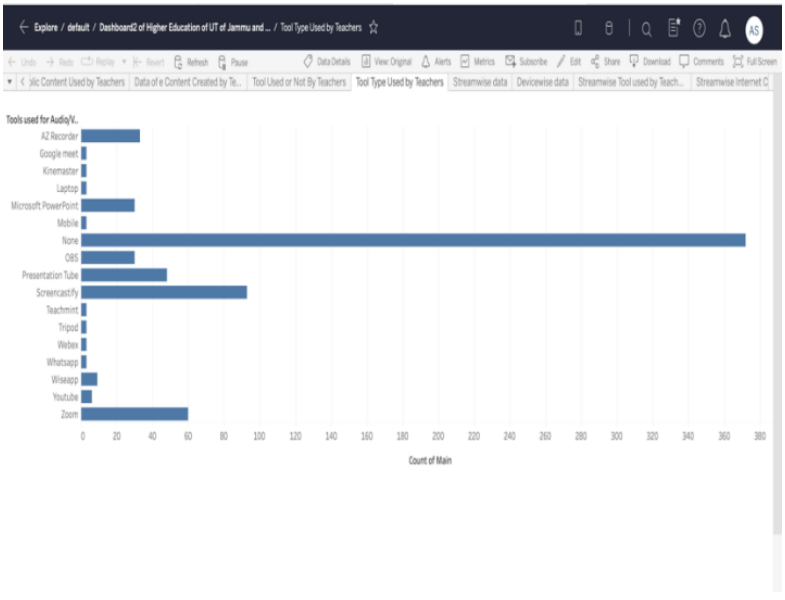

Fig. 23 Dashboard representing Tools used in Various colleges

Fig. 24 Dashboard representing Internet used and Courses Taught in Various colleges

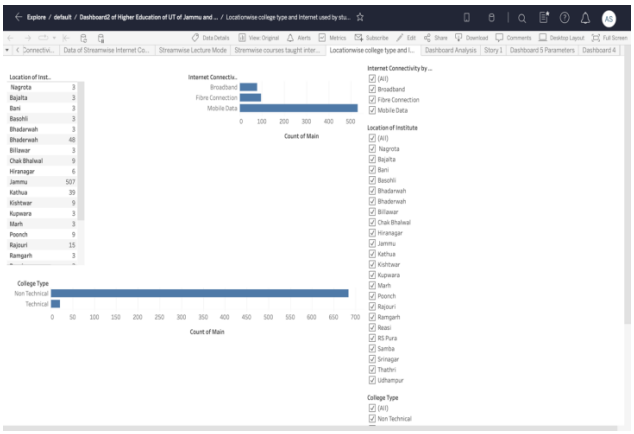

Fig. 25 Dashboard representing Location wise Internet connection in Various colleges

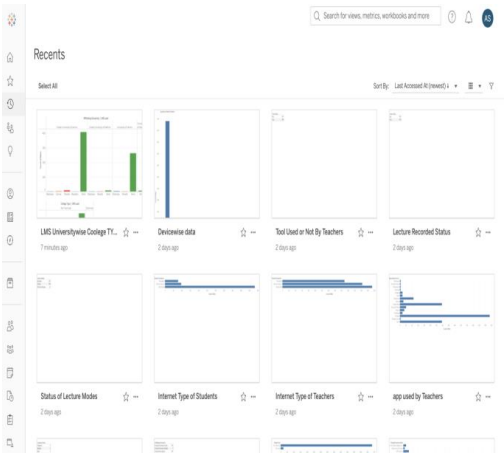

Fig. 26 Dashboard representing analysis on various parameters

XII. Conclusion

After careful examination of the data gathered and analysis, it has been observed that the Cell phones have been widely used both by students and faculty in virtual teaching and learning during the pandemic along with the usage of public contents by Faculty for sharing the study material. Very few Faculty members have created their e-Content for their courses and in addition to it, maximum faculty members have used google Meet for conducting and attending live classes. Due to lack of broadband based. Internet connection, Mobile Data was primary source of Internet used by teachers and students which indicates light weight software or mobile based academic software's need to be designed for future.

Learning management system was merely used by faculty during pandemic and physical classes or interaction was almost nil during the pandemic. Academic integrity was at stake during the pandemic as most of examination assignments were quiz based and identification of examiners was compromised along with no proctored examination has been conducted.

Acknowledgement

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Digital Technologies: Rise, Values, Norms, and Impact

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Abstract

Onset of Covid-19 has made a paradigm shift in the world and created a new normal with immense use of digital technologies. Work from home, online teaching, online media marketing, online workshops, conferences etc. are some of the examples of this paradigm shift. The thing which has made this all possible is the umbrella term 'Digital Technologies'. Digital technologies have a widespread impact on lives of people and is continuing to do so and slowly is taking the world towards World 2.0. World 2.0 imbibes on the idea of maximum usage of technology and integrating this technology into our daily lives. The whole perspective of using technology is to bring living and non-living things together i.e., integrating the physical, biological and social aspect of society with the technological and engineering aspect. In this paper, we propose to study different digital technologies and their usage area along with its impact on people's life. Also, a discussion about its rise, values and the new normal that the society has established post-covid is also presented.

Keyword: *Digital technologies, Covid-19, world 2.0, Education, Digitalization*

I. Introduction

Digital technology has become indispensable part of our lives and it is so expansive that it envelopsnearly everything. From manufacturing of items to moving from one place to another, from sending a message to buying some stuff, from enjoying music to reading books, everything involves some or whole part of technology. Like for manufacturing, machines are used which run on algorithms, for travelling there are so many applications involved like booking ticket online, booking cabs, using maps to get the location etc. All these activities envision the way in which technology is touching our lives and making us more and more dependable on it.It has become as necessary as oxygen. Artificial intelligence, Internet of Things (IOT), Wireless sensors, Machine learning etc. are some of the technologies which has speed up the usage of digital data and has also help in ingraining these technologies in our day-to-day life. These technologies haveled to discovery of significant events that were previously out of our reach due to time and location. With the help of technology, we can dig deep into finding answers to previously unsolved problems and can find innovative ways of doing things.

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It has provided with new ways of entrepreneurship which include digital content creation that Digitalization not only has affected the lives of individuals but has also helped in revamping the economy of the country and as a whole society varies from making YouTube videos, to making short reels and that to with a wide coverage of subjects. Finances, Education, Cooking, Baking, Dancing, Singing, Blogging, Makeovers, etc. everything can be included in this world of content creation. Digital platforms are increasingly used as business models for supply of goods and services, which in turn has boosted the economy. Deployment of broadband networks and widespread use of internet has led to the intensification of linked economy. This current trend is inclined on the path to a fast-moving digitalized economy, where all the three components i.e., social, environmental and economy are articulated on the integration of digital technologies.

The acquisition and merging of digital technologies (Artificial Intelligence (AI), 5G Mobile Networks, Wireless Sensors, Cloud Computing, Internet of Things (IOT), Robotics, Big Data Analysis, Blockchain etc.) signifies the transition from a widespread hi-tech connectivity world to one of digitalized economies and societies. These aspects of digital development are always changing, in a harmonious way that influences various facets of societal, industrial, and government level activities. As a result, the digital transformation process is very effective, dynamic, and compounded, making public policies difficult to implement in the sense that it necessitates ongoing modification and a stepwise perspective towards the growth of the nation.5G networks will enable the integration of telecommunications and IT automation, thereby transforming the sector's whole dynamics and layout, while the usage of digitization with artificial intelligence ushers in a new era of the digitalized economy.

Despite all these possibilities, digital development which is not controlled by inclusivity and sustainability principles can exacerbate social marginalization as well as unviable utilization and production practices. Although the expansion of digital development has the potential to contribute significantly to the main facets of sustainable development (equality, sustainability, and growth), its overall influence will still be determined by how widely it is accepted and how well it is managed.

Due to the COVID-19 lockdowns throughout the world, as well as the closing down of industries including hospitality, transport has resulted in massive company closures and more disruptions, including a large increase in unemployment projected in the coming months [2]. The majority of people who utilize technology are divided into various categories such as healthcare, education, economy, business, and others.

Fig 1 Trends in Digital Technologioes

II. Impact on Major Stakeholders of Digitalization

There are various stakeholders of digitalization. A few of them are listed below along with various aspects in which digitalization has affected them.

2.1 Education

Large portion of the teachers and understudies decide to utilize video-based gadgets and stages to proceed with their schooling. They are turning into the second biggest collection of digital innovation users during the pandemic. Educators need to adjust the speed of web-based instructing and put more noteworthy exertion into planning for online courses, improving, planning illustrations, and quietly diverting understudies from detached beneficiaries to connected students. Another collection of expert specialists that are associated with working from a distance. The COVID-19 pandemic constrained schooling from one side of the planet to the other to work from a distance and a large part of the writing on advanced innovation utilized for instruction surveyed the consequences of this emotional shift. The greater part of the action present in this instructive class incorporates educating, getting the hang of, conveying, and progressing from eye to eye to on the web. Application of advanced innovation use in training could utilize further appraisal to make upgrades in its execution.

Schools, teachers, and the print media have traditionally been the primary sources of education. Only through enrolling with schools, teachers, and libraries students were able to access these resources. But with the advancement of these technologies, education reaches all from urban to rural areas with the help of the internet. Digital technologies have a tremendous impact on the educational system as well as the processes of knowledge development, creation, and acquisition [7].

A synthesis of evidence from a meta-analysis on the impact of digital technology in schools on academic achievement can be very well observed from three facets. To create the background and justify the usefulness of this knowledge, the first section provides an overview of the larger research on the impact of technology on learning. A subsequent part examines trends in the applications of digital technology and learning worldwide, to offer more framework for the recommendations that follows. The current study determines the implications of the use of digital technology in schools for learningfor future investment. Our society has become increasingly reliant on digital technologies and it remains a striking question whether to utilize them or not [8].

The massive shifting needs of 21st-century learners as a result of higher education's massification and the knowledge economy's expectations can be very well attributed to the rise of digitalization. Digital technologies have been proposed as a way to respond to these shifts. In terms of increasing students' learning experiences, digital technologies have had a limited impact thus far. It is believed that employing digital technologies as a participatory communication tool to facilitate partnership and co-constructive knowledge can improve the quality of learning experiences. Learners must be aware of their learning characteristics in informal settings and be able to adjust their informal settings. It's also crucial to recognize the merging of styles [9].

2.2 E-Commerce

There is a huge impact of digitalization on B2B exchanges. Digitalization refers to organizations' use of Internet-connected digital technology and applications. While muchresearch on the alterations brought by digital technologies has focused on B2C transactions, B2B transactions have received significantly less attention. Based on characterization of exchange among organizations that comprises resource ties, actor relationship and activity links. There are three forms of "digitalization" depending on the nature of the most significantly impacted relationship. These types are illustrated by three examples of digitization in various industries and five organizations that provide digital solutions for businesses i.e. The Coca Cola Enterprises, Volvo Construction Equipment, and Renault Trucks.This offers an alternative to assessments that are focused on the characteristics of B2B organizations' digital systems [10].

2.3 Health Care

Clinical experts and a wide range of patients with different persistent conditions are the biggest groups of consumers of digital innovation during the COVID-19 outbreak. Some of them are radiologists, specialists, and medical attendants who are dynamic on the forefronts and use electronic technology to examine and diagnose patients. The radiologists stand firm on a significant foothold to arrange the chest CT scans to identify and diagnose coronavirus's distinct symptoms and portray principle computerized tomography elements and sore distribution. Simultaneously, patients with various ongoing illnesses are getting the administrations and treatment from medical services experts using advancements, particularly, for the people who have as of now been contaminated with the Covid. Deferring an appointment, or utilizing online medical care services, patients must deal with the unavoidable usage of modern digital technologies such as modernized tomography equipment and video-based messaging systems for acquiring guidance from a medical service proficient. As a result, medical services experts and their wide range of patients make up a large group of COVID-19 technology users. During the explicit sorts of medical care-related exercises through technology can be done. Virtual consultation and screening were the most common uses of healthcare-related advanced technologies. As stated, before the greater part of the innovative action that occurred during the pandemic was interestingly and unmistakably intelligent of the requirements that various clients had. In the medical services field, the most commonly revealed exercises were giving wellbeing administrations from a distance, communicating, and checking. During the pandemic, other popular applications of technology in medical services included diagnosis and detecting in the evaluation of chest computerized tomography scans. Coronavirus disease was 97% positive in the initial Reverse Transcription Polymerase Chain Reaction (RT-PCR) test [4]. Medical services frameworks have extraordinarily adjusted their utilization of technology as a reaction to the pandemic [5].

The digital revolution is accelerating at a breakneck speed. With the significant rise of digital communications, systems and facilities, there is a growing strain among mental health patients than ever before. Digital technology is poised to convert health care delivery, with integration of mobile technologies. Huge data, network information and computing power. Digitally mediated communication's impact on human connection, as well as its potential impact on mental states including mood, anxiety, and well-being, can be thoroughly investigated. These advancements

highlight the importance of combining theory and data-driven research [6].

2.4 Social Life

Social life is one such sector which has been immensely transforming with inclusion of digital technology in every day scenarios. Introduction of social media apps like Facebook, Instagram, snapchat, WhatsApp etc. have made people closer and a message away. The distances have reduced and various public communities, relationships, networks, processes are formed online. Even people are managing their business through these applications. Digital technologies have impacted the life of people in such a way that it influences the way people think, work, play, create, relate, learn and love[13].World has now become a global village where everyone has access to everyone with a whirlwind speed. The internet has transformed the way of looking at things. Face to face communication has been replaced by digital communication[14].
In this transformation process, various things have been missed out also. Like the worth of meeting someone individually and knowing their body language. Also, these digital technologies have led to an uprise of internet related crimes such as identity theft, trolling, phishing scams and many more.

2.5 Tourism

Tourism sector has also a new era with the emergence of digital technologies, often referred to as digital tourism. It occurs from the use of smart and modern technologies which are an integration of terms like network connectivity, big data, sensors, information exchange and open data[15]. Digital tourism is linked with enhancing the tourist experiences through digital tools. It enables the tourist to pre-plan its plan of actions using different options available online. Like now the tourist can plan his/her holiday or travel plan right from scratch in the comfort of his/her home and that too according to his/her budget. Various applications have been integrated with tourism industry from finding the perfect holiday destination to finding accommodation, from planning the itinerary to getting reviews of the place, from choosing mode of transport to locating a local guide. All these activities involve the usage of technology where people, process, price, promotion, place etc. are integrated with physical evidences to enhance the accountability of digital tourism[16].

People can have a 360o view of the places pre-hand and it saves a lot of time, effort and money. By having a pre-hand look, one can decide his/her future course of actions. Also, with technology comes accountability and reliability, and the tourist frauds can be hindered as the person is well aware of his/her visiting destination. Digitalization has truly lifted the face of tourism in terms of user's experiences and hassle-free bookings.

2.6 Economy

Digital technologies help the environment by minimizing negative environmental effects and maximizing resource use, which promotes ecological advancements that result in sustainable development. These technologies may result in a variety of advances that pave the way for a sustainable future as they develop and converge with biotechnology and nanotechnology. Digitalization has both positive and negative effects on the environment. On the one hand, it has

the potential to disperse the economic structure by making it easier to deliver digital stock and logistics, which are growing in importance in the economy. Motion and emissions are rising in tandem with the significance of digitally offered services.

In the manufacturing sector, the integration of artificial intelligence into policymaking will improve resource management processes and reduce the environmental footprint in sectors such as natural resource use, manufacturing, commodity and supply planning, and consumption. Disintermediation of operations is also achievable because of digitalization, which reduces transaction costs and value chain connections, resulting in energy and input savings. According to the Global e-Sustainability Initiative (GeSI) study SMARTer2030, the adoption of digital solutions across economic sectors will reduce total global carbon dioxide equivalent (CO_2e) emissions by 12 gigatons (Gt) by 2030. and pave the way for sustainable business. pave the way for development.

On the other hand, increasing digitization has negative consequences such as increased energy demand and usage (server nodes and network resources), broken hardware (display) manufacturing processes, and marketing frameworks that encourage rapid replacement of devices. increase. Likewise, the increased use of audio, image and graphics solutions, especially the explosion of data, leads to increased energy consumption. Despite considerable growth in subscriptions and data traffic, the rate of increase in electricity utilization and the carbon footprint of the data and telecommunication field has declined seriously between 2007 and 2015[3].

III. Effect on Values

Values can be defined as something we care about.They are the driving force behind all of our decisions and are equally vital. They can be organized into hierarchies of means and ends, and they can conflict or complement one another. Value trade-offs are almost always necessary when resources are limited. When two or more values clash, it's called a value conflict. For example, Economic and environmental values do conflict and clash with each other. In particular, focusing on maximizing profit may have bad consequences for the environment, whereas environmental values may, at least in the short term, negate efficiency.

Convergence serves as a strong alliance between digitalization and values. It encourages convergence and regularity with other technologies, yet it is diversified as it allows distinct and huge varieties of different technologies. Such adaptation in the public sector implies an unclear modification of professionalism values. The validity of this transition is strongly dependent on the technology facet that underpins it. Another way of understanding the relationship is to recognize digitaltechnology as a paradigmthrough the study of norms. It supports the idea of “Digital technology for Everyone” but the digital paradigm is strongly governed by the norms which are highly recommended by computer scientists and engineers.Since the execution of these values depends highly on their manifestation, a more aligned and uniform range of norms is required[11,17].

Digital transformation has a significant role not only in specific industries but also in overall value perception. The exact attributes of a real product are no longer important in a data-driven

market. The new currency is efficient, convenient, and easyto use.For example, in the previous few decades, social perceptions of the automobile sector have shifted dramatically. Previously, car makers concentrated on aspects that appealed to drivers, such as top speed and acceleration.With self-driving cars on the horizon and ride-sharing services becoming more popular, consumer preferences are changing and the demands of the rider will take precedence over those of the driver [12,18].

IV. Conclusion:

In this paper, a detailed discussion about the impact of digital technology on major sectors like healthcare, education, social life, tourism, economy, e-commerce is presented. Also the way in which digitalization, have impact on values has also been discussed. Digital technologies have both positive and negative impacts. Its mindfulness of the user, to decide whether to take benefit out of it or use it for destructive purposes. One should always be mindful while using digital technologies, as these enhances the user experiences and provide infinity of opportunities and tools to make life better. But at the same time, can also disrupt with those opportunities and make them harmful for the user.

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Non-Destructive Testing of Concrete- A Case Study

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Abstract

The first author was engaged as a technical expert in an international dispute relating to quality of concrete in foundation of transmission towers. The findings of the first author (assisted by the co-author) were contrary to those of a French expert. The findings of author were accepted by the Hon'ble Arbitration Tribunal. The paper discusses aspects relating to non-destructive testing of concrete in foundation in the matter.

Keyword*:* Concrete, quality, rebound hammer test, surface hardness, core testing, cylindrical specimens, Non-Destructive Testing.

I. Introduction

An Indian construction company executed work of transmission towers abroad in Africa. The testing of concrete foundations of transmission towers was done as per European Codes[1, 2] of practice. The concrete work had been tested by a Canadian company and was accepted by the Owner (Govt. of Rwanda). Typical details of foundation are presented in Fig. 1.

There was an escalation clause in the contract document. The energy department of Government of Rwanda denied the claim of the Indian construction company. The Indian company invoked Arbitration clause and disputed the issue. The Arbitrator made an award in favor of the Indian company. Instead of honoring the award of the Arbitrator, The Government of Rwanda engaged a French expert who declared the work of foundation concrete to be sub-standard and opined that the work of foundation concrete required major repair and rehabilitation. The Government of Rwanda came out with counter claims against the Indian the Indian construction company.

Thus, a dispute arose relating to quality of concrete in foundation consequent to the findings of a French expert who tested concrete and rejected the same. The first author was engaged as technical expert by the Indian construction company. On careful examination of the report of the French expert, the author (assisted by the co-author) noticed that sampling, testing as well as evaluation done by the French expert was flawed. The paper focuses on this issue and critically presents the evaluation of the first author (assisted by the co-author) relating to Non- Destructive Testing of concrete in question.

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II. Problem Formulation

The first author, after critically reviewing the report of the French expert, came to the conclusion that there were some basic errors in the report. The first author was of the considered view that errors in the report of the French expert had the effect of misguiding the Tribunal. Accordingly, the errors were brought to the notice of the Tribunal, duly supported by the relevant technical literature on the subject. The paper briefly highlights contents of the report of the first author in his capacity as a technical expert.

III. Non-Destructive Testing of Concrete

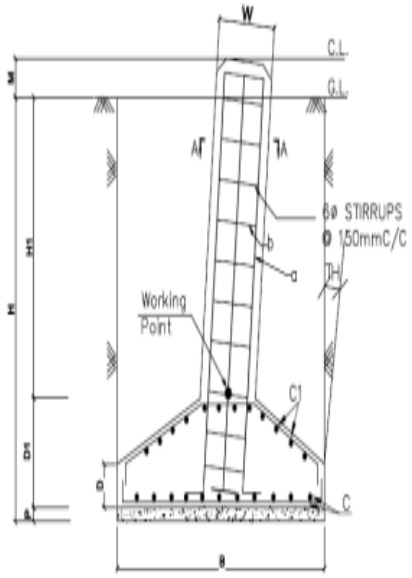
Rebound Hammer Test and Core-testing of concrete in foundation of towers were done by the French expert. The first author (assisted by the co-author) critically reviewed the report of the French expert and found that sampling, testing as well as evaluation were faulty and concluded that concrete quality was acceptable. Fig. 2 shows compression testing of core of concrete

IV. Concrete strength in compression

Requirement of concrete as specified in contract are presented in Table 1.
Table 2 reports the rebound values of surface of concrete in foundation, values of core-strengths in compression as evaluated by the French expert along with critical comments of authors. Core strength values (corrected) by authors of the paper are presented in Table3.

V. Critical Comments

Comments of authors on test result of the French expert are presented in Table 3. It is brought out that a variation in test results of the French expert is not acceptable.



FDN DIMENSION TABLE

H	3500
B	2550
W	490
M	300
P	50
D	150
D1	400
H1	3050
TH	18°
ϒ Kg/M^3	1632

Figure 1. Typical details of foundation

Figure 2: Compression testing machine in supporting transmission tower operation of testing concrete cores.

Table1: Specified concrete for foundation

Concrete class	**Cylinder/Cube strength @ 28 days N/mm²**	**Max. free water/cement ratio**	**Max. nominal aggregate size mm Ø**	**Min. cement content in kg/cubic m**
C16/20	16/20	0.60	25	280

Table 2: Critical comments of authors regarding Rebound Hammer Test & Concrete Core Strength values reported by the French expert.

Tower	**Core test (by French expert)**		**Hammer test (by French expert)**	**Comments of authors of the paper**
	Sample	Strength (MPa)	Median (MPa)	
109	C1 C2 C3	9.09 33.23 29.31	31,23,14 Av.=27	While both values are as per the contractual strength requirement of strength, it is seen that both these values differ by 4.27 MPa. In core tests, two extreme values of 33.23 and 9.09 MPa are seen. I cannot accept that concrete in some portion can be lower by ratio 1/3.7 as compared to some other portion.
		Av.=31.27		
143	C1 C2 C3	16.04 15.5 12.67	10	The difference in these values is 4.74 MPa. It raises doubt regarding reliability of results. Obviously, one of these values or both could be misleading.
		Av.=14.74		

144	C1 C2 C3 	5.27 15.89 13.13 Av.=11.43	10^3	In concrete core strength, values of 5.27 and 15.89 MPa are seen. I am not convinced that concrete in some portion has a strength as low as one-third of value in some other portion. The value of the hammer test appears to be absurd. Obviously, results of such testing are misleading.
145	C1 C2 C3 	10.94 7.45 8.67 Av.=9.02	23	The difference in these values is about 14 MPa. Even in core tests, the highest value is 10.94 MPa & the lowest is 7.45 MPa. I cannot accept that concrete in close proximity in the same foundation can have such variation. I have every reason to question errors in the sampling and testing.
146	C1 C2 C3 	12.03 13.13 14.43 Av.=13.20	-	The maximum and the minimum values are 14.43 and 12.03. The difference in the values is 2.40 MPa. I attribute this difference to errors in testing, and not to variation in concrete strength.
153	C1 C2 C3 	16.42 25.54 20.74 Av.=20.9	14 30	The variation in hammer test values between 14 and 30 indicates the misleading nature of the test. The maximum and the minimum values in the core test are seen to be 25.54 and 16.42 MPa; variation is 9.12 MPa. Such wide variation in values of both types of tests points to errors in sampling and testing.
250	C1 C2 C3 	14.23 12.03 12.32 Av.=12.86	8 11	The variation between the values indicated by both tests is 3.36 MPa. In the core tests, the highest and the lowest values are 14.23 and 12.03 MPa. The vast variation in values of strength raises questions about the reliability of such tests.
251	C1 C2 C3 	13.14 12.7 20.8 Av.=15.54	15 7	The variation between the average results of both type of tests is 4.54 MPa. The variation in the rebound hammer test values is 8 MPa. It is illogical to conclude that concrete strength in two positions in close proximity can be half or twice as compared to each other. In the core test, the maximum and the minimum values shown are 20.80 and 13.14 MPa, the difference being 7.66 MPa. The ratio between these values is 3:2, which is unacceptable.
257	C1 C2 C3 	13.14 10.62 13.14 Av.=12.30	7	The variation in assessment between both tests is 5.30 MPa. Looking at the maximum and minimum values, these are seen to be 13.14 and 10.62 with a difference of 2.52 MPa. These variations suggest errors in sampling and testing, which leads to misleading conclusions.
258	C1 C2 C3 	9.69 12.81 - Av.=11.25	14 15	The variation between both assessments is 3.25 MPa, which is high. The maximum and minimum values are 12.81 & 9.69 MPa. The difference raises questions on the accuracy of sampling and testing.

259	C1 C2 C3	13.14 15.32 6.02	6 14	The variation between both types of assessments is1.49 MPa. In the core test, the maximum value is 15.32 MPa. The minimum value is 6.02 MPa. The difference is 9.30 MPa. I cannot believe that concrete in one spot in the same foundation is just 1/2.5 of strength in close proximity.I attribute such wide variation to errors in sampling and testing, and not to variations in the concrete.
		Av.=11.49		
260	C1 C2 C3	10.31 8.17 13.32	11 19	The maximum and minimum values in core tests are 13.32 and 8.17 MPa. The difference is 5.15 MPa. I attribute such wide variation to errors in testing, and not to the concrete.
		Av.=13.32		
261	-	-	18,28,11	There is a large variation in test results. Any inference drawn based on this testing is questionable.
263	C1 C2 C3	15.97 6.29 14.01		The maximum value is 15.97. The minimum value is 6.29. The difference is 9.68. There is a wide variation in values. I do not agree with the suggestion that strength in some portion of concrete is just1/2.5 times that of concrete in the vicinity in the same foundation.
		Av.=12.09		
264	C1 C2 C3	10.2 11.32 13	6 21	The difference in hammer test results is absurd – 3½ times. In core tests, the maximum value is 13 MPa; the minimum value is 10.2 MPa. The difference is 2.8 MPa. do not agree with the suggestion that concrete in one portion is weaker by ratio 1/1.3. This suggests error in sampling and testing.
265	C1 C2 C3	13.49 12.96 10.33	16 33	The difference in hammer test results is absurd – it is more than two times. The maximum core strength is 13.49 MPa, the minimum core strength is 10.33 MPa. The difference is 3.16 MPa, which is high.

Table 3: Compressive Strength of Concrete Core samples (corrected by authors)

Loc No	**Length of sample (L)**	**Dia of Sample (D)**	**Compressive strength of core sample (F) = P/A**	**L/D ratio (ʎ)**	**Correction factor for l/d ratio (Kc) = 2.0/(1.5+1/ʎ)**	**Nos of bars inside the core sample (n)**	**Dia of bar (Φr)**	**Distance of bar From edge of core (d)**	**Correction factor for steel (Ks) = 1+1.5*∑ Φr*d/D* L**	**Estimated insitu cylinder strength applying Correction due to L/D and steel content = F*Kc*Ks**	**Min Characteristic insitu strength required as per clause 9 of EN 13791:2007 = 0.85*(Fck-4) i.e 0.85*(16-4)=10.2**	**Result**
	(mm)	**(mm)**	**(N/mm^2)**			**(Nos)**	**(mm)**	**(mm)**		**(N/mm^2)**	**(N/mm^2)**	
Tower 109	108	74	10.47	1.46	0.92	0	10	58	1.00	9.58	10.20	NO OK
	136	74	36.05	1.84	0.98	0	10	58	1.00	35.27	10.20	OK
	124	74	32.57	1.68	0.95	0	10	58	1.00	31.07	10.20	OK

Tower 143	105	74	18.61	1.42	0.91	0	10	58	1.00	16.88	10.20	OK
	118	74	17.45	1.59	0.94	1	10	65	1.11	18.24	10.20	OK
	94	74	15.12	1.27	0.87	0	10	58	1.00	13.22	10.20	OK
Tower 144	127	74	5.82	1.72	0.96	1	10	95	1.15	6.44	10.20	NO OK
	130	74	17.45	1.76	0.97	0	10	58	1.00	16.87	10.20	OK
	148	74	13.96	2.00	1.00	1	10	75	1.10	15.39	10.20	OK
Tower 145	148	74	11.63	2.00	1.00	0	10	58	1.00	11.63	10.20	OK
	79	74	9.30	1.07	0.82	1	10	58	1.15	8.77	10.20	NO OK
	142	74	9.30	1.92	0.99	0	10	58	1.00	9.20	10.20	NO OK
Tower 146	148	74	12.79	2.00	1.00	0	10	58	1.00	12.79	10.20	OK
	147	74	13.96	1.99	1.00	0	10	58	1.00	13.94	10.20	OK
	117	74	16.28	1.58	0.94	0	10	58	1.00	15.27	10.20	OK
Tower 153	148	74	17.45	2.00	1.00	0	10	58	1.00	17.45	10.20	OK
	97	74	30.24	1.31	0.88	1	10	58	1.12	29.97	10.20	OK
	146	74	22.10	1.97	1.00	0	10	58	1.00	22.02	10.20	OK
Tower 250	148	74	15.12	2.00	1.00	1	10	65	1.09	16.47	10.20	OK
	148	74	12.79	2.00	1.00	1	10	65	1.09	13.93	10.20	OK
	115	74	13.96	1.55	0.93	1	10	20	1.04	13.48	10.20	OK
Tower 251	148	74	13.96	2.00	1.00	0	10	58	1.00	13.96	10.20	OK
	95	74	15.12	1.28	0.88	0	10	58	1.00	13.27	10.20	OK
	148	74	22.10	2.00	1.00	1	10	95	1.13	24.98	10.20	OK
Tower 257	148	74	13.96	2.00	1.00	1	10	80	1.11	15.49	10.20	OK
	131	74	11.63	1.77	0.97	1	10	45	1.07	12.05	10.20	OK
	148	74	13.96	2.00	1.00	0	10	58	1.00	13.96	10.20	OK
Tower 258	138	74	10.47	1.86	0.98	0	10	58	1.00	10.28	10.20	OK
	98	74	15.12	1.32	0.89	1	10	15	1.03	13.83	10.20	OK
	7	74	DAMAGED									
Tower 259	148	74	13.96	2.00	1.00	0	10	58	1.00	13.96	10.20	OK
	148	74	16.28	2.00	1.00	1	10	95	1.13	18.40	10.20	OK
	105	74	6.98	1.42	0.91	0	10	58	1.00	6.33	10.20	NO OK
Tower 260	117	74	11.63	1.58	0.94	1	10	50	1.09	11.85	10.20	OK
	113	74	9.30	1.53	0.93	0	10	58	1.00	8.63	10.20	NO OK
	114	74	15.12	1.54	0.93	1	10	50	1.09	15.32	10.20	OK
Tower 263	103	74	18.61	1.39	0.90	0	10	58	1.00	16.78	10.20	OK
	125	74	6.98	1.69	0.96	0	10	58	1.00	6.67	10.20	NO OK
	139	74	15.12	1.88	0.98	0	10	58	1.00	14.88	10.20	OK
Tower 264	112	74	11.63	1.51	0.93	1	10	58	1.10	11.89	10.20	OK
	116	74	12.79	1.57	0.94	1	10	55	1.10	13.11	10.20	OK
	104	74	15.12	1.41	0.90	1	10	40	1.08	14.74	10.20	OK
Tower 265	120	74	15.12	1.62	0.94	0	10	58	1.00	14.29	10.20	OK
	140	74	13.96	1.89	0.99	0	10	58	1.00	13.76	10.20	OK
	118	74	11.63	1.59	0.94	0	10	58	1.00	10.93	10.20	OK

VI. Basic errors of the French expert [3,4,5]

The testing methods are stated in reference [3]. The French expert was engaged by Government of Rwanda and report of the first author (assisted by the second author) is a reaction to that report[4].

While the French expert rejected concrete in foundations, the first author submitted his report, and it had findings contrary to that of the French expert. Authors relied on Neville[5] in support of findings. Basic errors in the report of the French expert are brought out hereunder:

i. **Sampling**: Concrete in foundation of transmission towers is actually subjected to compressive as well as tensile stresses. Samples of concrete cores were collected from regions in foundation which were subjected to tensile stress. This could be the region of micro-cracking in concrete in foundations

ii. **Testing:** Concrete cores were tested in compression while concrete at site was subjected to tension as well as compression. Testing should be commensurate with actual state of stress at site.

iii. **Evaluation:** As per European codes of practice[1,2], the expected compressive strength of concrete in cores, $Fis \geq 0.85(Fck - 4)$. Here Fck=16MPa for cylindrical specimens. Therefore, after applying corrections for reinforcement in cores and length/ dia. ratio, the expected core strength should be 10.2 MPa. The French expert did not apply the required corrections.

Further, comparison was made with 16 MPa as the benchmark value of concrete core strength. It should instead have been 10.2 MPa.

VII. Discussion

As per findings of the French expert, 84% of samples of core failed while authors of the paper found that 84% of the samples met with requirements of Euro codes of practice[1,2].
The international Arbitration Tribunal comprising of Chairman from Switzerland & other members from Germany & UK, rejected the expert report of the French expert and accepted findings of the first author.

VIII. Conclusions

1. Rebound Hammer test is a test for surface hardness of concrete and evaluation of concrete strength based on this test can have error up to 30%[5].

2. Concrete core testing should be done with due precautions and proper care in sampling, testing and evaluation; otherwise, conclusions can be highly misleading and erroneous as happened in the case of the findings of the French expert which were rejected by the international tribunal of arbitration.

Acknowledgements
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Novel Approach of Animal Recognition Using Deep Learning Algorithm

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Abstract

Efficient and reliable monitoring of wild animals in their natural habitat is essential. This project develops an algorithm to detect the animals in wildlife. Since there are large number of different animals manually identifying them can be a difficult task. This algorithm classifies animals based on their images so we can monitor them more efficiently. Animal detection and classification can help to prevent animal-vehicle accidents, trace animals and prevent theft. This can be achieved by applying effective deep learning algorithms

Keyword: *Animal Detection, Classification, Deep Learning Algorithms, prediction, machine learning*

V. Introduction

Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves. The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly.

Deep learning is a subset of machine learning. Deep artificial neural networks are a set of algorithms that have set new records in accuracy for many important problems, such as image recognition, sound recognition, etc., In deep learning, a convolutional neural network (CNN) is a class of deep neural networks, most commonly applied to analyzing visual imagery. CNNs use relatively little pre-processing compared to other image classification algorithms. This means that the network learns the filters that in traditional algorithms were hand-engineered. This independence from prior knowledge and human effort in feature design is a major advantage. They have applications in image and video recognition, recommender systems, image classification, medical image analysis, and natural language processing.

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One of the applications of the deep learning technique called Convolutional Neural Network is animal detection. Observing wild animals in their natural environments is a central task in ecology. The fast growth of human population and the endless pursuit of economic development are making over-exploitation of natural resources, causing rapid, novel, and substantial changes to Earth's ecosystems.

An increasing area of land surface has been transformed by human action, altering wildlife population, habitat, and behavior. More seriously, many wild species on Earth have been driven to extinction, and many species are introduced into new areas where they can disrupt both natural and human systems. Monitoring wild animals, therefore, is essential as it provides researchers evidences to inform conservation and management decisions to maintain diverse, balanced, and sustainable ecosystems in the face of those changes.

VI. Literature Review

The purpose of animal detection is to prevent or reduce the number of animal-vehicle collisions. Thesesystems are specifically aimed at the wild animals that can cause human death, injury and property damage. This system detects the wild animals before they enter the road. Historically animal-vehicle collisions have been addressed by putting up signs that warn peoples of potential animal crossings. In other cases, wildlife warning reflectors or wildlife fences have been installed to keep animals away from the road. In some selected areas wildlife fencing has been combined with a series of wildlife crossing structures. In most cases however, such crossing structures are limited in number and width, mostly because of their relatively high costs.

2.1. Animal Detection Using Template Matching Algorithm

Animal detection is useful in prevention of animal- vehicle accidents and will increase human and wildlife safety, it will detect large animals before they enter the road and warn the driver through audio and visual signals. This also helps in saving crops in farm from animals. In this project there is survey of different object detection techniques and for object identification as animal techniques such as object matching, edge-based matching, skeleton extraction. After survey the most appropriate method is selected for animal detection and efficiency is measured. Proposed system has low false positive rate and false negative rate.

2.1.1 Template Matching

Template matching is a technique in digital image processing for finding small parts of an image which match a template image. To perform template matching the concept of normalized cross co relation can be used. In signal processing, cross-correlation is a measure of similarity of two waveforms as a function of a time-lag applied to one of them. This is also known as a sliding dot product or sliding inner product. It is commonly used for searching a long- duration signal for shorter, known feature. For image- processing applications in which the brightness of the image and template can vary due to lighting and exposure conditions, the images can be first normalized. This is typically done at every step by subtracting the mean and dividing by the standard deviation. Here we have used feature- based template matching mechanism using NCC

2.2 Automatically Identifying, Counting, and Describing Wild Animals in Camera-Trap Images with Deep Learning

Having accurate, detailed, and up-to-date information about the location and behavior of animals in the wild would revolutionize our ability to study and conserve ecosystems. This paper investigates the ability to collect such data automatically, accurately, and inexpensively, which could transform many fields of biology, ecology, and zoology into "big data" sciences. Motion sensor "camera traps" enable collecting wildlife pictures inexpensively, unobtrusively, and frequently. However, extracting information from these pictures remains an expensive, time-consuming, manual task. We demonstrate that such information can be automatically extracted by deep learning, a cutting-edge type of artificial intelligence.

We train deep convolutional neural networks to identify, count, and describe the behaviors of 48 species in the 3.2-million-image Snapshot Serengeti dataset. Our deep neural networks automatically identify animals with over 93.8% accuracy, and we expect that number to improve rapidly in years to come. More importantly, if our system classifies only images, it is confident about, our system can automate animal identification for 99.3% of the data while still performing at the same 96.6% accuracy as that of crowd sourced teams of human volunteers, saving more than 8.4 years (at 40 hours per week) of human labelling effort (i.e. over 17,000 hours) on this 3.2-million-image dataset.

Those efficiency gains immediately highlight the importance of using deep neural networks to automate data extraction from camera-trap images. Our results suggest that this technology could enable the inexpensive, unobtrusive, high-volume, and even real- time collection of a wealth of information about vast numbers of animals in the wild.

VII. Block Diagram

3.1 Convolutional Neural Network

A convolutional neural network (CNN) is a specific type of artificial neural network that uses perceptron's, a machine learning unit algorithm, for supervised learning, to analyze data. CNNs apply to image processing, natural language processing and other kinds of cognitive tasks. A convolutional neural network has an input layer, an output layer and various hidden layers. Some of these layers are convolutional, using a mathematical model to pass on results to successive layers.

- Input will hold the raw pixel values of the image and with three color channels R, G, B.

- CONV layer will compute the output of neurons that are connected to local regions in the input, each computing a dot product between their weights and a small region they are connected to in the input volume.

- RELU layer will apply an element wise activation function. This leaves the size of the volume unchanged.

- POOL layer will perform a down sampling operation along the spatial dimensions (width, height), resulting in volume such as [16x16x12].

- FC (i.e. fully-connected) layer will compute the class scores, resulting in volume of size. As with ordinary Neural Networks and as the name implies, each neuronin this layer will be connected to all the numbers in the previous volume.

3.2 Convolutional Layer

Fig. 1 shows the convolution which is the first layer toextract features from an input image. Convolution preserves the relationship between pixels by learningimage features using small squares of input data. It is a mathematical operation that takes two inputs such as image matrix and a filter or kernel. Convolution of an image with different filters can perform operations such as edge detection, blur and sharpen by applying filters.

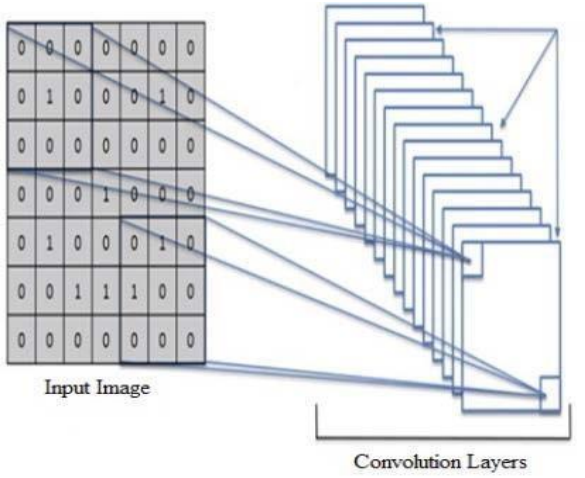


Figure 1. Convolution Layer

3.3 Pooling

Pooling layers section would reduce the number of parameters when the images are too large. Max pooling take the largest element from the rectified feature map. The objective is to down-sample an input representation (image, hidden-layer output matrix, etc.), reducing its dimensionality. This is shown in Fig. 2.

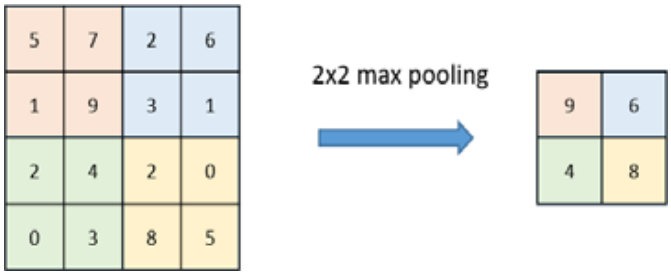


Figure 2. Pooling

3.3 Flattening

Flattening is the process of converting all the resultant 2 dimensional arrays into a single long continuous linear vector. It gets the output of the convolutional layers, flattens all its structure to create a single long feature vector to be used by the dense layer for the final classification. This is shown in Fig. 3

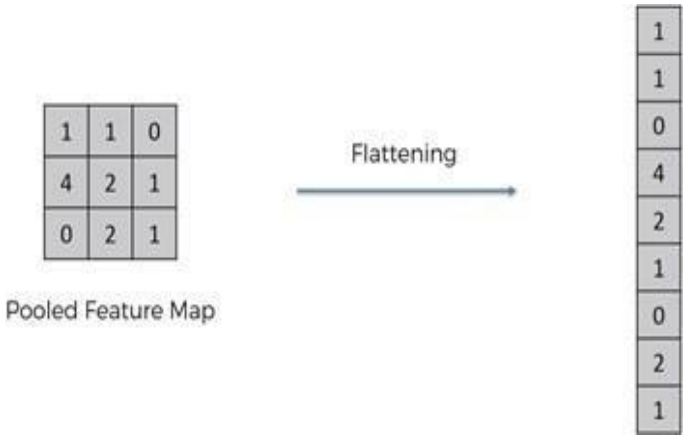
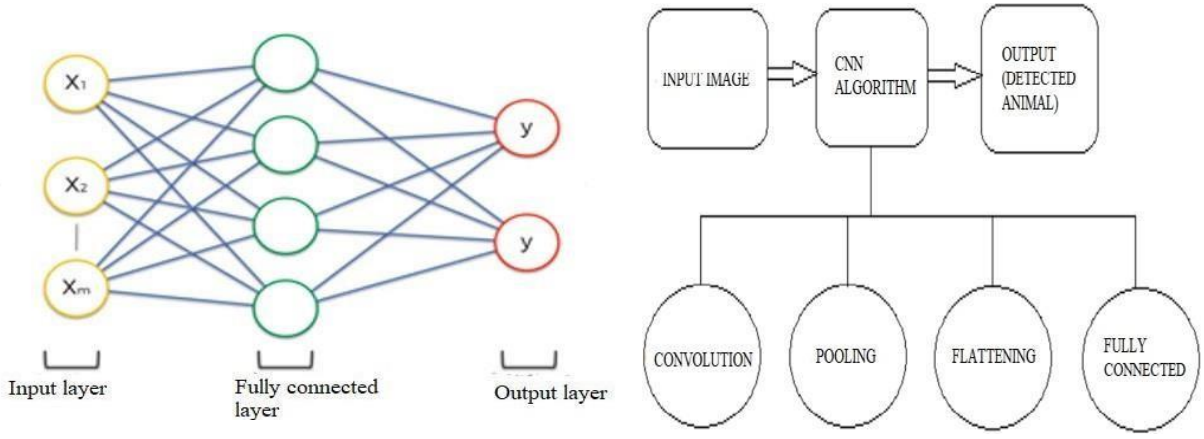


Figure 3. Flattening

3.4 Fully connected

Fig.4 shows the hidden layers inside a Convolutional Neural Network w are called Fully Connected Layers. These are a specific type of hidden layer which must be used within the CNN. This is used to combine the features into more attributes that predict the outputsmore accurately



(a) Fully connected (b) Block diagram

Figure 4(a) Fully connected layer (b). shows the block diagram of the animal detection using deep learning algorithm.

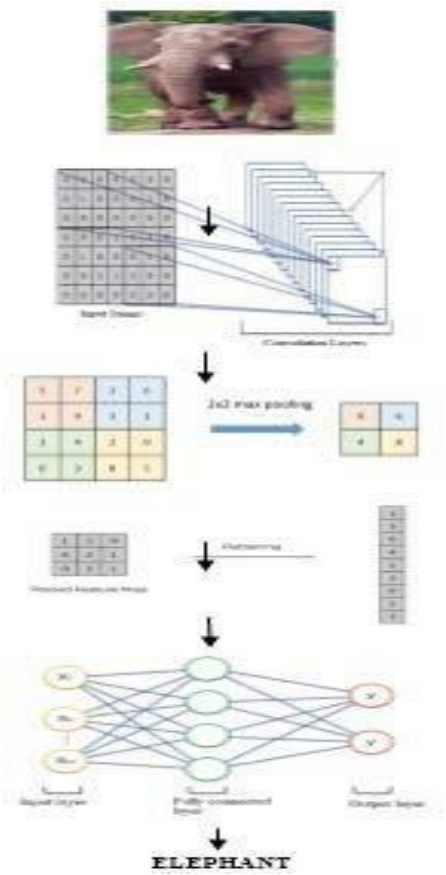


Figure 6. The flow diagram for animal detection

IV. Dataset

4.1 Dataset used

The dataset used here is a collection of image data that contains various images of animals. The Dataset is splitted into train and test in the ratio of 75:25 respectively.

(a)

(b)

Figure 7 The training dataset (a) Elephant (b) Cheetah

Figure 8. Elephant test data

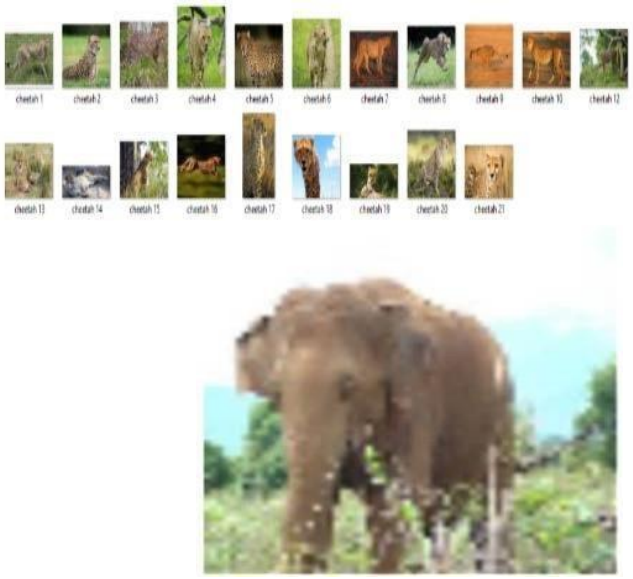
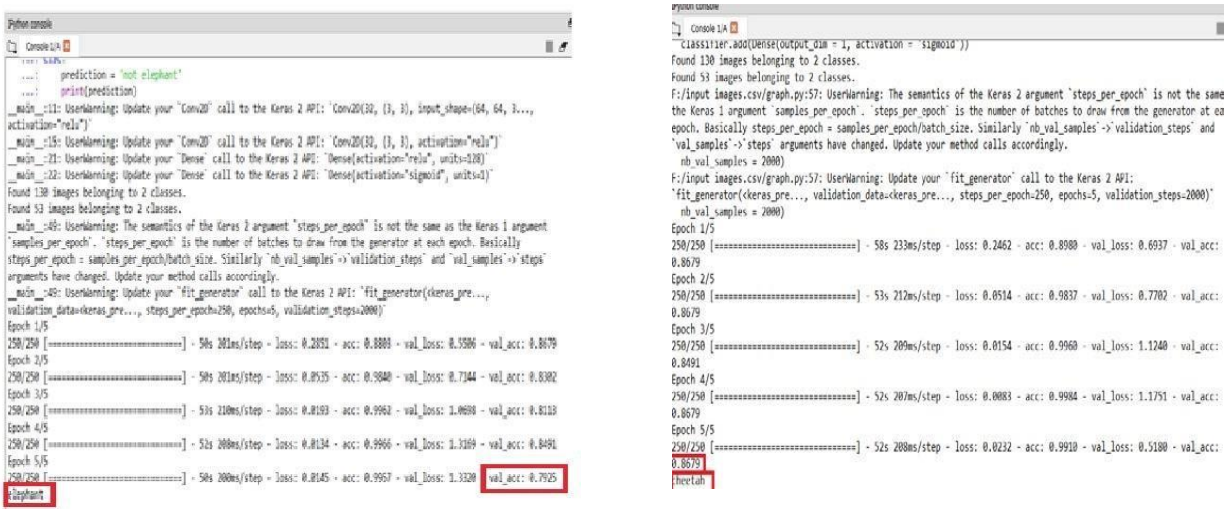


Figure 9 Cheeta test data and detected elephant image

V. Results

5.1 Detection of Cheetah and Elephants

The dataset is divided into two parts that is training and testing as a part of experimental study of animal recognition and detection. The sample dataset of training and testing shown in above figures. Figure 10 shows the experimental analysis of animal detection process wherein cheetah has been successfully detected. The study shows that the detection accuracy specifically of cheetah is close to 86% whereas the detection accuracy of elephant is quite low which is close to 80%.



(a) Elephant detection accuracy (b) cheetah detection accuracy

Figure 10. Accuracy of (a) elephant and (b) cheetah detection

Figure 11. The detected Cheetah

VI. Conclusion

Thus, this project uses Convolutional Neural Network (CNN) algorithm to detect wild animals. The algorithm classifies animals efficiently with a good number of accuracy and also the image of the detected animal is displayed for a better result so that it can be used for other purposes such as detecting wild animals entering into human habitat and to prevent wildlife poaching and even human animal conflict.

This work can be further extended by ending an alert in the form of a message when the animal is detected to the nearby forest office. Furthermore, it can be used to reduce human wildlife conflict and animal accidents.

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