

## **DIGITALIZATION IN TEACHING AND LEARNING: A COMPREHENSIVE STUDY**

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### **Abstract:**

The educational system was severely impacted due to COVID-19 pandemic and teachers and students were both supposed to adapt digital environment. Rapid development of digitalization has affected in the development of teaching and learning. Digitalization is to provide digital platform and it is process of transformation of information in computerized format. Teaching is world's largest profession of transmission of knowledge where learning is ability to learn and understands the knowledge. Digital age has changed, how we communicate, inform ourselves, and even how we teach and learn. Main objective is to minimize manual work and physical documentation. Technologies and use of digital media will improve teaching and learning development. This paper provides a comprehensive review of the digitalization in teaching and learning, highlighting its impact on education system. Based on literature review author describes effect of digitalization on teaching and learning, author specify challenges and suggestions to overcome for the same. Finally, some recommendation and future directions for digitalization is highlighted in this research studies.

**Keywords:** Digitalization, Digital, Learning, Teaching, Challenges

### **Introduction:**

Digitization is related to the concept of digital transformation. Digitization is to provide a digital platform in every field all over the world. Digitization is the process of transformation of analog data into digital information, so it can be stored and understood by computer machine which include transfer of paper document to electronic or digital format that result as digital representation. Digitization refers to the conversion of existing hardcopy learning material and process to making them available through digital means. It can be easily stored, shared and backup the information of all kinds in all formats with consistent efficiency & managed. Digital and new technologies are used to send and receive information, deliver services and also impacted the way learning occurs. In the current situation people, society, businesses, and education have to matched and access the knowledge via Information and combination technology(ICT's) to be heart of digital world.

Education is a system with several components that interact with each other to achieve a particular goal. Some of the components include objectives of education; teaching materials, teaching tools/

media, teaching methods etc. If anyone component is missing then the result will not be very good. Learning is process which can be done through formal and non-formal education. In formal education teacher and student are communicate with each other where teacher is facilitator of social interaction education for student. Learning is an ability to learn, understand knowledge, behavior, skills, value and many more new things which is continuous and lifelong process, it doesn't end and play very crucial role in human development and modify existing knowledge, attitude towards current trends. It is active and adaptive to the current environment to learn and engage with information, and experience, and develop the necessary skills to function effectively in various areas.

The digital revolution has brought about significant changes in various aspects of our lives, including education. With the proliferation of digital technologies and the internet, education has become more accessible and convenient than ever before. The impact of the digital revolution on education and how it has transformed the way is essential. Teaching is the world's largest and cutest profession, where we can transmit knowledge to learners, Students, or any other audience. During the teaching process, a teacher's job is to impart knowledge to students and inspire and motivate students to be more active. In higher education teaching are committed to developing as professional teachers not only as researchers, they should provide good quality learning material with the help of researchers. Teachers can broadly be defined as the confident, creative use of ICT tools, this is an essential skill for today's teachers. This helps the teacher to acquire and update skills needed in their work for teaching. To create a positive, respectful, curiosity, and punctuality learning attitude among the learner, teachers should be innovative, creative, motivational, caring, enthusiasm, adaptable, and research-oriented to lifelong learning.

The present paper is considering the view of digitalization in teaching learning process and its impact on education institutes. The present study based on mixed methods approach of secondary data with the following objectives -

- to understand the evolution of digitalization in education.
- to study the importance and relevance of digitalization in teaching and Learning.
- to know the benefits and challenges of digitalization in education.

**Review of Literature:** In 2015, Jessica Muetterties in her paper "Enhancing Education through Digitization" highlighted that teachers must learn to embrace the fact that computers and other aspects of technology are used by children every day the classroom needs to incorporate new and emerging technology. It also focuses on how to prepare online presentations with various methods. Dr. Raju Kumar (2020) emphasis that Artificial Intelligence will boost to digitalization and it can be used for making education systems online. It also highlights that computer tools and applications will help to conduct the examinations and evaluation of papers. Saiful Islam(2018) presented in his paper that today most of the learning styles have been converted into digital education system. Digital education also extends through social networks. He said the effect of social networking on our education site.

Dr. Anssi Mattila(2015) analyzed Teachers should be able to deepen students' understanding and knowledge, and develop skills like problems solving, interaction, self-correction, critical reflection,

competence improvement meaning making an experiential learning. In the future, we have to focus resources on teaching teachers, and not only at the beginning of their career, but teachers should have a possibility to develop professionally throughout their academic working life. M Tsarapkina(2021) concludes that the leading role in any pedagogical process belongs to the teacher, and in the application of digital technologies, his contribution is undeniable. He said the primary focus should be on innovations created by teachers which must associate with technology produced in the market and improved technological process while using in practice. Tarmo Tuis(2015) concluded this leads the researchers to believe that ICT does play a role in increasing and facilitating, interactions for students studying in an international context both with each other and with university staff.

Mei, X., Aas, E. & Medgard, M. (2019), stressed that teachers use of digital learning tools for teaching in higher education and exploring teaching practice and sharing culture as creating activity, variation and commitment are some of the main reasons for using digital learning tools in planning and conducting the teaching with positive impact which can improve by teaching practice through digital learning tool. Vasileios Dagdilelis (2018) concluded as the initial data analysis seems to indicate that the use of ICT in teaching has been generally accepted by the teachers.

Ulyawati (2022) describes digitalization is using media of digital form, the research illustrates that digitalization of effective elementary school natural science learning using E-learning, personalized learning, and continuous feedback mechanisms and student have their ownership towards learning. Issa I. Salame (2023) proposed there are significant differences between online learning and a traditional face-to-face format. Jens Riehemann & Regina Jucks (2017) highlighted that the digital age has changed how we communicate, inform ourselves, and even how we teach and learn. Sheila García-Martín (2019) concluded the ability to integrate and use of technologies for educational purposes requires generic and specific teaching skills, known as professional digital competence.

**Evolution of Digitalization in Education ;** As the effect of technology seen in every aspect of society, the results of digitalization in education have been unable to avoid. In educational field, digitalization has different applications like e-learning, online courses, online examinations, distant learning and administrative work. Along with these methods, mentality of students is also changing. They are not restricted with text books available in market. Their methods of learning are changing every day. They like to learn through social media such as YouTube, Online Apps, Facebook etc. The e-books provide an interactive media in which the students have access to multimedia contents such as videos, slide presentation and hyperlinks. Learning through animations like pictures, diagrams, and different color combinations is more effective.

Like traditional methods, nowadays people don't like to stand in long queue for admission process. Students can fill their applications online at their convenience. Payment of fees can be transferred online from anywhere and anytime using internet.

**Effect of Digitalization in Teaching and Learning:** Some benefits are not so obvious, but still worth noting. So, let us show you some of the critical areas where you can digitalize the learning process.

**Managing Admissions:** Uploading the enrollment application to institution offline is lengthy and time-consuming process but through the digital way submitting them is more convenient and a time-savvy.

**Minimizing Risks:** Whether lectures or classes were canceled due to unhealthy conditions, online learning can handle it all and convenience to maintain excellent attendance rates and not miss an important lesson through digital tools or just read through the material uploaded on the cloud.

**Improving Learning Outcomes:** With interactive lessons and implementing high-tech solutions can motivate students and, as a result, improve their learning skills. The more attention will give to what's going on, the more relevant information will be able to absorb at once.

**Evaluating Performance:** The process of digitalization in education offers a lot of benefits for students, such as faster access to tests and grades through online systems. E-learning systems allow to track students' performance levels that you can easily measure via a digital platform.

### **Benefits of Digitalization in Education:**

Today education is becoming digitized faster than expected the reason cited is that digital way of learning has a long-lasting impact on the memory of the learner and makes him smarter embodied with logical thinking and sharp reactions in a given situation that that being possessed when more reliance was on class room teaching and traditional methods of imparting education. Following are the important benefits of digital education over the traditional education system of education.

- Digital tools provide students with access to vast amounts of information, enabling them to explore diverse perspectives and resources beyond traditional textbooks.
- Digital platforms can be tailored to individual learning styles and paces, allowing students to engage with content at their own speed and receive personalized feedback.
- Interactive multimedia elements, gamified learning experiences, and virtual simulations can make learning more engaging and enjoyable, fostering active participation and motivation among students.
- Nowadays, E-learning, distant learning and online education have become very important of education system now days. Even several foreign universities have started online degree courses that students can join. There is no restriction to attend the class physically. Thus, digitization of education has crossed all boundaries for students who have thirst for knowledge.

### **Challenges of Digitalization in Education:**

While the benefits of digitalization in teaching and learning are clear, there are also significant challenges that must be addressed to realize its potential. According to review of various papers ,there are some challenges faced by people in various filed. It can be difficult to teachers to keep up with the latest trend in technology

- One of the key challenges is related to technology integration. Integrating technology effectively into teaching practices requires significant time, training, and support for teachers,

as well as access to reliable infrastructure and technical support. Without adequate support, teachers may not adopt digital technologies, or they may use them ineffectively which can negatively impact student learning outcomes.

- Socioeconomic disparities in access to technology and internet connectivity can exacerbate inequalities in educational opportunities, creating a digital divide among students from different socioeconomic backgrounds.
- Excessive use of digital devices and online platforms can lead to distractions, multitasking, and information overload, potentially hindering students' ability to focus, retain information, and develop critical thinking skills.
- Digitalization raises concerns about the privacy and security of student data, as well as the risk of cyber threats, data breaches, and unauthorized access to sensitive information stored on digital platforms.
- Implementing digital tools and online learning environments requires careful consideration of pedagogical approaches, instructional design principles, and assessment strategies to ensure meaningful learning experiences and academic integrity.
- Students and teachers need to develop digital literacy skills to navigate digital platforms effectively, evaluate online information critically, and use digital tools responsibly for learning and communication.
- Ensuring equitable access to digital resources and addressing barriers to participation for students with disabilities, English language learners, and other marginalized groups are critical challenges in digitalized learning environments.
- During online learning students complaining about of lack of motivation, it happens because every student is not accompanying by teacher face to face interaction of student teacher is not possible because more number of student are present in the session. Some students are not able to speak in front of all students due to fear as there is lack on one to one interaction between student and teacher.

### **Conclusion:**

Digitalization used to provide digital platform and it is process of converting hard paper in digital form. Teachers must realize that they are the main facilitators not replaced by new technology, but with the new technology, one can improve the efficiency of teaching by teachers. The use of digital learning media used by teachers for teaching as well as used by students for learning in beneficial in the current situation. Challenges faced by students are lack of motivation, infrastructure problem and faced by teacher as availability of learning media; innovative learning is an expensive part. In the following ways, the digitalization of education can be more fruitful results in terms of knowledge and learning

- Teachers must consistently update with the latest technologies by taking part in training and workshops, especially in the field of education sector which will help them not only to learn

how to use new technology but also how to provide meaningful instruction and activities using technology in the classroom.

- With the potentially powerful effect of media and the growing empirical evidence for the negative impact of technology on students, parents should take care to limit exposure to deleterious technology. They should know what content their wards are reading and viewing in the name of online education.
- There should be clear learning objectives and Institute should provide facilities to teachers and students as per the requirement of new digitization technology. So, be ensure about a technology planning team comprising administrators, teachers, technology coordinators to determine the educational goals for students and the types of technology that will be beneficial to meet the goals.

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University Grants Commission

Approved Journal  
vol. 54 No. 01

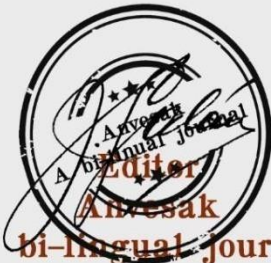
in

**Anvesak A bi-annual Journal**

**UGC Care Group - 1**

**ISSN: 0378 - 4568**

**January – June 2024**



**A bi-lingual journal**



**EFFECTIVE PROJECT MANAGEMENT WITH AN IOT**

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**Abstract-**Internet of Things (IoT) is one of the main indications in project management for the technology enhancement. It is a great relationship between project management and IoT by mutual understanding of project team and implement the project with great accuracy and faster. Nowadays to develop project management, project managers are supposed to do careful planning, designing, management and use of IoT in projects. Researcher found that IoT can offer significant benefit in project management including cost reduction, increase efficiency and improve communication. With the analysis of the different articles from other researcher's works, the authors are enabled to acquire detailed information about the implementation of IoT in the project management. This paper represents the impact of IoT on project management in project based organizations. A qualitative method of research was adapted to structure interview of 18 selected participants and identifies benefits and challenges of using IoT in project management. Also some feature recommendation and solution for implementing and managing IoT system is highlighted in this research studies.

**Keywords:** Internet of Things (IoT), Project Management, Mutual Understanding, Technology.

## **I. INTRODUCTION**

### **A. Internet of Technology**

The term IoT or Internet of Things integrates everyday “things” with the internet. It is the collective network of connected devices and the technology which provides communication between devices and the cloud, as well as between the devices themselves to share data and automate tasks. Due to inexpensive computer technology and high bandwidth telecommunication, nowadays billions of devices are connected to the internet. This means everyday devices like smart home appliances, vacuums, cars, and machines can use sensors to collect data and respond intelligently to user. The base of IoT system is the real-time collection and analysis of data. The smart devices, IoT applications and Graphical User Interface (GUI) are three components of IoT system. To improve business efficiencies, IoT is used in several industries such as manufacturing, retail, healthcare, transportation and other enterprises etc. In industrial IoT, Industrial devices, from sensors to equipment give business owners detailed, real-time data that can be used to improve business processes. They also gives insights on supply chain management, logistics, human resources, and production which leads to decrease costs and increase business revenue. In future, IoT will become increasingly tremendously in our daily routine.

### **B. Project Based Organization**

A project specifically focuses on one task or outcome. It is vast becoming an important approach to organize work in many firms either in small scale or large scale. It could be for internal development of any organization or for a client or customer. To utilize these business opportunities, many companies make arrangement for projects to work according to client or customer needs. After deployment of project, the client or customer perform acceptance testing gave feedback and the team works according to it requirement. Historically, every team in project management, have team leader or project manager who can decide to work on project with his team members. The team leader or project manager is responsible for the overall qualitative outcome of the project. He ensures that team expertise members of projects have access of right functionality. The project manager's responsibilities are to choose team members, assign tasks to them, and monitor the performances. The team members further divided into groups executes all the plans and do all the work. Project will need to handle in different ways; it can be traditional, IT project, hardware or software. There are different phases of any project such as communication, planning, execution, monitoring &

controlling and closure. Project manager or team manager should be involved in all phases as shown in fig.1

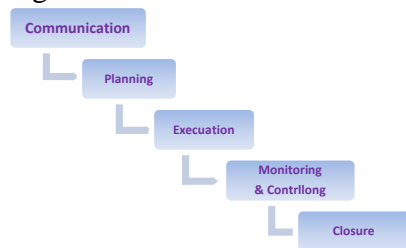


Figure 1: Phases of software development

Project manager use various ways to do planning and execution of projects and review should be taken time to time as project finalized on time, within budget and wider scope. This process of planning, monitoring and executing the progress of project is called project management. As IoT technology is rapidly growing, project manager must deeply understand this development. Initially, project management methodologies used different models in developing advanced projects such as Waterfall and Agile models. And now, we have IoT projects, where it provide real time data and help project manager to take better decisions, utilize resources, and improve project quality and it helps to automate project tasks.

## II. REVIEW OF LITERATURE

Different opinions from several authors help to provide the important concepts of Internet of Things, current trends in this project based organization and both the managerial as well as the technical challenges being faced in such projects.

For successful deployment of IoT-based products and services, the top five technologies that are essential such as radio frequency identification (RFID), wireless sensor networks (WSN), Internet of Things (IoT) and middleware, cloud computing and IoT application software. This study is highlighted by Vlad HurTOI (2020) in IOT project management

A literature review by M. Bakker(2017) focuses on five phases of an IoT project and analyses technical and managerial challenges occurs in these five phases. Also this study carries out some options to justify the investment in such projects. Additionally, this article introduces a conceptual model of IoT applications where challenges in implementing IoT in project management, especially in terms of information sharing and collaboration, monitoring and control, and business analytics aspects are highlighted.

Somayya Madakam,(2015) mentioned an introduction of Internet of Things, IoT architectures, different technologies and their socio-economic impacts, this study highlighted the requirements for implementation of IoT projects and their components This can help an enterprise in understanding the concept, search for the right tools and coming up with a solid business case, and a project management plan. This paper gives an idea about the technical and management areas, which need to be worked on from both organization and IoT projects.This review provides more insight into the IoT world and how stakeholders are receiving this technology interruption.

Internet of Things (IoT) and changing face of project management research by Prasher Vikram (2018) is an excellent article highlighting IoT technology in project based organization. In this article, author identified most important challenges being faced in IoT products development based on a mix of quantitative research, and then also suggests the solution to overcome this problem.

Percudani & Batrawi (2017) discussed that in any project based organization, IoT and project management are two close parameters, they also explained the challenges, obstacles, and advantages of IoT in PMO. The article also considered one of the most important elements of any organization or business, people, fixating on project managers and how the role of a project manager is affected in the innovative project oriented organizations.

The Internet of Things (IoT) provides many benefits for organizations but like other technology adoption, it may also introduce risks and opportunities. P. Brous, M. Janssen, and P. Herder (2020) analyze implementation in project management and insights into IoT advantages and disadvantages.

Also they highlighted necessary changes to the organization processes and system to overcome unexpected risks and ensures that IoT fits the organization puposes.

Jyotsna Gabhane, Shradha Thakare, and Monika Craig (2017) presented various problems and challenges in IoT as well as IoT-based smart home systems. They highlighted some solutions to overcome those problems and challenges.

According to Cisco survey, about 75% of IoT projects are this issue having a negative impact on several industries which are falling less confident in investing money in IoT business as is seen as a risky business.

Seamless connectivity is a key requirement of any IoT system. Means it requires anytime, anywhere by anyone and anything to provide intelligent services including identifying, sensing, networking, processing and execution capabilities. This concept is brought by Čolaković, A., & Hadžialić, M. (2018) in the article.

M. Elkhatab, A. A. Hosani, I. A. Hosani, and K. Albuflasa (2020), discusses improving Project Risk Management in agile projects in different sectors and analyzes if a hybrid approach adopted can deliver better results in project risk management in an agile environment. And it was concluded that agile projects will have a positive impact on project success.

### **III. RESEARCH METHODOLOGY**

The present study falls under research method which can be divided into two categories of qualitative and quantitative research. Qualitative research depends on studying and observing event before concluding it. Researchers can use several qualitative research methodologies include case study research, grounded theory, etc. whereas quantitative research methodologies collect and analyze the numerical data, which includes surveys, interviews, experiments, and observations.

In this research, quantitative research methodology is used. Structured interviews on questionnaires were used to collect qualitative data implementing the use of IoT in project management. This research paper focuses on establishing the impact of IoT in project management and this is determined by collecting the data from interviews. The participants selected for an interview based on various factors in terms of at least 4-5 years of experience and professional background in project management. In this structured interview, interviewers have a predetermined set of questions, and it allows a more in-depth exploration of the interviewee's thoughts and experiences on IoT implementation in project management.

### **IV. RESULT ANALYSIS**

The interviews were conducted among 25 people; only 70% cooperated throughout the interview and answered all questions. All eighteen participants agreed that any project is divided into five phases. In the project planning phase, 65% of respondents believed that IoT implementation in this phase helped and guided staff throughout the project. Also, manager gave a real time update on the progress of project to stakeholders during planning. In the execution phase, 60% of interviewees agreed that implementation of IoT improved effectiveness, efficiency, and productivity. Almost all respondents agreed that the benefits of IoT can be detected by the overcome at this stage. In the closing phase of the project, all respondents indicated that it is important to collect and store the data in this stage as it will acts as a reference in future.

TABLE 1  
PARTICIPANTS

Number of Participants	of	25
Participants responded	that	18
Participants that do not responded	that do	7

TABLE 2  
DETAILS OF PARTICIPANTS

Sr · N o.	Designation	Professio nal Experien ce	Mode of Intervi ew	Duratio n
1	Project Manager	Above 14	Phone	40 mins
2	CEO	Above 15	Physica l	45 mins
3	CEO	Above 16	Physica l	40 mins
4	Senior lecturer	Above 2	Skype	25 mins
5	Project Manager	Above 18	Phone	15 mins
6	Senior lecturer	Above 19	Zoom	45 mins
7	Senior lecturer	Above 6	Zoom	20 mins
8	Senior lecturer	Above 21	Zoom	30 mins
9	Senior lecturer	Less than 3	Physica l	70 mins
10	Professor	Above 23	Phone	45 mins
11	Professor	Above 9	Ms Team	50 mins
12	CEO	Above 35	Google Meet	60 mins
13	Project Manager	Above 14	Phone	35 mins
14	Project Manager	Above 17	Zoom	40 mins
15	Project Manager	Above 20	Skype and Phone	35 mins
16	Senior lecturer	Above 8	Physica l	55 mins
17	Senior lecturer	Above 12	Phone	20 mins
18	CEO	Above 29	Google Meet	30 mins

## V. BENIFITS OF IOT IN PROJECT MANAGEMENT

With an advanced technology, IoT will fundamentally change the speed of project implementation. Previously, an old data is stored in a traditional way which takes a lot of time to store. But by using Internet of Things, this data is stored in a centralized location and can be easily available and is useful for current and future projects. The Internet of Things helps project managers and stakeholders to monitor and manage project activities in real time. This monitoring is done through display showing all the steps which will be useful to manage project quickly. There is much equipment that uses different sensors to monitor the needs for maintenance throughout the project implementation

process that will help to reduce the risk to project. IoT ensures continuous flow of data which automates business system and execute the project with IoT. Project manager can prepare smart devices which will assist him to prepare the reports quickly that help to communicate the data fast.

## VI. CHALLENGES OF IOT IN PROJECT MANAGEMENT

The adoption and implementation of new technology is always difficult. However it is reasonable to consider the impact of IoT technology in corporate world is transforming change in which a company makes significant changes or innovation is a faster. But these new updates will influence all the activities such as products, policies and practices. In IoT based project management organization, standardization is

also a key problem which represents the first technical issue related with IoT implementation. Since IoT is a series of interconnected devices and networks, any software or hardware (devices) failure will leads to failure opportunities and inconveniences. Since many IoT devices are mostly focused on connectivity not on the security. So they are easily hacked by attackers. Therefore, accessibility, secrecy, authenticity and authorization are major requirements of IoT based project management. The implementation of IoT requires a high technology and services from any organizations point of view, mostly a huge storage place to store the data and uninterrupted flow of data. The cost of implementing such storage systems is high and ability to handle such quantity of data should be organized on a cloud.

## VII. FUTURE RECOMMENDATION

The following are some research recommendations to implement IoT in effective project management:

- To introduce and implement IoT in project management, the regulatory authority plays an important role. To establish regulation and framework in project management, all project team members and stakeholders must follow the regulatory authority. Accordingly, the regulatory authority should facilitate to protect the big data of project by setting security policies for collected data during the different project stages through the Internet of Things, and to protect it from unauthorized access. So, it is recommended that the regulatory authority to prepare the guidelines for security and privacy of data or information for the project and show positive impact of an IoT on project management in terms of reduced cost, resources to monitor and execute the project.
- It is essential to have a clear understanding of the goals and objectives of the project before implementation starts. As per project requirement, research and select the most appropriate IoT technology.
- Considering the data security and privacy manage the data collected by IoT devices carefully.

## VIII. CONCLUSION

The result of research methodology showed that IoT impacts project management in project-based organizations in every project stage. Since IoT implementation have a positive impact on project management by increasing project quality and reducing risks. This study also presented an overview of the challenges that the project manager and stakeholder may be facing in implementation of IoT in projects. Hence we emphasis the e-future recommendation to implement IoT in effective project management.

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**MADHYA BHARTI**  
(UGC CARE Group-1, Multi disciplinary)

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This is to certify that the article entitled

**EFFECTIVE PROJECT MANAGEMENT WITH AN IOT**

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University Grants Commission

Published in

Madhya Bharti - Humanities and Social Sciences  
(मध्य भारती) मानविकी एवं समाज विज्ञान की द्विभाषी शोध-पत्रिका

: ISSN **0974-0066** with IF=6.28

Vol. 85, No. 20, January - June : 2024

UGC Care Approved, Group I, Peer Reviewed, Bilingual, Biannual,  
Multi-disciplinary Referred Journal



**Chief Editor**  
प्रो. अश्विकादत्त शर्मा