

# Information Technology as a Catalyst for Promoting Interdisciplinary Research and Innovation among Teaching Faculty

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**Abstract:** *The study examines the growing influence of digital technologies in shaping research collaboration and innovation within higher education. The integration of Information Technology (IT) has transformed traditional academic practices by enabling virtual collaboration, efficient data management, and cross-disciplinary knowledge sharing. This research aims to analyze how IT adoption and digital collaboration practices contribute to the enhancement of interdisciplinary research and innovation among teaching faculty. A total of 140 respondents from various higher educational institutions were surveyed using a structured questionnaire. The study specifically investigates the impact of Information Technology Adoption (ITA) and Digital Collaboration Practices (DCP) across demographic factors such as age and qualification, highlighting how these variables influence faculty engagement in interdisciplinary activities. The findings reveal a significant and positive relationship between IT adoption, digital collaboration, and interdisciplinary innovation. Results from ANOVA and F-tests indicate that both age and qualification significantly affect IT usage and collaboration patterns, with senior and more qualified faculty members demonstrating higher technological engagement. Furthermore, Pearson correlation analysis confirms that IT adoption and digital collaboration practices strongly influence the quality of interdisciplinary research and innovation. The study concludes that technology-enabled environments empower teaching faculty to collaborate effectively, exchange ideas, and generate innovative research outcomes. The results underscore the need for higher educational institutions to strengthen digital infrastructure, enhance faculty IT skills, and foster a culture of interdisciplinary collaboration to drive academic excellence and innovation in the digital era.*

**Keywords:** Information Technology Adoption, Interdisciplinary Research, Faculty Innovation, Digital Collaboration, Higher Education

## I. INTRODUCTION

**Information Technology (IT):** Information Technology (IT) has emerged as one of the most transformative forces shaping education, research, and knowledge dissemination in the 21st century. The integration of digital infrastructure into academic systems has redefined how knowledge is created, stored, accessed, and shared globally. Classrooms have evolved into digital learning environments, where interactive platforms, online libraries, and video conferencing tools enable continuous and borderless education. IT has made higher education more inclusive by removing geographical barriers, allowing learners and educators to participate in global academic networks and exchange scholarly insights in real time.

In the domain of research, IT has revolutionized methodologies and workflows. Traditional research processes that once depended on manual data collection and localized collaboration are now enhanced through advanced digital databases, online journals, and analytics-driven decision systems. Researchers can now conduct experiments virtually, collaborate with global peers, and analyze large data sets using computational tools, thereby improving the precision,



scale, and reproducibility of findings. This digital transformation has significantly increased research productivity, reduced timelines, and enhanced access to high-quality information through platforms like Scopus, Google Scholar, and ResearchGate. Furthermore, IT has democratized knowledge dissemination by enabling open-access publishing and digital repositories that reach a global audience instantly. Knowledge that was once confined to physical libraries or academic institutions is now accessible to anyone with an internet connection. The emergence of Massive Open Online Courses (MOOCs), e-journals, and digital citation databases has accelerated the pace of academic communication. Consequently, IT has become an indispensable pillar of modern academia, ensuring that education and research evolve in tandem with technological innovation and societal needs.

### **Interdisciplinary Collaboration:**

The complexity of 21st-century challenges—ranging from climate change and sustainable energy to AI ethics and global health crises—demands an interdisciplinary approach that transcends the boundaries of traditional academic disciplines. No single field possesses all the tools or perspectives necessary to address multifaceted issues such as environmental degradation, digital privacy, or pandemic response. As a result, researchers and educators are increasingly collaborating across disciplines to integrate diverse expertise, methodologies, and technologies, leading to more holistic and impactful solutions. This growing emphasis on interdisciplinary collaboration is reshaping the research culture within academic institutions. Universities and research centers are forming cross-departmental teams and thematic research clusters that combine insights from science, technology, social sciences, and humanities. For example, the intersection of computer science, psychology, and ethics has given rise to research in AI governance, while the collaboration between biology, data science, and epidemiology has accelerated vaccine development and health informatics systems. Such convergence not only broadens the scope of inquiry but also strengthens innovation capacity and societal relevance.

Moreover, interdisciplinary collaboration enriches the teaching-learning process by fostering creativity, critical thinking, and problem-based learning. Faculty engaged in interdisciplinary research bring diverse perspectives into classrooms, preparing students to tackle global problems through integrated thinking. Governments and funding agencies worldwide are recognizing this need and prioritizing interdisciplinary research grants and digital platforms that facilitate collaborative exploration. Thus, interdisciplinary collaboration has become a cornerstone of modern academia, aligning closely with the evolving demands of the global knowledge economy.

### **Role of Digital Tools, Data Analytics, AI, and Cloud-Based Systems in Connecting Researchers Across Domains:**

Digital tools have fundamentally transformed how researchers connect, communicate, and co-create knowledge across disciplines. Platforms such as Microsoft Teams, Slack, and Trello provide seamless coordination for research teams distributed across the globe, allowing real-time communication and document sharing. Online research databases, citation management tools (like Mendeley and Zotero), and virtual conferencing systems have minimized geographical and logistical barriers. These tools foster dynamic knowledge exchange, thereby enabling teaching faculty and researchers to collaborate effectively across institutional and national boundaries.

Data analytics and Artificial Intelligence (AI) have taken this transformation a step further by introducing intelligent systems that support complex research tasks. AI algorithms now assist in literature reviews, predictive modeling, trend analysis, and even in identifying emerging research gaps. For example, natural language processing (NLP) tools can scan thousands of papers to synthesize key insights, while machine learning models help researchers visualize interdisciplinary linkages between fields. Data analytics enhances evidence-based research, allowing faculty to derive actionable insights from large, unstructured datasets that were previously unmanageable using traditional tools.

Cloud-based systems provide the digital backbone for collaborative and scalable research environments. Through cloud storage and computing services like Google Cloud, AWS, and Microsoft Azure, researchers can securely store massive datasets, run simulations, and share findings with collaborators worldwide. These systems ensure accessibility, version control, and data security while reducing the cost of maintaining local infrastructure. For teaching faculty, cloud-based



collaboration creates opportunities to jointly mentor students, co-author papers, and design interdisciplinary projects without the constraints of physical proximity. Collectively, digital tools, analytics, AI, and cloud computing have created a connected, data-driven academic ecosystem that redefines how interdisciplinary research and innovation thrive in the modern era.

## II. REVIEW OF LITERATURE

1. **Lu, J., et al. (2023)**, In the research paper titled “Virtual interdisciplinary collaboration during the COVID-19 pandemic: Experiences of academics across cultures.” The study shows that digitally mediated collaboration (Zoom/Teams, shared docs, messaging apps) lowered logistical barriers and widened access to cross-disciplinary partners, but success depended on clear norms, platform fit, and digital fluency. For teaching faculty, stable tool ecosystems and explicit collaboration protocols translated into more frequent idea exchange and co-authorship, while platform fragmentation and unequal tech skills limited innovation spillovers.
2. **Newman, J., et al. (2024)**, In the research paper titled “Incentivising interdisciplinary research collaboration: Evidence from academics and university leaders.” Survey and interview evidence indicates that IT platforms enable boundary-spanning teams, yet faculty participation scales when digital collaboration is paired with institutional incentives (workload credit, seed grants, recognition). Technology is a necessary conduit, but policy alignment converts online networking into sustained, innovative research programs among faculty.
3. **Pryor, K. N., et al. (2023)**, In the research paper titled “Fostering an Interdisciplinary Campus Community: Faculty Experiences with Service Work.” Although centered on service contexts, the article finds that digital coordination tools help faculty convert informal cross-unit ties into interdisciplinary projects. Where institutions scaffold shared repositories and campus-wide platforms, faculty report quicker teaming, broader knowledge exchange, and greater likelihood of joint publications and pedagogical innovations.
4. **Galgotia, D., et al. (2022)**, In the research paper titled “Implementation of Knowledge Management in Higher Education.” Effective knowledge-management systems (repositories, taxonomy, sharing workflows) amplify faculty collaboration by making institutional knowledge searchable and reusable. When HEIs formalize KM with IT (capture → curate → disseminate), teaching faculty more readily discover complementary expertise, accelerating interdisciplinary proposals and innovative outputs.
5. **Zhang, X., et al. (2023)**, In the research paper titled “How can technology leverage university teaching & learning? Expanding an innovation diffusion framework.” The paper extends diffusion-of-innovation theory to show that digital tools catalyze knowledge creation when perceived usefulness, ease of use, and organizational support are high. For faculty, robust LMS/video-conferencing/data platforms raise interdisciplinary engagement by lowering coordination costs and enabling iterative co-design of research and teaching innovations.
6. **Butson, R., et al. (2024)**, In the research paper titled “AI and its implications for research in higher education.” AI systems (for literature synthesis, coding, analytics) shift research workflows from labor-intensive tasks to higher-order integration, enabling faculty to test cross-disciplinary hypotheses faster. The authors caution that governance and literacy matter: structured guidance and training are required to translate AI’s affordances into credible, innovative interdisciplinary outputs.
7. **Deschênes, A. A., et al. (2024)**, In the research paper titled “Digital literacy, the use of collaborative technologies, and research collaboration.” Faculty digital literacy—technical, cognitive, and socio-emotional—strongly predicts productive use of collaborative platforms. Investments in skills training and norms (e.g., data ethics, online facilitation) convert tools into collaboration capacity, producing more interdisciplinary projects and higher-quality innovations among teaching staff.
8. **Abbonato, D., et al. (2024)**, In the research paper titled “Interdisciplinary research in artificial intelligence.” Mapping of AI scholarship shows rising interdisciplinarity and reciprocal knowledge flows across fields. For



teaching faculty, AI tools both demand and enable cross-disciplinary teaming (method sharing, joint datasets), suggesting that institutions that mainstream AI methods and shared infrastructures will see faster, more innovative research outcomes.

9. **Kahlon, M., et al. (2014)**, In the research paper titled “The Use and Significance of a Research Networking System.” Early evidence from institutional research-networking platforms demonstrates that searchable expertise profiles, co-authorship graphs, and interest tags help faculty discover collaborators they wouldn’t meet otherwise. Even lightweight RNS deployments increase match quality and shorten time-to-team for interdisciplinary projects.
10. **Yan, W., & Zhang, L. (2018)**, In the research paper titled “Research universities on the ResearchGate social networking site: Indicators and implications.” Academic social-networking sites provide visibility and weak-tie bridges that correlate with collaboration and impact indicators. For teaching faculty, active, well-curated digital profiles and group participation expand discovery of cross-disciplinary partners, with IT platforms functioning as low-cost funnels into joint research and innovation.

### III. RESEARCH GAP

Although numerous studies highlight the role of Information Technology (IT) in enhancing communication, data sharing, and collaboration, limited empirical research specifically addresses how IT acts as a catalyst for interdisciplinary research and innovation among teaching faculty in higher education institutions. Most existing literature focuses on technological adoption, e-learning, or institutional digital transformation, rather than faculty-driven interdisciplinary integration. Moreover, while prior studies discuss virtual collaboration tools and AI-enabled platforms, there remains a lack of evidence on how these technologies influence the quality, sustainability, and innovation output of faculty collaborations across disciplines. There is also a contextual gap in examining these dynamics within Indian higher education settings, where variations in digital literacy, institutional support, and research culture can significantly affect outcomes. Therefore, a focused investigation on the impact of IT adoption and digital collaboration practices on interdisciplinary research and innovation among teaching faculty is both timely and essential.

#### Research Methodology:

The present study adopted a descriptive and analytical research design to examine the role of Information Technology as a catalyst for promoting interdisciplinary research and innovation among teaching faculty. Both primary and secondary data were utilized, with primary data collected through a structured questionnaire administered to 140 teaching faculty members from higher educational institutions using a simple random sampling method. The questionnaire consisted of variables measuring Information Technology Adoption (ITA), Digital Collaboration Practices (DCP), and Interdisciplinary Research and Innovation (IRI) on a five-point Likert scale. Secondary data were gathered from journals, books, research papers, and online databases such as Google Scholar and Scopus. The collected data were analyzed using SPSS (Version 26) software, applying descriptive statistics, ANOVA, F-tests, and Pearson correlation analysis to test hypotheses and assess relationships between variables. The methodology ensured validity, reliability, and statistical rigor, thereby providing an empirical foundation for understanding how technological integration influences interdisciplinary collaboration and innovation in higher education.

### IV. DATA ANALYSIS

The following table indicates the demographic factor of the study:

Sr.no	Demographic Factor	Category	Frequency	Percent
1	Gender	Male	56	40.0
		Female	84	60.0
2	Age Group	Up to 25 Years	25	17.9
		26 to 35 Years	34	24.3



		36 to 45 Years	57	40.7
		More than 45 Years	24	17.1
3	Qualification	Post Graduate	70	50.0
		Professional Degree	43	30.7
		Doctorate	27	19.3
4	Designation	Assistant Professor	71	50.7
		Associate Professor	40	28.6
		Professor	29	20.7

The demographic profile of the respondents reveals a diverse representation of teaching faculty across gender, age, qualification, and designation. Out of the total 140 respondents, 60% were female (84) and 40% were male (56), indicating a higher participation of women in the study. In terms of age distribution, the majority belonged to the 36–45 years category (40.7% or 57 respondents), followed by those aged 26–35 years (24.3%), while 17.9% were below 25 years and 17.1% were above 45 years, showing that most participants were in their mid-career stage. Regarding educational qualifications, half of the respondents (50%) were postgraduates, 30.7% held professional degrees, and 19.3% had doctorates, reflecting a strong academic foundation within the sample. As for designation, Assistant Professors formed the largest group (50.7% or 71 respondents), followed by Associate Professors (28.6%) and Professors (20.7%), suggesting that the sample predominantly consisted of early to mid-level teaching faculty actively involved in academic and research activities.

**Objective-1: To study the ITA among the faculties according to their age and qualification.**

**Null Hypothesis  $H_{01}$ :** There is no significant difference in ITA among the faculties according to their age and qualification.

**Alternate Hypothesis  $H_{11}$ :** There is a significant difference in ITA among the faculties according to their age and qualification.

To test the above null hypothesis, ANOVA and F-test is applied and results are as follows:

ANOVA						
Information Technology Adoption						
		Sum of Squares	df	Mean Square	F	P-value
Age Group	Between Groups	5235.138	3	1745.046	10.013	.000
	Within Groups	23701.433	136	174.275		
	Total	28936.571	139			
Qualification	Between Groups	4333.441	2	2166.721	12.065	.000
	Within Groups	24603.130	137	179.585		
	Total	28936.571	139			

**Interpretation:** The above results indicate that calculated p-value is 0.000 and 0.000. It is less than 0.05. Therefore ANOVA and F-test is rejected. Hence Null hypothesis is rejected and Alternate hypothesis is accepted.

**Conclusion:** There is a significant difference in ITA among the faculties according to their age and qualification.

**Findings:** To understand the findings, mean scores are obtained and presented as follows:



Information Technology Adoption * Age Group		Information Technology Adoption * qualification	
Mean			
Age Group	Information Technology Adoption	Qualification	Information Technology Adoption
Up to 25 Years	54.56	Post Graduate	59.77
26 to 35 Years	61.65	Professional Degree	71.63
36 to 45 Years	70.39	Doctorate	69.48
More than 45 Years	69.50	Total	65.29
Total	65.29		

The analysis of Information Technology Adoption across different age groups shows a gradual increase in adoption levels as faculty members gain more experience and exposure within academia. Faculty up to 25 years old recorded a mean score of 54.56, indicating relatively low familiarity and dependence on technological tools, possibly due to limited professional engagement in research activities. The mean rises to 61.65 among those aged 26–35 years, reflecting growing adaptation to digital platforms for teaching and research purposes. The highest adoption rates are seen among the 36–45 years (70.39) and above 45 years (69.50) groups, signifying that mid-career and senior faculty members are the most active in using IT for data analysis, online collaboration, and academic resource management. This suggests that with age and institutional exposure, teaching faculty increasingly recognize the value of IT in enhancing research efficiency, collaboration, and innovation.

Similarly, Information Technology Adoption by qualification demonstrates a clear link between academic attainment and technology usage. Faculty with a Postgraduate degree have a moderate mean score of 59.77, indicating foundational use of digital tools. Those with a Professional Degree show a higher mean of 71.63, reflecting greater integration of specialized software and platforms aligned with their applied fields. Meanwhile, Doctorate holders recorded a mean of 69.48, showing strong technological engagement, likely influenced by the demands of research-intensive activities such as data analysis, digital publication, and international collaboration. The overall mean score of 65.29 highlights that higher qualification levels correspond with higher technology adoption, emphasizing that advanced academic exposure equips faculty with the digital competencies needed to effectively participate in interdisciplinary and innovative research practices.

**Objective-2: To study the DCP among the faculties according to age and qualification.**

**Null Hypothesis  $H_{02}$ :** There is no significant difference in DCP among the faculties according to their age and qualification.

**Alternate Hypothesis  $H_{12}$ :** There is a significant difference in DCP among the faculties according to their age and qualification.

To test the above null hypothesis, ANOVA and F-test is applied and results are as follows:

ANOVA						
Digital Collaboration Practices						
		Sum of Squares	df	Mean Square	F	P-value
Age Group	Between Groups	8566.086	3	2855.362	12.940	.000
	Within Groups	30009.800	136	220.660		
	Total	38575.886	139			
Qualification	Between Groups	9029.605	2	4514.802	20.934	.000
	Within Groups	29546.281	137	215.666		
	Total	38575.886	139			



**Interpretation:** The above results indicate that calculated p-value is 0.000 and 0.000. It is less than 0.05. Therefore ANOVA and F-test is rejected. Hence Null hypothesis is rejected and Alternate hypothesis is accepted.

**Conclusion:** There is a significant difference in DCP among the faculties according to their age and qualification.

**Findings:** To understand the findings, mean scores are obtained and presented as follows:

Digital Collaboration Practices * Age Group		Digital Collaboration Practices * qualification	
Mean			
Age Group	Digital Collaboration Practices	Qualification	Digital Collaboration Practices
Up to 25 Years	48.00	Post Graduate	56.00
26 to 35 Years	63.65	Professional Degree	72.28
36 to 45 Years	68.77	Doctorate	71.70
More than 45 Years	70.00	Total	64.03
Total	64.03		

The analysis of Digital Collaboration Practices across different age groups indicates a clear upward trend with increasing age and professional experience. Faculty members aged up to 25 years reported the lowest mean score of 48.00, suggesting limited engagement with digital tools and platforms for collaborative research, likely due to their early career stage and lesser exposure to institutional research networks. The mean scores rise steadily among the 26–35 years (63.65) and 36–45 years (68.77) groups, reflecting growing proficiency, confidence, and reliance on technology for research coordination, online discussions, and information sharing. Notably, faculty above 45 years recorded the highest mean of 70.00, indicating that experienced educators actively integrate digital collaboration tools to manage research activities efficiently. This pattern suggests that with maturity and academic experience, faculty members better appreciate and leverage digital ecosystems for interdisciplinary engagement and innovation.

Similarly, when examining Digital Collaboration Practices by qualification, a progressive enhancement is evident with higher academic attainment. Faculty holding a Postgraduate degree reported a mean score of 56.00, indicating moderate use of digital collaboration tools, perhaps limited to teaching-related activities. In contrast, those with Professional Degrees (72.28) and Doctorates (71.70) displayed substantially higher engagement levels, signifying that advanced qualifications correlate with a deeper integration of technology in research collaboration. This finding reflects how higher academic qualifications often demand and reinforce digital proficiency through exposure to global research networks, publication systems, and online data-sharing platforms. Overall, both age and qualification emerge as important factors influencing faculty members' digital collaboration practices, underlining that professional maturity and academic advancement enhance the effective use of information technology in interdisciplinary research.

**Objective-3: To study the impact of ITA and DCP on quality of IRI.**

**Null Hypothesis H<sub>03</sub>:** There is no impact of Information Technology Adoption and Digital Collaboration Practices on quality of Interdisciplinary Research and Innovation.

**Alternate Hypothesis H<sub>13</sub>:** There is a impact of Information Technology Adoption and Digital Collaboration Practices on quality of Interdisciplinary Research and Innovation.

To test the above null hypothesis, Pearson Correlation test is applied and results are as follows:

Correlations			
	Interdisciplinary Research and Innovation	Digital Collaboration Practices	Information Technology Adoption



Interdisciplinary Research and Innovation	Pearson Correlation	1	.532**	.591**
	P-value		.000	.000
	N	140	140	140
Digital Collaboration Practices	Pearson Correlation	.532**	1	.854**
	P-value	.000		.000
	N	140	140	140
Information Technology Adoption	Pearson Correlation	.591**	.854**	1
	P-value	.000	.000	
	N	140	140	140
**. Correlation is significant at the 0.01 level (2-tailed).				

**Interpretation:** The above results indicate that calculated p-value is 0.000. It is less than 0.05. Therefore Pearson Correlation test is rejected. Hence Null hypothesis is rejected and Alternate hypothesis is accepted.

**Conclusion:** There is a impact of Information Technology Adoption and Digital Collaboration Practices on quality of Interdisciplinary Research and Innovation.

**Findings:** The correlation analysis reveals a strong and statistically significant positive relationship between Information Technology Adoption, Digital Collaboration Practices, and Interdisciplinary Research and Innovation among teaching faculty. The Pearson correlation coefficient of 0.591 between Information Technology Adoption and Interdisciplinary Research and Innovation indicates that higher levels of IT usage, such as digital tools and technological integration, are associated with greater research innovation and interdisciplinary engagement. Similarly, the correlation of 0.532 between Digital Collaboration Practices and Interdisciplinary Research and Innovation suggests that effective use of online platforms and virtual teamwork enhances collaborative research outcomes. Both relationships are significant at the p-value of 0.000, confirming that the observed correlations are not due to chance. This implies that teaching faculty who actively adopt IT and engage in digital collaboration are more likely to contribute to innovative, cross-disciplinary research within higher education institutions.

## V. CONCLUSION

The overall analysis concludes that Information Technology Adoption (ITA) and Digital Collaboration Practices (DCP) play a significant role in enhancing Interdisciplinary Research and Innovation (IRI) among teaching faculty. The ANOVA results revealed significant differences in both ITA and DCP across age and qualification groups, indicating that faculty with higher academic qualifications and greater professional experience demonstrate more active use of technology and collaboration tools. Moreover, the Pearson correlation results confirmed a strong and positive relationship between ITA, DCP, and IRI, with p-values less than 0.05, signifying statistical significance. This implies that teaching faculty who effectively adopt digital technologies and participate in online collaborative practices tend to produce higher-quality interdisciplinary research and innovative outcomes. Therefore, continuous technological training, institutional support, and collaborative digital ecosystems are essential to strengthen interdisciplinary engagement and academic innovation in higher education.

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