Navigating Complexities: Challenges in Managing and Collaborating within Interdisciplinary Research

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Full Article

Abstract

Interdisciplinary research embodies the collaborative essence of the academic community, bringing together individuals with diverse backgrounds and expertise. Nonetheless, the integration of these various disciplines into research projects is a complex endeavour. This study seeks to investigate the difficulties faced by academics when undertaking interdisciplinary research projects and collaborating with colleagues from different fields. Specifically, it seeks to determine whether age plays a significant role in project management, whether teaching experience contributes to project success, and whether gender influences collaboration within research teams. Data was collected from 36 academics across multiple educational institutions. The findings indicate that numerous challenges are linked to managing interdisciplinary research and working with colleagues from diverse backgrounds. Furthermore, the study found no significant differences in age, teaching experience, or gender concerning the difficulties encountered in managing and collaborating on research projects.

***Keywords**: Interdisciplinary Research, Challenges in Interdisciplinary Research, Challenges in project management and collaboration*

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1. Introduction

Interdisciplinary research has become a potent strategy for tackling complicated issues that go beyond the purview of conventional academic specialities. Working together, specialists from many professions bring their distinct viewpoints, approaches, and knowledge to bear on complex problems (McCallin, 2006). Interdisciplinary research is alluring because it has the potential to produce creative ideas (Szostak, 2017) that can significantly improve society, from tackling climate change to advancing healthcare. Interdisciplinary research, by its very nature, stimulates the fusion of ideas and expertise, but it also creates some complex management and collaboration issues.

Interdisciplinary research is at its core an effective collaborative effort (Lingard et al., 2007). To accomplish shared research objectives, researchers from many disciplines must collaborate effectively and integrate their areas of expertise (O'Rourke et al., 2013; Siedlok et al., 2015). However, achieving this equilibrium can be quite difficult. It frequently entails bridging linguistic, procedural, and expectation gaps among team members. Successful interdisciplinary collaboration depends on having open lines of communication, cultivating understanding, and handling different personalities and working methods.

Numerous stages are frequently included in interdisciplinary research initiatives, from conception and planning to execution and results dissemination. Managing the research projects can be difficult (Doherty, 2013; Garwood & Poole, 2018) since they call for coordinating the work of people with different backgrounds, controlling timeframes, obtaining funding from many sources, and making sure the project stays on course despite potential research path divergences. In addition, dealing with the demands and expectations of many stakeholders as well as issues with data integration and ethical issues (Shannon, 1997) may provide difficulties for transdisciplinary initiatives.

For this strategy to continue to develop and be effective, it is critical to recognise and solve the difficulties involved in leading and collaborating in multidisciplinary research. This study explores the intricacies of these challenges, providing insights and strategies for effectively dealing with the common issues in interdisciplinary research projects. It is hoped that by illuminating these nuances, researchers, organisations, and policymakers will be better prepared to utilise the full potential of multidisciplinary research to address some of the most important problems of our day.

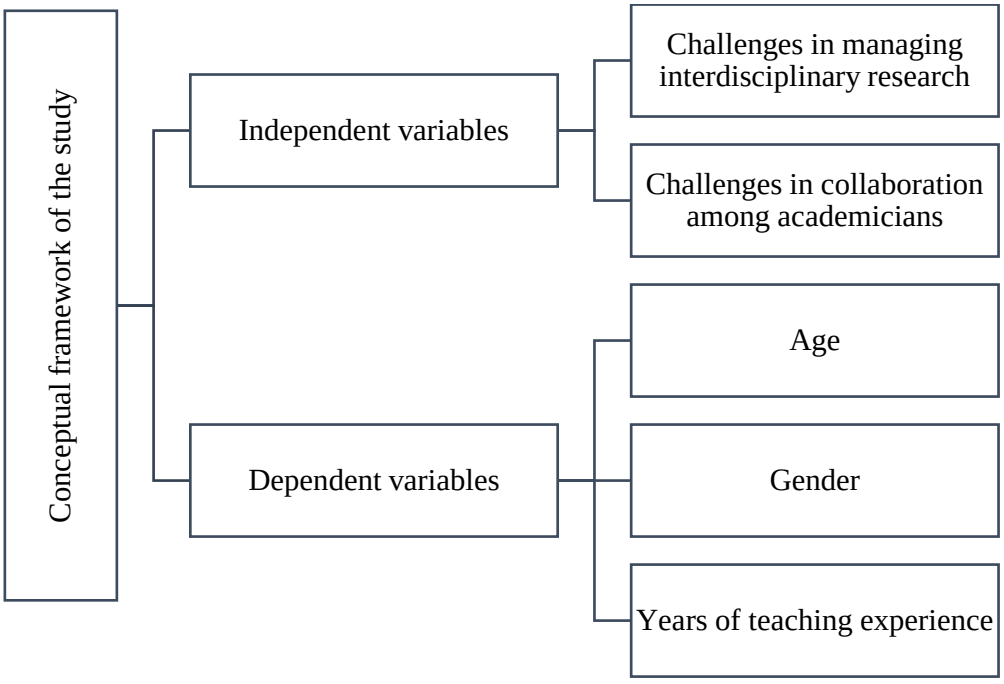
1.1. Research Questions

1. What are the academicians' challenges in managing research projects when conducting interdisciplinary research?
2. What are the academicians' challenges in terms of collaboration when conducting interdisciplinary research?
3. Is there any difference between age and managing research projects when conducting interdisciplinary research?
4. Is there any difference between years of teaching experience and managing research projects when conducting interdisciplinary research among academicians?
5. Does gender play a significant role in the dynamics of collaboration within interdisciplinary research among academics?

1.2. Conceptual Framework

A conceptual framework is essential in conducting research. It explains the ways that the research problems will be solved or explored, the direction that the study is taking and the variables and their relationships involved in a particular study (Grant & Osanloo, 2014). Figure 1 shows the conceptual framework of the study in that it describes the independent and dependent variables. The former includes challenges in managing interdisciplinary research and challenges in collaboration among academicians. On the other hand, the dependent variables are age, gender and years of teaching experience of the research team.

Figure 1: The conceptual framework of the study



2. Literature Review

Interdisciplinary research refers to a method of research that integrates theories, tools, and methods from multiple disciplines to address problems or challenges that cannot be solved using a single discipline approach (Klein, 1990). Such research aims to generate new knowledge, models, and solutions that would not be possible within the constraints of individual disciplines (Repko, 2008).

2.1 Challenges in Interdisciplinary Research

Communication Barriers: Academics from different disciplines have their own terminologies, methodologies, and epistemological beliefs, which may pose challenges in effective communication (Stokols et al., 2008).

Cultural Differences: Disciplines have unique cultures, including values, norms, and ways of thinking. When researchers from varied fields collaborate, these cultural differences can hinder effective collaboration (Nissani, 1997).

Resource Allocation: Distributing resources fairly among team members from various disciplines can be a challenging task, given the diverse requirements of each discipline (Bruce et al., 2004).

2.2 Role of Age in Interdisciplinary Research

Research on age and interdisciplinary collaboration is sparse. However, some studies suggest that early-career researchers may be more open to interdisciplinary approaches due to their recent exposure to varied educational content, whereas established researchers might be more entrenched in their disciplinary traditions (Rhoten, 2004). Yet, age might not necessarily be a limiting factor, as experienced researchers bring a wealth of knowledge and connections that can facilitate interdisciplinary collaborations (Boix Mansilla, 2006).

2.3 Influence of Teaching Experience

Teaching experience might provide academics with a broader perspective, having been exposed to diverse student opinions, backgrounds, and methods of inquiry. Furthermore, instructors with extensive teaching experience may develop better communication and teamwork skills (Jacobs & Frickel, 2009). However, the direct correlation between teaching experience and success in interdisciplinary research remains an underexplored area.

2.4 Gender Dynamics in Research Collaboration

Gender dynamics play a significant role in academic collaborations. Studies suggest that while women are often underrepresented in some disciplines, they tend to engage in more

collaborative and interdisciplinary research than their male counterparts (Fox, 2005). Despite this, gender biases can influence roles, resource allocation, and recognition within interdisciplinary teams (Larivière et al., 2013).

2.5 Recent Interdisciplinary Researches

In a unique exploration of interdisciplinary collaboration, Razzaq and Khan (2023) merged the fields of linguistics and physical therapy, proposing a combined approach to enhance both communication and rehabilitation results. Their study elucidated the profound synergistic potential between these two seemingly disparate disciplines. The researchers argued that understanding linguistic nuances and techniques could significantly improve patient-therapist communication, thereby leading to more effective and tailored physical therapy interventions. This study underscores the infinite possibilities and benefits that can emerge from interdisciplinary research, highlighting the importance of looking beyond traditional disciplinary boundaries.

In a groundbreaking study on the digital marketing landscape, Kapoor and Singh (2023) examine how sustainability-driven advertising influences consumer buying decisions. Their research uncovers a rising trend among consumers, particularly the younger generation, to favor brands that champion environmental responsibility and ethical practices. Kapoor and Singh argue that in an age of information and activism, businesses that harness the power of digital marketing to promote sustainability are poised to outperform their competitors in both reputation and revenue.

Razzaq's (2023) investigation into the intersection of language and religious discourse provides a profound insight into the linguistic intricacies of Islamic sermons. This study meticulously dissects the specific linguistic features and persuasive strategies employed within religious oratory. Razzaq's analysis reveals that sermons utilize a unique blend of rhetorical devices, lexicon, and syntactical structures, aiming to engage, inspire, and persuade their audience towards religious teachings and values. By understanding these linguistic mechanisms, one can gain a deeper appreciation for the art and impact of religious communication, emphasizing the significance of language in conveying and resonating spiritual messages.

In an interdisciplinary exploration of urban planning's impact on mental health, Ali and Ahmad (2023) highlight the critical role of green spaces and efficient infrastructure in promoting mental well-being. The study emphasizes that urban areas with accessible parks, reduced noise pollution, and efficient public transportation correlate with lower rates of anxiety and depression among their inhabitants. Ali and Ahmad's findings advocate for an

urgent reconsideration of urban development strategies, underlining the need for planners and policymakers to prioritize mental well-being in their design blueprints.

The undertaking of interdisciplinary research projects is a multifaceted endeavor that encompasses various stages ranging from the project's inception and strategic planning to its implementation and the eventual dissemination of findings. These stages present challenges in management due to the intricate nature of interdisciplinary collaborations. Doherty (2013) and Garwood & Poole (2018) emphasize the complexities involved, such as aligning the efforts of team members from diverse academic and experiential backgrounds, adhering to strict timelines, securing financing from multiple avenues, and ensuring the research remains on track in the face of potential deviations in the research trajectory. Navigating these intricacies necessitates not only expertise in the subject matter but also exceptional project management and adaptive capabilities.

In a critical examination of the intersections between contemporary Western thought and the lived experiences of Pakistani women, Razzaq, S. (2023) delves into the challenges and responses that arise from this interplay. The study sheds light on the potential cultural, social, and philosophical clashes, as well as areas of convergence, between Western paradigms and the traditional values held by many Pakistani women. Razzaq underscores the importance of acknowledging the nuances and complexities of these interactions, particularly in an era of increasing globalization and cross-cultural exchange. The paper serves as a testament to the resilience and adaptability of Pakistani women, as they navigate the multifaceted challenges and opportunities presented by contemporary global thought.

Interdisciplinary research is vital for addressing complex real-world problems, but it comes with its own set of challenges. While factors like age, teaching experience, and gender might influence the dynamics of interdisciplinary collaborations, it is crucial to approach these studies with an understanding of the broader sociocultural contexts of academia.

3. Methodology

The data collection of the current study follows a descriptive research approach. This research method involved the gathering of quantitative data through a survey, with subsequent analysis of the data obtained from Likert scale items. As Atmowardoyo (2018) notes, descriptive research encompasses various research methods, including surveys, correlations, qualitative studies, and content analysis. Table 1 presents the demographic information about the participants involved in the study. As for the research instruments, the study employs a set

of questionnaires designed to investigate the perspectives of academics engaged in interdisciplinary research. The questionnaire ecompasses two key constructs: challenges related to project management and challenges associated with collaboration. The researchers utilised the SPSS software to analyse the responses collected through these questionnaires. In the current study, the Cronbach alpha coefficient yielded a value of .92. Fraenkel et al. (2012) suggest that a reliability coefficient of .70 or higher signifies that the research instrument can be considered reliable for use in a study. Regarding validity, content-related evidence was employed, involving expert judgment to validate the questionnaire. A colleague's author was appointed to assess and evaluate the questionnaire items to ensure their suitability for the intended samples.

Table 1: Demographic profile of participants

Variables	Frequency	Per cent	Cumulative Percent
Gender			
Male	19	52.8	52.8
Female	17	47.2	100.0
Total	36	100.0	
Age			
20-39	19	52.8	52.8
40-59	16	44.4	44.4
60 and above	1	2.8	2.8
Total	36	100.0	100.0
Education Level			
PhD	17	47.2	47.2
Master's Degree	18	50.0	50.0
Bachelor's Degree	1	2.8	2.8
Total	36	100.0	100.0
Years of teaching experience			
1-10 years	9	25.0	25.0
11-21 years	21	58.3	83.3
22-32 years	5	13.9	97.2
Other	1	2.8	100.0
Total	36	100.0	
Expert areas			
English Linguistics	15	41.7	41.7
Technology in Education	3	8.3	50.0
Language & Technology	1	22.2	72.2
Ethics in Science and Technology	1	2.8	75.0
Artificial Intelligence	1	2.8	77.8
Nanotechnology	1	2.8	80.6
Machine learning	1	2.8	83.3
Cybersecurity	1	2.8	86.1

Education	3	8.3	94.4
Breast diseases	1	2.8	97.2
Do not state	1	2.8	100.0
Total	36	100.0	

4. Results and discussions

4.1. Challenges in research project management for interdisciplinary academic research

Table 2 shows the analysis of challenges in terms of managing the interdisciplinary project among academicians. Overall, they experienced a high degree to moderate degree of challenges when they worked with colleagues that are from different backgrounds. Item 8 (M=3.72, SD=1.26) relating to figuring out members' respective tasks obtains the highest mean scores. The second challenge concerns guiding members toward a shared goal while the third challenge is in Item 4 (M=3.92, SD=.94). Academicians argue that it is difficult for them to draft a proposal that combines respective members' approaches. The remaining items with a high degree of challenge relate to the length in obtaining approvals for interdisciplinary project management (Item 2, M=3.83, SD=1.08) and Item 8 (M=3.72, SD=1.26). Meanwhile, Item 7 which concerns clarifying the project objectives that are in line with researcher members' various disciplines indicates moderate challenge (M=3.56, SD=1.25). Another moderate challenge (M=3.50, SD=1.06) is in Item 3 which concerns researchers' difficulties in conducting cross-departmental. Other moderate challenges are in Item 5 (M=3.42, SD=1.05), Item 6 (M=3.42, SD=1.16), Item 7 (M=3.5, SD=1.25) and Item 10 (M=3.47, SD=1.13).

Table 2: Descriptive analysis of challenges in project management among academicians

Nos	Items	Mean	Std. Deviation
1.	There is a need for task identification for researchers to ensure the smoothness of the research project	4.30	1.14
2.	Obtaining approvals for interdisciplinary research requires additional time	3.83	1.08
3.	It is difficult to conduct cross-departmental researcher meetings	3.50	1.06
4.	Drafting proposals that incorporate interdisciplinary approaches presents a challenge	3.92	.94
5.	Investment in research materials is an obstacle when doing an interdisciplinary research project	3.42	1.05
6.	It is troublesome to adjust work schedules to complete assigned tasks	3.42	1.16

7.	Clarifying project objectives that align with the goals of multiple disciplines can be challenging	3.56	1.25
8.	Managing and integrating data from diverse sources is challenging	3.72	1.26
9.	Guiding an interdisciplinary team toward a shared goal is demanding	4.03	.88
10.	Incorporating interdisciplinary projects can be problematic	3.47	1.13

Prior studies have noted the importance of project management in conducting interdisciplinary research. There are a few important findings from the analysis. First, there is a need to conduct a need analysis to figure out members' respective tasks that are identified as the highest mean score mentioned earlier (Item 1). Brown et al. (2023) state the need to do need analysis to ensure members' tasks are fulfilled as members can set priorities when involved in interdisciplinary projects. Second, it is worth noting that team effectiveness is associated with the need analysis to overcome the challenges in managing interdisciplinary research projects. It requires the team leader to identify the appropriate tasks to be assigned to the right members (Brown et al., 2023, p. 2). Third, need analysis can be identified by performing a cross-sectional questionnaire to research members (Teunissen et al., 2023). Their instrument enables researchers to answer multiple-choice and open-ended questions to identify their strengths and contributions to the project.

4.2. Challenges in interdisciplinary research collaboration among academicians

Collaboration is another challenge that is faced among researchers attempting to conduct interdisciplinary research. More than half of the items show a high degree mean whereas the remaining have a moderate degree mean. The biggest challenge to collaborate relates to aligning terminologies, concepts and other fundamental issues when doing cross-disciplinary research. Such indicates the results' scores in Item 7 (M=4.06, SD=.86). The second challenge (Item 5) to collaborate relies on identifying spaces to work on a project (M=3.97, SD=.91). The third challenge concerns the difficulty in calling visiting scholars to collaborate in interdisciplinary research (Item 1, M=3.78, SD=1.12). The remaining high degree means are in Item 2 (M=3.75, SD=1.16) and Item (M=83.72, SD=1.03). On the other hand, there are four (items) that show a moderate degree of mean scores. These are Item 3 (M=3.64, SD=.93) and Item 4 (M=3.31, SD=1.12). Whereas Items 7 (M=3.53, SD=1.23) and Item 10 (M=3.53, SD=.99) show the same moderate degree mean. Table 3 shows the descriptive analysis of challenges to collaboration among academicians.

Table 3: Descriptive analysis of challenges to collaboration among academicians

Nos	Items	Mean	Std. Deviation
1.	Visiting scholars/ professors are required to implement interdisciplinary projects	3.78	1.12
2.	Reflecting on learning is crucial in interdisciplinary collaboration	3.75	1.16
3.	Conducting external workshops is required in conducting interdisciplinary research	3.64	.93
4.	Faculty-led in-house workshops are enough to grasp interdisciplinary research	3.31	1.12
5.	Collaborative spaces are required to work on my research project(s) with other team members	3.97	.91
6.	During collaboration to do interdisciplinary research, difficulties may arise in aligning terminology, concepts, and methodologies	4.06	.86
7.	Trust and understanding among team members from diverse backgrounds is difficult	3.53	1.23
8.	Cross-disciplinary communication often demands a significant amount of time	3.72	1.03
9.	Differences in terminology and communication styles between disciplines can hinder effective communication	3.78	.93
10.	Facilitating the transfer of knowledge among team members is challenging	3.53	.99

The analysis revealed that the primary hurdle faced by interdisciplinary researchers when embarking on collaborations is the necessity to establish alignment in terminology, concepts, and methodologies as a prerequisite for commencing any research initiatives (Item 6). However, Stokols et al. (2008) contend that the foremost aspect demanding attention is the contextual dimension. According to their perspective, understanding personal values, goals, expectations, the physical environment, and the bureaucratic framework is paramount in achieving successful interdisciplinary projects while facilitating the alignment of terminology, concepts, and methodologies. Another finding that stands out from the results reported earlier is about time (Item 8). A comparison of the findings with that of Teunissen et al. (2023) confirms that the research members may need to have the capacity to provide more work time for the project and also they may need to invest more time to communicate among them.

4.3. Age disparities in interdisciplinary research project management among academicians

Age is an important variable to determine whether there is a significant difference in managing multidisciplinary research projects. A one-way between-groups analysis of variance was conducted to explore age's impact in conducting interdisciplinary research project management among scholars from various academic backgrounds. They were divided into

three groups according to their age (Group 1: 20 to 39 years; Group 2: 40 to 59 years; Group 3: 60 and above). Results show that there was no statistically significant difference at the $p < .05$ level in age scores for the three age groups: $F(1, 33) = 2.09$, $p = .14$. Tables 4 and 5 show the findings of the analysis.

Table 4: Descriptive statistics concerning age in managing interdisciplinary research projects

Age	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
20-39	19	3.62	.71	.16	3.28	3.97	2.20	4.70
40-59	16	3.90	.73	.18	3.51	4.30	2.30	5.00
60 above	1	2.50	.	.	.	.	2.50	2.50
Total	36	3.72	.74	.12	3.47	3.97	2.20	5.00

Table 5: ANOVA concerning age in managing the interdisciplinary research projects

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.17	2	1.09	2.09	.14
Within Groups	17.16	33	.52		
Total	19.33	35			

Age is seen to have a substantial impact on doing multidisciplinary research because the variable reflects a researcher's maturity. Surprisingly, no differences were found in age scores with that of managing interdisciplinary research projects. The variation in the results could be attributed to the way ages were categorized in the participants' demographic information. It appears that the age intervals used in the questionnaire were relatively wide, with 19-year gaps in each of the categories. It is hypothesized that as researchers gain seniority, they may have the opportunity to mentor junior members to enhance their capabilities. However, it is crucial to emphasize that effective communication is essential for the successful management of interdisciplinary research (Teunissen et al., 2023). This holds true irrespective of whether the project is overseen by a senior or junior project manager. To foster capacity development, a leader must integrate intercultural, interpersonal, and interdisciplinary competencies into the various activities of diverse teams (Teunissen et al., 2023, p.11).

4.4. Difference between years of teaching experience and managing research projects when conducting interdisciplinary research among academicians

The effective management of interdisciplinary research projects hinges upon the wealth of pedagogical experiences possessed by academicians. In light of this, a unidirectional between-groups analysis of variance (ANOVA) was executed to investigate the relationship between the duration of teaching experiences and the execution of interdisciplinary research project management among academicians representing diverse domains of expertise. These academicians were categorized into four distinct groups based on their tenure in academia (Group 1: 1 to 10 years; Group 2: 11 to 21 years; Group 3: 22 to 32 years; and Group 4: Other).

The results of this analysis indicate that, at a significance level of $p < .05$, there is no statistically significant disparity observed in the scores denoting years of teaching experiences among the four groups of academicians, as evidenced by the following statistics: $F (3, 32) = 2.15$, $p = .11$. The detailed findings from this analysis are presented in Tables 6 and 7.

Table 6: Descriptive analysis of years of teaching and conducting interdisciplinary research

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1-10 years	9	3.58	.75	.25	3.00	4.16	2.20	4.40
11 - 21 years	21	3.70	.76	.16	3.36	4.04	2.30	5.00
22- 32 years	5	4.28	.18	.08	4.06	4.50	4.00	4.50
Other	1	2.50	.	.	.	.	2.50	2.50
Total	36	3.72	.74	.12	3.47	3.97	2.20	5.00

Table 7: Anova concerning years of teaching experience in relation to conducting interdisciplinary research

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.25	3	1.08	2.15	.11
Within Groups	16.08	32	.50		
Total	19.33	35			

Regarding the current finding, it was discovered that there is no connection between the number of years of teaching experience and project management skills. This outcome could have several interpretations. First, it is possible that the participants have not had enough exposure to research. The reason for this is that few academics conduct research while they are teaching. Their involvement in research may also be hampered by their several teaching responsibilities. Participants may not have been able to focus on study activities because they were primarily focused on teaching, curriculum creation, or classroom management. Finally, individuals show their ability, enthusiasm, and interest in other activities that are compatible with their skill set.

4.5. Gender and the dynamics of collaboration within interdisciplinary research among academics

Gender and collaborative dynamics in interdisciplinary research among academics are measured using an independent-sample t-test. Specifically, it was used to compare the collaboration scores for male and female academicians. Results show that there was no statistically significant difference in scores for males (M = 3.68, SD =.83) and females (M = 3.88, SD = .42; t (27.38) = -.93, p = . 36, two-tailed).

Table 8: Descriptive analysis of gender and collaboration in conducting interdisciplinary research

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Mean Collaboration	Male	19	3.68	.83	.19
	Female	17	3.88	.42	.10

Table 9: Anova of gender and collaboration in conducting interdisciplinary research

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Mean Collaboration	Equal variances assumed	6.82	.01	-.90	34	.37	-.20	.22	-.66	.25
	Equal variances not assumed			-.93	27.38	.36	-.20	.22x	-.65	.24

According to the inquiry conducted to address this last research question, there is insufficient data to support the claim that academics' collaboration on multidisciplinary research was impacted by gender. According to Merchant (2012), communication patterns demonstrate that men and women communicate in different ways, with women frequently being more collaborative and males being more competitive. The way that interdisciplinary research teams communicate, make decisions, and handle disagreements may be impacted by these variances. Additionally, the disparity can be explained by preconceived notions about the roles and aptitudes of men and women (Wood & Ridgeway, 2010). It consequently results in unequal opportunities, acknowledgement, or duties among interdisciplinary research teams.

5. Conclusion

In conclusion, interdisciplinary research activities are frequently necessary to address the world's most important problems, whether they are related to science, technology, health,

or societal well-being. These projects are not without their complex difficulties, even though they show considerable promise for innovation and breakthroughs. Resource management, communication, and expectation setting must be done carefully for collaboration across a variety of sectors. It takes skill to maintain equilibrium across the various disciplines' varied approaches. To fully utilise the advantages of multidisciplinary research, it is essential to acknowledge and overcome these difficulties. Interdisciplinary research can continue to be an effective tool as we look for new approaches to challenging issues. By recognising and addressing the challenges it poses, we can make sure that it continues to spur significant progress and revolutionary change in the coming years.

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