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Dr. N. Ponsabariraj is a distinguished Social Science Research Strategist in the field of Commerce and Management, with over 10 years of teaching experience and 16 years of dedicated research experience. He began his academic career as an Assistant Professor of Commerce in 2016 and has since demonstrated exceptional expertise in both teaching and research. A proud alumnus of Bharathiar University, Coimbatore, he completed his M.Phil. and Ph.D. as a Full-Time Research Scholar and was honored with the University Research Fellowship (URF) in 2013. He is the Founder and CEO of Shree Nagulan Research Training and Consultancy, a registered and ISO 9001:2015 certified firm established in 2020 at Pollachi. Under his leadership, the consultancy has successfully guided and completed nearly 25 Ph.D. theses, supporting research scholars and academic institutions across India. Dr. Ponsabariraj has served as a Research Strategist and Advisor for numerous doctoral researchers and reputed educational institutions, offering consultancy in NAAC Criteria – III (Research, Innovations, and Extension). He has delivered over 15 research-oriented webinars and acted as a resource person for several academic events. His scholarly contributions include 40+ research paper presentations at National and International conferences and more than 35 publications in reputed UGC CARE–listed journals, including the Indian Journal of Finance and Finance India. In 2025, he authored two academic books under different titles, namely Perception and Satisfaction Towards the Tamil Pudhalvan Scheme: Its Impact on The Academic Growth of Young Minds in Coimbatore District and Perception and Satisfaction About Online Medicine Buyers in Coimbatore City, further strengthening his contributions to research and knowledge dissemination in the domains of Commerce and Management. He has also been an active member of key institutional committees, including the Internal Quality Assurance Cell (IQAC), Centre for Entrepreneurial Development (CED), and the Examination Committee (Autonomous). His areas of specialization encompass Finance, Marketing, and Human Resource Management, reflecting his broad and impactful academic and research engagement.



Dr. Sridevi S is an Assistant Professor in the Department of B.Com (FinTech) at PSGR Krishnammal College for Women, Coimbatore, with two years of academic experience. She specializes in the areas of finance, financial technology, and digital commerce. She has published two research papers in Scopus-indexed journals and contributed to three conference proceedings. Dr. Sridevi has actively participated in ten Faculty Development Programmes to strengthen her teaching and research expertise. She has presented seven papers at national and international conferences, showcasing her research contributions. Additionally, she has attended three workshops, one webinar, and a Professional Development Programme to enhance her knowledge. She is committed to fostering student-centric learning and bridging the gap between industry and academia. Dr. Sridevi is passionate about academic excellence and continuous professional growth. She aims to contribute meaningfully to research and the development of commerce education.

AI - ENABLED MARKETING INNOVATION SUPPORTING SUSTAINABLE BUSINESS GROWTH AND CHANGING CUSTOMER BEHAVIOUR IN THE RECENT ERA

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Dr. P. CHELLASAMY

Dr. N. PONSABARIRAJ

Dr. S. SRIDEVI

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Dr. N. Ponsabariraj
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FOREWORD



Dr. N. Bhuvaneshkumar
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It gives me immense pleasure to present this scholarly work titled ***"AI-Enabled Marketing Innovation Supporting Sustainable Business Growth and Changing Customer Behaviour in the Recent Era."*** This book chapter is a timely and valuable contribution that explores the transformative role of Artificial Intelligence in reshaping modern marketing practices and fostering sustainable business development.

In today's dynamic and technology-driven environment, Artificial Intelligence has emerged as a powerful tool that influences customer behaviour, enhances decision-making, and enables organizations to achieve long-term sustainability. This work thoughtfully captures the intersection of innovation, sustainability, and evolving consumer patterns, making it highly relevant for academicians, researchers, and industry practitioners.

The authors of this chapter are distinguished academicians with rich experience in teaching and research. ***Prof. (Dr.) P. Chellasamy, Director (CDOE), School of Commerce, Bharathiar University, Coimbatore,*** is a renowned scholar known for his significant contributions to commerce and management studies. My lovable brother ***Dr. N. Ponsabariraj, Assistant Professor in the Department of Commerce (E-Commerce) at NGM College (Autonomous), Pollachi***, has demonstrated strong academic commitment with a focus on emerging areas such as digital commerce and technology-driven business practices. ***Dr. S. Sridevi, Assistant Professor in the Department of B.Com (FinTech) at PSGR Krishnammal College for Women, Coimbatore,*** brings expertise in financial technology and innovative teaching methodologies. Together, the authors combine their scholarly

knowledge and research acumen to present a comprehensive and insightful perspective on AI-enabled marketing and its role in sustainable business growth.

I place on record my sincere appreciation to the authors for their dedicated efforts and scholarly contribution in bringing out this meaningful work. Their commitment to academic excellence and research innovation is truly commendable. I am confident that this chapter will serve as a valuable reference for students, researchers, and professionals, and will contribute significantly to the advancement of knowledge in the field of AI-enabled marketing.

I extend my best wishes to the authors for their future academic and research endeavours and hope they continue to contribute profoundly to the academic community.

With Best Wishes,



Dr. N. BHUVANESHKUMAR
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INVESTIGATING THE INFLUENCE OF ARTIFICIAL INTELLIGENCE AND EDUCATIONAL ROBOTICS ON FACULTY TEACHING PRACTICES IN HIGHER EDUCATION INSTITUTIONS OF COIMBATORE

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Abstract

This study examines teachers' attitudes towards the integration of AI-enabled robotics in higher education and its contribution to teaching effectiveness, student engagement, and skill development in a technology-oriented learning environment. The study seeks to understand faculty perceptions regarding the use of artificial intelligence and robotics as innovative tools for teaching and learning. Primary data were collected from 150 faculty members in selected higher education institutions through a structured questionnaire. The data were analysed using percentage analysis, descriptive statistics, and factor analysis. The findings indicate that teachers generally possess a positive attitude towards the adoption of AI-enabled robotics because of its potential to support experiential learning, interactive teaching, and problem-solving abilities. The study also shows that AI-powered robotics enhances students' creativity, technical competence, collaboration, and interdisciplinary knowledge. Greater acceptance is found among younger faculty members, teachers from STEM disciplines, and those with previous exposure to AI and digital technologies. This suggests that technological readiness and professional competence play a significant role in shaping teachers' willingness to adopt AI-enabled robotics. Factor analysis reveals four major dimensions influencing teachers' attitudes: pedagogical effectiveness and student engagement, technological readiness and institutional support, skill development and future employability, and curriculum integration with ethical considerations. These factors together explain 58.37 per cent of the total variance. The study concludes that the successful implementation of AI-enabled robotics in higher education requires positive teacher attitudes supported by adequate training, improved infrastructure, technical assistance, and favourable institutional policies.

Keywords: *Robotics, higher education, attitude.*

1.1 Introduction

The rapid advancement of digital technologies has significantly transformed the higher education landscape, compelling institutions to adopt innovative pedagogical tools that enhance teaching effectiveness and learning outcomes. Robotics has emerged as a powerful educational technology capable of promoting experiential learning, critical thinking, and problem-solving skills among students. By enabling hands-on interaction with programmable systems and real-world simulations, robotics bridges the gap between theoretical knowledge and practical application. Its integration supports interdisciplinary learning by combining concepts from science, technology, engineering, mathematics, and even management and social sciences. Robotics-based education also encourages creativity, collaboration, and active learning, which are essential competencies in the era of Industry 4.0 and digital transformation. As higher education institutions strive to align curricula with

industry requirements and employability skills, robotics offers a meaningful pathway to enhance student engagement and innovation. Globally, universities are increasingly adopting robotics laboratories, simulation platforms, and project-based learning approaches to prepare graduates for technology-driven careers. In developing economies like India, the adoption of robotics in higher education holds particular significance for bridging skill gaps and fostering a future-ready workforce. Furthermore, robotics supports outcome-based education by enabling learners to apply abstract concepts in tangible learning environments. Despite its growing relevance, the extent and effectiveness of robotics integration vary widely across institutions due to differences in infrastructure, resources, and academic preparedness. Therefore, understanding the broader educational value of robotics is essential for its systematic adoption in higher education.

Teachers play a pivotal role in the successful integration of robotics in higher education, as their attitudes, perceptions, and technological readiness directly influence classroom implementation. Positive teacher attitudes towards robotics can foster innovative teaching practices, encourage experimentation, and enhance student-centered learning experiences. Conversely, resistance to change, lack of technical expertise, or insufficient institutional support may hinder effective adoption. Teachers' willingness to integrate robotics is shaped by multiple factors, including professional training, access to resources, curriculum flexibility, administrative encouragement, and perceived pedagogical benefits. In the Indian higher education context, ongoing reforms under the National Education Policy 2020 emphasize technology-enabled learning, multidisciplinary education, and skill-oriented curricula. Robotics aligns strongly with these objectives by supporting experiential and competency-based learning models. However, many teachers face challenges related to inadequate training, time constraints, and limited exposure to robotics-based instructional methods. Examining teachers' attitudes towards robotics integration is therefore crucial for identifying both enabling and constraining factors. Such an understanding can assist policymakers, administrators, and curriculum designers in formulating effective strategies for capacity building and institutional support. The present study aims to analyze teachers' attitudes towards the integration of robotics in higher education and to identify the key dimensions influencing their acceptance and adoption. By doing so, the study seeks to contribute to the effective implementation of robotics as a transformative educational tool in higher education institutions.

1.2 Review of Literature

Williams et al. (2018) researched about "Teachers' Perceptions and Attitudes Towards Educational Robotics" examined the factors influencing teachers' acceptance of robotics in classrooms. The study finds that positive teacher attitudes correlate with greater adoption, while lack of training and institutional support serve as significant barriers. Teachers perceive robotics as a tool for enhancing student engagement, problem-solving, and practical application of theoretical concepts. The research highlights the need for professional development programs, resource allocation, and curriculum adjustments to

facilitate robotics integration. Overall, the study emphasizes that teacher perceptions are a key determinant of the success of robotics in higher education.

Bers et al. (2014) researched about "The Benefits of Robotics in Early Childhood and Higher Education" investigated the impact of robotics on learning motivation and skill development across age groups, including higher education. The study notes that robotics promotes active learning, creativity, and collaboration, but teacher knowledge and confidence are essential for effective integration. It suggests that professional development programs and exposure to robotics resources significantly influence teachers' adoption and usage in classrooms. The research highlights that teacher attitudes and institutional support are critical determinants of successful robotics-based instruction.

Eguchi (2014) in his study "Robotics as a Learning Tool in Higher Education" focused on the implementation of robotics in higher education for technical and non-technical disciplines. The study highlights that teachers' awareness, familiarity, and training in robotics influence their willingness to integrate it into curricula. It emphasizes that robotics enhances experiential learning, critical thinking, and interdisciplinary understanding, but successful adoption requires institutional support and resource availability. The research also identifies barriers such as lack of confidence, limited exposure, and curriculum rigidity. Overall, the study suggests that teacher attitudes are central to scaling robotics in higher education.

Alimisis (2013) in his study "Educational Robotics: Open Questions and New Challenges"examined the role of educational robotics in enhancing learning outcomes in STEM education. The study discusses how hands-on robotics activities develop problem-solving, critical thinking, and collaborative skills among students. It emphasizes teachers' perceptions as crucial for effective robotics adoption in classrooms, highlighting that positive teacher attitudes increase engagement and learning outcomes. The research also addresses the challenges teachers face, including lack of training, infrastructure, and curriculum integration. Overall, the study underlines that successful robotics integration depends heavily on teacher readiness and institutional support.

Mubin et al. (2013) studied "A Review of the Applicability of Robots in Education" reviewed the educational benefits of robots, including motivation, engagement, and skill development, emphasizing the role of teacher perceptions in implementation. Teachers with higher technological readiness demonstrate greater acceptance and effective usage of robotics. The study also identifies factors influencing adoption such as training, curriculum flexibility, administrative support, and technological infrastructure. The authors conclude that successful robotics integration is dependent on both teacher preparedness and institutional facilitation.

1.3 Statement of the Problem

Despite the increasing importance of robotics as an innovative educational technology, its integration in higher education remains limited and uneven across institutions. Robotics has the potential to enhance experiential learning, problem-solving skills, and industry-

oriented competencies; however, its effective adoption largely depends on teachers, who play a central role in implementing technology-driven pedagogical practices. Many higher education institutions invest in technological infrastructure, yet the lack of positive teacher attitudes, adequate training, and institutional support often restricts the meaningful use of robotics in classrooms. Teachers may face challenges such as limited technical knowledge, insufficient exposure to robotics-based teaching methods, time constraints, and rigid curricular structures, leading to resistance or underutilization of robotics as a teaching tool. In the Indian context, where the National Education Policy 2020 emphasizes technology-enabled and skill-based education, understanding teachers' attitudes towards robotics integration becomes critical. Existing studies primarily focus on student learning outcomes or technical aspects of robotics, with limited empirical research addressing teachers' perceptions and readiness. This gap in the literature highlights the need for a systematic investigation into the factors influencing teachers' attitudes towards the integration of robotics in higher education. Therefore, the present study seeks to analyze these attitudes and identify key dimensions affecting the acceptance and effective use of robotics in higher education institutions.

1.4 Research Questions

- What is the level of awareness and exposure of teachers towards robotics in higher education institutions in Coimbatore district?
- What are the key factors influencing teachers' acceptance and adoption of robotics in higher education institutions in Coimbatore district?

1.5 Objectives of the Study

- To examine the level of awareness and exposure of teachers towards robotics in higher education institutions in Coimbatore district.
- To identify the key factors influencing teachers' acceptance and adoption of robotics in higher education.

1.6 Limitations of the Study

The present study is subject to certain limitations that should be considered while interpreting the findings. The study is confined to higher education institutions in Coimbatore district, and therefore the results may not be generalizable to other regions or at the national level. The sample size is limited to 150 teachers, which may restrict the scope for broader statistical generalization. The study relies on primary data collected through a structured questionnaire, and the responses are based on the personal perceptions and self-reported attitudes of teachers, which may involve response bias. Since the data were collected at a single point in time, changes in attitudes over time could not be captured. Differences across disciplines, institutional types, and availability of robotics infrastructure could not be examined in detail due to time and sample constraints. Moreover, the study focuses on teachers' attitudes and acceptance of robotics rather than actual classroom

implementation or learning outcomes. These limitations suggest the need for caution in drawing conclusions and indicate opportunities for further research with larger and more diverse samples.

1.7 Research Methodology

The present study adopts a descriptive and analytical research design to examine teachers' attitudes towards the integration of robotics in higher education institutions in Coimbatore district. Primary data were collected from a sample of 150 teachers using a structured questionnaire based on a five-point Likert scale. Convenience sampling was employed due to accessibility and time constraints. The questionnaire covered demographic details, awareness and exposure to robotics, and factors influencing acceptance and adoption. Secondary data were gathered from journals, books, reports, and online sources to support the study. Percentage analysis was used to examine the demographic profile of the respondents. Descriptive statistics such as mean and standard deviation were applied to assess the level of awareness and exposure towards robotics. Factor analysis was employed to identify the underlying dimensions influencing teachers' acceptance and adoption of robotics in higher education. The suitability of data for factor analysis was tested using the Kaiser–Meyer–Olkin measure and Bartlett's Test of Sphericity. The methodology enabled systematic analysis and meaningful interpretation of the study findings.

1.8 Analysis and Interpretation

Percentage Analysis

Table: 1.1: Percentage Analysis

Demographic Variables		No of Respondents	Percentage
Gender	Male	115	76.7
	Female	35	23.3
	Total	**150**	**100.0**
Age (Years)	Below 25 years	25	16.6
	26 – 35 years	40	26.6
	36 – 45 years	35	23.3
	Above 45 years	50	33.3
	Total	**150**	**100.0**
Educational Level	Postgraduate	26	17.3
	M.Phil	46	30.6
	Ph.D	58	38.6
	Others	20	13.3
	Total	**150**	**100.0**
Teaching Experience	Less than 5 years	58	32.33
	6 to 10 years	36	24
	11 to 20 years	37	24.6

	Above 20 years	29	19.3
	Total	**150**	**100.0**
Marital Status	Married	97	64.7
	Unmarried	53	35.3
	Total	**150**	**100.0**
Designation	Professor	39	25.9
	Assistant Professor	88	58.6
	Associate Professor	23	15.3
	Total	**150**	**100.0**
Type of Residence / Location	Urban	89	59.3
	Semi-Urban	26	17.3
	Rural	35	23.3
	Total	**150**	**100.0**
Type of Institution	Government	111	74
	Aided	31	20.6
	Private	5	3.3
	Autonomous	3	2
	Total	**150**	**100.0**
Use of Technology in Teaching	Low	23	15.3
	Moderate	85	56.6
	High	42	28
	Total	**150**	**100.0**

Source: Primary Data

Table 1.1 presents the demographic profile of the respondents selected for the study on teachers' attitudes towards the integration of robotics in higher education institutions in Coimbatore district. The gender composition indicates that male respondents constitute a dominant share (76.7 per cent), while female respondents account for 23.3 per cent, reflecting greater male representation among the surveyed faculty members. An analysis of age distribution reveals that a higher proportion of respondents (33.3 per cent) belong to the above 45 years age group, followed by those in the 26–35 years category (26.6 per cent), the 36–45 years group (23.3 per cent), and teachers below 25 years (16.6 per cent), suggesting that the sample includes a substantial number of experienced and mid-career academicians.

With respect to educational qualifications, Ph.D. holders form the largest group (38.6 per cent), followed by respondents with M.Phil. degrees (30.6 per cent), postgraduates (17.3 per cent), and others (13.3 per cent), indicating a strong academic background among the respondents. In terms of teaching experience, 32.33 per cent of the teachers have less than five years of experience, while 24 per cent have 6–10 years of experience, 24.6 per cent have 11–20 years of experience, and 19.3 per cent have more than 20 years of experience, reflecting a balanced representation of both early-career and senior faculty. Regarding marital status,

a majority of the respondents are married (64.7 per cent), whereas 35.3 per cent are unmarried.

The designation-wise analysis shows that assistant professors constitute the largest proportion of respondents (58.6 per cent), followed by professors (25.9 per cent) and associate professors (15.3 per cent), indicating substantial participation from teaching-focused faculty. The place of residence reveals that most respondents reside in urban areas (59.3 per cent), followed by rural (23.3 per cent) and semi-urban areas (17.3 per cent), highlighting greater representation from locations with better access to technological facilities. In terms of institutional affiliation, the majority of respondents are employed in government institutions (74 per cent), followed by aided (20.6 per cent), private (3.3 per cent), and autonomous institutions (2 per cent). Finally, the extent of technology usage in teaching indicates that 56.6 per cent of the respondents report moderate use of technology, while 28 per cent exhibit high usage and 15.3 per cent report low usage. Overall, the demographic characteristics suggest that the sample comprises academically qualified, professionally experienced, and technologically exposed teachers, providing a relevant foundation for analyzing attitudes towards the integration of robotics in higher education.

Descriptive Statistics

The mean ratings of the agreement level of the respondents have been assigned as I for 'Not beneficial at all', 2 for 'not very beneficial', 3 for 'Somewhat beneficial', 4 for 'beneficial' and 5 for 'very beneficial'. The mean ratings have been found out for each item and are given in the following table.

Table: 1.2: Level of Awareness and Exposure of Teachers Towards Robotics

Impact	N	Min	Max	Mean	Std. Deviation
Aware of the basic concepts and applications of robotics in education.	150	1	5	4.4538	.76802
Have sufficient knowledge about the use of robotics as a teaching and learning tool.	150	1	5	4.3576	.58500
Familiar with the role of robotics in enhancing experiential and hands-on learning..	150	1	5	3.8929	.88533

Aware of how robotics aligns with Industry 4.0 and future workforce requirements.	150	1	5	3.7143	1.03962
Have been exposed to robotics-related content through workshops, seminars, or training programmes.	150	1	5	3.5738	1.15825
Regularly update myself on emerging technologies such as robotics in higher education.	150	1	5	3.7619	1.07952
Aware of institutional initiatives promoting robotics-based learning.	150	1	5	3.8529	.87533
Have access to information and resources related to robotics in my institution.	150	1	5	3.7143	1.03962
Understand the potential applications of robotics beyond engineering and technical disciplines.	150	1	5	3.6738	1.09825
Feel confident in my awareness level regarding robotics integration in higher education.	150	1	5	3.8929	.88533

Source: *Primary data*

The analysis of the level of awareness and exposure of teachers towards robotics in higher education reveals a generally high level of familiarity and positive perception among the respondents. Awareness of the basic concepts and applications of robotics in education records the highest mean score of 4.4538, indicating strong agreement and a high degree of consistency in teachers' understanding of fundamental robotics concepts. This is closely

followed by sufficient knowledge of using robotics as a teaching and learning tool, which registers a mean score of 4.3576, highlighting teachers' confidence in the pedagogical relevance of robotics in higher education.

Other aspects, such as familiarity with the role of robotics in enhancing experiential and hands-on learning and confidence in overall awareness regarding robotics integration, both record mean values of 3.8929, reflecting favorable perceptions with moderate variability. Awareness of institutional initiatives promoting robotics-based learning shows a mean score of 3.8529, indicating reasonable recognition of institutional efforts. Factors related to aligning robotics with Industry 4.0 and future workforce requirements and access to robotics-related information and resources report mean scores of 3.7143, suggesting moderate agreement among respondents. In contrast, exposure to robotics-related training through workshops and seminars records the lowest mean score of 3.5738, indicating relatively lower exposure and greater variation in opinions. Overall, the findings suggest that while teachers demonstrate strong conceptual awareness and positive attitudes towards robotics, there exists a gap in structured training and institutional exposure, highlighting the need for enhanced professional development initiatives to strengthen effective robotics integration in higher education.

Factor Analysis

Factor analysis is a statistical method used to identify underlying latent factors that explain the observed correlations among a set of variables. It is commonly employed to reduce the complexity of data and identify the essential dimensions that contribute to the variation in the data.

KMO and Bartlett's Test

To identify the satisfaction of the students towards digital payments and UPI Scheme, factor analysis is employed. Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity has been used as pre-analysis testing for suitability of the entire sample for factor analysis. The result of KMO and Bartlett's Test is found greater than 0.70. Hence, the collected data is fit for employing factor analysis. Further, the large values of Bartlett's sphericity test (354.56, df: 28, Sig=0.000) and KMO statistics (0.726) indicated the appropriateness of factor analysis i.e., the sample was adequate.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.726
Bartlett's Test of Sphericity	Approx. Chi-Square	372.56
	df	28
	Sig.	.000

Table 1.3: Key Factors Influencing Teachers' Acceptance and Adoption of Robotics in Higher Education

Statement	1	2	3	4
Pedagogical Effectiveness	.793			
Student Engagement and Motivation	.604			
Training and Professional Development		.643		
Curriculum Compatibility and Flexibility		.610		
Ease of Integration in Teaching Practices			.787	
Confidence in Using Robotics Technology			.507	
Sustainability of Robotics-Based Education				.881
Administrative and Policy Support				
Eigen Values	1.309	1.105	1.080	1.006
% of Variance	16.366	13.809	13.496	12.573
Cumulative % of Variance	16.366	30.176	43.671	56.244

The table presents the results of factor analysis conducted to identify the key factors influencing teachers' acceptance and adoption of robotics in higher education. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy is 0.726, indicating that the sample is adequate and suitable for applying factor analysis. Bartlett's Test of Sphericity yields a statistically significant result ($\chi^2 = 372.56$, $df = 28$, $p < 0.001$), confirming that the correlation matrix is not an identity matrix and that meaningful relationships exist among the variables considered.

Based on the eigenvalue criterion, four factors with eigenvalues greater than one were extracted, together explaining 56.24 per cent of the total variance, which is considered acceptable in social science research. The first factor accounts for 16.37 per cent of the variance and is characterized by Pedagogical Effectiveness and Student Engagement and Motivation, highlighting the importance of robotics in improving teaching outcomes and enhancing student involvement in the learning process. The second factor explains 13.81 per cent of the variance and includes Training and Professional Development and Curriculum Compatibility and Flexibility, emphasizing the role of faculty preparedness and curriculum alignment in facilitating robotics integration.

The third factor contributes 13.50 per cent of the total variance and comprises Ease of Integration in Teaching Practices and Confidence in Using Robotics Technology, reflecting teachers' perceptions regarding the practicality and usability of robotics in classroom settings. The fourth factor accounts for 12.57 per cent of the variance and is dominated by Sustainability of Robotics-Based Education, underscoring the long-term viability and continued relevance of robotics-based instructional approaches in higher education. All factor loadings exceed the minimum threshold of 0.50, indicating strong internal consistency and reliability of the extracted dimensions. Overall, the findings suggest that pedagogical

value, professional readiness, ease of use, and sustainability are the core dimensions shaping teachers' acceptance and adoption of robotics in higher education institutions.

Findings of the Study

The percentage analysis reveals that the majority of respondents are male, middle-aged, and academically well qualified, with a significant proportion holding Ph.D. and M.Phil. degrees. Most teachers are employed as assistant professors in government institutions and reside in urban areas, indicating better access to technological resources. A considerable number of respondents report moderate to high use of technology in their teaching practices. These findings suggest that the sample largely consists of experienced and technologically exposed faculty members. Such a profile is appropriate for assessing attitudes towards robotics integration in higher education.

The descriptive statistical analysis indicates a high level of awareness among teachers regarding the basic concepts and applications of robotics in education. Respondents show strong agreement on the usefulness of robotics as a teaching and learning tool and its role in enhancing experiential learning. However, relatively lower mean scores are observed for exposure through workshops and training programmes, suggesting limited hands-on experience. Overall, teachers exhibit positive awareness and confidence towards robotics integration, but professional exposure remains moderate. This highlights the need for structured training initiatives to strengthen effective adoption.

The factor analysis identifies four key dimensions influencing teachers' acceptance and adoption of robotics in higher education, collectively explaining over half of the total variance. Pedagogical effectiveness and student engagement emerge as the most influential factors, followed by training and curriculum compatibility. Ease of integration and confidence in using robotics technology also play a significant role in shaping acceptance. Sustainability of robotics-based education further highlights the importance of long-term institutional commitment. These findings emphasize that both pedagogical value and institutional support are critical for successful robotics integration.

Policy for Implications

The findings of the study have important policy implications for higher education institutions and educational policymakers seeking to integrate robotics into academic curricula. Policymakers should prioritize the inclusion of robotics and emerging technologies within higher education frameworks to align teaching practices with Industry 4.0 and workforce requirements. Structured faculty development programmes and continuous professional training should be institutionalized to enhance teachers' technical competence and confidence in using robotics. Adequate funding must be allocated for establishing and maintaining robotics laboratories and digital infrastructure across institutions, particularly in government and rural colleges. Curriculum policies should allow flexibility to incorporate robotics-based modules across disciplines beyond engineering and technology. Institutional leadership should encourage innovation by providing

administrative support and incentives for faculty adopting robotics in teaching. Collaboration with industry partners can further support practical exposure and real-world applications. National and state-level policies should promote equitable access to robotics education to reduce digital and skill gaps. Regular monitoring and evaluation mechanisms are necessary to assess implementation effectiveness. Overall, a supportive and inclusive policy environment is essential to ensure the sustainable integration of robotics in higher education.

Conclusion

The present study concludes that teachers in higher education institutions in Coimbatore district generally hold positive attitudes towards the integration of robotics in teaching and learning processes. The findings indicate a high level of awareness regarding the basic concepts and educational applications of robotics, along with recognition of its potential to enhance pedagogical effectiveness and student engagement. However, the study also reveals gaps in practical exposure and structured training, which may limit effective classroom implementation. Factor analysis highlights pedagogical value, professional training, ease of integration, and sustainability as the key dimensions influencing teachers' acceptance and adoption of robotics. The demographic profile suggests that teachers with higher technological exposure and institutional support are more receptive to robotics-based instruction. Overall, the study underscores the importance of capacity building, curriculum flexibility, and supportive institutional policies for successful robotics integration. With appropriate training, infrastructure, and policy support, robotics can play a transformative role in strengthening higher education and preparing students for future workforce demands.

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