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Perceived usefulness of e-learning platforms among the research scholars of faculty of agriculture, Annamalai university, Chidambaram

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Abstract

The present study was conducted to assess the awareness, knowledge, perception, attitude, perceived usefulness, and utilization of e-learning platforms among agricultural research scholars. The study was carried out among 120 research scholars selected from the Tamil Nadu Agricultural University (TNAU), Annamalai University, and the Agricultural College and Research Institute, Madurai, using a proportionate random sampling technique. Data were collected through a structured and pre-tested questionnaire and analysed using frequency, percentage, mean, standard deviation, correlation, and regression analysis. The findings revealed that a majority of the respondents exhibited medium to high levels of awareness and utilization of e-learning platforms. SWAYAM, TNAU Agritech Portal, Shodhganga, Krishikosh, Zoom, and ChatGPT were widely valued for academic and research purposes. Research scholars perceived e-learning positively, particularly in terms of flexibility, accessibility, academic support, reduced study time, easy access to learning resources, and opportunities for continuous learning. However, comparatively lower perceptions were observed regarding time management, motivation, flexibility, clarity of explanations, and practical exposure. Technical difficulties, distractions, inadequate digital infrastructure, and reduced motivation were identified as major constraints. Overall, e-learning platforms were perceived as a useful and supportive complement to conventional education among agricultural research scholars. The study recommends strengthening digital infrastructure and ICT competencies, improving platform usability, and developing interactive, agriculture-specific and research-oriented e-learning resources with collaborative and practical learning features to enhance effective adoption and utilization in agricultural higher education.

Keywords: E-learning, agricultural research scholars, awareness, perceived usefulness, perception, attitude, utilization, digital learning, agricultural higher education, ICT

Introduction

Information and Communication Technology (ICT) has transformed higher education by promoting flexible and technology-enabled learning. Learning Management Systems (LMS) and other e-learning platforms have become essential for knowledge dissemination, collaboration, and academic productivity, particularly among research scholars who require autonomous learning, access to scholarly resources, and virtual collaboration. The COVID-19 pandemic further accelerated the adoption of e-learning across educational institutions (Mlitwa, 2007) [22]. Understanding research scholars' perceived usefulness and attitudes towards e-learning is essential because these factors strongly influence technology adoption and continued use. Perceived usefulness, a key construct of the Technology Acceptance Model (TAM), refers to the extent to which users believe that a technology enhances their academic performance, while positive attitudes promote greater engagement and learning outcomes. Although several studies

have examined e-learning among general student populations, limited attention has been given to research scholars despite their unique academic and research requirements. E-learning encompasses computer-based learning, web-based learning, virtual classrooms, and digital collaboration. Lee and Lee (2006) [18] defined e-learning as the online delivery of education through web-based technologies. Khan (2005) [15] described it as an innovative, learner-centred approach that enables learning anytime and anywhere through digital technologies. Similarly, Guri-Rosenblit (2005) [11], Alonso *et al.* (2005) [4], and Garrison (2011) [10] emphasized the role of electronic media, multimedia technologies, internet-based communication, and synchronous or asynchronous interaction in facilitating knowledge construction. Overall, e-learning complements traditional classroom teaching by promoting student-centred, interactive, and collaborative learning. In India, e-learning has gained considerable momentum in higher education through the expansion of online courses,

virtual classrooms, and digital learning resources. These developments have improved accessibility, flexibility, and self-directed learning while supporting research and academic collaboration. However, challenges such as limited technological infrastructure, poor internet connectivity, and the digital divide continue to hinder effective implementation. Emerging trends, including blended learning, personalized learning, gamification, artificial intelligence, virtual and augmented reality, data analytics, and micro-credentialing, are expected to further reshape higher education. These innovations will enhance learner engagement, improve instructional quality, and support lifelong learning. The future of e-learning in India depends on strengthening technological infrastructure, enhancing faculty competencies, promoting research and innovation, and fostering collaborations among educational institutions, industry, and technology partners. Such initiatives are expected to improve accessibility, scalability, inclusiveness, and industry relevance of higher education.

India ranks among the world's leading countries in higher education, yet a substantial section of the population still lacks access to quality education because of social, economic, and geographical constraints. UNESCO (2005) ^[32] recognized ICT as a promising solution for expanding educational opportunities amid increasing demand and limited teaching resources. Consequently, higher education institutions, including agricultural universities, are increasingly integrating e-learning platforms into teaching and research. However, their successful implementation depends on understanding users' willingness, perceived usefulness, and attitudes. Therefore, the present study investigates the perceived usefulness of e-learning platforms, attitudes of research scholars towards their use, challenges encountered during utilization, and suggestions for improving their effectiveness. Despite the growing importance of e-learning, studies focusing specifically on agricultural research scholars remain limited, highlighting the need for the present investigation. The present study titled as "Perceived usefulness and attitude towards e-learning among the research scholars in Faculty of Agriculture, Annamalai university" has been undertaken to get a meaningful insight into their e-learning behaviour with the following specific objectives.

Objectives of the study

1. To study the characteristics of the research scholars in the Faculty of Agriculture.
2. To assess the perceived usefulness of e-learning platforms by the research scholars.

Research Methodology

Selection of District and Institution

The present study was conducted in Cuddalore district of Tamil Nadu state purposively selected considering Annamalai university is a Traditional, Residential University rendering an effective educational service to the poor people in the most backward district of Tamil Nadu, Availability of research scholars is sufficient for conducting the present study and It's a parental institution for the student researcher and his familiarity with the research scholars. The Faculty of Agriculture started in the year 1958, has contributed significantly during the last five academic years. The unique

feature of this faculty is that it offers B.Sc. (Hons.) Agriculture and B.Sc. (Hons.) Horticulture programmes as undergraduate courses, where in all the nine departments and the sub-divisions join hands and share the credit loads of the programmes as outlined by ICAR. As per the decision of National Agricultural Education Accreditation Board (NAEAB) in its 33rd meeting (2023), seven departments such as Agronomy, Agricultural Economics, Agricultural Extension, Agricultural Microbiology, Entomology, Genetics and Plant breeding and Plant Pathology were approved for accreditation to offer Post graduate and Ph.D. programmes.

Research Design

The design of research is the most important and critical aspect of research methodology. In a broad sense research design is the process of planning and carrying out research. The research design adopted for the present study was ex-post facto, since the phenomenon had already taken place. Keeping this in view, the adaptability of the proposed design with respect to the type of variables under consideration, size of respondents and phenomenon to be studied, the exploratory method was selected as an appropriate research design. The main focus of investigation was to know the perceived usefulness and attitude towards e-learning among research scholars and constraints faced by the research scholars while using the e-learning platforms.

Selection of respondents

The sample of the present study consisted of Post Graduate and Doctoral scholars of Faculty of Agriculture, Annamalai University. The total selected sample size was 120. The Faculty of Agriculture has a total of nine departments. Seven departments were approved by ICAR-NAEAB (2023). Therefore, respondents were selected only from the seven approved departments. The samples were selected by using Proportionate random sampling technique for the study.

Selection of e-learning platforms

The e-learning platforms investigated in the study were selected based on expert consultation and familiarity among research scholars. The selected platforms represented different categories including agricultural education portals (e-Krishi Shiksha, AgriDIKSHA, Agropedia, CeRA, TNAU Agritech Portal and NARES), electronic thesis repositories (Krishikosh, Shodhganga and Krishi Prabha), MOOCs (AgMOOCs, SWAYAM, PGDAEM-MANAGE MOOC and TELAgE-NAARM), artificial intelligence tools (ChatGPT, DeepSeek, Gemini AI, Meta AI and Microsoft Copilot), AI-assisted research tools (Grammarly, QuillBot, Scite, Elicit, Zotero, Turnitin, Gamma and Canva), video conferencing platforms, statistical software packages and MYLOFT online library services.

Selection of Independent variables

By reviewing various relevant literature and discussion with extension scientists, a list of 29 independent variables that could possibly influence the dependent variable was prepared. The list of variables was sent to judges consisting of the extension scientists working in our Faculty of Agriculture and Tamil Nadu Agricultural university (TNAU) to ascertain the degree of relevancy of each of these variables

for the study. The responses of judges were quantified by assigning scores of 3, 2 and 1 for 'Most relevant', 'Relevant' and 'Irrelevant' respectively. The variables with 80.00 per cent relevancy score and above were selected. Totally fourteen variables were selected for this study. They were Age, Gender, Educational qualification, Medium of schooling, Academic performance, Place of residence, Annual family income, electronic device possession, Awareness of e-learning platforms, Accessibility of e-learning platforms, Knowledge about e-learning platforms, User ability of e-learning platforms, use of social networking sites and use of open access platforms. Operationalization and measurement of dependent variables.

Selection of Dependent Variables

The dependent variables of the study were selected based on extensive review of relevant literature, discussions with experts in agricultural extension and e-learning research, and considering the objectives of the study. The major focus of the investigation was to understand the research scholars' evaluation and behavioural responses towards digital learning resources. Accordingly, perceived usefulness of e-learning platforms, perception towards e-learning platforms, attitude towards e-learning platforms were selected as dependent variables. The perceived usefulness of e-learning platforms was considered as the extent to which research scholars believe that the use of digital learning platforms improves their academic performance, learning efficiency and research productivity. The perception towards e-learning

platforms represented the overall beliefs, opinions and experiences of scholars regarding the effectiveness and quality of online learning platforms. The attitude towards e-learning platforms was selected to measure the positive or negative disposition of research scholars towards adopting and using digital learning resources for academic purposes. Thus, these dependent variables collectively represented the cognitive, affective and behavioural aspects of research scholars' engagement with e-learning platforms.

Findings and Discussion

Characteristics of research scholars in the Faculty of Agriculture

This section is dealt with the characteristics of research scholars in the Faculty of Agriculture, Annamalai University. In order to fulfil the above objective, the variables studied were Age, Gender, Educational qualification, Medium of schooling, Academic performance, Place of residence, Family annual income, Electronic device possession, Awareness of e-learning platforms, Accessibility of e-learning platforms, Knowledge about e-learning platforms, User ability of e-learning platforms, Use of social networking sites and Use of open access platforms. The characteristics of research scholars were studied with respect to their socio-personal characteristics, digital device possession, awareness, accessibility, knowledge, user ability, utilization pattern, perceived usefulness, and attitude towards e-learning platforms. The Characteristics of research scholars in the Faculty of Agriculture was presented in Table.1

Table 1: Characteristics of research scholars in the Faculty of Agriculture

Variable No	Variable	Category	Number of respondents	Percent
1	Age	Less than or equal to 25	71	59.17
		26 – 28	44	36.67
		29 and above	5	4.16
2	Gender	Male	51	42.50
		Female	69	57.50
3	Educational status	B.Sc., Agriculture	73	60.83
		M.Sc., Agriculture	47	39.17
4	Medium of schooling	Tamil	37	30.83
		English	83	69.17
		Others	0	0
5	Academic performance	Low (<7)	0	0
		Medium (7-8.3)	25	20.83
		High (>8.3)	95	79.17
6	Place of residence	Rural	34	28.34
		Semi-urban	59	49.16
		Urban	27	22.50
7	Annual family income	Low (67000-2,28,000)	73	60.83
		Medium (2,29,000-3,89,000)	34	28.33
		High (3,90,000-5,50,000)	13	10.84
8	Electronic device possession	Smartphone	120	100.00
		Tablet	34	28.33
		Laptop	99	82.50
		Desktop	18	15.00
9	Awareness of e-learning platforms	Less	29	24.17
		Moderate	26	21.66
		More	65	54.17
10	Accessibility of e-learning platforms	Low	24	20.00
		Medium	68	56.67
		High	28	23.33
11	Knowledge about e-learning platforms	Low	12	10.00
		Medium	68	56.67

		High	40	33.33
12	User ability of e-learning platforms	Low	13	10.83
		Medium	65	54.17
		High	42	35.00
13	Use of social networking sites	Facebook	74	61.67
		X-Twitter	27	22.50
		Whatsapp	112	93.34
		Instagram	90	75.00
		Youtube	102	85.00
		LinkedIn	51	42.50
		Snapchat	56	46.67
		Slideshare	78	65.00
14	Use of open access platforms	Moodle	65	54.17
		OpenEdx	35	29.17
		e-PG pathsala	69	57.50
		e-Gyankosh	25	20.83
		e-Adhyayan	24	20.00
		NDL India	26	21.67
		Vidyamitra	75	62.50
15	Overall perceived usefulness of e-learning platforms	Low	20	16.67
		Medium	68	56.67
		High	32	26.66
16	Overall Attitude towards e-learning platforms	Less favourable	20	16.67
		Favourable	69	57.50
		More favourable	31	25.83

Socio-personal Characteristics of Research Scholars

The findings revealed that a majority of the respondents (59.17%) belonged to the age group of less than or equal to 25 years, followed by 36.67 per cent in the age group of 26–28 years, whereas only 4.16 per cent belonged to the age group of 29 years and above. The higher proportion of young research scholars may be attributed to their direct transition from undergraduate studies to postgraduate and doctoral programmes. Younger scholars are generally more exposed to digital technologies and possess greater adaptability towards emerging online learning tools. Similar findings were reported by Sathiyapriya and Keerthana (2024) ^[28].

Regarding gender distribution, more than half of the respondents were female (57.50%), while 42.50 per cent were male. The higher representation of female scholars indicates the increasing participation of women in agricultural higher education. This trend may be due to enhanced awareness regarding the importance of women's education, improved educational opportunities, and various government initiatives promoting female participation in higher education. Similar observations were reported by Yadav and Kashyap (2017) ^[35].

With respect to educational status, 60.83 per cent of the respondents had B.Sc. (Agriculture) qualification, whereas 39.17 per cent had M.Sc. (Agriculture) qualification. The higher proportion of B.Sc. (Ag.) scholars may be due to the greater number of students entering higher education after undergraduate agricultural programmes and comparatively higher enrolment capacity at the undergraduate level.

The medium of schooling revealed that a majority of respondents (69.17%) had English medium education, while 30.83 per cent had Tamil medium education. The predominance of English-medium scholars may be due to the importance of English in accessing scientific literature, online academic resources, research databases, and digital learning platforms. Since most e-learning resources and technical interfaces are available in English, English-medium

students may experience greater convenience in using digital platforms.

The academic performance of respondents indicated that 79.17 per cent had high academic performance (>8.3 OGPA), while 20.83 per cent had medium academic performance (7–8.3 OGPA). The higher academic achievement among research scholars may be attributed to their merit-based selection for postgraduate and doctoral programmes and their motivation towards academic excellence and research activities.

Regarding place of residence, nearly half of the respondents (49.16%) belonged to semi-urban areas, followed by rural (28.34%) and urban (22.50%) areas. The higher representation of semi-urban scholars may be because these areas provide comparatively better educational facilities, internet connectivity, and access to institutions while maintaining affordability compared to urban regions.

The annual family income distribution showed that 60.83 per cent of respondents belonged to the low-income category (Rs.67,000–2,28,000), followed by medium (28.33%) and high-income categories (10.84%). This indicates that many agricultural scholars come from farming, service, and moderate-income family backgrounds. Similar findings were reported by Kirti *et al.* (2017) ^[16].

Digital Device Possession and Exposure to E-learning Platforms

The findings on electronic device possession revealed that all respondents (100.00%) possessed smartphones, followed by laptops (82.50%), tablets (28.33%), and desktops (15.00%). The universal ownership of smartphones highlights their importance as essential digital tools for academic communication, accessing online resources, and participating in e-learning activities. The higher possession of laptops may be attributed to their requirement for research-related activities such as literature review, data analysis, online documentation, and manuscript preparation. Similar findings

were reported by Muthuprasad *et al.* (2021) ^[23].

The awareness level of e-learning platforms revealed that more than half of the respondents (54.17%) had high awareness, followed by low (24.17%) and moderate (21.66%) awareness levels. The higher awareness among scholars may be due to their frequent use of internet-based resources, online academic platforms, digital libraries, and virtual learning environments for research purposes.

The accessibility of e-learning platforms indicated that 56.67 per cent of respondents had medium accessibility, followed by high (23.33%) and low (20.00%) accessibility. The medium level of accessibility suggests that scholars had access to essential digital learning resources; however, limitations related to internet connectivity, infrastructure, and technical support may influence regular usage. Similar findings were reported by Raj *et al.* (2024) ^[27].

The knowledge level regarding e-learning platforms revealed that 56.67 per cent of respondents possessed medium knowledge, followed by high (33.33%) and low (10.00%) levels. This may be because research scholars regularly use online platforms for academic activities, which enhances their familiarity with digital learning resources and their functions. Similar findings were reported by Meenambigai *et al.* (2017) ^[21].

The user ability of e-learning platforms showed that 54.17 per cent of respondents had medium user ability, followed by high (35.00%) and low (10.83%) levels. The medium level of user ability indicates that scholars possess basic operational skills in using e-learning platforms but require further training to utilize advanced features effectively. Similar findings were reported by Acheampong (2019) ^[1].

Utilization Pattern of Digital Learning Resources

The utilization pattern of social networking sites revealed that **WhatsApp (93.34%)** was the most commonly used platform for academic purposes, followed by YouTube (85.00%), Instagram (75.00%), SlideShare (65.00%), Facebook (61.67%), Snapchat (46.67%), LinkedIn (42.50%), and X-Twitter (22.50%). The higher preference for WhatsApp may be due to its convenience in academic communication, instant sharing of research materials, and group discussions. YouTube and SlideShare were preferred because they provide visual learning resources such as lectures, presentations, and tutorials that support better understanding of academic concepts. Similar findings were reported by Alfari *et al.* (2018) ^[3]. The use of open-access platforms showed that Vidyamitra (62.50%) was the most accessed platform, followed by e-PG Pathshala (57.50%) and Moodle (54.17%). Other platforms used were OpenEdx (29.17%),

NDL India (21.67%), e-Gyankosh (20.83%), and e-Adhyayan (20.00%). The higher usage of Vidyamitra and e-PG Pathshala may be due to the availability of structured academic content, subject-specific resources, and free access to educational materials. Moodle was also preferred due to its interactive learning features and organized course management facilities. Similar findings were reported by Prince and Saravanan (2015) ^[26].

Perceived Usefulness and Attitude towards E-learning Platforms

The overall perceived usefulness of e-learning platforms revealed that 56.67 per cent of respondents had medium perceived usefulness, followed by high (26.66%) and low (16.67%) levels. The medium level of perceived usefulness indicates that research scholars recognized the academic benefits of e-learning platforms, but their extent of utilization may vary depending on digital skills, accessibility, and research requirements. The overall attitude towards e-learning platforms showed that 57.50 per cent of respondents had a favourable attitude, followed by more favourable (25.83%) and less favourable (16.67%) attitudes. The favourable attitude among research scholars may be attributed to the flexibility, convenience, time-saving nature, and easy accessibility of digital learning resources for academic and research activities. Overall, the findings indicated that research scholars of the Faculty of Agriculture were predominantly young, academically competent, digitally equipped, and moderately proficient in utilizing e-learning platforms. Their positive perception and favourable attitude highlight the growing importance of digital learning technologies in agricultural higher education.

Perceived usefulness of e-learning platforms by the research scholars

Perceived usefulness of e-learning refers to the degree to which a student believes that using e-learning systems will improve their academic performance or learning effectiveness. The extent to which an individual believes that using an information system will enhance their academic productivity. Perceived usefulness is crucial in e-learning as it strongly influences student's acceptance and continued use of platforms. An understanding of perceived usefulness is very important for improving system design to meet learners' needs. Study the perceived usefulness of e-learning platforms were vital for understanding how learners, especially research scholars, value these tools in their academic journey.

Table 2: Distribution of respondents according to their perceived usefulness of various e-learning platforms (n=120)

S. No.	E-learning Platforms	Mean score
I.	E-learning portal for agricultural education	
1.	a) e-krishi Shiksha (e-courses portal)	3.79
2.	b) AgriDIKSHA (Agri web education channel)	3.15
3.	c) Agropedia (Online agricultural information source)	3.94
4.	d) ICAR- Consortium for e-Resources in Agriculture (CeRA)	3.15
5.	e) TNAU- Agritech portal	4.25
6.	f) NARES - Blended learning platform	2.31
	Average mean score	3.43
II	e-THESIS	
1.	a) Krishikosh	4.02

2.	b) Shodhganga	4.06
3.	c) Krishi Prabha	1.12
Average mean score		3.06
III.	MOOCs	
1.	a) AgMOOCs	3.30
2.	b) MOOC with MOOKIT	3.05
3.	c) SWAYAM	4.31
4.	d) PGDAEM-MANAGE MOOC	2.52
5.	e) TELAgE-NAARM MOOC	2.49
Average mean score		3.13
IV.	A) AI tools	
1.	ChatGPT – openAI	4.00
2.	Deepseek	1.37
3.	Gemini AI -Google	3.34
4.	Meta AI Whatsapp	3.59
5.	Microsoft copilot	3.49
Average mean score		3.16
	B) AI assisted research tools	
1.	Grammarly	3.90
2.	Quilbot	3.98
3.	Scite	1.76
4.	Elicit	1.89
5.	Zotero (citation tool)	1.88
6.	Turnitin (plagiarism checker)	3.62
7.	Gamma (for ppt making)	3.93
8.	Canva (for ppt making)	3.30
Average mean score		3.03
V.	Video conferencing platforms	
1.	Google meet	3.88
2.	Zoom	4.10
3.	Microsoft Teams	2.51
4.	Webex	1.95
5.	Skype	2.56
Average mean score		3.00
VI	Statistical tools software	
1.	JAMOV	2.10
2.	SPSS - Statistical Package for Social Science	2.76
3.	WASP 2.0	2.91
4.	OPSTAT	3.00
Average mean score		2.76
VII.	MYLOFT (ONLINE LIBRARY)	2.71
Overall average mean score		3.06

Perceived usefulness of various e-learning platforms

The perceived usefulness of various e-learning platforms was assessed using a five- point continuum scale. To assess the perceived usefulness of various e-learning platforms, mean scores were worked out for seven different categories interpreted and were presented in Table-2.

The analysis of e-learning platforms among the research scholars showed varied levels of perceived usefulness. Among the various categories of e-learning platforms, SWAYAM (MS = 4.31), TNAU Agritech Portal (MS=4.25), Zoom (MS = 4.10), Shodhganga (MS = 4.06), Krishikosh (MS = 4.02) and ChatGPT (MS = 4.00) were perceived as very much useful, indicating that research scholars choose e-learning platforms based on offering comprehensive academic content, reliable access to research materials and effective virtual communication.

In the category of e-learning portals for agricultural education, TNAU Agritech portal (MS = 4.25) and Agropedia (MS = 3.94) were perceived as very much useful, reflecting their relevance and accessibility for agricultural learners. Conversely, NARES - Blended Learning Platform

(MS = 2.31) scored the lowest, possibly due to usability or integration issues. Among the e-thesis platforms, Shodhganga (MS = 4.06) and Krishikosh (MS = 4.02) were well-regarded, showing strong support for platforms that offer open access to scholarly dissertations. While Krishi Prabha (MS = 1.12), was perceived as useful, may need enhancements in content availability or user interface. Among MOOCs, SWAYAM (MS = 4.31) and AgMOOCs (MS = 3.30) received favorable ratings, demonstrating their usefulness in offering structured and topic-specific courses. However, PGDAEM-MANAGE MOOC (MS = 2.52) and TELAgE-NAARM MOOC (MS = 2.49) were rated lower, which may reflect course delivery issues or limited awareness. In the category of AI tools, ChatGPT (MS = 4.00), Gamma (MS = 3.93), Meta AI on WhatsApp (MS = 3.59) and Microsoft Copilot (MS = 2.49) stood out for their roles in enhancing productivity and presentations. Meanwhile, tools like Deepseek (MS = 1.37) showed lower engagement or perceived benefit.

Among the AI-assisted research tools, Grammarly (MS = 3.90), Quilbot (MS=3.78), Turnitin (MS = 3.62), and Canva

(MS = 3.30) were appreciated for improving academic writing and visual communication. In contrast, tools like Scite (MS = 1.76), Elicit (MS = 1.89) and Zotero (MS = 1.88) received lower scores, possibly due to limited awareness or functionality challenges. Among the video conferencing platforms, Zoom (MS = 4.10) and Google Meet (MS = 3.88) were preferred for their ease of use and stability, whereas Webex (MS = 1.95) and Skype (MS = 2.56) were rated less useful, potentially due to outdated interfaces or lower adoption rates. In case of statistical software category, usage and satisfaction were moderate for OPSTAT (MS = 3.00) and WASP 2.0 (MS = 2.91) and SPSS (MS = 2.76) were relatively more accepted, while JAMOV (MS = 2.10) received limited recognition, pointing to a need for greater exposure or training. Finally, MYLOFT (Online Library Platform) scored a moderate mean of 2.71, suggesting that while digital libraries are useful, there may be issues related to accessibility, user interface, or the availability of relevant content for some users. Hence, it could be concluded that the e-learning platforms that were intuitive, content-rich and aligned with academic and research needs tend to be rated more positively. Tools with technical complexity, unfamiliarity or limited scope often show lower engagement, indicating areas for improvement or greater institutional support. The utilization of e-learning platforms depends heavily on how useful to users and perceive them to be. Developers and educators must prioritize user-centered design, high-quality content and effective pedagogical strategies to enhance this perception. As digital learning continues to grow, understanding and improving perceived usefulness will be essential for creating impactful and sustainable e-learning experiences.

The present findings are in agreement with the Technology Acceptance Model (TAM) proposed by Davis, who reported that perceived usefulness is one of the strongest predictors of users' intention to adopt information technologies. Similar findings were reported by Venkatesh and Davis, who

observed that systems perceived to improve users' performance are more readily accepted and continuously used. The findings are also supported by Tarhini *et al.* (2014) [31], who reported that perceived usefulness significantly influences students' behavioural intention to adopt e-learning systems in higher education. Likewise, Al-Emran *et al.* (2018) [2] concluded that usefulness, ease of use and system quality positively influence learners' acceptance and continued usage of e-learning platforms.

The higher usefulness of SWAYAM and online learning portals observed in the present study is consistent with the findings of Muthuprasad *et al.* (2021) [23], who reported that university students preferred structured online learning platforms because of their flexibility, accessibility and availability of quality learning resources. Similarly, Dhawan (2020) [8] emphasized that digital learning platforms became indispensable for higher education by providing uninterrupted access to educational content and academic interactions. The high usefulness scores obtained by ChatGPT, Grammarly and QuillBot also corroborate recent studies on artificial intelligence in education. Kasneci *et al.* (2023) [13] observed that generative AI tools substantially enhance academic writing, information synthesis and personalized learning support for higher education students. Likewise, Lo (2023) [20] reported that AI-powered educational tools significantly improve research productivity, writing efficiency and learning outcomes when used appropriately with academic guidance. Therefore, the study concludes that perceived usefulness remains a critical determinant of successful adoption of e-learning platforms among agricultural research scholars. Institutions should strengthen digital infrastructure, organize regular capacity-building programmes and improve awareness regarding advanced research-support tools to maximize the educational benefits of e-learning technologies.

Perception towards e-learning platforms

Table 3: Distribution of respondents according to their Perception towards e-learning platforms (n=120)

S. No.	Statements	Mean score
1.	The e-learning platform helps me to understand the course content more effectively.	4.12
2.	The e-learning platform enhances my ability to learn new concepts.	2.90
3.	Using the e-learning platform improves my overall academic performance.	4.11
4.	The platform supports my understanding through detailed and clear explanations.	2.75
5.	The e-learning platform provides high-quality resources that are essential for my learning.	3.22
6.	The e-learning platform helps me to complete my learning tasks more efficiently.	3.19
7.	Using the platform reduces the time I need to study compared to traditional methods.	3.68
8.	The platform streamlines the learning process by organizing resources in a structured manner.	3.30
9.	The e-learning platform offers quick and easy access to relevant learning materials.	3.61
10.	I am able to manage my time better with the support of the e-learning platform.	2.65
11.	The e-learning platform allows me to learn at my own pace.	3.34
12.	The flexibility of platforms allows users to access them anytime and anywhere.	4.20
13.	The platform makes it easier to balance learning with my other responsibilities.	2.89
14.	I can revisit lessons and resources as many times as I need to on the platform.	3.81
15.	The mobile accessibility of the platform is highly convenient for my learning.	3.58
16.	The interactive features of the platform, such as quizzes and forums, help me to stay engaged.	3.70
17.	The e-learning platform facilitates better communication with instructors and peers.	3.79
18.	The platform increases my interest and motivation to learn.	2.65
19.	I feel more involved in my learning through the use of multimedia content on the platform.	3.81
20.	The platform encourages active participation in my learning process.	4.10
Average mean score		3.41

Perception towards e-learning platforms was assessed using a five-point continuum scale viz., strongly agree to strongly disagree. Based on the responses, mean scores were calculated. To know about the Perception towards e-learning platforms data were collected and presented in Table 3.

It could be inferred that among the 20 statements, the mean score of the statements revealed high level of Perception towards e-learning platforms. Majority of the scholars strongly agreed that e-learning platforms significantly support their learning. Statements such as “The flexibility of platforms allows users to access them anytime and anywhere” (MS = 4.20), “The e-learning platform helps me to understand the course content more effectively” (MS = 4.12), “Using the e-learning platform improves my overall academic performance” (MS = 4.11) and “The platform encourages active participation in my learning process” (MS = 4.10) reflect strong appreciation for these platforms enhance learning outcomes and engagement. Similarly, the ability to revisit lessons (MS = 3.81), multimedia involvement (MS = 3.81), better communication with instructors and peers (MS = 3.79) and interactive tools like quizzes and forums (MS = 3.70) are viewed as highly beneficial features. The medium level of perception (mean score between 3.19 and 3.68) includes responses for positive statements. Statements such as “Using the platform reduces the time I need to study compared to traditional methods” (MS = 3.68) and “The e-learning platform offers quick and easy access to relevant learning materials” (MS = 3.61) highlight convenience and accessibility. Mobile access (MS = 3.58), organized structure (MS = 3.30), self-paced learning (MS = 3.34), high-quality resources (MS = 3.22) and task efficiency (MS = 3.19) were also seen as useful, but comparatively lesser than the highly perceived statements. On the other hand, the low level of perception (mean score below 3.00) reflects areas where the platforms are perceived to be less effective. These include “The e-learning platform enhances my ability to learn new concepts” (MS = 2.90) and “The platform makes it easier to balance learning with my other responsibilities” (MS = 2.89), which suggest moderate limitations in flexibility and conceptual support. More notably, statements like “The platform supports my understanding through detailed and clear explanations” (MS = 2.75), “I am able to manage my time better with the support of the e-learning platform” (MS = 2.65) and “The platform increases my interest and motivation to learn” (MS = 2.65) indicate that time management, motivation and clarity of instructions were the key areas needs improvement. In nutshell, while scholars found e-learning platforms highly effective in enhancing content understanding and engagement, there is moderate appreciation for efficiency and convenience and relatively lower satisfaction in areas such as time management, flexibility and motivation. Hence, it could be concluded that research scholars perception towards e-learning platforms was useful and supportive component of their academic journey. Their acceptance was largely driven by the platform’s convenience, accessibility, ability to facilitate continued learning and research development. To better serve this user group, e-learning platforms should incorporate features that cater to advanced academic needs, including access to peer-reviewed content, interactive research communities and tools for academic collaboration. Addressing these aspects will not only enhance

the user experience but also reinforce the role of e-learning in higher education and scholarly advancement.

Summary and Conclusion

The study found that research scholars in the Faculty of Agriculture, Annamalai University were young, digitally equipped, and moderately proficient in using e-learning platforms. They had favourable awareness, knowledge, perception, and attitudes towards e-learning, with platforms such as SWAYAM, TNAU Agritech Portal, Shodhganga, Krishikosh, Zoom, and ChatGPT being widely valued for academic and research purposes. Despite challenges such as technical issues, reduced motivation, and limited practical learning opportunities, e-learning was recognized as an effective complement to conventional education. The study recommends strengthening digital infrastructure, improving ICT skills, and integrating interactive, agriculture-specific e-learning resources to enhance research and learning outcomes in agricultural higher education. The study concludes that research scholars in the Faculty of Agriculture, Annamalai University demonstrated a favourable overall orientation towards e-learning, supported by adequate digital access and moderate proficiency in using e-learning platforms. Platforms such as SWAYAM, TNAU Agritech Portal, Shodhganga, Krishikosh, Zoom and ChatGPT were perceived as useful for accessing learning resources, supporting research activities and enabling flexible and continuous learning. The perceived usefulness of e-learning was particularly evident in terms of saving study time, providing easy access to relevant learning materials and supporting academic activities. However, the findings also indicate that time management, motivation, flexibility, clarity of explanations and opportunities for practical learning require further attention. Technical constraints and limitations in interactive learning may reduce the effectiveness of e-learning when used independently of conventional education. Therefore, e-learning should be strengthened as a complementary component of agricultural higher education, rather than a complete replacement for face-to-face and practical learning. Improving digital infrastructure, strengthening ICT competencies, developing agriculture-specific and research-oriented content, and incorporating interactive tools, peer-learning communities and academic collaboration facilities could enhance the effectiveness and sustained adoption of e-learning among research scholars. Overall, the study demonstrates that well-designed e-learning systems can make a meaningful contribution to academic learning, research productivity and digital transformation in agricultural higher education.

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Competing Interests

The authors have declared that no competing interests exist. Statement about the Use of Generative AI

The authors did not use generative AI or AI-assisted technologies in the writing or preparation of this manuscript.

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