

EXPLORING THE FACTORS DRIVING E-LEARNING SATISFACTION OF FARMERS

Vidanapathirana N.P.^{1*}, Hirimburegama K.², Nelka S.A.P.¹, Siriwardena B.P.¹, Rifnas L.M.¹, Nawarathna S.L.¹, Ketipearachchi K.G.¹ and Bandusekara B.S.¹

¹Department of Agro-Technology, University of Colombo Institute for Agro-Technology and Rural Sciences, Hambantota, Sri Lanka

²Department of Plant Sciences, Faculty of Science, University of Colombo

*Corresponding Author: nisansala@uciars.cmb.ac.lk. (<https://orcid.org/0000-0003-1187-5681>)

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ABSTRACT

The growth of the internet and web technology has made it easier to educate farmers and "reach the unreachable." Farmers need information at every stage of the farming life cycle to make the best decisions possible. E-Learning is a cutting-edge educational strategy that incorporates the right information and communication tools in order to advance teaching-learning processes that are student-centered, active, transparent, and lifelong. There are many different aspects determining user satisfaction with e-learning, in various target scenarios. However, not much research has looked at the aspects influencing e-Learning satisfaction among users in agriculture. Therefore, understanding the variables affecting learners' satisfaction with e-learning in agriculture is required. Therefore, this study aims to determine the factors affect farmers' satisfaction with e-learning. Farmers who are following the degree program used as target group of the study and web-survey research methodology used to collect data and 230 farmers responded for the web survey. This study verified twelve e-learning satisfaction indicators among farmers. The findings showed that, out of a total of twelve independent variables, nine independent variables such as appropriate online tutor and mentor assistance, interactivity of learning activities, satisfaction with online discussion forums, language of instruction and language of the learning management system, usefulness of the course, and flexibility of the course were the critical factors significantly affecting farmers' perceived satisfaction with e-Learning. To enhance farmers' satisfaction with e-learning systems, developers and educators should focus on providing high-quality, flexible courses with strong instructor support, practical content, and interactive features. Special attention should be given to farmer-specific needs, such as localized language, relevant multimedia, and accessible discussion forums, as these unique factors significantly impact their learning experience and satisfaction.

Keywords: Agriculture, E-learning, Farmers, Internet, Rural development

INTRODUCTION

With farmers' time often limited in busy workplaces, finding time to allocate for learning within a traditional classroom can be difficult and costly. E-learning provides an economical, flexible learning solution that allows farmers to learn at their desktops, working at their own place wherever and whenever they can, which can optimize their limited time. Apart from traditional ICT tools such as TV and Radio, the use of modern ICT tools such as a computers, the internet, and mobile phones for getting agricultural knowledge and information remains very low in Sri Lanka.

The digital divide still affects a considerable portion of agricultural communities and farmers (Sideridis et al., 2010). E-learning programs for farmers can bring benefits such as enrolling large numbers of learners, covering a broad area, reducing costs, sharing quality learning resources, and increasing farmers' access to education. It bridges the gap between farmers,

researchers, and experts (Balakrishnan et al., 2014). A successful and well-organized delivery system of essential information and technology services facilitates the farmers' critical role in decision-making towards improved agricultural production, processing, trading, and marketing (Maningas et al., 2005).

However, e-learning in agriculture-related fields is still in the early phases of adoption, and there are few researches with e-learning opportunities related to users in agriculture (Ahmadpour & Mirdamadi, 2010; Alexandrescu et al., 2010; Balakrishnan et al., 2014; Camara, Shrestha et al., 2010 and Wickramasuriya, 2010).

Motivation and research gap

Many businesses, like Dell Learning, Cisco E-Learning, and HP Virtual Classroom, have implemented e-learning solutions for their community education programs (Dongsong Zhang & Nunamaker, 2003; Zhang, 2002). However, when it comes to the agricultural industry, there are not many initiatives that give farmers access to this technology.

E-learning may be one of the methods available to close the information gap between farmers and information sources. However, the adoption of e-learning in agriculture is much slower than in other industries. Even though e-learning is being used more frequently in affluent nations to educate farmers, it is still mostly underutilized in underdeveloped nations. There may be numerous causes for this, but it is crucial to identify solutions that will boost adoption and satisfaction (Balakrishnan et al., 2014; Leary, 2006).

User satisfaction is major concern when introducing e-learning for any users (Al-Samarraie et al., 2017; Asoodar et al., 2016; Chow & Shi, 2014; Cole et al., 2014; De Melo Pereira et al., 2015; Mohamed et al., 2021; Navimipour & Zareie, 2015; Teo, 2014; Violante & Vezzetti, 2015). The system may not work successfully if it does not fulfil learner satisfaction among mostly adult farmers with different educational backgrounds who are already engaged in their profession. Therefore, it is very important to find out the factors affecting e-learning satisfaction among farmers. Sun et al. (2008) identified and listed factors vital to the activities of e-learning and affecting learners' satisfaction with e-learning based on prior studies in e-learning. However, very few researches have been done to validate factors affecting e-learning satisfaction among farmers. Therefore, this study developed a new model for determining the factors affecting e-learning satisfaction based on the study by Sun et al. (2008).

Research setting

The University of Colombo Institute for Agro-technology and Rural Sciences (UCIARS), Sri Lanka, designed the target e-learning system employed in this study for users at the grass-roots level, such as farmers. The program encourages and supports learning in many ways, including interactivity, flexibility, accessibility, critical understanding, problem-based learning, learner-generated content, open educational resources, learner participation and engagement, blended learning, authentic learning, outreach, and community building. This is accomplished through the use of appropriate instructional design and online technologies.

Previous need analysis done with farmers revealed that farmers who followed this program had a real need to improve their knowledge of their profession and to be qualified in their profession to improve their socioeconomic well-being, resulting in high demand for the program among farmers (Vidanapathirana, 2012). The sustainability of the course depended highly on the learner satisfaction and quick adoption of the course. Therefore, in the present study, an experimental study was carried out using a Bachelor

of Agro-technology Degree program for farmers as e-learning system to determine e-learning satisfaction.

Research objectives and research questions

The main objective of this study is to determine the factors that influence learners' (farmers) satisfaction with e-learning.

Based on the above objectives, the following research question is formulated.

RQ: What are the factors that influence learners' (farmers) satisfaction with the e-learning program?

RQ is related to investigating farmer's satisfaction with e-learning systems. To answer this research question, a model was developed based on the study by Sun et al. (2008) to validate dimensions and factors of e-learning satisfaction among users in the agriculture field, such as farmers and agricultural entrepreneurs, with some modifications.

Theoretical model development

The factors discussed by previous studies cover most aspects of e-learning environments. The study by Sun et al. (2008) integrated them into one framework to examine for validation and relationship. This study aims to validate those dimensions and factors of e-learning satisfaction among users in agriculture, such as farmers and agricultural entrepreneurs, with some modifications. Based on the dimensions and antecedents of perceived e-learner satisfaction noted by Sun et al. (2008), we propose twelve factors which are mostly affected by the satisfaction of e-learning in the field of agriculture, giving special focus on the farmers and agriculture entrepreneurs as users. Those are categorized under six dimensions. Based on the model developed by Sun et al. (2008), it has developed a model for determining the factors affecting e-learning satisfaction among the farming community (Figure 1).

Learner dimension

E-learning requires student proficiency in computers. The results will be effective when students show a positive attitude towards computers. Therefore, we considered learners' attitudes towards computers under the learner dimension as an important factor in learning satisfaction for farmers. Therefore, it has been hypothesized that:

H1: farmer's positive attitude towards computers has a significant influence on farmer's e-learning satisfaction

Instructor dimension

Student satisfaction with online learning is affected by the instructor's teaching style, quick response and providing quality content, friendly approach to students, understandability of student problems, and proper handling of IT (Sun et al., 2008; Volery, 2000; Webster, 1997).

This study included one factor under the instructor dimension: instructor assistance. Instructor Assistance, such as timely responses to discussion

forums, feedback for assignments and exams, and prompt solutions when problems arise regarding the course navigation and course contents, are very important factors for e-learning satisfaction for farmers.

Therefore, this study hypothesizes that instructor assistance has a significant effect for farmers' e-learning satisfaction:

H2: Instructor Assistance has a significant influence on farmer's e-learning satisfaction.

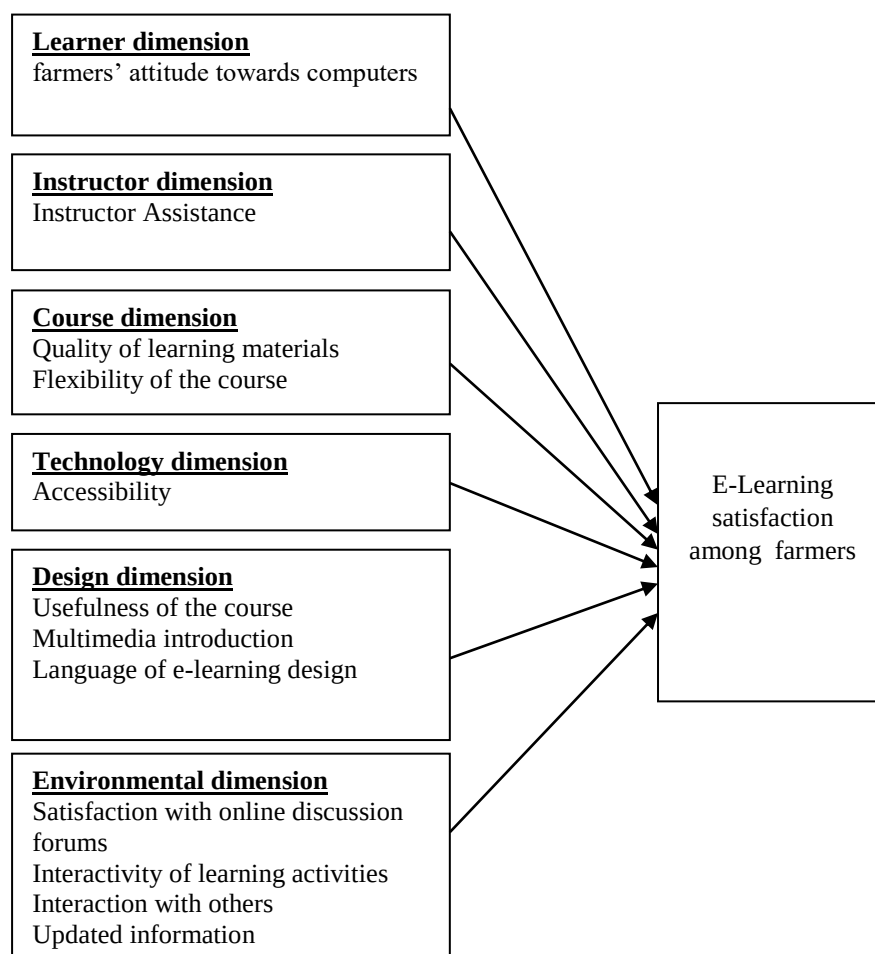


Figure 1: Dimensions and antecedents of perceived e-learner satisfaction for farmers

Course dimension

An attractive feature of the e-learning course dimension is very important for maintaining student satisfaction among users. Sun et al. (2008) in their study considered the significance of determining satisfaction towards the e-learning material under the course dimension as e-learning course flexibility and e-learning course quality. This study considered these two factors under the course dimension for validating among farmers. Therefore, it has been hypothesized

that course flexibility and course quality significantly affect farmer's satisfaction with e-learning.

H3: E-learning course quality has a significant influence on farmer's e-learning satisfaction.

H4: E-learning course flexibility has a significant influence on farmer's e-learning satisfaction.

Technology dimension

To achieve successful implementation and student satisfaction towards e-learning, the quality of technological features needs to be satisfactory (Webster, 1997). Under course dimension, Sun et al. (2008) tested two e-learning satisfaction factors: technology quality and Internet quality. This study has considered one factor including both meanings from the above two factors, which is Accessibility. This includes Internet quality and technology quality.

Therefore, it has been hypothesized that accessibility significantly affects farmer's satisfaction with e-learning.

H5: Accessibility has a significant influence on farmer's e-learning satisfaction.

Design dimension

Zhang et al. (2006) emphasized that recent advances in multimedia and communication technologies have resulted in powerful learning systems with instructional video components. This may enhance learner engagement, and so improve learning effectiveness.

The design of the e-learning course with a language that is preferable for users may increase satisfaction among users. The language of lessons and the language of the learning management system will significantly affect learner satisfaction since users will be more attracted to the course if the contents and LMS are in their own language. Then it will be easy for them to use the course with few difficulties.

The Technology Acceptance Model (TAM) looks at two beliefs crucial to system adoption, that is, perceived ease of use and perceived usefulness (Davis, 1989). Perceived usefulness, in this case, refers to the degree to which the learner believes that Internet-based learning will contribute to their personal job performance. When designing an e-learning course for users in agriculture field, above mentioned all factors will be influenced for farmer's satisfaction with e-learning course. This study considered three factors: the usefulness of the course, multimedia introduction, and language of e-learning design. Therefore, it has been hypothesized that,

H6: Usefulness of the course has a significant influence on farmers' e-learning satisfaction.

H7: Multimedia introduction has a significant influence on farmers' e-learning satisfaction.

H8: The language of e-learning design has a significant influence on farmers' e-learning satisfaction.

Environmental dimension

Under the environmental dimension, four satisfaction factors are considered: satisfaction with online discussion forums, interactivity with learning activities, interaction with others, and updated information. This is a slight change from the original research from Sun et al. (2008), and we considered those factors under the environmental dimension for farmers' satisfaction with e-learning.

H9: Satisfaction with online discussion forums has a significant influence on farmers' e-learning satisfaction

H10: Interactivity of learning activities has a significant influence on farmers' e-learning satisfaction.

H11: Interaction with others has a significant influence on farmers' e-learning satisfaction.

H12: Updated information has a significant influence on farmers' e-learning satisfaction.

MATERIALS AND METHODS

A survey was carried out to get the answers to the research questions. A seven-point Likert scale was used to score all items related to the constructs in both surveys, with response options ranging from "Strongly disagree (1)" to "Strongly agree (7)." The survey's final questionnaire is divided into three sections: a motivational letter, questions about the respondents' demographics, questions about the constructs used in the research models, and open-ended questions.

The farmers were asked to complete a questionnaire in order to get quantitative information. The items for the constructs are then shown in Table 1, which are drawn from earlier work with slight phrasing modifications to represent the target audience.

Sample description

The sample was the all the farmers who followed the degree program who had experience in using e-learning platform in their studies. Total population sampling was used as sampling method. The questionnaire and cover letter were uploaded to LMS home. The survey ran for approximately four weeks, and 230 farmers answered the survey. After filtering missing data, it was observed that there were no missing data since the survey was designed to avoid

missing data. The demographic information of the respondents is shown in Table 2.

Table 1. The measured constructs for e-learning satisfaction.

Variables	Reference
Learner dimension	(Arbaugh, 2000)
farmer's attitude towards computers	
Instructor dimension	(Thurmond, 2002; Webster, 1997)
Instructor Assistance	
Course dimension	(Arbaugh, 2000)
Quality of learning materials	
Flexibility of the course	
Technology dimension	(Arbaugh, 2000)
Accessibility	
Design dimension	(Arbaugh, 2000)
Usefulness of the course	
Multimedia introduction	
Language of e-learning design	
Environmental dimension	(Arbaugh, 2000; Fulford, 1993; Liaw, 2008; Welsh, 2003; Zhang, 2006)
Satisfaction with online discussion forums	
Interactivity of learning activities	
Interaction with others	
Updated information	
E-learning satisfaction among farmers	(Arbaugh, 2000)

Table 2. Demographic profile of the farmers

Variable	Category	Frequency	Percentage
Gender	Male	177	77
	Female	53	23
Age	Less than 21	02	0.7
	21-30 years	95	41.2
	31-40 years	86	37.5
	41-50 years	35	15.4
	51-60 years	10	4.4
	Above 60	02	0.7
Batch number (Seven batches of farmers following the course)	1 st batch	12	7
	2 nd batch	14	8
	3 rd batch	22	13
	4 th batch	34	20
	5 th batch	24	14
	6 th batch	74	44
	7 th batch	51	30

RESULTS AND DISCUSSION

Instrument validation of the e-learning satisfaction model

Data screening and normality test

Since the survey was created to avoid missing data, none were discovered. In order to infer the precise measurement and structural model, a Bollen-Stine bootstrap method was employed because the data did not satisfy the univariate and multivariate normality requirements (Byrne, 2016). The respondents were asked to score their responses on a scale of 1 to 7, with 7 representing the highest rating. According to

Table 3, the typical response from farmers was neutral or in agreement with the assertions, with mean scores for all the items ranging from 4.07 to 6.27 (neutral to agree) and standard deviations of the scores ranging from 0.84 to 1.80.

Reliability and convergent validity

Through the use of the program Analysis of a Moment Structures, this study examined both the measurement model and the structural model in order to test the research model (AMOS 21). To evaluate the consistency, convergent validity, and discriminant validity of each construct, a confirmatory factor analysis was performed. All thirteen constructs met the recommended thresholds of factor loading,

composition reliability, average variance extracted (AVE), and Cronbach's alpha (See Table 4). The outcomes show that the internal consistency and reliability of our research tool are good (Table 3).

Table 3. Mean and standard deviation

Construct	Mean	SD
1. E-learning satisfaction among farmers	5.46	1.48
2. farmer's attitude towards computers	4.98	1.51
3. Instructor Assistance	6.27	1.52
4. Quality of learning materials	5.12	1.61
5. Flexibility of the course	6.10	1.68
6. Accessibility	4.74	1.48
7. Usefulness of the course	5.25	1.70
8. Multimedia introduction	5.02	1.10
9. Language of e-learning design	5.63	1.80
10. Satisfaction with online discussion forums	4.69	0.95
11. Interactivity of learning activities	6.00	1.01
12. Interaction with others	4.07	0.84
13. Updated information	5.03	1.10

Table 4. Reliability and convergent validity statistics

Construct	α Cronbach's alpha	Composite reliability (CR)	Minimum factor loading	AVE
1. E-learning satisfaction among student farmers	0.95	0.97	0.93	0.91
2. Student farmer's attitude towards computers	0.96	0.94	0.81	0.82
3. Instructor Assistance	0.95	0.93	0.88	0.81
4. Quality of learning materials	0.96	0.86	0.73	0.84
5. Flexibility of the course	0.95	0.93	0.86	0.91
6. Proper accessibility	0.96	0.94	0.88	0.67
7. Usefulness of the course	0.95	0.95	0.95	0.74
8. Multimedia introduction	0.95	0.89	0.83	0.85
9. Language of e-learning design	0.95	0.86	0.80	0.72
10. Satisfaction with online discussion forums	0.95	0.94	0.88	0.84
11. Interactivity of learning activities	0.95	0.92	0.86	0.80
12. Interaction with others	0.95	0.94	0.87	0.83
13. Updated information	0.95	0.95	0.86	0.90

Discriminant validity

When determining whether the measurements of two different theoretical constructs are empirically distinct, discriminant validity is used. Each square root of the AVE is larger than the relationships with other components, as seen in Table 5. As a result, this study supports high discriminant validity using Fornell and Larcker's criteria (1981).

Model fit

Model-fit indices shown in Table 6 were used to estimate the measurement model and structural model fit. All the indices indicate a good model fit for the current study.

Investigating farmers' e-learning satisfaction

The RQ1 (RQ1: What are the factors that influence learners' (farmers') satisfaction with the e-learning program?) is addressed in this section. In actuality, the author created a research model that hypothesized a number of variables that affect farmers' satisfaction with e-learning.

Estimates of the path coefficients, which show the strength of the correlations between the dependent and independent variables, and the R-squared values, which show how much variance is explained by the independent variables, are included in the test of the structural model. The outcomes of the test of the thenproposed structural model are displayed in Figure 2 and Table 7.

Table 5: Discriminant validity for the measurement model

Construct	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Overall satisfaction	(0.95)												
(2) Attitudes towards computers	0.49	(0.90)											
(3) Instructor Assistance	0.90	0.49	(0.90)										
(4) Quality of learning materials	0.68	0.37	0.59	(0.92)									
(5) Flexibility of the course	0.80	0.30	0.70	0.78	(0.95)								
(6) Accessibility	0.49	0.20**	0.50	0.47	0.48	(0.81)							
(7) Usefulness of the course	0.80	0.40	0.71	0.51	0.61	0.39	(0.86)						
(8) Multimedia introduction	0.80	0.40	0.71	0.51	0.61	0.39	1.00	(0.92)					
(9) Language of e-learning design	0.81	0.41	0.72	0.67	0.70	0.50	0.62	0.62	(0.85)				
(10) Satisfaction with online discussion forums	0.87	0.37	0.77	0.55	0.66	0.38	0.68	0.68	0.68	(0.92)			
(11) Interactivity of learning activities	0.90	0.49	0.82	0.61	0.71	0.38	0.68	0.68	0.71	0.78	(0.89)		
(12) Interaction with others	0.90	0.49	0.82	0.61	0.71	0.38	0.68	0.68	0.71	0.78	1.0	(0.91)	
(13) Updated information	0.85	0.54	0.76	0.72	0.75	0.45	0.65	0.65	0.67	0.73	0.85	0.85	(0.95)

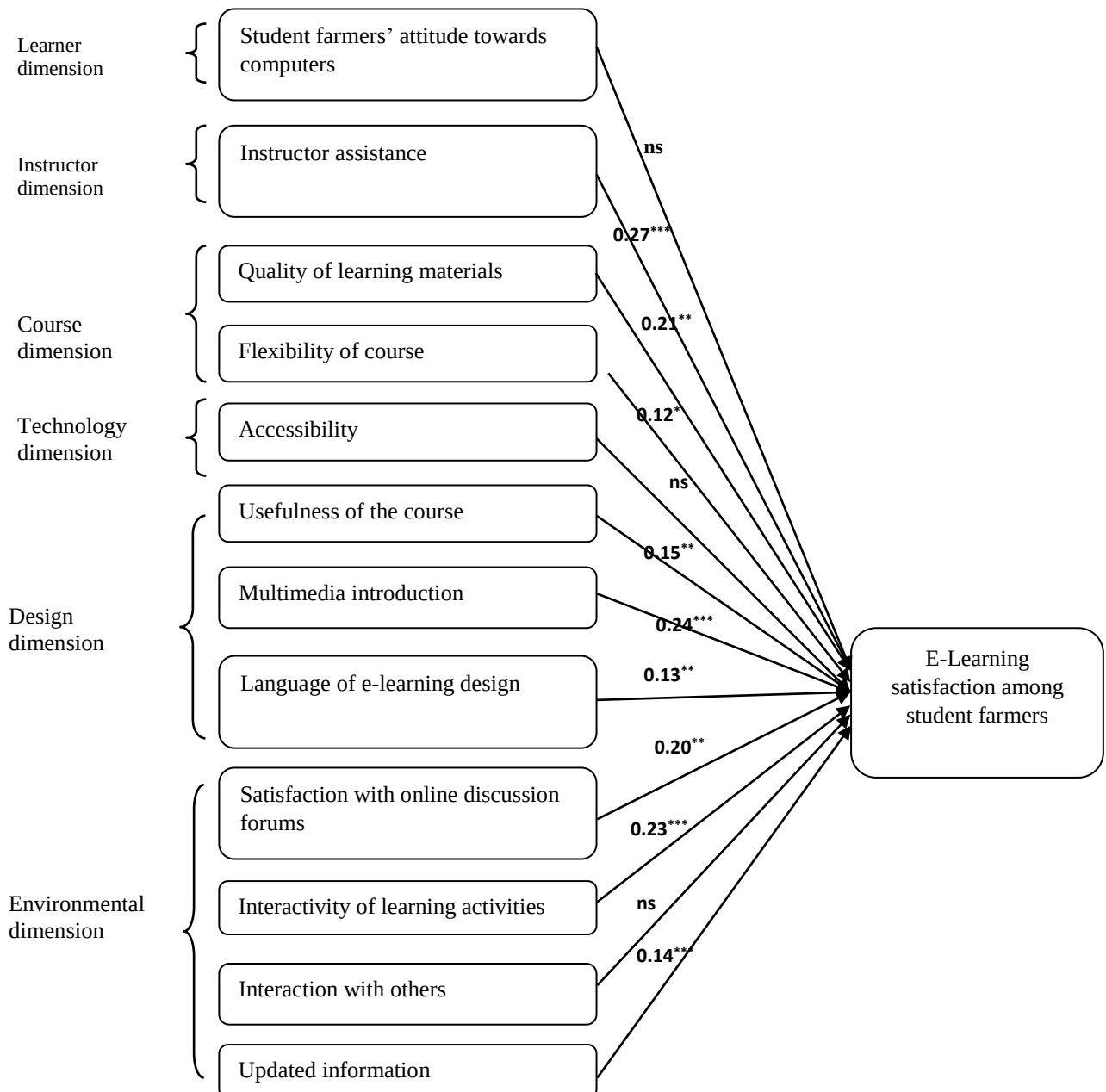
Table 6. Fit indices for measurement model and structural model

Fit statistics	Measurement model	Structural model	Recommended value
GFI	0.953	0.948	> 0.9
AGFI	0.926	0.921	> 0.8
NFI	0.973	0.971	> 0.9
CFI	0.982	0.980	> 0.9
RMSEA	0.053	0.059	< 0.06
X ² /df	2.803	2.825	< 3

Table 7: Summary of hypotheses tests

Independent variable	Dependent variable: learner satisfaction			
	Beta (β)	t	Sig.(p-value)	Result
Student farmers attitude towards computers (H1)	0.22	0.58	0.559	Not supported
Instructor assistance (H2)	0.27	4.44	0.000	Supported
Quality of learning materials (H3)	0.21	3.23	0.001	Supported
Flexibility of course (H4)	0.12	2.42	0.019	Supported
Accessibility (H5)	0.03	0.11	0.305	Not supported
Usefulness of the course (H6)	0.15	3.22	0.002	Supported
Multimedia introduction (H7)	0.24	3.94	0.000	Supported
Language of e-learning design (H8)	0.13	2.63	0.002	Supported
Satisfaction with online discussion forums H9)	0.20	3.70	0.001	Supported
Interactivity of learning activities (H10)	0.23	3.40	0.000	Supported
Interaction with others (H11)	0.16	0.48	0.232	Not supported
Updated information (H12)	0.14	2.52	0.000	Supported
R ²	0.956			

With p-values under 0.05, nine of our twelve hypotheses are supported by evidence of significant connections to learner satisfaction.



Note: *p < 0.05; **p < 0.01; ***p < 0.001; ns: non-significant

Figure 2: Hypotheses testing results in the research model

Influence of learner dimension

Under the learner dimension, hypothesis 1 examines whether learner satisfaction with e-learning is influenced by farmers' attitudes towards computers. The results show that it has no significant effect. According to the previous findings of (Arbaugh, 2002; Arbaugh, Duray, 2002; Piccoli, 2001), it has shown that users' attitudes towards computers affect e-learning satisfaction. However, this study revealed that farmers' attitude towards computers is not

affecting their e-learning satisfaction. But considering the users like farmers, majority of them do not have much experience in computers. Therefore, at the beginning of this research, it was thought that attitude towards computers may be a factor in their e-learning satisfaction. However, the result of this study shows that farmers' attitudes, efficacy, and skills should no longer be considered an issue in the e-learning environment.

Sample quotes from the open-ended survey questions regarding the learner dimension-related variables are given below.

“....Initially, I thought I needed very good computer skills to follow this course. But I am very happy that I now use the system without difficulty. Because I learnt about computers while following this course because I wanted to follow this course somehow since it is essential for me....”

“....I am an old farmer, and I decided to use this system even though I do not have computer skills. After following the course, I found that it is not necessary to have much computer skill to have this system, and I do not have fear about computers....”

“....At the beginning, I thought this technology was only for young people. But as a farmer, I also can use the computer for my learning, and it is not an advanced technology for me to learn....”

The above quotes reflect farmers' attitudes towards computers.

Influence of Instructor dimension

Under the instructor dimension, hypothesis 2 was tested, and it was found that instructor assistance affects learner satisfaction for student farmers. Out of all independent variables, instructor assistance has the strongest association with satisfaction with a high significance level. Sun et al. (2008) tested two factors: instructor response timeliness and instructor attitudes towards e-learning. They significantly influence instructor attitudes towards e-learning for learner satisfaction, while instructor response timeliness has no influence. These parameters are combined by the author in this study, and the results partially support those of Sun et al. (2008) as well as those of Smeets (2005), Piccoli et al. (2001), and Webster and Hackley (1997). In either traditional face-to-face teaching contexts or online learning environments, instructors are crucial to students' learning processes. Overall, the tutors and mentors (instructors) should be effective course facilitators. They have a large responsibility for retaining students in the course, especially in an e-learning course designed for users like farmers, since they do not have much experience with e-learning.

Sample quotes from the open-ended survey questions regarding the instructor dimension-related variables are given below.

“....Beginning of the course, I felt very difficult with the e-learning system, and after some time, it was so easy for me to handle the system because the teachers and IT team gave me a high level of assistance for using it. Now I am very much satisfied with the system....”

“....Teachers are assisting me when I need assistance in handling the e-learning system. Without their motivation and help, I would not follow the course successfully....”

The above quotes from the respondents show the proper assistance by instructors.

Influence of course dimension

Hypothesis 3 and 4 examine the effects of the course dimension. Factors such as the quality of the learning material and the e-learning course's flexibility have significantly affected e-learning satisfaction for student farmers. Therefore, Hypothesis 3 and Hypothesis 4 are supported. The study found that course flexibility positively affects farmers' satisfaction with e-learning systems. This result corresponds to Arbaugh's (2002) and Sun et al. (2008) findings. Due to the demands of their jobs and their limited time, farmers benefit from a flexible and accessible atmosphere.

Institutions with online learning for learners like farmers should explore the advantages of this virtual environment and design courses with maximum flexibility to accommodate students' needs. Most farmers follow this web-based course because of its flexibility in aspects such as the flexibility of selecting the language, accessing the lesson contents, and entry requirements. Under course dimension, the study by Sun et al. (2008) revealed that course flexibility and quality are both proven to be significant for e-learning satisfaction in their research. Our study also supported the influence of course quality, supporting the hypothesis that the quality of learning materials significantly influenced e-learning satisfaction among farmers. For higher satisfaction, course scheduling and course materials should be properly prepared, and assistance with e-learning instructional expertise must be used to maintain quality. A well-designed delivery process with appropriate assistance can increase the satisfaction of e-learning, even for users like farmers. Sample quotes from the open-ended survey questions regarding the course dimension-related variables are given below.

“....I can follow this course without the time and space barriers. I can access the lessons when I have free time after work. These are the main reasons for following this course as a farmer”

“....As I didn't qualify to the university because of the lack of advanced level results, here I found a chance to obtain a degree while working....”

Coded as flexibility.

Influence of technology dimension

Under the technology dimension, hypothesis 5 has been tested as accessibility for e-learning satisfaction among farmers. The study reveals that this factor in the technology dimension has no significant effect on e-learning satisfaction among farmers. Therefore, Hypothesis 5 is not supported.

When building this hypothesis, it was assumed that farmers may be very much concerned with accessibility, and it may affect their satisfaction with the system. But even for target groups such as farmers, such technology is not a matter of e-learning satisfaction. Somehow, they will find a solution since they need to learn, which will benefit them. The study by (Sun et al., 2008) also revealed that no factor in the technology dimension has a significant effect on user satisfaction with e-learning.

Sample quotes from the open-ended survey questions regarding the technology dimension-related variables are given below. This has proven the above facts further.

“...In the beginning, I faced some difficulties with internet facilities, which caused me to have trouble accessing the lessons. However, I could find the solution by getting support from institute staff and internet facilitators in the country after discussing it with them. Therefore, I have no problems with accessibility for e-learning system so far...”

Influence of design dimension

This test supports all hypotheses under design dimensions (H6, H7 and H8). The variables such as the usefulness of the course, language of instruction, language of LMS, and multimedia introduction had a significant influence on learner satisfaction among farmers. The study by Sun et al. (2008) also considered usefulness as a factor affecting learner satisfaction under the design dimension. This result is consistent with previous research that illustrates usefulness is a critical factor in the context of information systems (Karahanna et al., 1999; Davis et al., 1989). This implies a high level of perceived usefulness toward higher education with e-learning creates high satisfaction. The users in the agriculture sector demand knowledge and information from their courses to improve their job performance and agricultural productivity.

The study found that language of instruction and learning management system also influence learner satisfaction. Lessons, instructions and LMS designed in learners' own language give a great satisfaction with the course, making it easier for farmer students to follow the course. The study also found that there is a significant influence of multimedia introduction on e-learning satisfaction for farmers. This is because

most of them are adult students, and the interaction of lessons and learning activities with multimedia introduction will attract them to learn without boredom.

Sample quotes from the open-ended survey questions regarding the design dimension-related variables are given below. This has proven the above facts further.

“...This course has lessons with video, animations and colourful pictures. Those attracted me for studying the lessons without bored...”

“...I found all course materials in one place....”

“...I am getting knowledge and information useful for my farming through this course....”

“...Following the course with my own language is a great opportunity....”

Influence of environment dimension

Hypothesis 9, 10, 11 and 12 examine the links between the environmental dimension and perceived e-learning satisfaction among users in the agriculture field. Hypothesis 9, 10 and 12 are supported, and hypothesis 11 is not supported.

They are satisfaction with online discussion forums, interactivity of learning activities, and updated information are positively affected by e-learning satisfaction among farmers. The course consists of interactive learning activities such as interactive discussion arrangements, online group assignments, video conferencing, chat sessions, online quizzes, etc. Also, all lessons include videos, graphics, and animations in the course design. They consist of lessons prepared with flash, animations and colour pictures. In addition video lessons are also included where necessary. This kind of interactivity is much needed to improve learner satisfaction, especially for target groups like farmers since most of them are adults. Swan (2001) also discovered the importance of interactivity in creating online courses that increase student happiness. Liaw (2008) emphasized that interactive learning activities positively influenced e-learning effectiveness. Interaction between students, instructors, and the course materials itself can increase e-learning user happiness (Arbaugh, 2000).

According to the study findings, satisfaction with online discussion forums also hampers farmers' satisfaction with e-learning courses. This course discussion forum helps student farmers post about the problems they encountered in lessons and their profession (agriculture) and discuss them with teachers and their colleagues. Student farmers are from all around the country, and they can communicate easily with each other through

discussion forums. Welsh (2003) mentioned that Discussion forums ensure social interaction in e-learning systems. Therefore, satisfaction with online discussion forums is a significant factor to improve learner satisfaction in e-learning.

The study also revealed that updated information given by the e-learning system significantly affects e-learning satisfaction among farmers. Users, like farmers, need updated and timely information on their farming practices. Information related to agriculture is changing very frequently. Therefore, updating the lessons and information provided through the e-learning system will help them manage their farming properly. It is creating a high level of satisfaction towards e-learning among farmers.

Sample quotes from the open-ended survey questions regarding the environmental dimension-related variables are given below. This has proven the above facts further.

“....For each course, we had a good group discussion on the system. The topic was interesting, and other colloquies also participated, and it worked well, which stimulated me by the course and doing assignment....”

“....course lessons are found to be updated all the time. This is very important for applying those facts for my profession....”

The findings of the analysis make important contributions to research question one, RQ1 (What are the factors that influence learners' (farmers') satisfaction with the e-learning program?). The findings suggest factors for e-learning system satisfaction among farmers, and most of the factors are supported by previous study findings. Also, the study introduces some new factors affecting e-learning satisfaction among users like farmers.

CONCLUSIONS

Summary of the Answers to the Research Question

RQ1: What are the factors that influence learners' (farmers) satisfaction with the e-learning program?

Farmers' satisfaction with an e-learning system can be assessed by considering elements like appropriate instructor support, high-quality learning materials, course flexibility, usefulness, multimedia introduction, the system's language, satisfaction with online discussion forums, interactive learning activities, and current information. Some of these factors are special factors specified for farmers which were not tested by previous literature. These factors are significantly influenced for e-learning satisfaction

among farmers and they can be considered as the determinants of farmers' e-learning satisfaction.

IMPLICATIONS

Theoretical implications

Several instruments have been developed to measure user satisfaction with e-learning systems. However, according to previous literature, it is hard to find an instrument for measuring e-learning satisfaction dimensions and antecedents for users like farmers.

This study achieved significant progress towards developing a general instrument for measuring farmers' satisfaction with e-learning systems. The validated 12-factor e-learning satisfaction instrument is specified for farmers; some of them have not been tested by previous research. Therefore, this instrument can be used to test e-learning satisfaction among different target groups, such as farmers. Future research efforts can use the proposed instrument to develop and test research hypotheses and theories relating to e-learning satisfaction.

This study provides several new findings that are inconsistent with previous literature. Previous research findings revealed that users' attitudes towards computers under the learner dimension affect e-learning satisfaction (Arbaugh, 2000; Arbaugh and Duray, 2002; Hong, 2002; Piccoli, 2001). This study revealed that farmers' attitude towards computers is not affecting their e-learning satisfaction because they are willing to accept the technology since they need it for their profession. Most e-learning satisfaction studies found that accessibility is a problem for e-learning satisfaction. This study found that accessibility has no significant influence. Factors such as instructor assistance, multimedia introduction, the language of e-learning designing, satisfaction with online discussion forums, and interactivity of learning activities are new factors among the twelve tested factors that can be used for e-learning satisfaction factors for users like farmers.

Implications for practice

The findings in this study imply that e-learning system developers and implementers for target groups like farmers need to give more attention on the instructor, course, design, and environmental dimensions rather than user and technology dimensions. This study clearly showed that farmers' attitudes towards computers under the user dimension and accessibility under the technology dimension have no significant influence on their satisfaction towards e-learning systems. Therefore, when implementing such a system for them, developers should not much bother on technology matters and also not much on computer knowledge and experience. They do not consider those issues in e-learning satisfaction, and they are concerned about

instructor guidance towards them during the learning process. Therefore, instructors should be ready to guide them properly with high level of motivation and institutes should give proper training for instructors on e-learning systems.

Institutions should also consider the flexibility aspects and flexible nature of the online learning environment, which increases learner satisfaction for the people who are on the job and want to continue their education. Another point that course developers should focus on is the quality of the material. Quality of course content is an important attribute that leads to farmers' satisfaction and successful implementation of e-learning. When designing e-learning courses for farmers, e-learning interface designers should consider the interactivity of learning activities, multimedia introduction, and introduction of discussion forums and chat boxes for social mobilization, which are important to attract farmers.

Furthermore, farmers are concerned about the language of instruction and learning management systems in e-learning. Therefore, implementers should develop the system using their local language, making it more convenient. In addition, farmers are concerned with updated information from the e-learning system and the usefulness of the e-learning system since they directly apply the knowledge and information gained by the system to their profession. Therefore, e-learning system providers for farmers should regularly update the lessons and provide useful content relevant to their profession from the e-learning system.

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