Factors Influencing the Use of the e-Learning System of Extension Agents in the Northeast Thailand

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ABSTRACT— The recent surge in Covid-19 cases has been prompted educational organizations to embrace e-learning systems as a viable substitute for traditional classroom instruction. Nonetheless, concerns among stakeholders, particularly in developing countries, persist and are on the rise due to challenges. This research delves into the factors influencing the utilization of the e-Learning system developed by the Department of Agricultural Extension. The study targeted a population of 1,986 professional extension agents across 20 provinces in Northeast Thailand. Sample size determination employed Krejcie and Morgan's formula along with cluster selection, resulting in 326 extension agents participating as respondents in an online questionnaire. This survey aimed to collect general data, incentives, and factors influencing the use of the e-Learning system. Utilizing descriptive statistics and multiple regression analyses through SPSS, the study revealed that respondents predominantly used personal digital devices, such as laptops, smartphones, and tablets, accounting for 63.50% of usage, attributed to their convenience and higher processing capacities. Multiple regression results, significant at the 0.005 level, underscored the substantial influence of awareness of the benefits of the e-Learning system. The data provided by the system proved instrumental, particularly in facilitating academic reports for professional advancement. Positive impacts were also observed concerning the system's user-friendliness and the appropriateness of its learning contents. In conclusion, the study advocates for the imperative use of the e-Learning systems for educational purposes. It however emphasizes the necessity for regular updates and adjustments to ensure the continued engagement of learners with such a system.

KEYWORDS: E-learning system, agricultural extension, extension agent, digital education, Thailand

1. INTRODUCTION

Due to the rapid advancements in information technology and the growing demand for its integration into the educational sector, e-learning systems, also known as online learning, have emerged as pivotal components. They serve as crucial facets within institutions, delivering modern, diverse, and high-quality services to key stakeholders such as students and administrative officers [5]. The significance of these systems is monumental, given their utilization of new technologies, including the internet and other enabling technologies, to facilitate effective two-way communication between instructors and learners [30]. Furthermore, e-learning systems enable learning processes to extend beyond the confines of classrooms, delivering course materials remotely at required times. This efficacy has been underscored by the substantial growth of e-learning systems in recent years, particularly with the abrupt transition from traditional classrooms to online education, notably accelerated by the challenges posed during the COVID-19 pandemic [1], [25]. Despite the highlighted attention, numerous studies have persistently sought to investigate constraints that pose potential threats to guaranteeing the continuity of e-learning systems [34]. As an illustration, the efficacy of e-learning systems is intricately linked to the quality of software applications, and the success of any

software is contingent upon its utilization by diverse stakeholders [12]. Disregarding these stakeholders from the developmental process, without soliciting their explicit requirements and feedback, presents a formidable challenge in meeting their needs [15].

The Department of Agricultural Extension (DOAE), akin to other organizations in Thailand and around the world, has embraced online learning, officially referred to as the e-Learning system, to advance its objectives. The DOAE has introduced online formats, including DOAE e-Learning, DOAE K-Station, and DOAE Baoding Time, investing a budget of 99,183.42 USD (3,486,000 baht) to disseminate information and knowledge to extension agents under its purview [27]. This implementation aims not only to position the DOAE as a leader in agricultural extension but also to align the organization and stakeholders, including domestic farmers, with the government's flagship policy, Thailand 4.0. This policy, the fourth economic development plan, was deliberately designed to transform the country into a high-income nation by 2030 through digitalization and innovations [6]. However, the DOAE's path to success faces several obstacles [7].

Economic competency in Thailand, as indicated by findings from the Economist Intelligence, has stagnated in recent years, reminiscent of its state two decades ago. Elements such as computer operating systems, monetary systems, mindset, and related laws have not maximized their resources, resulting in a deficiency of efficiency and responsiveness to meet the DOAE's goals [29]. However, the most significant constraint lies in the capacity of human resources. Extension agents, as reported, lack digital expertise and skills. Accustomed to traditional learning approaches such as onsite seminars, they are not familiar with e-learning formats and exhibit a hesitancy to adapt, remaining rooted in the era of 3.0, characterized by traditional bureaucratic styles [6]. This observation aligns with a survey from the global employment service giant Manpower Group, indicating that Thailand is not adequately prepared for the transition to Thailand 4.0 due to the absence of a qualified workforce, especially among government civil servants [21].

Previous studies emphasize that the usage of online knowledge sources is determined by various factors, with a primary consideration being the perceived fit of a novel technology to specific tasks [13]. This condition is more pronounced in developing countries, where e-learning systems were not widely adopted before the COVID-19 pandemic [5], [26]. This includes the quality of mobile networks and digital devices used for learning, allowing for the universal accessibility of relevant information [16]. However, such quality must be accompanied by trust and security from service providers. Most importantly, the ability of extension agents to adopt e-learning systems efficiently and effectively is paramount [3].

The aforementioned challenges need addressing. Extension agents represent the department's most critical human resources, playing a pivotal role in agricultural development. They require continuous training in education to efficiently deliver best practices to farmers concerning crop management, pest control, weather patterns, and market trends [4]. Extension agents are also expected to motivate farmers to access information via e-learning systems and other types of online learning communities. In recent years, these systems have served as vast repositories of information across sectors, with agricultural extension being no exception [9]. This is crucial, as digital devices have become popular instruments among farmers to communicate and obtain farming-related information for informed decisions [4], [20]. Additionally, the new agricultural extension paradigm of using digital devices is expected to supplement traditional methods of delivering information to farmers through "face-to-face" extension, an approach that tends to be absent if extension agents, as crucial actors in the promotion of agricultural activities, are not adept in technological accessibility [19].

Specifically, this study seeks to identify the factors influencing the use of the e-Learning system at a time when traditional learning approaches, such as social-contact meetings and physical seminars, were limited by

government protocols. In other words, this study aims to answer two questions: (1) what factors influence extension agents' decisions to use the e-Learning system? (2) What are the interrelationships between these factors? Addressing these questions provides the DOAE and stakeholders with a set of practical recommendations to enhance the utilization of the e-Learning system for achieving superior results in extension works.

This research is organized as follows: The subsequent section discusses the methodology and the data analysis conducted in this research. Section 3 answers the research questions and discusses the factors influencing the use of the E-learning system. The final part concludes the paper and outlines the research implications.

2. MATERIALS AND METHODS

2.1 Study Site and Sampling Procedure

The present research was conducted in Northeast Thailand, commonly known as Isan, encompassing 20 provinces. This region, constituting the largest geographical expanse in Thailand, accommodates approximately one-third of the national population [24]. Despite historical challenges related to agroecological constraints and a group of the population with limited education, the predominant agricultural activities in this region revolve around rice, sugar cane, and rubber cultivation. Agriculture, employing 85% of the population, remains the cornerstone of the economy. The enduring significance of this sector is underscored by its critical role in ensuring the country's food security [11]. Presently, the Northeast region has assumed strategic importance for the Ministry of Agriculture and Cooperation and the Department of Agricultural Extension (DOAE). This strategic focus aims to elevate farmers from smallholders to smart farmers through network establishments, collaboration with local academic institutions, and the judicious deployment of appropriate technologies to enhance efficiency and reduce production costs [9].

The research population comprised 1,986 extension agents distributed across the 20 provinces. These individuals, occupying the professional echelons of the DOAE civil service hierarchy, constituted the targeted population for this study [10]. Employing the Krejcie and Morgan sampling method, a sample size of 326 extension agents was determined as respondents [17]. A deliberate usage of cluster sampling followed, aspiring to ensure the representativeness of the entire geographic expanse of the 20 provinces and to derive comprehensive inferences from the collected data. The clustering was based on provincial divisions, with the number of extension agents in each province serving as the criterion for proportionate allocation, meticulously calculated using the rule of three [2]. Consequently, an optimal and justifiable sample size of respondents in each province was ascertained, as detailed in Table 1.

Table 1: Number of population and sample group

Area	Population	Suggested sample size
Kalasin Provincial Agriculture Office	119	20
Khon Kaen Provincial Agriculture Office	164	27
Chaiyaphum Provincial Agriculture Office	101	17
Nakhon Phanom Provincial Agriculture Office	62	10
Nakhon Ratchasima Provincial Agriculture Office	197	32
Bueng Kan Provincial Agriculture Office	47	8
Buriram Provincial Agriculture Office	131	22
Maha Sarakham Provincial Agriculture Office	99	16
Mukdahan Provincial Agriculture Office	44	7
Yasothon Provincial Agriculture Office	60	10

Area	Population	Suggested sample size
Roi-et Provincial Agriculture Office	129	21
Loei Provincial Agriculture Office	75	12
Sisaket Provincial Agriculture Office	133	22
Sakon Nakhon Provincial Agriculture Office	104	17
Surin Provincial Agriculture Office	117	19
Nong Khai Provincial Agricultural Office	51	8
Nong Bua Lamphu Provincial Agricultural Office	50	8
Amnat Charoen Provincial Agriculture Office	44	7
Udon Thani Provincial Agriculture Office	111	18
Ubon Ratchathani Provincial Agriculture Office	148	25
Total	**1,986**	**326**

2.2 Data Collection and Data Analysis

Due to the DOAE's policies [9], a deliberate decision was made to employ an online questionnaire using Google Forms. This survey instrument was meticulously crafted by a panel of experts who are practitioners in the field of agricultural extension and technological issues. Furthermore, its statistical validation through Cronbach's alpha yielded a coefficient alpha of 0.974, signifying high reliability for quantitative monitoring [8].

The content of the online questionnaire was systematically organized into three main sections. The initial segment comprised closed-ended questions designed to elicit general information from respondents, including gender, age, and educational level. The second section delved into the incentives and digital devices used by respondents to access the DOAE's e-Learning system. The third and most extensive segment, consisting of 29 items in the form of checklists, was dedicated to measuring the factors significantly influencing the utilization of such a system. A Likert scale with five points was employed for the assessment, with 1 indicating "strongly disagree" and 5 denoting "strongly agree" [2].

In the context of this research, the dependent variable was the respondents' utilization of the e-Learning system, while the independent variables encompassed eight factors derived from recommendations in relevant research, amalgamated with the DOAE's scenario variables [2], [10], [28]. These variables included (1) Gender, (2) Educational level, (3) Personal incentives, (4) Awareness of benefits, (5) Ease of use, (6) Appropriateness of learning contents, and (7) Quality of provided digital devices and internet connectivity.

The data collected from the measurement were subjected to analysis using SPSS Statistics version 28. Frequencies, percentages, and means were calculated to elucidate the general characteristics of respondents. Simultaneously, multiple linear regression analysis was employed to predict the variables influencing the utilization of the e-Learning system.

Participation in this research was entirely voluntary. They all provided informed consent by signing a consent form prior to their involvement in the study.

3. RESULTS AND DISCUSSION

3.1 General Characteristics of Respondents

From the comprehensive data outlined in Table 2, an examination of the gender distribution among respondents reveals that out of the total 326 extension agents sampled, 198 individuals (60.73%) identify as

female, while 164 (39.37%) are male. Regarding educational attainment, the predominant qualifications are at the bachelor's and master's degree levels, accounting for a combined total of 99.70%. These characteristics align with expectations, as the current composition of the DOAE reflects a prevalence of female representation [10]. Additionally, the prerequisite for individuals to attain the status of professional extension agents within the department necessitates a minimum educational qualification of a bachelor's degree, a criterion met by most respondents [22].

Table 2: General characteristics of respondents (n=326)

Characteristic	Frequency	%
Sex		
Male	128	39.37
Female	198	60.73
Age (year)		
25 and below	1	0.31
26-30	33	10.12
31-35	52	15.95
36-40	107	32.82
41-45	84	25.77
46-50	27	8.28
More than 50	22	6.75
Educational level		
Bachelor's degree	216	66.26
Master's degree	109	33.44
Doctor of Philosophy	1	0.31
Experience of being extension agent (years)		
5 and below	156	47.86
6-10	112	34.36
11-15	22	6.75
16-20	15	4.60
More than 20	21	6.45

3.2 Devices and Incentives towards the Use of the e-Learning System

Table 3 provides a comprehensive analysis of the digital devices employed by respondents to access the DOAE's e-Learning system. The selection of devices exhibited significant variability within the sampled group. Most respondents (63.50%) used personal devices, such as smartphones, laptops, and tablets, to navigate the e-Learning system. This preference was primarily attributed to the convenience and robust processing capabilities offered by these individual instruments. Notably, the DOAE, particularly at the provincial level, faces constraints in providing digital devices to all extension agents, especially portable ones facilitating internet connectivity as needed [23]. Additionally, the existing devices are predominantly outdated, posing challenges for respondents in transferring and receiving data interactively [22]. This predicament is pervasive in Thailand, as evidenced by previous studies highlighting deficiencies in the quality of digital devices and internet connectivity within governmental organizations [7]. The Northeastern region of Thailand, in particular, lags behind in updating information technology infrastructure, notably in comparison with other regions, and slightly falls below the national average in terms of high-speed internet connectivity [16].

Approximately 30.98% of the respondents used devices provided by both themselves and the organizations to which they belong. This authorization is granted to chief extension agents, empowering them with types of

handheld devices on a temporary or permanent basis to enhance their effectiveness in professional performance [10].

Table 3: Devices of respondents towards the use of the e-Learning system (n=326)

Incentive	Frequency	%
Device owned by themselves	207	63.50
Device owned by organization	18	5.52
Device owned by themselves and organization	101	30.98
Total	**326**	**100**

When queried about their motivations for using the e-Learning system, the respondents underscored the paramount importance of enhancing both their personal (x = 4.03, SD = 0.78) and professional performance as extension agents (x = 3.97, SD = 0.82), with minimal variation among them. This heightened significance is further encapsulated in the acknowledgment that utilizing the e-Learning system equips them with knowledge and skills conducive to career advancement and elevation in position (x = 3.85, SD = 0.86). Nevertheless, the pivotal incentive driving their utilization of the system lies in its capacity to facilitate learning on desired topics at any time and from any location (x = 4.29, SD = 0.79). Additionally, the e-Learning system empowers them to access a wealth of sophisticated, dynamic, and abundant resources, unconstrained by the limitations of an educator's physical reach [28]. Consequently, extension agents can engage in personalized learning tailored to individual needs and at their convenience (x = 4.24, SD = 0.74). These attributes represent significant advantages of online learning. It apparently transcends geographical boundaries and affords learners the opportunity to partake in a class regardless of their physical location [33].

Table 4: Incentive of respondents towards the use of the e-Learning system (n=326)

Incentive	Mean	Std. Dev.	Interpretation
Increase in performance as human	4.03	0.78	Very important
Increase in performance as extension agent	3.97	0.82	Very important
Increase the opportunity of career promotion	3.85	0.86	Very important
More alternative of learning sources	4.24	0.74	Extremely important
Easy to use	3.98	0.77	Very important
Allowing to learn at anytime and anywhere	4.29	0.79	Extremely important

Source. Survey (2023)

3.3 Factors Influencing the Use of the e-Learning System

As mentioned in the introduction, the principal objective of this research is to examine the factors influencing the using of the e-Learning system. The outcomes derived from the multiple regression analysis are presented in Table 5. The coefficient of determination (R^2) is reported as 0.575, signifying that 57.50 percent of the variability in the dependent variable can be explained by the independent variables in the model [2]. It is noteworthy that only three out of the eight independent variables exhibited a positive relationship with the utilization of that system, specifically (4) Awareness of benefits, (5) Easy to use, and (6) Appropriateness of learning contents.

Table 5: Factors influencing the use of e-learning systems (n=326)

Variables	Coefficient (b)	t	*P*-value
Constant	5.073	2.05	< 0.001*
1. Gender	0.182	0.842	0.400

2 Educational level	0.143	2.278	0.23
3. Personal incentives	0.194	2.526	0.12
4. Awareness of benefits	0.514	7.078	0.001*
5. Easy to use	-0.221	-3.667	0.001*
6. Appropriateness of learning contents	0.256	3.471	0.002*
8. Quality of provided digital devices and internet connectivity	0.148	2.559	0.27
R = 0.670 R^2 = 0.575 F = 72.046 F = 10.049 Sig of F = 0.025			

Remark: Significant at 5% level.

As indicated in Table 5, the respondents indicated that the e-Learning system's numerous benefits demonstrated a positive relationship (P-value = 0.001). This correlation stems from the system's ability to deliver substantial and essential information applicable to both real-life scenarios and the professional responsibilities of extension agents. The latter aspect is particularly crucial within the context of civil service norms in Thailand, where the generation of quality academic reports and success in the department's comprehensive test are mandatory prerequisites for promotion to higher ranks, advancing from professional extension agents to senior professional extension agents [22], [29]. Presently, the information available in the system transcends traditional textual documents, encompassing extensive audio-visual learning resources presented in various media formats. Consequently, these formats enhance convenience, facilitating the grasping and retention of knowledge [28]. These affirmations align with Herzberg's assertion that individuals in the workplace exhibit greater productivity and enthusiasm for self-development when presented with growth opportunities [14], [18].

The second pivotal variable is the appropriateness of learning contents, denoted by a statistically significant P-value of 0.002. While the e-Learning system is capable of incorporating information through high-quality videos and images at a cost-effective measure, a cautious approach to customization is warranted. Optimal effectiveness is achieved by maintaining organized and uncomplicated interfaces, strategically designed to ensure that learning contents are easily comprehensible [12]. According to scholarly literature, effective e-learning courses go beyond the provision of valuable information; instead, they focus on tailoring content in various appropriate forms to meet the diverse needs of learners, thereby motivating them to actively retain the information [30], [32].

Moreover, Table 5 highlights the third statistically significant variable: the ease of use of the e-Learning system (P-value = 0.001). The appropriateness of learning contents must be seamlessly integrated with user-friendliness [31]. E-learning systems designed for training high-level professionals not only serve as a medium for fostering intellectual inclusion but also operate as pioneers of excellence, proficiency, and opportunity [32].

4. CONCLUSION AND RECOMMENDATIONS

Since the onset of the Covid-19 pandemic in 2019, e-learning systems have assumed a prominent role, showcasing substantial potential for educational enhancement, and serving as tools for agricultural extension work in Thailand. This significance is underscored not only by their pragmatic utility in supplementing educational training but also aligns with the Department of Agricultural Extension's (DOAE) overarching missions — encouraging staff to exhibit confidence and responsible utilization of digital technologies.

This investigation delves into the factors influencing the adoption of the DOAE developed E-learning system among 326 extension agents in Northeast Thailand. Outcomes derived from multiple regression analysis

indicate three significant positive factors. Respondents express a preference for the E-learning system due to its user-friendly interfaces, coupled with learning contents that are both pertinent and comprehensible. Their satisfaction is intricately linked to an awareness of the benefits conferred by the system, which includes structured information facilitating their professional development, such as using the data for academic reports. Consequently, aspiring to ascend from professional extension agents to senior professional extension agents becomes a tangible goal.

From the aforementioned data, three recommendations emerge. Firstly, recognizing the imperative for e-learning systems to remain relevant, the DOAE should designate specific administrators for regular updates and undertake digitalization efforts to convert the DOAE's paper files and documents into digital formats, fostering a sense of novelty and excitement among learners. Secondly, the optimization of contents for smartphones and tablets, adaptable to varying digital competencies among extension agents, is crucial. Ensuring a user-friendly experience becomes imperative to cater to diverse learner profiles.

Thirdly, acknowledging that learning processes are collaborative endeavors between instructors and learners, a bottom-up approach is recommended. Inquiring into the current interests of learners and tailoring contents accordingly represents a viable strategy to actively engage them in the manner of active learning. This recommendation gains additional strength if the DOAE sets up training workshops aimed at enhancing staff digital literacy, thereby fostering a positive and proactive approach towards embracing digital educational literacy.

5. ACKNOWLEDGEMENT

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