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Necessity for artificial intelligence in higher education: Learners' motivation for continuous use of AI-powered tools

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Abstract

Contemporary AI-powered tools have significantly enhanced the efficacy of language acquisition. The growing demand for a concentrated understanding of the integration between AI-powered tools and learners' comprehension in higher education has been highlighted in the previous literature. Among numerous investigations on AI integration and education, only a few were carried out in Arabic contexts. This study aims to explore the influences of learners' comprehension of AI-powered tools (ChatGPT, QuillBot, Grammarly, Turnitin) on motivations for continuous usage based on the explanations of the Unified Theory of Acceptance and Use of Technology (UTAUT). Quantitative cross-sectional data were collected through 40 questions in a survey questionnaire from 351 respondents in 10 universities. The data were analyzed using Partial Least Squares-Structural Equation Modeling (PLS-SEM), in two models, i.e., measurement model analysis and structural model analysis. The study first draws the hypothesized relationships between the constructs. A novel finding was identified through the designed model and proposed hypotheses. In addition, behavioral intentions of learners showed significant influences on learners' comprehension of AI-powered tools and their motivations for usage. Further, the study determined a significant correlation between the tools' comprehension, challenges, and learners' behavioral intentions toward continuous usage in the future, as shown in the Important-Performance Analysis. The validated model displayed a total variance of 87.3% for learners' motivation to continue using AI-powered tools. Based on the acquired results, implications and recommendations for future research in both theory and practice have been declared.

Keywords: AI-powered tools, Competence, Artificial intelligence, Challenge, Behavioral intentions, Learners' comprehension, Learners' motivation.

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1. Introduction

Artificial intelligence (AI) has undergone significant advancements, evolving from rule-based systems that replicate human intelligence to sophisticated models capable of deep learning. These advanced systems are capable of problem-solving, adaptation, and human language generation, as well as image analysis and processing. Additionally, AI has demonstrated the capacity to leverage data for predicting future outcomes and facilitating informed decision-making [1]. The education sector has expanded due to advancements in AI-powered tools that have significantly influenced learning and assessment methodologies. Recently, investigations indicated that the higher adoption of AI-powered tools in higher education, especially in advanced countries such as China and the United States for implementation and research, while recognizing that this adoption remains promising in other developing countries [2, 3].

The significance of AI in higher education settings encompasses more than the implementation of administrative roles, reforming crucial necessities for platforms of personalized learning and fast response assessment, which address diverse requests and progress of every student [4]. Accordingly, AI technology offers a personalized educational experience that increases engagement and enhances learners' academic outcomes. Likewise, AI technology is increasingly positioned for academic research, using large datasets to assist learners in performing multiple tasks and enabling collaboration across disciplines [5]. Thus, contributing to facilitating the challenges encountered by both learners and researchers, while motivating them to engage in an interactive and effective educational experience. However, despite the advantages and attractions of using AI technology in education and research, there are still some concerns that learners and researchers may completely depend on AI technologies instead of using them to develop their educational experience [6].

Research concerning AI-powered tools in education mainly focused on ChatGPT as a widely utilized tool that supports learners in creating and developing written content, responding to their questions, and explaining complicated themes. Thus, ChatGPT has turned out to be a central tool that supports learners in inquiry and clarification, placing itself as a dynamic tool across numerous disciplines [7]. Likewise, Grammarly is another AI-powered tool that mainly focuses on improving learners' writing skills by offering immediate corrections for their grammar and style. This tool uses a set of rules for language processing to evaluate learners' written texts in terms of simplicity and coherence, thereby supporting learners in achieving a high quality of their writing tasks, research, and projects [8].

Similar indications are presented by AI-driven platforms represented by Turnitin software, which enables learners, researchers, and educators to identify plagiarism and raise awareness on citation accuracy, thereby preserving academic truthfulness and assisting referencing capabilities [9]. Still, the implementation of AI-powered tools encounters some challenges within the context of higher education. Most of the challenges relate to concerns about ethical issues and the aspects of misuse of technologies in education [10]. In addition to the assistance offered by AI-powered tools in writing tasks, further support is provided in other educational settings, including content understanding and comprehension. The QuillBot tool is used to rephrase learners' written texts and improve their comprehension of complicated resources, also assisting them in enriching the intelligibility of their writings [11]. These tools are not only contributing to the efficiency of learners' writings but also introducing them to a personalized interactive learning experience. The continuing growth of AI-powered tools and their influence in developing learners' independence and attractive learning competence is expected to increase, thereby inducing the future trends of education [12].

The present study contributes to investigating elements that influence learners' acceptance of AI-powered tools, i.e., ChatGPT, Grammarly, QuillBot, and Turnitin, within the context of higher education. It contributes to the analysis of how these tools expand learning outcomes and practices. It focuses on categorizing vital factors, including usefulness, ease of use, competence, and behavioral intentions that affect learners' motivation to use these tools for carrying out academic tasks. The study also explores the role of AI-driven tools in improving learners' academic performance, engagement, and promoting learning experiences. Besides, the advantages and obstacles of incorporating AI-powered tools into educational settings will be examined, offering important insights on the effective use of AI tools to address various learning requirements and enhance academic performance. Thus, the current study is guided by the subsequent questions;

1. What are the influences of learners' comprehension and apprehension of AI-powered tools for learning English?
2. What are the influences of AI-powered tools' ease of use, usefulness, competence, and behavioral intentions on learners' motivation and the adoption of AI-powered tools?
3. What are the influences of AI challenges on behavioral intentions towards motivation to use AI-powered tools?
4. To what extent does learners' comprehension of AI-powered tools impact their ongoing use of AI-powered tools?

2. Literature

Numerous studies have investigated the effects of AI tools on student performance. Most of the existing literature has focused on developed regions, particularly in the US and China, where technological advancements are visible. Strielkowski, et al. [13] recently conducted bibliometric research on technological changes that have significantly transformed AI-driven learning, a transformation further accelerated by the "digital surge" in education caused by the COVID-19 pandemic. Meanwhile, Eltahir and Babiker [14] examined the effectiveness of AI-driven platforms in improving learning outcomes for EFL learners in China. A substantial rise in the academic performance of students utilizing the platform was identified when compared to those who did not, underscoring the effectiveness of AI in personalizing education along with improving academic results (Maghsudi, et al. [4]). Luo and Hsiao-Chin [15] conducted a study examining the efficiency of a platform powered by AI aimed at enhancing English language learning for Chinese students. This investigation employed both machine learning and natural language processing algorithms to deliver content adaptively, provide real-time feedback, and predict learning outcomes. The review of existing literature utilized pertinent queries within the Scopus database, rather than other databases such as WoS, Science Direct, Springer, and Sage Publications, due to the number of studies published in

those databases, as shown in Appendix A. However, the Scopus database indicates a growing number of publications on the current research phenomenon over the past decade, as illustrated in Figure 1 generated by Scopus Analysis.

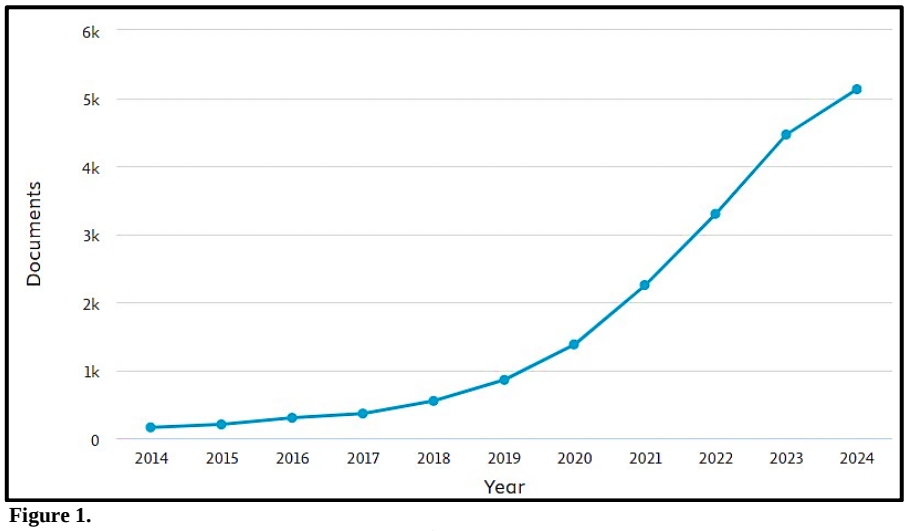

Figure 1.
Published articles between (2014-2024) adopted from Scopus analysis database.

Moreover, most of those publications in the aforementioned dates focused on the implications of AI tools on social sciences within multilevel educational environments as shown in Figure 2.

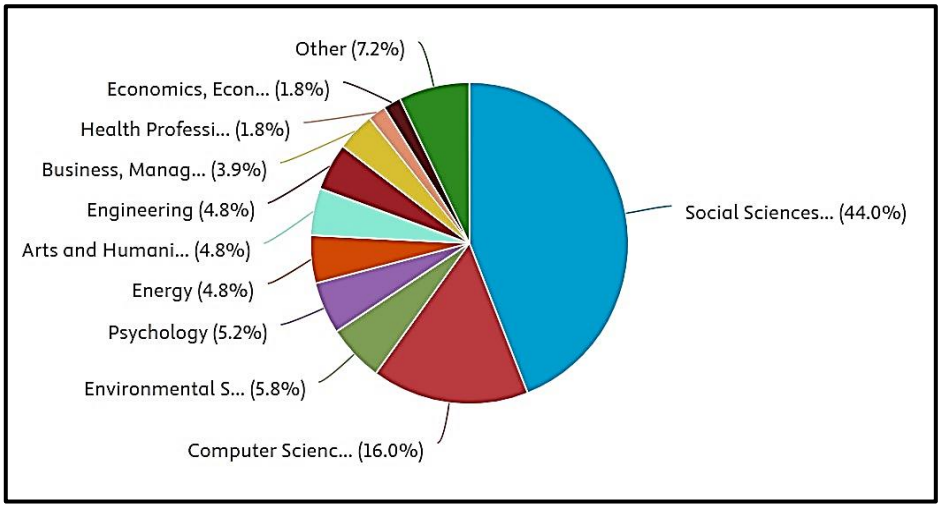

Figure 2.
Publications by subject adopted from Scopus analysis database.

2.1. AI-Powered Tools in Higher Education

AI-powered tools have become essential in contemporary learning environments, providing innovative solutions for learners and educators alike. Some prominent software, such as ChatGPT and QuillBot, have become increasingly popular due to their effectiveness in aiding writing and content creation. ChatGPT, an advanced AI-powered tool operated by OpenAI, allows learners to suggest and write high-quality texts, such as articles, essays, and academic assignments [16]. It supports learners with instant and continuous responses, encouraging them to adopt independent learning. Whereas, QuillBot enables learners to enhance their style of writing and offers them an innovative experience to improve the clarity of their writings. Previous research identified such tools as appropriate aids for non-native learners to understand complicated structures of English and improve the quality of their writings [17, 18]. Besides, the AI-powered tool Grammarly supports learners in proofreading and improving the linguistic structures of their writing by detecting errors encountered in style, punctuation, and syntax. These AI-powered resources assist learners in attaining high quality in their writing through presenting real-time suggestions and corrections for educational tasks.

In addition to writing support, AI plagiarism recognition tools are commonly used in higher education. These technologies intend to sustain the integrity of writings in academia. Common software in educational contexts for plagiarism detection is Turnitin. It analyzes submitted writings against an wide-ranging database of academic papers, articles, and websites to identify probable cases of plagiarism and enable students to understand proper citation practice, thereby maintaining academic integrity [19]. Thus, promoting self-regulated learning, providing personalized immediate feedback and learners' success are the consequences of implementing AI-powered tools in educational sector [20]. Yet, there is an increasing anxiety about the over-dependence of learners on these tools instead of refining their competences of critical

thinking and writing capabilities [21]. Nonetheless, these tools represent a wide tendency for the integration of AI-powered tools with higher education, enabling roadmap enhancement of student success within accepted academic standards [22].

2.2. Learners' Perceptions of AI in Education

Previous research on learners' perceptions toward AI-powered tools had been conducted. Studies display that several learners consider AI-powered tools like ChatGPT to be useful for academia, particularly in reduction of time and efforts in research. Recently, González, et al. [23] identified wide-ranging use of ChatGPT by leaners, due to the ability of the tool to conduct instant feedback and clarify complex thoughts, thus enabling them to understand course materials. Additionally, AI-tools can support learners in generating professional-quality writing and increase their confidence which is mainly beneficial for non-native English speakers or people encounter trials with their writing skills [23]. Therefore, understanding the main concepts that affect learners' motivation to accept and use AI-powered tools is crucial to enable its integration with educational settings.

As AI technology continue in influencing educational settings, thus the integration of these tools with academia is not only related to the advancement of the tools, but also correlated to the perceptions and acceptance of learners, especially in the developing countries [24]. Research had referred to some factors that might influence learners' usage of AI-powered tools, whereas willingness to implement AI tools can be considered as the prominent one [25]. Thus, attaining more in-depth understanding for these factors enables educators and policymakers to design strategies to overcome main obstacles, suggesting appropriate training, and fostering setting for further implementation of AI technologies in higher education. Carrying out these strategies contributes to effective integration of AI-powered tools, resulting in significant development of learning outcomes and personalized effective educational experiences for learners.

Even though the assistance offer by AI-powered tools to learners, but some worries expressed concerning the use and orientation of the tools in weakening learners' writing skills, eliminating learners' voice in written texts and over-dependance of learners on these tools that might resulted in reduction of their critical thinking skills Smith and Jones [26]. Koroleva and Jogezai [27] performed an investigation that identified an appreciated for suitable assistance offered by GAI tools, but numerous contributors stated anxieties for unnecessary dependence on AI-tools, that might weaken their skill over time. Another issue related to the possibility of misapplication or break integrity of the written text, especially in using tools such as Turnitin, which some learners distinguish as meddling instrument rather than helpful tool [28]. However, learners might encounter some sense of anxiety concerning the minor similarities that resulted in biased confidence in the tool [29]. In addition, the costs of using AI-powered tools or restrictions for using some tools in some educational contexts can lead to discrepancies in educational experiences, raising some questions regarding the fairness and comprehensiveness of AI application in educational settings [30]. Accordingly, overcoming these challenges through highlighting the necessity for hands-on procedures for the application of AI-powered tools, confirming the enhancement of educational experience rather than affect learners.

2.3. Artificial Intelligence and Learning Enhancement

Inspiring studies had shown an efficiency for AI-powered tools in evolving educational outcomes. Such outcomes encourage for advanced research, regarding personalized education and academic integrity. Accordingly, AI tools like ChatGPT can expand learners education, offering immediate support and feedback, besides enabling adaptive learning for individual needs [31, 32]. Accordingly, some of the AI-powered tools contributes to enhance learners' comprehension through enabling collaborative discourses, thus supporting learners in understanding of complicated notions and concepts more effectively. While, other tools such as QuillBot and Grammarly, meaningfully improve writing skills of learners as long as immediate supervision on syntax and style, thereby assisting them in revising their works [11]. Thus, non-native learners can have advanced assistance on language and sentence structure, thereby refining writing skill and learning outcomes [33]. Thus, AI-powered tools can present significant assistance for educators in evolving learning experience for learners, when performed properly, resulting in promising educational outcomes.

On top, AI tools contribute to strengthening student engagement by creating interactive and dynamic educational settings that surpass the responsiveness of conventional methods. Research indicates that continuous, context-specific feedback enhances student motivation by reinforcing progress and maintaining engagement with the content [34]. These systems adapt in real time to student responses, providing tailored explanations, recommending resources, and modifying task difficulty to align with the learner's abilities [35]. Currently, there is a growing demand for evidence regarding the effect of AI-powered tools for adaptive learning on student achievement [13, 15, 36-39]. These tools can significantly transform personalized learning by adjusting the difficulty level and types of learning materials to align with the specific needs of each learner. The present investigation is guided by the following hypotheses;

2.4. Hypotheses

H_1- Learners' comprehension and apprehension of AI-powered tools influence their motivation to use them for English language learning.

H_{1a}- Usefulness of AI-powered tools influences learners' motivation for continuous use.

H_{1b}- Ease of use influences learners' motivation to continue using AI-powered tools.

H_{1c}- Behavioral intentions influence learners' motivation to continue using AI-powered tools.

H_{1d}- Competence of learners influences their motivation to continue using AI-powered tools.

H_2- Behavioral intentions of learners influenced by challenges of AI-powered tools

2.5. Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology (UTAUT), first declared by Venkatesh, et al. [40], designates a noteworthy development of learners' attitudes during the investigation of technology acceptance. It is composed of eight important frameworks relating to the acceptance of technology, including the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), and Innovation Diffusion Theory (IDT), all of which provide measurements to investigate the complex questions relating to the acceptance of technology in diverse settings. The UTAUT model proposes a causal integration to predict and explain distinct awareness or social stimuli. Yet, the integrated model existing as UTAUT overcomes all the deficiencies reported with the implementation of any of the aforementioned models [41]. The advantage of considering UTAUT as one of the most systematic models offered in the field to measure technology acceptance is significant [13].

Four main concepts are the paradigms of UTAUT model that regulate technology acceptance. The concepts are Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. Performance Expectancy discusses to the deceptive practicality of utilizing technology to improve performance, which designates key role in the user's technology acceptance [42]. While, ease of using technology without employing high efforts or require advanced training referred as Effort Expectancy, research indicate that as much as the technology is ease to use, users are expected to indicates higher rates of acceptance [43]. Social influence refers to the influences of others, including colleges or educators, have influences on the decision users have toward technology. Lastly, Facilitating Conditions is the concept that refers to the external support available to users, including software, hardware and training, which increase the actual application of technology [42].

Hence, the flexible nature of UTAUT permit researchers to analyze technology acceptance in various countries, organization, industries and cultural settings. Even though, the employment of UTAUT to measure AI-specific factors, empowers designers and educationalists to design more effective approaches for developing the adoption of AI-powered tools in educational settings [44]. Hence, Figure 3 displays the conceptual model developed for the present research, that draws the interaction between research variables toward the addressed phenomenon.

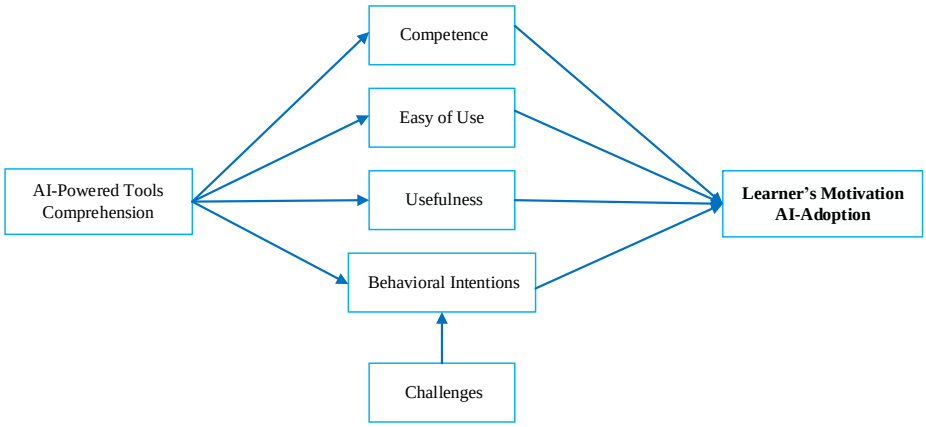

Figure 3.
Research Conceptual Model.

3. Methodology

The present study utilized a quantitative methodology grounded in a cross-sectional questionnaire framework. This was rationalized due to the aim of explaining the predicted associations among the variables of interest as outlined in the proposed hypotheses across educational levels, age, gender, and other factors in educational settings. The questionnaire for respondents was developed based on the questions of Van Niekerk, et al. [45] and Annamalai, et al. [46] for some of the research variables, while other questions were developed based on investigations in the previous literature. The questionnaire consisted of seven essential sections, with the first aimed at obtaining data on the respondents' demographics. The subsequent sections focused on critical variables, including comprehension, usage, usefulness, competence, and challenges in the context of using AI-powered tools, as well as the motivation for continuing usage. According to the norms proposed by Nuby, et al. [47] to evade the inclusion of questions that might cause any possible distress, discomfiture, or unpleasantly disturb the respondents, a five-point Likert scale ranging from Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree was employed, as shown in Appendix B. The scale aims to allow respondents to show their status of agreement or disagreement with the provided statements in the questions. The tool underwent two stages of validity before conducting the main data collection: first, the questions had been reviewed by experts, and then pilot testing was conducted to approve the trustworthiness of the questionnaire before the actual data collection.

The investigation had been conducted in Ten Iraqi universities, collecting responses from target population of 4,000 English Foreign Language learners. The respondents were undergraduate, master's, and doctoral students. The sample population was selected based on their use of AI-powered language assistance tools. At the outset of the forms, participants were informed of the research objectives and provided with detailing the process, along with a request for their consent. Data collection took place from November 2024 to January 2025 via an online link to feed student survey responses. Accordingly, a total of 351 responses were obtained from the sample. Benchmarking against the criteria established by Krejcie and Morgan

[48] as detailed in Appendix-C, regarding required number of respondents. This is due to a confidence level of 95% and a margin of error of 5%. The data collected was subjected to preliminary screening and error correction (including multiple entries, missing values, and outlier detection) prior to routine for analysis using Smart-PLS.4 software. The following section presents data analysis based on the relationships outlined in the proposed hypotheses, aimed at addressing the research questions within the context of the current study.

4. Findings

The demographic data of respondents on the research instrument are displayed in Table 1. The age group of 20–25 covered the largest number of respondents, with a frequency of 165, representing 47% of the total number of respondents. The lowest age category was respondents aged 36-40 years, as evidenced by a representation of 9%. The table indicates a greater number of male respondents compared to the number of females. This is substantiated by the respective percentages of 66% and 34%. In terms of AI-powered tools comprehension and usage, 76% of the respondents designate usage of Quill Bot, 67% use Grammarly, 64% use Turnitin, and 61% use ChatGPT. Nearly 53% of the total respondents were postgraduate students, in contrast to their undergraduate peers. Moreover, around 58% of the respondents used AI-powered tools in their education, in comparison to the 5% of the respondents who have used it for more than 10 years.

Table 1.
Demographics Data

Demo. Variable	Categories	Frequencies	Percentage
Age	20-25	165	47.0
	26-30	115	33.0
	31-35	39	11.0
	36-40	32	9.0
Gender	Male	231	66.0
	Female	120	34.0
AI-Powered Tool	Grammarly	235	67.0
	Quill Bot	267	76.0
	Turnitin	225	64.0
	Chat GPT	214	61.0
Education	Postgraduate	186	53.0
	Undergraduate	165	47.0
AI-Usage	2 Years	203	58.0
	5-8 Years	102	29.0
	10 Years	28	8.0
	More than 10 Years	18	5.0
Papulation Size	4000	Sample Size	351

4.1. Measurement Analysis Model

Two-stages analysis technique was employed using smart PLS-SEM, as proposed by Hair and Joe [49] and Sarstedt, et al. [50]. The internal consistency was attained through measurement model analysis. Table 2 determines that completely indicators athwart the variables of the survey exceeded the necessary threshold loading of 0.700 Hair and Joe [49]. The outer loadings wide-ranging from 0.712 to 0.911, as visually represented in Figure 4. Regarding the assessment of reliability through Cronbach's Alpha and other values exceeded the lowest threshold. Hair and Joe [49] indicates that acceptable value of AVE is 0.500, whereas the results show that all variables in this study successfully met the AVE criterion. Hence, the results confirmed that the model can positively confirm inner reliability and validity.

Table 2.
Measurement model analysis results.

Constructs	Outer loadings	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
B.I.1 <- Al-C & A	0.734	0.946	0.949	0.952	0.501
B.I.1 <- B.I.	0.804	0.802	0.804	0.863	0.559
B.I.2 <- B.I.	0.739				
B.I.2 <- Al-C & A	0.716				
B.I.3 <- Al-C & A	0.774				
B.I.3 <- B.I.	0.767				
B.I.4 <- B.I.	0.709				
B.I.5 <- B.I.	0.715				
CH.1 <- CH.	0.865	0.886	0.887	0.917	0.69
CH.2 <- CH.	0.807				

Constructs	Outer loadings	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
CH.3 <- CH.	0.74				
CH.4 <- CH.	0.823				
CH.5 <- CH.	0.908				
CO.1 <- CO.	0.805	0.873	0.883	0.907	0.662
CO.1 <- Al-C & A	0.797				
CO.2 <- CO.	0.815				
CO.3 <- CO.	0.881				
CO.3 <- Al-C & A	0.802				
CO.4 <- CO.	0.818				
CO.5 <- CO.	0.746				
E.U.1 <- E.U.	0.712	0.832	0.839	0.882	0.599
E.U.2 <- E.U.	0.762				
E.U.2 <- Al-C & A	0.721				
E.U.3 <- E.U.	0.773				
E.U.4 <- E.U.	0.787				
E.U.5 <- E.U.	0.832				
E.U.5 <- Al-C & A	0.724				
L.M.1 <- L.M.	0.786	0.922	0.924	0.934	0.587
L.M.10 <- L.M.	0.757				
L.M.2 <- L.M.	0.776				
L.M.3 <- L.M.	0.751				
L.M.4 <- L.M.	0.758				
L.M.5 <- L.M.	0.728				
L.M.6 <- L.M.	0.797				
L.M.7 <- L.M.	0.751				
L.M.8 <- L.M.	0.796				
L.M.9 <- L.M.	0.755				
U.1 <- U.	0.791	0.85	0.856	0.893	0.626
U.1 <- Al-C & A	0.752				
U.2 <- Al-C & A	0.814				
U.2 <- U.	0.822				
U.3 <- Al-C & A	0.725				
U.3 <- U.	0.786				
U.4 <- U.	0.721				
U.5 <- U.	0.831				
U.5 <- Al-C & A	0.817				

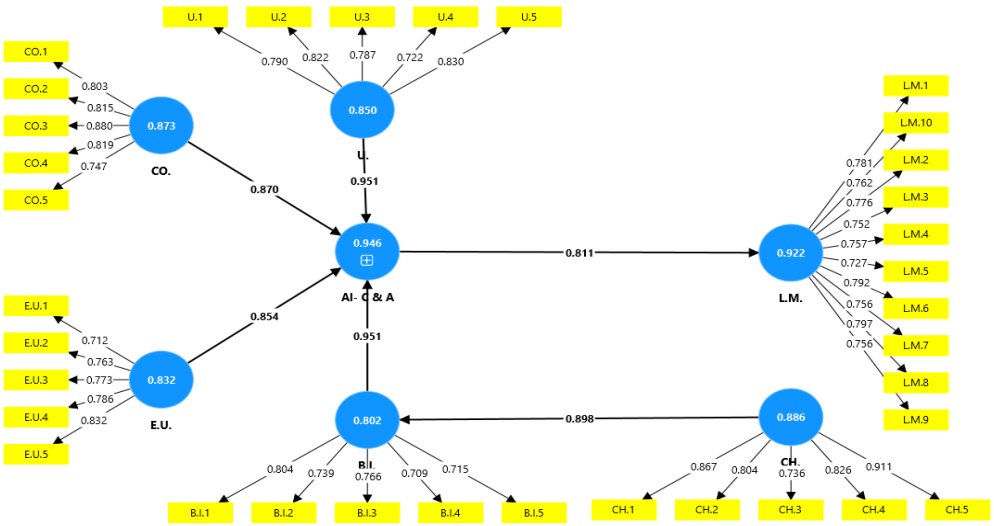

Figure 4.
PLS-Algorithm for confirmatory factor.

Examining the unique features of each variable in the suggested model is crucial for precisely determining their roles in enhancing the model's validity and explanatory capacity [51]. HTMT value proposed by Sarstedt, et al. [52] serves as a dependable metric for this criterion in the model that should not exceed 0.900. Table 3 displays attainment of discriminant validity, the suggested correlation coefficient between any two variables between 0.523 to 0.889. The values derived from different variables suggest that each factor exhibited distinct characteristics within the model. Therefore, discriminant validity has been established.

Table 3.
Discriminate validity (HTMT).

Variables	Al-C & A	B.I.	CH.	CO.	E.U.	L.M.	U.
Al-C & A	0						
B.I.	0.524	0					
CH.	0.623	0.723	0				
CO.	0.546	0.889	0.653	0			
E.U.	0.661	0.542	0.632	0.669	0		
L.M.	0.856	0.523	0.644	0.759	0.674	0	
U.	0.582	0.621	0.721	0.885	0.886	0.734	0

Collinearity is crucial for errors' reduction within estimated paths' significance [53]. They recommended assessing variance inflation factor (VIF) to identify collinearity or multicollinearity in a model. Thus, VIF values should not exceed 3.300, for any interaction between dependent and independent variables. The present analysis values for VIF are showed in Table 4, starting from 2.407 for the correlation between AI- comprehension & appreciation, and learners' motivation. The remaining values ranged from 2.672 to 3.012, indicating that the model was suitable for subsequent significance analysis, due to lacking of multicollinearity.

Table 4.
Inner Model- Variance inflation factor (VIF).

Variables	VIF
Al-C&A -> L.M.	2.407
B.I. -> Al-C&A	3.012
CH. -> B.I.	1.000
CO. -> Al-C&A	2.672
E.U. -> Al-C&A	2.857
U. -> Al-C&A	2.931

4.2. Structural Analysis Model

The assessment of predicted paths within the model requires the utilization of 5000-bootstrap PLS-SEM. The analysis results are displayed in Table 5 and illustrated in Figure 5. Table 5 indicates that comprehension of AI-powered tools influences learners' motivation for continuous use and appreciation. The significant values obtained are SM = 0.830 and p = 0.000 for all the constructs. Validity is supported by the unidirectional nature of the confidence interval values associated with the projecting paths. The correlation between challenges and behavioral intentions showed significant outcomes toward learners' motivation to continue using AI-powered tools (OS = 0.898, SM = 0.905, SD = 0.028, p = 0.000). The multidimensional nature of interval values confirms this. Figure 5 illustrates that the items' outer weights across the models' constructs are adequate, thereby providing supplementary model validation.

Table 5.
Path's significance results.

Hypotheses	Variables	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T statistics (|O/STDEV|)	P-Values
H.1	Al- C & A -> L.M.	0.811	0.830	0.055	14.779	0.000
$H.1_a$	U. -> Al- C & A	0.302	0.304	0.024	12.459	0.000
$H.1_b$	E.U. -> Al- C & A	0.225	0.219	0.032	6.924	0.000
$H.1_c$	B.I. -> Al- C & A	0.288	0.290	0.025	11.698	0.000
$H.1_d$	CO. -> Al- C & A	0.283	0.280	0.032	8.856	0.000
H.2	CH. -> B.I.	0.898	0.905	0.028	32.094	0.000

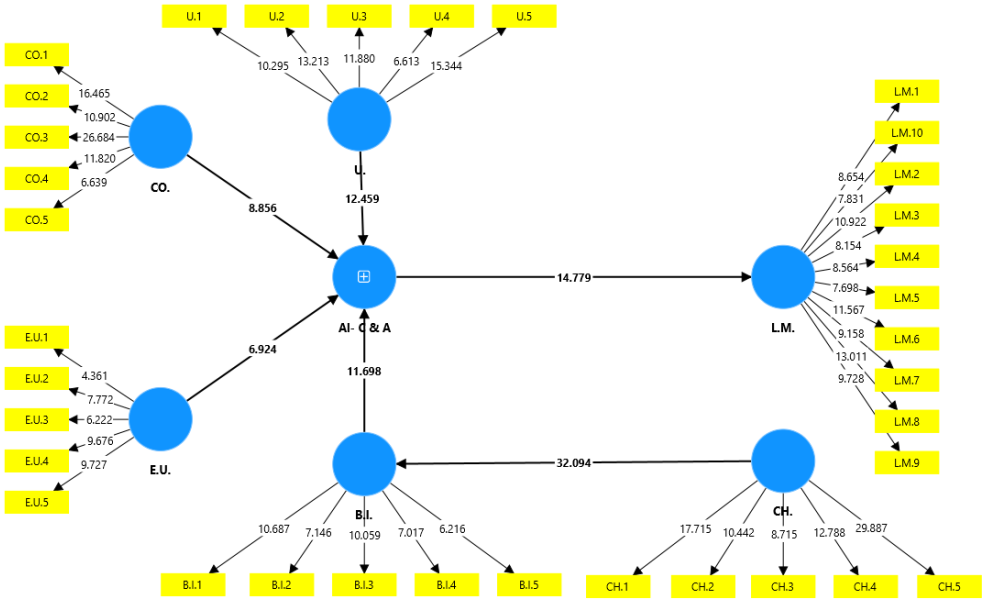

Figure 5.
Bootstrap image results.

Determination coefficient (R^2) was used to assess total variance of the model. Table 6 illustrates the model's explanatory power. The structural model accounted for 87.3% of total variance, as indication to continue using the primary dependent variable. The tested model in this study accounted for over 87% of the variance in learners' motivation to continuously use AI-powered tools for English language learning. This rate of motivation is extensive as stated by Hair, et al. [54] despite around 13% of the variance in learners' motivation are not motivated for continuous use, due to some suspects of AI adoption in learning experience.

Table 6.
Determination Coefficient (R^2).

Variables	R-square	R-square adjusted
Al- C & A	0.832	0.827
B.I.	0.807	0.801
L.M.	0.621	0.609

The last analysis utilizing Importance-Performance Map Analysis (IPMA) was performed to examine the relevance of the direct antecedents of AI-powered tools comprehension to motivate continuous usage and to compare their importance. It has been designated that usefulness, behavioral intentions, and competencies are considered the primary antecedents required for motivating learners to continue using AI-powered tools. AI comprehension represents the highest performing antecedent of learners' motivations. Figure 6 presents the map that validates the results of IPMA.

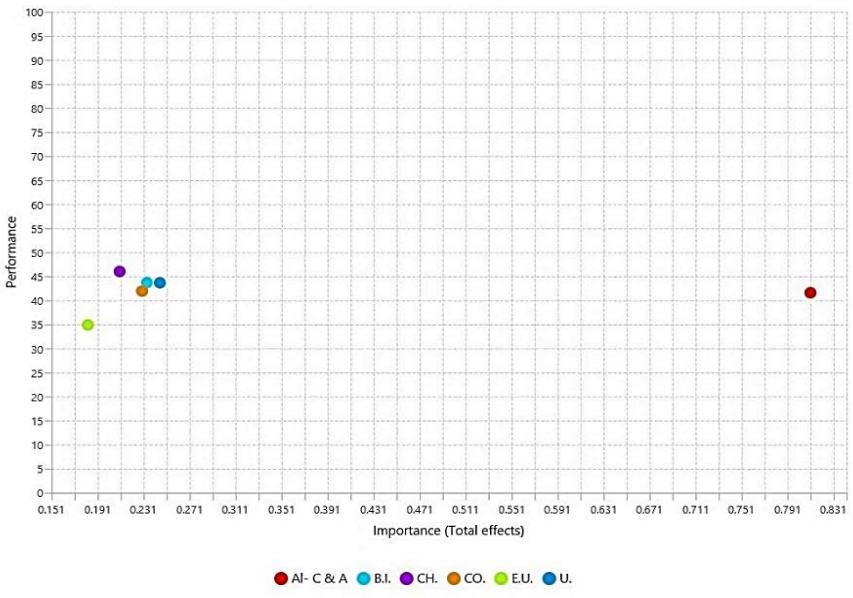

Figure 6.
Importance Performance Map.

5. Discussion

According to the data reported in the preceding section, learners' understanding of AI-powered tools, such as implementation, simplicity of use, competency, and behavioral intents, had a significant influence on their willingness to continue using them. As a result, the data demonstrated the correlations between the study's variables, providing significant answers to the research questions and validating the provided hypotheses. Furthermore, learners' use of AI-powered tools for English language acquisition revealed successful nonlinear dependence on their teachers or supervisors inside the educational environment. These findings are consistent with the indications presented via [46] on the independence of learners in acquiring new knowledge. Furthermore, the findings provided vital insight into the idea of learning beyond boundaries, since the respondents demonstrated unlimited access to the information that AI-powered technologies provide for them. These findings corroborate prior findings provided in the literature by Ahn [55], and Rahiman and Kodikal [56].

Results provided an obvious response to the present study questions. The postulated variables' correlation within the specified framework allowed for the hypothesized correlations. Whereas usefulness, behavioral goals, simplicity of use, and skills all had strong connections with learners' comprehension and anxiety regarding the use of AI-powered technologies. Those results stemmed from the ongoing use of AI-powered technologies in learner instruction. Furthermore, the effectiveness of AI-powered tools and learners' goals to improve their educational experience and academic results provided a sense of confidence in continuing to utilize them. These indicators helped to improve their ability to use AI-powered tools and increase their competencies in utilizing those technologies for English language acquisition. The significant multidimensional connection between variables in the current study framework suggests that students' usage of AI-powered tools becomes increasingly regular and intensive, as does their competency in their use within an educational setting. As a result, the more they utilize AI tools, the more competent students perceive themselves to be in utilizing them in various techniques to learn English, which confirmed previous findings [12, 46].

As a consequence, learners' comprehension of AI-powered tools is significantly correlated with learners' inclinations to use technology. This signal is strongly evident in the statistical link between the two variables. When students ask questions or need help with their English language comprehension and structure, AI-powered tools provide the simplest and most efficient response tool. This technique fosters the rapid engagement and acceptance of AI-powered solutions within educational settings. These indications are supported by the findings of the previous literature presented by Dobrescu, et al. [57] and Šumak, et al. [58]. Furthermore, prior research identified substantial issues with the deployment of AI-powered solutions. The proposed study approach revealed a substantial association between the problems of utilizing AI-powered tools and learners' behavioral objectives. This link has a considerable influence on the association between learners' behavioral intents and their comprehension and apprehension of AI-powered technologies, which is addressed by the construct with the largest factor loading among the others in the framework. Thus, learners' comprehension of the issues presented by AI-powered technologies might lead to the implementation of new approaches to prevent such challenges. Yang [59]; Dobrescu, et al. [57] and Šumak, et al. [58] have already found similar results.

Furthermore, the postulated correlations within the context of the UTAUT model demonstrated a strong correlational significance between the variables that included the predicted impacts of simplicity of use and utility of AI-powered technologies on the UTAUT model's performance and effort expectations. The current study reveals and supports these links through empirical evaluation. The development of such a correlation is anticipated to stimulate regular usage of AI-powered tools and improve learners' perception of competency in a language learning setting. The substantial implications afforded by technology help to increase learners' abilities and engagement in studying English. Thus, students improved their skills in using AI-powered tools to study English. The UTAUT model's supportive circumstances shed light on these norms, leading to better rates of technology adoption in educational settings [13, 42, 43].

In conclusion, the study identified significant consequences for learners' comprehension and apprehension regarding the ongoing use of AI-powered products. These findings are in line with those of Annamalai, et al. [46], and Bongcac and Pabalan [60]. However, the effects of competence and challenges were not significant in predicting the ongoing usage of AI-powered products. This finding contradicts the positions taken by Sabah [61]; Ibarra-Vazquez, et al. [62] and Hmoud, et al. [63] respectively. For the current study's participants, institutional support in the form of infrastructure preparation, training, and supervision had a major influence on their willingness to continue using AI technology. The benefits of utilizing AI-powered technologies may outweigh the limitations associated with their use in English teaching and learning. This reveals the partial impact of difficulties on learners' motives for future use of AI-powered technologies in the context of higher education in Iraq.

6. Implication

The proposed correlations in the current study framework were evaluated throughout the UTAUT model and approved for their significance and trustworthiness. As a result, the current investigation's implications are divided into two categories: theoretical implications and empirical implications. The newly tested correlations throughout the model added to the UTAUT model's usefulness and reliability in investigating suggested constructs. Furthermore, the essential dimensions of performance, effort expectation, social influences, and facilitating conditions allowed for a more in-depth assessment of learners' comprehension of AI-powered tools and the reasons for their continued use. As a result, creating the circumstances for learner self-reliant learning is influenced by ethical concerns regarding the interaction relationship between learners and AI-powered technologies in the context of learning. Thus, the development of a multidimensional model was enabled based on the major routes' interaction between the constructs of the current research and learners' incentives to use AI-powered products.

The second aspect is related to the practice and policies of education; the findings of the research illustrate the necessity to expose learners, especially in the higher education context, to the interaction between AI and educational goals. This behavior contributes to a better understanding of the challenges and facilitates the ethical usage of AI-powered tools within educational settings. Meanwhile, the constant development of AI-powered tools matches the number of learners using these technologies in the coming generations. These claims are supported by the high number of AI-powered tool users between the ages of 20-25, particularly among undergraduates compared to postgraduate respondents. Additionally, fostering learners' comprehension of the usage and usefulness of AI-powered tools contributes to developing their competencies and motivating their behavioral intentions for the future implementation of generated technologies in education. Lastly, the present research offers developers of modern AI-powered tools in education a more in-depth understanding of the facilitating factors that control the acceptance of technologies from learners' perspectives. Thus, focusing on specific requirements contributes to fostering human-AI interaction design for continuous motivation through sustainable engagement to support AI-enhanced learning environments.

7. Recommendations for Future Research

Although the number of significant findings presented in this study is worthy of acknowledgment, it is important to recognize its limitations. First, the present study focused mainly on collecting quantitative data through a survey questionnaire, which might miss valuable insights into the respondents' attitudes and opinions that could provide further explanations through implementing qualitative interviews. These interviews may enrich our understanding of the facilitating factors that control learners' comprehension of AI-powered tools and their future usage. Thus, the implementation of mixed-methods research is highly recommended for investigating the present research phenomena. Second, the cross-sectional nature of the present research might miss additional evidence on the motivations of learners to use AI-powered tools inside and outside educational settings. Therefore, longitudinal studies are recommended for future research that may offer insights into learners' behaviors, preferences, and trends toward the use of AI-powered tools for English language learning.

Lastly, the present investigation did not consider the moderating impacts of age and gender on the motivations to use AI-powered tools. Thus, further examination of these factors may enhance the classification of the findings toward a more detailed understanding of the phenomenon under investigation. The large amount of data and the number of pages for a single study were the main reasons behind the limitations identified after the completion of the present study. Hence, further investigations regarding these anxieties are required in future research.

Acronyms Map

Demographic Questions = D.Q
Unified Theory of Acceptance and Use of Technology = UTAUT
A.I Comprehension & Apprehension = A.I C & A
Usefulness = U.
Ease of Use = E.U.
Behavioral Intensions = B.I.
Competence = CO.
Challenges = CH.
Learners' Motivation = L.M.

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Appendix

Appendix A.
Literature Survey Queries.

Digital Library	Query / Search terms	No. of Articles
Science Direct	("student" OR "learner" OR "pupil" OR "scholar") AND ("acceptance" OR "adoption" OR "attitude" OR "perception") AND ("artificial intelligence" OR "ai" OR "machine learning" OR "intelligent systems") AND ("tools" OR "resources" OR "technologies" OR "applications").	202
Web of Science	("student" OR "learner" OR "pupil" OR "scholar") AND ("acceptance" OR "adoption" OR "attitude" OR "perception") AND ("artificial intelligence" OR "ai" OR "machine learning" OR "intelligent systems") AND ("tools" OR "resources" OR "technologies" OR "applications").	159
springer	("student" OR "learner" OR "pupil" OR "scholar") AND ("acceptance" OR "adoption" OR "attitude" OR "perception") AND ("artificial intelligence" OR "ai" OR "machine learning" OR "intelligent systems") AND ("tools" OR "resources" OR "technologies" OR "applications").	395

Sage Publications	("student" OR "learner" OR "pupil" OR "scholar") AND ("acceptance" OR "adoption" OR "attitude" OR "perception") AND ("artificial intelligence" OR "ai" OR "machine learning" OR "intelligent systems") AND ("tools" OR "resources" OR "technologies" OR "applications").	857
Scopus	("student" OR "learner" OR "pupil" OR "scholar") AND ("acceptance" OR "adoption" OR "attitude" OR "perception") AND ("artificial intelligence" OR "ai" OR "machine learning" OR "intelligent systems") AND ("tools" OR "resources" OR "technologies" OR "applications").	5130
Total of articles collected until 20 Dec. 2024		6743

Appendix B.

Survey Questionnaire.

Thank you for participating in this survey on the use of AI-powered tools in education. The purpose of this questionnaire is to gather insights and perspectives on how artificial intelligence (AI) technologies are being integrated into educational environments. Your responses will help us understand the benefits, challenges, and potential impacts of AI tools on teaching and learning. The survey is anonymous, and your honest feedback is invaluable in shaping the future of AI in education. Please take a few minutes to answer the questions based on your experiences and opinions. Please tick as applicable;

1. **STRONGLY AGREE**.
2. **AGREE**.
3. **NEUTRAL**.
4. **DISAGREE**.
5. **STRONGLY DISAGREE**.

Section One: Demographic Question

1. Your Age
2. Your Gender? Male – Female – Prefer not to answer.
3. What are the tools that used to use in your field of study?
   (Grammarly, Quill Bot, Chat GPT and Turnitin)
4. What is your education level? (**Undergraduate, Postgraduate**)
5. How many years of using AI powered tools?

Section Two: Usefulness

1- Using AI powered tool would improve the structure and flow of my writing.
2- AI powered tool can provide critical insight into the topics I want to write about.
3- AI powered tool helps me to write concisely.
4- AI powered tool helps me to present arguments objectively.
5- AI powered tool helps me to write in a formal tone.

Section Three: Ease of Use

1- It is easy to use AI powered tool to improve the structure and flow of my writing.
2- It is easy to use AI powered tool to provide critical insight into the topics I want to write.
3- It is easy to use AI powered to write concisely.
4- It is easy to use AI powered tool to present arguments objectively.
5- It is easy to use AI powered tool to write in a formal tone.

Section Four: Behavioral Intension

1- I use AI powered tools because I get a feeling of satisfaction when finding out words, phrases and expressions.
2- I use AI powered tools because I get stimulated to learn English.
3- I use AI powered tools because I want to have mastery in English writing.
4- I use AI powered tools because it helps me to get good grades.
5- I use Ai powered tools because it is important for my future.

Section Five: Competence

1- I believe I am talented to use AI powered tools.
2- I do well in using AI powered tools as compared to my other colleagues.
3- I feel pretty confident about my AI powered tools usage skills.
4- I am satisfied with my ability to use AI powered tools in English language.
5- I am pretty skilled at using AI powered tools in preparing my assignments.

Section Six: Challenges

1- AI powered tools sometimes provides incorrect or misleading information.
2- AI powered tools results in biased outputs which perpetuate harmful stereotypes.
3- AI powered tools can reduce my critical thinking and problem-solving skills.
4- AI powered tools could be used for academic dishonesty, such as plagiarism or copying answers.
5- AI powered tools may be impacted by technical issues, such as network connectivity or software compatibility, which could disrupt the practical and interactional experience.

Sections Seven: Motivations for continuous use of AI-powered tools

1- Your will continue using AI-powered tools.
2- AI-powered tools are beneficial for your learning process.
3- The information provided by AI-powered tools are accurate.
4- AI-powered tools make learning more efficient compared to traditional learning methods.
5- Using AI-powered tools increase your motivation to study or complete assignments.
6- Features of AI-powered tools make learning experience more engaging.
7- Use of AI-powered tools impact your overall academic performance.
8- AI-powered tools help you overcome learning obstacles, such as difficulty in understanding concepts or time constraints.
9- More personalized content encourages you to use AI-powered learning tools more regularly.
10- Overdependence on AI-powered tools reduce your mental abilities and academic skills.

Thank you for your participation!

Appendix C.

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	103	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note: (***N)*** is population size. (***S)*** is sample size
Source: Krejcie and Morgan [48].